ENTERED

DEPARTMENT OF THE AIR FORCE
HEADQUARTERS 49TH WING (ACC)
HOLLOMAN AIR FORCE BASE, NEW MEXICO

MAR 06 2012

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Deputy Base Civil Engineer
550 Tabosa Avenue
Holloman AFB NM 88330-5840

New Mexico Environment Department
Attn: Mr. John Kieling (Acting Chief)
Hazardous Waste Bureau
2905 Rodeo Park Drive East, Building 1
Santa Fe NM 87105-6303

Dear New Mexico Environment Department

Holloman Air Force Base is pleased to submit the RCRA Facility Investigation Work Plan Group 2 (Five former UST sites) for your review.

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision according to a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

If you have any questions, please contact Mr. David Scruggs of our Asset Management Flight at (575) 572-5395.

Sincerely

1 Mar 2012

A. DAVID BUDAK, GS-14, DAFC

Attachment:
RCRA Facility Investigation Work Plan Group 2 (Five former UST sites)

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Final
RCRA Facility Investigation Work Plan
Group 2 - Five Former UST Sites
Holloman Air Force Base, New Mexico

Prepared for U.S. Air Force Center for Engineering and the Environment
2261 Hughes Ave., Suite 155
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Contract No. FA8903-09-D-8580, Task Order No. 0013
Project No. 144106
Revision 0
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Table of Contents

Table of Contents (continued)

List of Tables

List of Figures

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • February 2012 • WERC-09-13-019

List of Appendices

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • February 2012 • WERC-09-13-019

Acronyms and Abbreviations

°F	degrees Fahrenheit
AFB	Air Force Base
AFCEE	Air Force Center for Engineering and the Environment
ASTM	ASTM, International
bgs	below ground surface
COC	constituent of concern
CY	cubic yards
DPT	direct push technology
DRO	diesel range organics
EPA	U.S. Environmental Protection Agency
ERPIMS	Environmental Resources Program Information Management System
GIS	Geographic Information System
GRO	gasoline range organics
HSA	hollow-stem auger
ID	identification
IDW	investigation-derived waste
MCL	maximum contaminant level
mg/kg	milligrams per kilogram
mg/L	milligrams per liter
mL	milliliter
NMAC	New Mexico Administrative Code
NMED	New Mexico Environment Department
NMOSE	New Mexico Office of the State Engineer
NMWQCC	New Mexico Water Quality Control Commission
NTU	Nephelometric Turbidity Unit
ORO	Oil Range Organics
OVA	organic vapor analyzer
PBR	Performance-Based Remediation
PPE	personal protective equipment
QAPP	Quality Assurance Project Plan
QC	quality control
QPP	Quality Program Plan
RCRA	Resource Conservation and Recovery Act
RFI	RCRA Facility Investigation
RSL	Regional Screening Level
SAP	Sampling and Analysis Plan
SC	specific conductance
Shaw	Shaw Environmental & Infrastructure, Inc.
SOP	standard operating procedure

Acronyms and Abbreviations (continued)

SSHP	Site Safety and Health Plan
SSL	soil screening level
SVOC	semivolatile organic compound
TAL	target analyte list
TDS	total dissolved solids
TPH	total petroleum hydrocarbons
UFP	Uniform Federal Policy
URS	URS Corporation
U.S.	United States
UST	underground storage tank
VCM	Voluntary Corrective Measure
VOC	volatile organic compound
WSMR	White Sands Missile Range

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • February 2012 • WERC-09-13-019

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • February 2012 • WERC-09-13-019

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1.0 INTRODUCTION

This Resource Conservation and Recovery Act (RCRA) Facility Investigation (RFI) Work Plan has been prepared by Shaw Environmental & Infrastructure, Inc. (Shaw) for the Air Force Center for Engineering and the Environment (AFCEE) under Contract FA8903-09-D-8580, Task Order No. 0013, Modification 01. This Work Plan presents the approach for investigation of five former underground storage tank (UST) sites located at Building 2395 (TU/US-C502), Building 1272 (TU/US-C507), Building 882 (TU/US-C514), Building 889 (TU/US-C515), and Building 684 (TU/US-C516), at Holloman Air Force Base (AFB), New Mexico, which are also referred to as the Group 2 UST sites under the Midwestern Region Performance-Based Remediation (PBR) Contract with AFCEE. This RFI Work Plan has been prepared pursuant to the requirements of the Holloman AFB Hazardous Waste Facility RCRA Permit Number NM6572124422 (the Permit) (New Mexico Environment Department [NMED], 2004).

This RFI is being submitted concurrently with a Voluntary Corrective Measure (VCM) Request. The VCM Request proposes to remove a maximum of 40 cubic yards (CY) of soil at each UST site as part of accelerated corrective action activities for the Midwestern Region PBR Contract. During the performance of VCM activities, if it is determined that additional soil, in excess of 40 CY, must be removed at any of the five former UST sites, this work plan will be implemented to determine the nature and extent of contamination at the site and propose recommendations for additional corrective action.

To meet the project objectives, this work plan provides current site-specific information for the five former UST sites, and employs the approach used in the NMED-approved *Basewide Septic Tank Solid Waste Management Units, RCRA Facility Investigation Work Plan, Holloman AFB, New Mexico* (URS Corporation [URS], 2010). The RFI sampling program is designed to evaluate the nature and extent of hydrocarbon contamination at each of the five former UST sites, based on VCM activities and results.

Holloman AFB is situated in south-central New Mexico, in the northwest central part of Otero County, approximately 75 miles north-northeast of El Paso, Texas (Figure 1-1). The five former UST sites are located throughout Holloman AFB (Figure 1-2). Each former UST is positioned adjacent to a building; as a result, each UST is named in reference to its most proximal building (Building 2395 [TU/US-C502], Building 1272 [TU/US-C507], Building 882 [TU/US-C514], Building 889 [TU/US-C515], and Building 684 [TU/US-C516]). Site descriptions for the former USTs are presented in Table 1-1. Each of the five USTs have been excavated and removed from the ground, as indicated in the Midwestern Region PBR Contract Statement of Objectives. The USTs were removed in the 1990s;

minimal information is available for the USTs located at Buildings 684 (TU/US-C516), 889 (TU/US-C515), and 1272 (TU/US-C507). The USTs at the remaining buildings ranged in size from 100 gallons to 10,000 gallons. Available analytical results indicate low concentrations of volatile organic compounds (VOCs) or total petroleum hydrocarbons (TPH) in soil associated with the UST sites, but there are no records to show that soil remediation was performed.

1.1 Purpose and Objectives

The objective of this RFI at each of the five former UST sites is to delineate potential constituents of concern (COCs) that may have been released to the environment, and provide physical and spatial data to allow for design and implementation of future remedial measures as required.

Project quality objectives for each UST site consist of the following:

- Gather and review all site historical information
- Identify UST components and historical uses
- Communicate and gain acceptance of planned investigatory measures with all stakeholders
- Determine the nature and extent of potential COCs at each site
- Evaluate the risk at each site
- Develop remedial options for each site.

The RFI Work Plan presents the technical approach and associated quality parameters designed to meet these project quality objectives.

1.2 Scope of Activities

This RFI Work Plan describes all activities associated with the advancement and sampling of boreholes, as well as the installation and sampling of three groundwater monitoring wells at each site. The tasks described in this work plan will be performed in accordance with the Quality Program Plan (QPP) (Shaw, 2012). The QPP contains the Site Safety and Health Plan (SSHP), which describes the health and safety guidelines developed by Shaw to protect Shaw personnel, subcontractors, and government personnel involved in the project at Holloman AFB. The Uniform Federal Policy (UFP)–Sampling and Analysis Plan (SAP)/Quality Assurance Project Plan (QAPP) presented in the QPP establishes the analytical and data collection protocols and documentation requirements necessary to ensure data are generated, reviewed, and analyzed in a consistent manner. The program UFP-

SAP/QAPP was prepared in accordance with the *Uniform Federal Policy (UFP) for Quality Assurance Project Plans (QAPPs): Evaluating, Assessing, and Documenting Environmental Collection and Use Programs Part 2A: UFP-QAPP Workbook* (Intergovernmental Data Quality Task Force, 2005). The Construction Quality Plan of the QPP defines the methodology and practices to control construction work quality during the performance of this work plan. A hard copy of the QPP will be present on site during the performance of the tasks described herein and is also provided on compact disc as Appendix A.

1.3 Regulatory Setting

The Permit (NMED, 2004) establishes the general and specific standards and activities for managing hazardous waste pursuant to Subtitle C of RCRA, the New Mexico Hazardous Waste Act, and the New Mexico Hazardous Waste Management Regulations. The Permit also sets forth requirements for investigation, notification, corrective action, and reporting for the storage, management, and releases of hazardous wastes. Because NMED has primary regulatory responsibility corrective action must be performed under Title 20 New Mexico Administrative Code (NMAC). The proposed RFI will be based upon the action/cleanup levels stipulated in Appendix 4-F of the Permit to be protective of human health and the environment. Permit Appendix 4-F specifies the use of the NMED residential soil screening levels (SSLs), as presented in the *Risk Assessment Guidance for Site Investigations and Remediation* (NMED, 2012), and the United States (U.S.) Environmental Protection Agency's (EPA) Regional Screening Levels (RSLs) if no SSL is available (EPA, 2011). Holloman AFB also has NMED-approved background concentrations for metals in soil (NMED, 2011a). For groundwater, the Permit specifies that the more stringent value of either the New Mexico Water Quality Control Commission (NMWQCC) groundwater quality standards or the EPA maximum contaminant levels (MCLs) is used for comparison with measured sample concentrations (EPA, 2010).

The individual USTs are not listed on the Permit either as sites requiring corrective action or as corrective action complete (NMED, 2004; NMED, 2005). However, AOC-D (SD-26 Building 882 Spills) is listed as an area of concern not currently requiring corrective action (NMED, 2005).

1.4 RFI Work Plan Organization

This RFI Work Plan is organized into the following sections:

- Section 1.0 – Introduction: Identifies the objectives and purpose of this plan.
- Section 2.0 – Physical and Environmental Setting: Provides pertinent descriptions of history, location, physiography, topography, surface water, hydrology, regional

geology, soils, regional hydrogeology, climate, current and future land, and current and future water use for Holloman AFB.

- Section 3.0 – Technical Approach and Investigative Activities: Presents the approach for collection of data to meet primary project objectives.
- Section 4.0 – Field Investigation Methods: Details the proposed field techniques and analytical requirements.
- Section 5.0 – Project Quality Assurance: Includes summary discussions pertaining to data quality objectives, standard operating procedures (SOPs), sample identification, and project documentation.
- Section 6.0 – Project Schedule
- Section 7.0 – References

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • February 2012 • WERC-09-13-019

Table 1-1
Group 2 (Five Former UST Sites) Descriptions

Site Name	Site ID	Site Description
Holloman AFB		
Building 2395	TU/US-C502	Records indicate that a 1000-gallon diesel UST was removed from Building 2395 in 1990. There were no records to indicate whether there was evidence of spills/leaks and no samples to show whether the site was contaminated.
Building 1272	TU/US-C507	Soil sample results from 1991 associated with Building 1272 indicate TPH contamination of 268 mg/kg. There are no records to indicate what these sampling results are associated with, however the results are included with a report that lists sampling results for UST removal locations. It is assumed that a UST associated with Building 1272 was removed. There are no records to indicate whether the site was remediated.
Building 882	TU/US-C514	Records indicate that a 110-gallon gasoline UST associated with Building 882 was removed in 1990. Sample results indicate xylenes contamination of 2,900 µg/kg in the soil; however there are no records to indicate that the site was remediated.
Building 889	TU/US-C515	Records indicate that a UST associated with Building 889 was closed in 1992. There are no records available to identify the size, contents, or possible contaminants associated with the tank.
Building 684	TU/US-C516	Records indicate that a UST associated with Building 684 was closed in 1991. There are no records to indicate the size, contents, or possible contamination associated with the tank.

µg/kg denotes microgram per kilogram.
AFB denotes Air Force Base.
ID denotes identification.
mg/kg denotes milligrams per kilogram.
TPH denotes Total petroleum hydrocarbons.
UST denotes Underground storage tank.

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • February 2012 • WERC-09-13-019

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • February 2012 • WERC-09-13-019

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OFFICE: HOU

LEGEND

Holloman AFB

N

WGS 84 UTM ZONE 13N METERS

0 20 40 80
Kilometers

0 10 20 40
Miles

Shaw

Figure 1-1

Holloman
Air Force Base (AFB)
Location

New Mexico

BACK OF FIGURE

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • February 2012 • WERC-09-13-019

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- Holloman AFB
- Group 2 UST Sites

N

WGS 84 UTM Zone 13N
Meters

1 inch = 2,750 feet

0 700 1,400 2,800
Feet

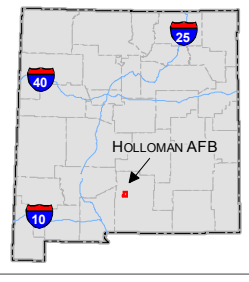

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Figure 1-2

Holloman
Air Force Base (AFB)
Group 2 UST Locations

Holloman AFB, NM

BACK OF FIGURE

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • February 2012 • WERC-09-13-019

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • February 2012 • WERC-09-13-019

2.0 PHYSICAL AND ENVIRONMENTAL SETTING

2.1 Physical Setting

Holloman AFB is situated in south-central New Mexico, in the northwest central part of Otero County, approximately 75 miles north-northeast of El Paso, Texas (Figure 1-1). Holloman AFB has a population of 6,000 and occupies about 50,000 acres. The White Sands Missile Range (WSMR) testing facilities occupy additional land extending northward from the base. Private and public owned lands border the remainder of Holloman AFB. The major highway servicing Holloman AFB is Highway 70, which runs southwest from the town of Alamogordo and separates Holloman AFB from publicly owned lands to the south. Alamogordo, which has a population of 30,401 according to the 2010 U.S. Census, is located about 7 miles east of the base.

2.2 Holloman Air Force Base History

Holloman AFB was first established in 1942 as Alamogordo Army Air Field. From 1942 through 1945, Alamogordo Army Air Field served as the training grounds for over 20 different flight groups, flying primarily B-17s, B-24s, and B-29s. After World War II, most operation had ceased at the base. In 1947, Air Material Command announced the air field would be its primary site for the testing and development of unmanned aircraft, guided missiles, and other research programs. On January 13, 1948, the Alamogordo installation was renamed in honor of the late Colonel George V. Holloman; a pioneer in guided missile research. In 1968, the 49th Tactical Fighter Wing arrived at Holloman AFB and has remained since. Today, Holloman AFB also serves as the training center for the German Air Force's Tactical Training Center.

2.3 Physiography and Topography

Holloman AFB is located within the Sacramento Mountains physiographic province on the western edge of the Sacramento Mountains. The base is approximately 59,600 acres in area, and is located at a mean elevation 4,093 feet above mean sea level. The region is characterized by high tablelands with rolling summit plains; cuesta-formed mountains dipping eastward and of west-facing escarpments with the wide bracketed basin forming the basin and range complex. Holloman AFB is located in the Tularosa Basin which is part of the Central Closed Basins. The bordering mountains rise abruptly to altitudes of 7,000 to 12,000 feet above mean sea level. The San Andres Mountains bound the basin to the west (about 30 miles) with the Sacramento Mountains approximately 10 miles to the east (Figure 2-1). At its widest, the basin is about 60 miles east to west and stretches approximately 150 miles north to south. The former UST sites are located throughout the base.

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • February 2012 • WERC-09-13-019

2.4 Climate

As a whole, New Mexico has a mild, arid to semiarid continental climate characterized by light precipitation totals, abundant sunshine, relatively low humidity, and relatively large annual and diurnal temperature ranges (Western Regional Climate Center, 2003). The climate of the Central Closed Basins varies with elevation. The base is located in the low areas and is characterized by warm temperatures and dry air. Daytime temperatures often exceed 100 degrees Fahrenheit (°F) in the summer months and are in the middle 50s in the winter. A preponderance of clear skies and relatively low humidity permits rapid time cooling resulting in average diurnal temperature ranges of 25 to 35°F. Potential evapotranspiration, at 67 inches per year, significantly exceeds annual precipitation, usually less than 10 inches. Arid conditions resulting from very low rainfall amounts, coupled with the topographically induced wind patterns combining with the sparse vegetation, tend to cause localized “dust devils.” The annual rainfall for Alamogordo is 12 inches per year. Much of the precipitation falls during the midsummer monsoonal period (July and August) as brief, yet frequent, intense thunderstorms culminating in 30 to 40 percent of the total annual rainfall.

2.5 Regional Geology and Soils

2.5.1 Geology

The sedimentary rocks which make up the adjacent mountain ranges are between 500 and 250 million years old (WSMR, 2003). During the period when the area was submerged beneath the shallow intracontinental sea, the layers of limestone, shale, gypsum, and sandstone were deposited. In time, these layers were pushed upward through various tectonic forces forming a large bulge on the surface. Approximately 10 million years ago the center began to subside resulting in a vertical drop of thousands of feet leaving the edges still standing (the present day Sacramento and San Andres mountain ranges). In the millions of years following, rainfall, snowmelt, and wind eroded the mountain sediments depositing them in the valley (i.e., Tularosa Basin). Water carrying eroded limestone, dolomite, gravel, and other materials continue to flow into the basin.

As the Tularosa Basin is a bolson, which is a basin with no surface drainage outlet, sediments carried by surface water into a closed basin are bolson deposits. The overlying alluvium generally consists of unconsolidated gravels, sands, and clays. Soils in the basin are derived from the adjacent ranges as erosional deposits of limestone, dolomite, and gypsum. A fining sequence from the ranges towards the basin’s center characterizes the area with the near surface soils as alluvial, eolian, and lacustrine deposits. The alluvial fan deposits are laterally discontinuous units of interbedded sand, silt, and clay while the eolian deposits consist primarily of gypsum sands. The eolian and alluvial deposits are usually indistinguishable due to the reworking of the alluvial sediment by eolian processes. The playa, or lacustrine

deposits, consist of clay containing gypsum and are contiguous with the alluvial fan and eolian deposits throughout the base. There has been the identification of stiff caliche layers, varying in thickness, at different areas of the base.

2.5.2 Soils

The U.S. Natural Resources Conservation Service (formerly the Soil Conservation Service) has identified two soil associations in the vicinity of Holloman AFB—the Holloman-Gypsum Land-Yesum Complex and the Mead silty clay loam (Figure 2-2). The permeability of these horizons ranges from 4×10^{-4} to 1×10^{-3} centimeters per second.

The Holloman-Gypsum Land-Yesum Complex, 0 to 5 percent sloped soil consists of larger areas of shallow and deep, well drained soils and areas of exposed gypsum. The Holloman soil makes up about 35 percent of the complex. Typically, the surface layer is light brown, very fine sandy loam about 3 inches thick. The upper 13 inches of the substratum is pink, very fine sandy loam that is very high in gypsum. Below that, the substratum is white gypsum to a depth of more than 60 inches. This soil is calcareous and mildly alkaline to moderately alkaline throughout. Permeability is moderate, and available water capacity is very low.

Gypsum Land makes up about 30 percent of the Holloman-Gypsum Land-Yesum Complex (0 to 5 percent slopes). Typically, less than 1 inch of very fine sandy loam overlies soft to hard, white gypsum. The deep Yesum consists of very fine sandy loam that makes up about 20 percent of the complex. Typically, the surface layer is light brown, very fine sandy loam about 3 inches thick. The upper 9 inches of the substratum is light brown, fine sandy loam that is very high in gypsum. Below that, the substratum is pink, very fine sandy loam to a depth of more than 60 inches. The soil is calcareous throughout and is mildly alkaline. Permeability is moderate, and available water capacity is moderate. Many fine gypsum crystals are found throughout the profile.

The soil type found across the main drainage area for the installation is Mead silty clay loam, 0 to 1 percent slopes. This deep, poorly drained, nearly level soil is on outer fringes of alluvial fans. This soil formed in fine textured alluvium over lacustrine lake sediment. It is very high in salt content because of periodic flooding and poor drainage. Slopes are smooth and concave. Typically, the surface layer is reddish brown, silty clay loam and clay loam about 5 inches thick. The substratum, to a depth of 48 inches, is light reddish brown clay that has a high content of salt. Below that, the substratum is lacustrine material of variable texture and color to a depth of more than 60 inches. Included within this soil are areas of Holloman soils and Gypsum Land along the margins of the unit of steep, short gully sides and knolls. These inclusions make up about 15 percent of the map unit for this soil type. Individual areas are generally smaller than 10 acres. This soil is moderately calcareous throughout and is

moderately to strongly alkaline. It has a layer of salt that is more soluble than gypsum. Permeability is very low, and available water capacity is low.

2.6 Regional Hydrogeology

Groundwater occurs as an unconfined aquifer in the unconsolidated deposits of the central basin, with the primary source of recharge as rainfall percolation and minor amounts of stream runoff along the western edge of the Sacramento Mountains. Surface water/rainfall migrates downward into the alluvial sediments at the edge of the shallow aquifer near the ranges and flows downgradient through progressively finer-grained sediments towards the central basin. Because the Tularosa Basin is a closed system, water that enters the area leaves either through evaporation or percolation. This elevated amount of percolation results in a fairly high water table. Beneath Holloman AFB, groundwater ranges from 5 to 50 feet below ground surface (bgs). Flow for the base is generally towards the southwest with localized influences from the variations in the topography of the base (Figure 2-3). In the northern and western portions of the base, groundwater flows more to the west towards the Ritas Draw, Malone Draw, and Lost River drainages. Groundwater flow is affected by local topography in areas immediately adjacent to arroyos, where groundwater flows directly toward the drainages regardless of the regional flow pattern.

Groundwater quality in the Tularosa Basin is of potable quality at the recharge areas in close proximity to the Sacramento Mountains and becomes increasingly mineralized toward the central portion of the basin and discharge areas. The majority (over 70 percent) of the Environmental Restoration Program sites located across Holloman AFB have groundwater monitoring wells containing water with an average total dissolved solid (TDS) concentration greater than 10,000 milligrams per liter (mg/L). These TDS data support the hypothesis that TDS concentrations below 10,000 mg/L at Holloman AFB are caused by dilution of natural groundwater quality from leaking water lines and surface irrigation from the domestic water supply. TDS concentrations greater than 10,000 mg/L exceed the NMWQCC limit as potable water and thus, the groundwater beneath Holloman AFB has been designated as unfit for human consumption. Likewise, the EPA guidelines have identified the groundwater as a Class IIIB water source, characterized by TDS concentrations exceeding 10,000 mg/L and is characterized by a low degree of interconnection with adjacent surface water or groundwater of a higher class. Groundwater does not discharge or connect to any adjacent aquifers because the Tularosa Basin is a closed basin. Adjacent surface waters include Lost River and Lake Holloman, which also have high concentrations of TDS, and are not considered potential drinking water sources.

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • February 2012 • WERC-09-13-019

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • February 2012 • WERC-09-13-019

2.7 Surface Water and Hydrology

The Tularosa Basin contains all of the surface flow in its boundaries. The nearest inflow of surface waters to the base comes from the Lost River, located in the north-central region of the base. The upper reaches of the Three Rivers and the Sacramento River are perennial in the basin. Holloman AFB is dissected by several southwest trending arroyos that control the surface drainage. Hay Draw arroyo is located in the far north. Malone and Ritas Draws, which drain into the Lost River and Dillard Draw arroyos, are located along the eastern perimeter of the base. Approximately 10,000 years ago, indications are of a much wetter climate. The present day Lake Otero encompassed a much larger area, possibly upwards of several hundred square miles. Its remains are the Alkali Flat and Lake Lucero. Lake Lucero is a temporary feature of merely a few inches in depth during the rainy season.

Ancient lakes and streams deposited water bearing deposits over the older bedrock basement materials. Fractures, cracks, and fissures in the Permian and Pennsylvanian bedrock yield small quantities of relatively good quality water in the deeper peripheral. Potable water is only found from wells near the edges of the basin with more saline water towards the center. Two of the principal sources of potable water are a long narrow area on the upslope sides of Tularosa and Alamogordo with the other in the far southwestern part of the basin. A portion of the city of Alamogordo's water, as well as Holloman AFB's water, is supplied from Bonito Lake (which is in the Pecos River Basin).

2.8 Current and Future Land Use

The land surrounding Holloman AFB consists of residential areas to the east and northeast (City of Alamogordo), rangeland to the south, the White Sands National Monument to the west, and areas where military activities are conducted to the north. The desert terrain of the area immediately surrounding Holloman AFB has limited development, and there are no agricultural operations, residential communities, or large industrial operations located adjacent to the base. Holloman AFB is an active military installation and is expected to remain active for the foreseeable future. No transfer of military property to the public is anticipated, and public access to the base is restricted (Foster Wheeler Environmental Corporation, 2002). Future land use is not expected to differ significantly from current land use practices (Foster Wheeler Environmental Corporation, 2002).

2.9 Current and Future Water Use

At present, the primary fresh water resource for the City of Alamogordo and Holloman AFB is Bonito Lake, located 60 miles northeast of the Tularosa Basin. Currently, there are no potable supplies of groundwater or surface water located on the base. Holloman AFB obtains its water supply from the city of Alamogordo and the Holloman AFB wells in the Boles, San Andres, and Douglas well fields at the base of the Sacramento Mountains. No water supply

wells are located on or near the base because of poor groundwater quality with TDS concentrations greater than 10,000 mg/L. There are no potable or irrigation wells near to or immediately downgradient of the base (Foster Wheeler Environmental Corporation, 2002).

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • February 2012 • WERC-09-13-019

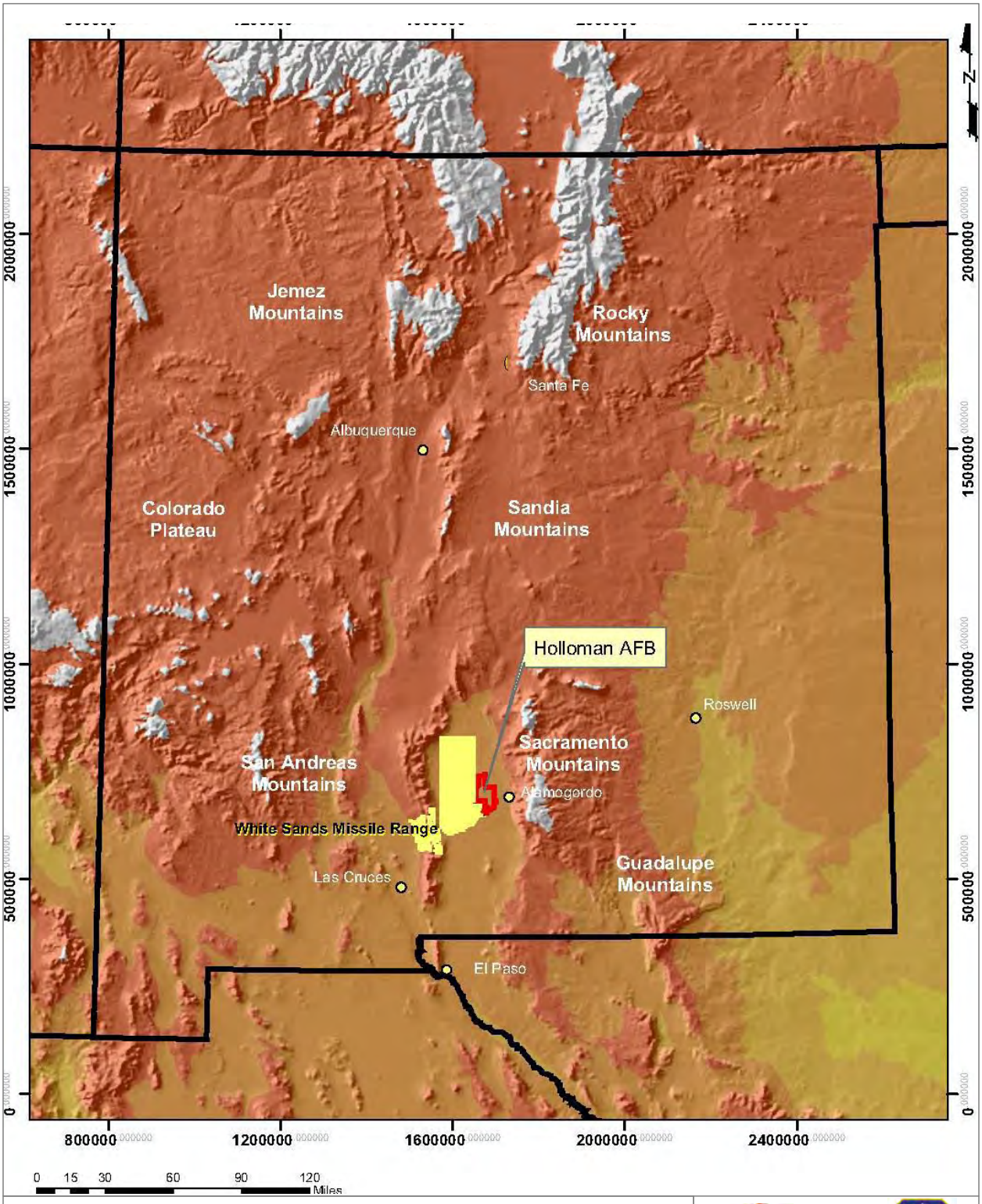

Figure 2-1

Physiographic Map

Holloman Air Force Base (AFB)
New Mexico

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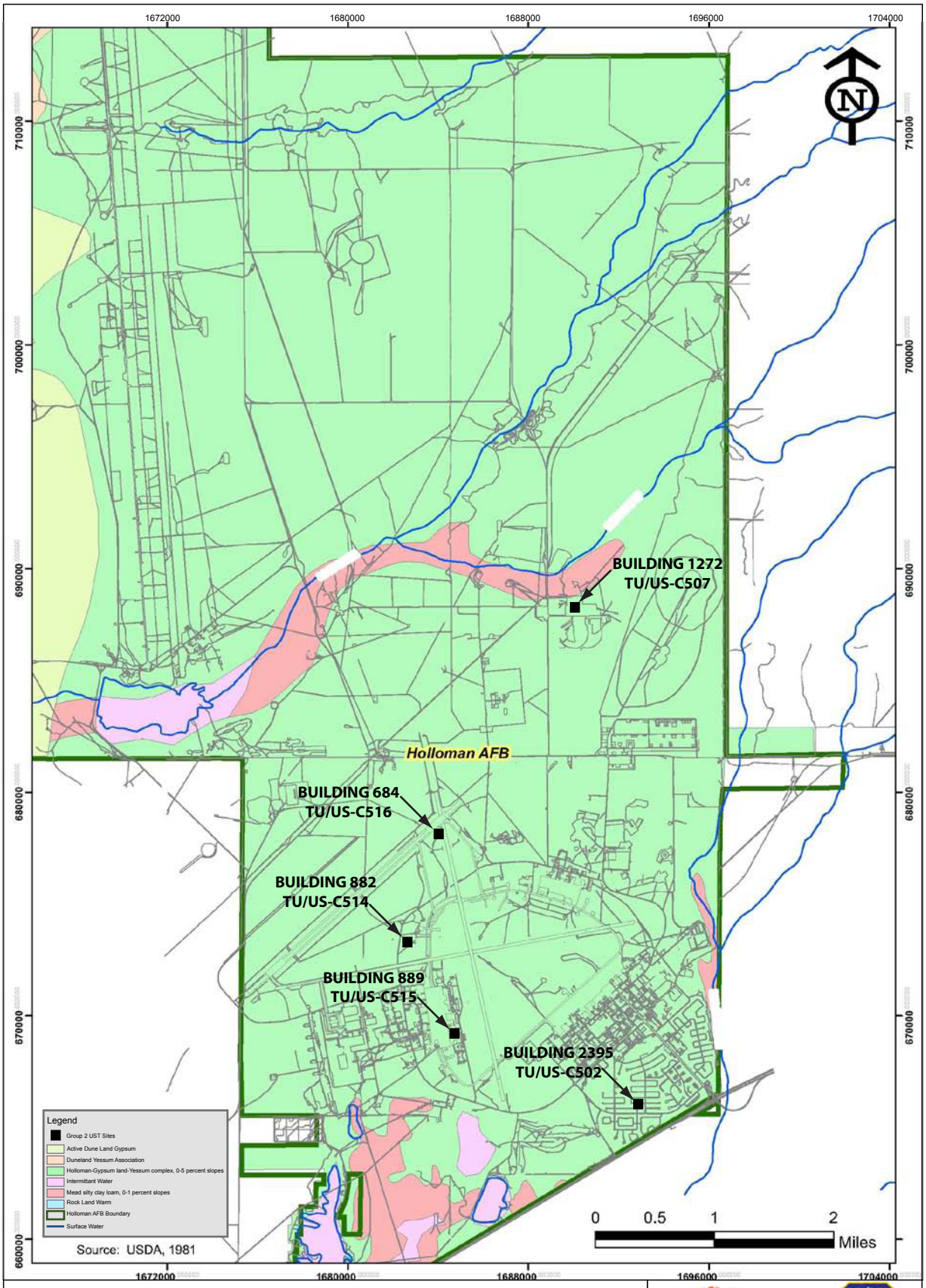

Notes:

1. UST = Underground Storage Tank
2. Soil types at Holloman Air Force Base, New Mexico, are based on United States Department of Agriculture (USDA) Soil Conservation Service Classifications.

Shaw

Figure 2-2

Group 2 UST Sites and Soils Map

Holloman Air Force Base (AFB)
New Mexico

BACK OF FIGURE

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • February 2012 • WERC-09-13-019

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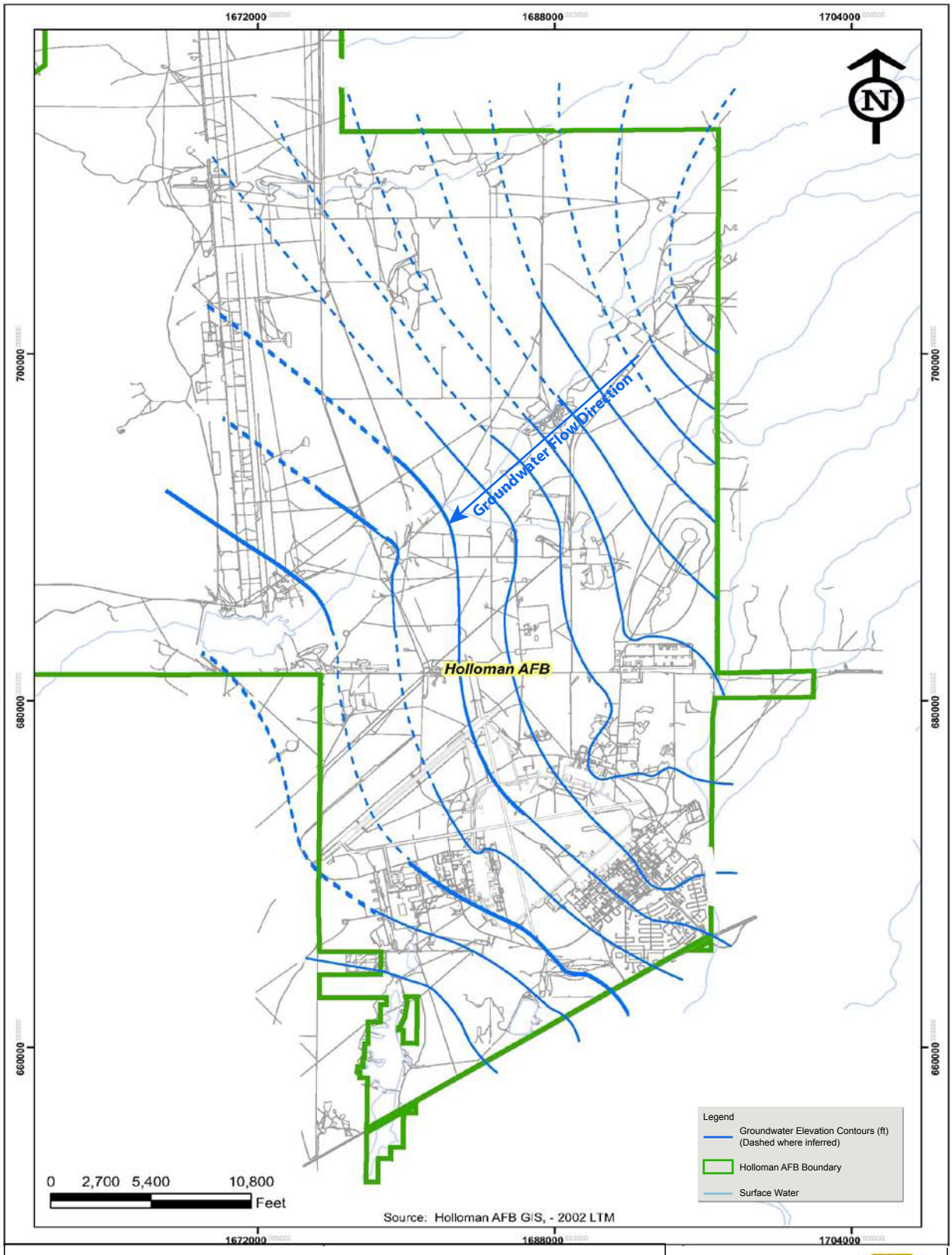

Note: Groundwater contour map showing groundwater elevation contours across Holloman Air Force Base, New Mexico, are based on 2002 measurements taken from the shallow aquifer.

Shaw

Figure 2-3

Groundwater Contour Map

Holloman Air Force Base (AFB)
New Mexico

BACK OF FIGURE

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • February 2012 • WERC-09-13-019

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • February 2012 • WERC-09-13-019

3.0 TECHNICAL APPROACH AND INVESTIGATIVE ACTIVITIES

The section presents the overall technical approach and details the investigative activities that will be implemented during the RFI activities for the five former UST sites, also referred to as the Group 2 UST sites.

3.1 Overview

This Work Plan assumes that a VCM has been initiated at each of the five former UST sites. The VCM was initiated under the Midwestern Region PBR contract, which limited corrective action activities to the removal of a maximum of 40 CY. Corrective measures will have been implemented or partially implemented under the NMED-approved VCM Request, premobilization and mobilization/site setup activities will have been completed, exploratory trenching will have been initiated, and confirmation soil sampling will have been conducted. Results of the VCM indicate that additional site characterization activities are necessary and additional soil excavation and removal may be required.

This RFI Work Plan has been designed to delineate potential COCs that may have been released to the environment and to provide physical and spatial data that facilitates design and implementation of additional future remedial and abandonment activities.

The general locations of the five former USTs are shown on Figure 1-2. The UST locations are identified by name according to the nearest building. Information about operational histories for the USTs is scant; therefore, the exact location of these former USTs was or will be determined by exploratory trenching.

The primary environmental media of concern at these sites are soil and groundwater. The extent of contamination in soil is expected to be relatively local to the former UST site locations. Therefore, the basic approach at any given site will be to identify the former tank location, and then work outward from the location in identifying contaminated soil. To evaluate the potential impacts to groundwater, monitoring wells will be installed in the shallow groundwater zone at upgradient and downgradient positions relative to the former UST locations. The analytical programs for both soil and groundwater are focused on the expected nature of contamination likely to be associated with petroleum product USTs. The initial trenching plan for the five sites is shown on Figure 3-1. Exploratory trenching will be conducted along four straight-line transects, oriented as shown. Further trenching will be conducted as required to determine the horizontal and vertical extent of soil contamination. Organic vapor analyzer (OVA) readings and visual screening will be used to guide the excavation and to identify the extent of soil contamination. Additional evidence of USTs that

could be observed during trenching includes tank saddles, soil staining and odors, remnant piping, backfill material, and dissimilar soil profiles.

The general technical approach that will be implemented to evaluate the nature and extent of potential contamination at any or all of the five former UST sites is provided as follows:

- Assemble information obtained during the VCM, including records search data, the extent and findings of the initial exploratory trenching, and confirmatory sampling results.
- Digitally photograph the current site conditions following the completion of VCM activities and prior to initiating the RFI work activities.
- Prepare a site drawing depicting the current site conditions (following the VCM work), including completed exploratory trenching, confirmatory sampling locations, monitoring well locations, and soil stockpile and roll-off locations.
- Clearly define the work completed under the VCM, and to use this information for efficient continuance of the site work under the RFI Work Plan.
- Perform additional delineation of the petroleum-contaminated soil will be conducted via trenching, using visual staining and positive OVA readings to guide the process.
- Install three groundwater monitoring wells, collect soil samples during drilling.
- Perform well development, collect groundwater samples, and send groundwater samples to the laboratory for analysis
- Receive, validate, and evaluate the soil and groundwater analytical results.
- Compare the soil analytical results to NMED residential SSLs (NMED, 2012) or EPA RSLs (EPA, 2011), as appropriate, to determine corrective action complete or additional sampling points.
- Compare the groundwater analytical results to NMWQCC standards (20.6.2 NMAC) or EPA MCLs (EPA, 2010), as appropriate, to determine action complete or additional sampling points.
- Prepare and submit a single RFI Report, to include each of the former UST sites evaluated under this RFI.

3.2 Investigation Activities

Field activities that will be conducted during the RFI include soil boring sample collection, groundwater monitoring well installation, monitoring well development, groundwater sample collection, and soil and groundwater sample analysis.

3.2.1 Soil Boring Sample Collection and Analysis

Soil samples will be collected from boreholes during monitoring well installation, at depths of up to 50 feet depending on depth to groundwater. Hollow-stem auger (HSA) drilling techniques will be employed in accordance with Shaw SOP EI-GS001 *Split-Spoon Soil Sampling* (Appendix C), to facilitate soil sample collection using stainless steel, continuous drive, and split-spoon samplers. During drilling, a Shaw Geologist will document the following information for each boring:

- Boring or well identification (this identification will be unique, and the Contractor is responsible for ensuring it has not been used previously at the installation)
- Purpose of the boring (e.g., soil sampling, monitoring well)
- Location in relation to an easily identifiable landmark
- Names of drilling subcontractor and logger
- Start and finish dates and times
- Drilling method
- Diameters of surface casing, casing type, and methods of installation
- Depth at which saturated conditions were first encountered
- Lithologic descriptions and depths of lithologic boundaries
- Sampling-interval depths
- Zones of caving or heaving
- Drilling rate
- Drilling rig reactions, such as chatter, rod drops, and bouncing.

This information and other pertinent information will be recorded on boring logs (provided in Appendix B).

As soon as the split-spoon sampler is opened, the soil will be monitored for organic vapors using an OVA. Vapor monitoring results will be recorded on the boring log. A total of three soil samples will be collected from each well boring for laboratory analysis. The soil samples

to be sent for chemical analysis will be collected from the following intervals: 0 to 2 feet interval, interval with the highest OVA field screen result, and the interval immediately above groundwater.

Soil samples collected from the well borings will be analyzed for VOCs, semivolatile organic compounds (SVOCs), TPH-gasoline range organics (GRO), TPH-diesel range organics (DRO), TPH-oil range organics (ORO) and target analyte list (TAL) metals, using the EPA analytical methods (EPA, 1986a) shown on Table 3-1. Table 3-2 provides the required sample containers, preservatives, and holding times for soil samples.

Soil samples for VOC analysis will be collected in accordance with EPA Method 5035 and 8260 using the TerraCore® Sampler device (EPA, 1986a). Soil samples for non-VOC analysis will be placed in laboratory-provided containers, as shown on Table 3-2. If soil from several depth intervals must be composited to provide sufficient sample volume for a particular analysis, the sample will be composited and homogenized in a stainless steel bowl using a stainless steel trowel or scoop in accordance with Shaw SOP EI-FS-011 *Compositing* (Appendix C). The sample will then be transferred into the appropriate sample container and shipped to the laboratory for analysis.

3.2.2 Monitoring Well Installation and Development

3.2.2.1 Monitoring Well Installation

Three monitoring wells will be installed in the vicinity of each the former UST locations, to determine impact whether groundwater has been impacted. At each site, one monitoring well will be located approximately 50 feet upgradient of the UST location, and two monitoring wells approximately 50 feet downgradient of the former UST location (Figure 3-1).

Well drilling operations must be performed by an individual with a current and valid well driller license issued by the State of New Mexico. Monitoring wells will be installed using the HSA drilling technique in accordance with NMED Ground Water Quality Bureau *Monitoring Well Construction and Abandonment Guidelines* (NMED, 2011b). The boreholes will be advanced into the water table using HSA such that the borehole diameter will be at least 4 inches larger than the outside diameter of the well casing. This will allow for proper placement of the filter pack and sealant. Care will be taken so that the completed monitoring wells will be sufficiently straight and plumb to allow passage of measuring and sampling devices.

During drilling, a Shaw Geologist will document the following information detailed in Section 3.2.1. Field forms (including soil boring log forms) for documentation of field activities are provided in Appendix B. Well installation equipment will be decontaminated according to the specifications of Section 4.2.9 and in accordance with Shaw SOP EI-FS-014

Decontamination of Contact Sampling Equipment (Appendix C). Three soil samples will be collected during the advancement of each well boring as described in Section 3.2.1.

Well borings will be advanced approximately 8 feet into the water table and completed such that the well screen intersects the water table enabling groundwater samples to be collected from the top of the saturated zone. The monitoring wells will be constructed of 2-inch diameter Schedule 40 polyvinyl chloride riser and screen. The screened section of the wells will consist of 10 feet of 0.010-inch slotted screen (or other field-determined slot size). A silica sand filter pack will be placed around the screen to approximately 2 feet above the top of the screen. A 2-foot thick bentonite seal will be placed above the filter pack. The remaining annular space will be grouted with neat cement.

For wells that will be finished aboveground, the casing must extend from the top of the screen to at least 1 foot above ground surface. The top of the casing will be fitted with a removable cap, and the exposed casing will be protected by a locking steel protective casing. The protective casing will be large enough in diameter to allow easy access for removal of the cap. A concrete pad (2-foot minimum radius, 4-inch minimum thickness) will be installed around the protective casing and wellhead. The concrete and surrounding soil will be sloped to direct rainfall and runoff away from the wellhead. Protective steel posts (bollards) will be installed around the wells where needed to protect the wellhead from damage by vehicles or equipment.

Monitoring wells that are completed as “flush mounted” will be constructed with water-tight well vaults that are rated to withstand traffic loads and fitted with locking, expandable well plugs. Concrete pads (2-foot minimum radius, 4-inch minimum thickness) will be poured around the well vaults. Vault covers will be secured with at least one bolt. In addition, the vault cover will have a label indicating that the wellhead of a monitoring well is contained within the vault. The concrete and surrounding soil must be sloped to direct rainfall and runoff away from the well vault.

To document specific details of the monitoring well installations, the Shaw Geologist will prepare drilling logs and as-built well construction diagrams in the field as the activity is taking place. Specific procedures for installing monitoring wells are provided in Shaw SOP EI-GS031 *Standards for Design and Installation of Groundwater Monitoring Wells* (Appendix C). The monitoring wells will be constructed in accordance with the *RCRA Ground-Water Monitoring, Technical Enforcement Guidance Document* (EPA, 1986b). Monitoring Well Diagram and Well Completion Report forms are provided in Appendix B.

3.2.2.2 Monitoring Well Development

The newly installed monitoring wells will be developed to create an effective filter pack around the well screen, remove fine particles from the formation near the borehole, and assist in restoring the natural water quality of the aquifer in the vicinity of the well. All newly installed monitoring wells will be developed no sooner than 48 hours after installation to allow for grout curing. Monitoring wells will be developed using surge blocks, bailers, or pumps, either individually or in combination, to achieve the most effective well development.

Well development will be documented by recording water level measurements, depth-to-bottom measurements, water quality parameters, discharge water color, water volume, and time period. A field form for the documentation of well development activity is provided in Appendix B.

Well development will continue until the following criteria are met:

- Water has been removed from the well is visually clear and the turbidity measures less than or equal to 10 nephelometric turbidity units (NTUs)
- The pH, temperature, and specific conductance (SC) parameters have stabilized (less than 10 percent variation for three successive readings).

Specific well development procedures are provided in Shaw SOP EI-GS037 *Standards for Conducting Well Development*. Appendix C contains copies of all Shaw SOPs referenced in this RFI Work Plan. Field instruments such as those used for the measurement of water quality parameters will be calibrated in accordance with methods specified by the manufacturer and will be recorded on calibration record forms (Appendix B).

In the event that fine-grained deposits are encountered, it may be difficult to achieve a turbidity of less than or equal to 10 NTUs during well development. If turbidity remains greater than 10 NTUs after the required three borehole volumes of water have been removed, additional volumes will be removed in an attempt to lower the turbidity. If after 4 hours of continuous well development, the turbidity does not fall below 10 NTUs, well development will cease. If the well is pumped dry, it will be allowed to recharge and be re-pumped as much as possible within the 4-hour time limit.

Well development equipment will be decontaminated according to the specifications of Section 4.2.7. Water generated during well development will be contained and held for proper disposal per the Section 4.2.8 of this RFI Work Plan.

3.2.2.3 Monitoring Well Abandonment

Upon NMED approval of corrective action complete, Shaw will abandon site monitoring wells after obtaining NMED approval to abandon monitoring wells associated with this RFI. Well abandonment must be accomplished by removing the well casing and placing neat cement grout, bentonite-based plugging material, or other sealing material approved by the New Mexico Office of the State Engineer (NMOSE) for wells that encounter water pursuant to 19.27.4 NMAC from the bottom of the borehole to the ground surface using a tremmie pipe.

If the casing cannot be removed, neat cement grout, bentonite-based plugging material, or other sealing material approved by the NMOSE must be placed in the well using a tremmie pipe from the bottom of the well to the ground surface. After abandonment, written notification describing the well abandonment must be submitted to the NMED. Written notification of well abandonment will consist of a copy of the well plugging record submitted to the NMOSE in accordance with 19.27.4 NMAC, or alternate documentation containing the information to be provided in a well plugging record required by the NMOSE as specified in 19.27.4 NMAC.

3.2.3 Groundwater Sampling and Analysis

Groundwater sampling will be conducted at the installed monitoring wells (three wells per site) after the wells are properly developed. One groundwater sample will be collected from each well. Monitoring wells will be sampled using low-flow sampling techniques in accordance with NMED's guidance document *Use of Low-Flow and Other Non-Traditional Sampling Techniques for RCRA Compliant Groundwater Monitoring* (NMED, 2001) and Shaw SOP EI-FS-111 *Low Flow Sampling* (Appendix C). Groundwater samples will be obtained and collected as detailed in Section 4.2.3.

Groundwater samples will be analyzed for TPH-GRO, TPH-DRO, TPH-ORO, TAL metals, SVOCs, VOCs, and TDS using the EPA analytical methods shown on Table 3-1. Table 3-3 provides the required sample containers, preservatives, and holding times for water samples.

3.3 Evaluation of Analytical Results

Soil and groundwater analytical results will be evaluated to determine if: (1) no further site activities are required and the reporting phase can be initiated, or (2) additional assessment activities are required.

As a part of the evaluation, the validated soil analytical results will be compared with the NMED SSLs (NMED, 2012), or the EPA RSLs (EPA, 2011), if NMED residential SSLs are not available for a specific analyte. If results are at or below the comparative concentration criteria, the RFI Report preparation will begin. If results are above the comparative

concentration criteria, additional "step-out" sampling will occur, with appropriate COC analysis as required to complete the soil contamination delineation.

Groundwater analytical results will be compared to the NMWQCC water quality standards (20.6.2 NMAC). If results are at or below the comparative concentration criteria, the RFI Report preparation will begin. If groundwater exceeds NMWQCC water quality standards, a TDS survey will be conducted using TDS levels from the newly installed monitoring wells and any nearby monitoring wells. If the TDS survey indicates that the groundwater in the immediate vicinity of these sites is over the NMWQCC-established 10,000 mg/L potable water threshold, groundwater is not regulated by NMED and the results will be compared to EPA MCLs (EPA, 2010). If results exceed the MCLs, additional "step-out" sampling point locations with appropriate COCs will be determined for groundwater. In addition, a land use control plan will be prepared, placing restrictions on groundwater use and publicizing the basewide restrictions.

3.3.1 Comparison of Chemical Detections

For all chemicals detected in soil, the maximum concentration determined by laboratory analysis for each site will be evaluated against the NMED SSLs provided in *Risk Assessment Guidance for Site Investigations and Remediation* (NMED, 2012). If a NMED SSL has not been established for a particular constituent, the EPA RSLs for soil will be used for comparison (EPA, 2011).

In addition to the risk-based chemical screening, metal concentrations for soil and groundwater will be evaluated against the results of the basewide background study currently being implemented (NMED, 2011a).

For chemicals detected in groundwater, the results will be compared to the NMWQCC groundwater quality standards. The NMWQCC standards are for aquifers with TDS concentrations less than or equal to 10,000 mg/L (20.6.2 NMAC). The TDS concentration is a direct measure of the presence of total ions in the aquifer and is one of the primary criteria for classifying the aquifer based on its use as a potential drinking water source. Under the NMWQCC regulations, if TDS in groundwater is greater than 10,000 mg/L, the aquifer is classified as nonpotable and results will be compared to the EPA MCLs (EPA, 2010).

Based on the guidance provided by the NMED pertaining to the remediation of petroleum-impacted sites at Holloman AFB, a TPH screening level of 1000 milligrams per kilogram (mg/kg) will be used to evaluate the laboratory analytical data. The 1000 mg/kg action level for petroleum contaminated soil is the Residential Direct Exposure Limit for unknown oil, listed in Table 6-2 TPH Screening Guidelines for Potable Groundwater of the *Risk Assessment Guidance for Site Investigations and Remediation* (NMED, 2012).

For UST sites where the maximum concentration of each chemical of potential concern is below its respective screening value, no additional evaluation will be performed and the findings will be reported to NMED.

3.3.2 Exposure Model

For UST sites with chemical(s) of potential concern concentrations above the screening criteria, an exposure model will be developed. The exposure model identifies the following:

- Media of concern
- Current and future receptors
- Complete and incomplete exposure pathways.

3.3.3 Calculation of Site-Specific Screening Levels

Site-specific screening levels may be developed for all complete routes of exposure identified in the exposure model. Parameters required for the calculation of site-specific SSLs include:

- Carcinogenic toxicity values (slope factors)
- Noncarcinogenic toxicity values (reference doses)
- Exposure factors
- Fate and transport parameters.

Default toxicity values and exposure factors will be obtained from Tables C-1 and B-1 (respectively) of the *Risk Assessment Guidance for Site Investigations and Remediation* (NMED, 2012). Using available site information, site-specific screening levels will be calculated using equations presented in the *Risk Assessment Guidance for Site Investigations and Remediation* (NMED, 2012). The maximum detected concentration for each contaminant will be used to determine the site hazard index in accordance with NMED guidance. A hazard index greater than 1 will be further evaluated.

3.3.4 Site-Specific Screening Level Evaluation

A representative concentration (e.g., the 95 percent upper confidence level value) will be compared with the site-specific screening levels of each contaminant of concern on a media by media basis. If any contaminant of concern exceeds its respective site-specific screening level, target levels for the contaminant of concern will be developed. The Johnson & Ettinger Model will be used to develop the indoor vapor inhalation target levels via the subsurface soil and groundwater pathways (EPA, 2004a). The use of the Johnson & Ettinger Model is required because the NMED *Risk Assessment Guidance for Site Investigations and*

Remediation does not contain an indoor inhalation pathway (NMED, 2012). Additionally, target levels for dermal contact with soil and groundwater will be developed as per the *Risk Assessment Guidance for Superfund Volume 1, Part E Supplemental Guidance for Dermal Risk Assessment* (EPA, 2004b).

3.4 RCRA Facility Investigation Report

A RFI Report will be prepared to document all activities performed at the UST sites, in accordance with this RFI Work Plan. The report will consist of the items presented in the Permit outlining RFI Report Requirements (NMED, 2004), including:

- **Introduction** – describing the purpose of the report and a summary description of the project.
- **Environmental Setting** – describing the environmental setting in an around the sites. The setting presented in the RFI Work Plan will serve as the basis for this section, which will also include additional information gathered during the implementation of the RFI.
- **Source Characterization** – summarizing the sources of contamination and the nature and extent of the releases at the sites, including additional information gathered during the RFI and VCM.
- **Sampling and Analytical Results** – presenting the results from sampling conducted during the RFI and VCM, interpretation of the results versus the RFI objectives, modifications to the conceptual site model, and risk-based evaluation of the analytical results.
- **Data Quality Assurance and Data Quality Control (QC) Review** – providing the results of the data quality assurance/QC review in accordance with EPA *Contract Laboratory Program National Functional Guidelines for Inorganic Data Review* (EPA-540/R94-013) and the EPA *Contract Laboratory Program National Functional Guidelines for Organic Data Review* (EPA-540/R94-012) (EPA, 2004c, 2004d).
- **Conclusions** – summarizing major conclusions reached after analysis of the RFI/VCM data.
- **Recommendations** – providing recommendations on what further action is needed to complete the characterization of releases from the sites, or if no further action is warranted.

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • February 2012 • WERC-09-13-019

Table 3-1
Analytical Procedures

Analysis	Analytical Method (SW846 unless otherwise specified)
VOCs	8260B/5035
SVOCs	8270D
TPH-GRO / TPH-DRO/TPH-ORO	8015B
TDS	160.1
TAL Metals	6010C and 7471A
Mercury – Solid Samples	7471A
Mercury - Aqueous Samples	7470A
TCLP	1311

EPA 1986, Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW-846, 3rd ed., including all promulgated updates and new methods, July 2010.

DRO denotes diesel range organics.

EPA denotes U.S. Environmental Protection Agency.

GRO denotes gasoline range organics.

ORO denotes oil range organics.

SVOC denotes semivolatile organic compound.

TAL denotes target analyte list.

TCLP denotes toxicity characteristic leaching procedure.

TDS denotes total dissolved solids.

TPH denotes total petroleum hydrocarbons.

VOC denotes volatile organic compound.

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • February 2012 • WERC-09-13-019

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • February 2012 • WERC-09-13-019

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Table 3-2
Required Containers, Preservatives, and Holding Times for Solid Samples

Analysis	Sample Container	Preservative	Holding Time	Sample Quantity
VOCs	TerraCore® sampler	Cool to 4°C	14 days	Fill completely
SVOCs	One 8-oz glass bottle with Teflon-lined cap	Cool to 4°C	14 days	Fill to shoulder
TPH-GRO, TPH-DRO, TPH-ORO	One 8-oz glass bottle with Teflon-lined cap	Cool to 4°C	14 days	Fill to shoulder
TAL Metals	One 4-oz glass bottle with Teflon-lined cap	Cool to 4°C	6 months; 28 days for mercury	Fill to shoulder
Reactivity, Corrosivity, Ignitability	One 8-oz glass bottle with Teflon-lined cap	Cool to 4°C	7 days for sulfide; 14 days for cyanide	Fill to shoulder
TCLP Volatiles	One 8-oz glass bottle with Teflon-lined cap	Cool to 4°C	14 days to extraction, 14 days to analysis	Fill completely
TCLP, all other organics	One 8-oz glass bottle with Teflon-lined cap	Cool to 4°C	14 days to leach, 7 days to extraction, 40 days to analysis	Fill completely
TCLP Metals	One 8-oz glass bottle with Teflon-lined cap	Cool to 4°C	180 days to leach,180 days to analysis	Fill completely
TCLP Mercury	One 8-oz glass bottle with Teflon-lined cap	Cool to 4°C	28 days to leach, 28 days to analysis	Fill completely

°C denotes degrees Celsius.
DRO denotes diesel range organics.
GRO denotes gasoline range organics.
ORO denotes oil range organics.
oz denotes ounces.
SVOC denotes semivolatile organic compound.
TAL denotes target analyte list.
TCLP denotes toxicity characteristic leaching procedure.
TPH denotes total petroleum hydrocarbons.
VOC denotes volatile organic compound.

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • February 2012 • WERC-09-13-019

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • February 2012 • WERC-09-13-019

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Table 3-3
Required Containers, Preservatives, and Holding Times for Liquid Samples

Analysis	Sample Container	Preservative	Holding Time	Sample Quantity
VOCs	Three 40-mL glass vial with Teflon-lined cap (TerraCore® sampler)	HCl to pH <2; Cool to 4°C	14 days	Fill completely; no air bubbles
SVOCs	Two 1-liter glass bottles with Teflon-lined cap	Cool to 4°C	7 days to extraction, 40 days to analysis	Fill to shoulder
TPH-GRO, TPH-DRO, TPH-ORO	Two 1-liter glass bottles with Teflon-lined cap	Cool to 4°C	7 days to extraction, 40 days to analysis	Fill to shoulder
TAL Metals	1-liter polyethylene bottle	HNO_3 to pH <2 Cool to 4°C	6 months; 28 days for mercury	Fill to shoulder
TDS	500-mL polyethylene bottle	Cool to 4°C	7 days from collection	Fill to shoulder
Reactivity, Corrosivity, Ignitability	1-liter polyethylene bottle	Cool to 4°C	7 days	Fill to shoulder
TCLP Volatiles	Three 40-mL glass vial with Teflon-lined cap	HCl to pH <2; Cool to 4°C	14 days to extraction, 14 days to analysis	Fill completely; no air bubbles
TCLP, all other organics	Two 1-liter glass bottles with Teflon-lined cap	Cool to 4°C	14 days to leach, 7 days to extraction, 40 days to analysis	Fill to shoulder
TCLP Metals	1-liter polyethylene bottle	HNO_3 to pH <2; Cool to 4°C	180 days to leach,180 days to analysis	Fill to shoulder
TCLP Mercury	1-liter polyethylene bottle	HNO_3 to pH <2; Cool to 4°C	28 days to leach, 28 days to analysis	Fill to shoulder

< denotes less than.
°C denotes degrees Celsius.
DRO denotes diesel range organics.
GRO denotes gasoline range organics.
HCl denotes hydrochloric acid.
HNO_3 denotes nitric acid.
mL denotes milliliter.
ORO denotes oil range organics.
SVOC denotes semivolatile organic compound.
TAL denotes target analyte list.
TCLP denotes toxicity characteristic leaching procedure.
TDS denotes total dissolved solids.
TPH denotes total petroleum hydrocarbons.
VOC denotes volatile organic compound.

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • February 2012 • WERC-09-13-019

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • February 2012 • WERC-09-13-019

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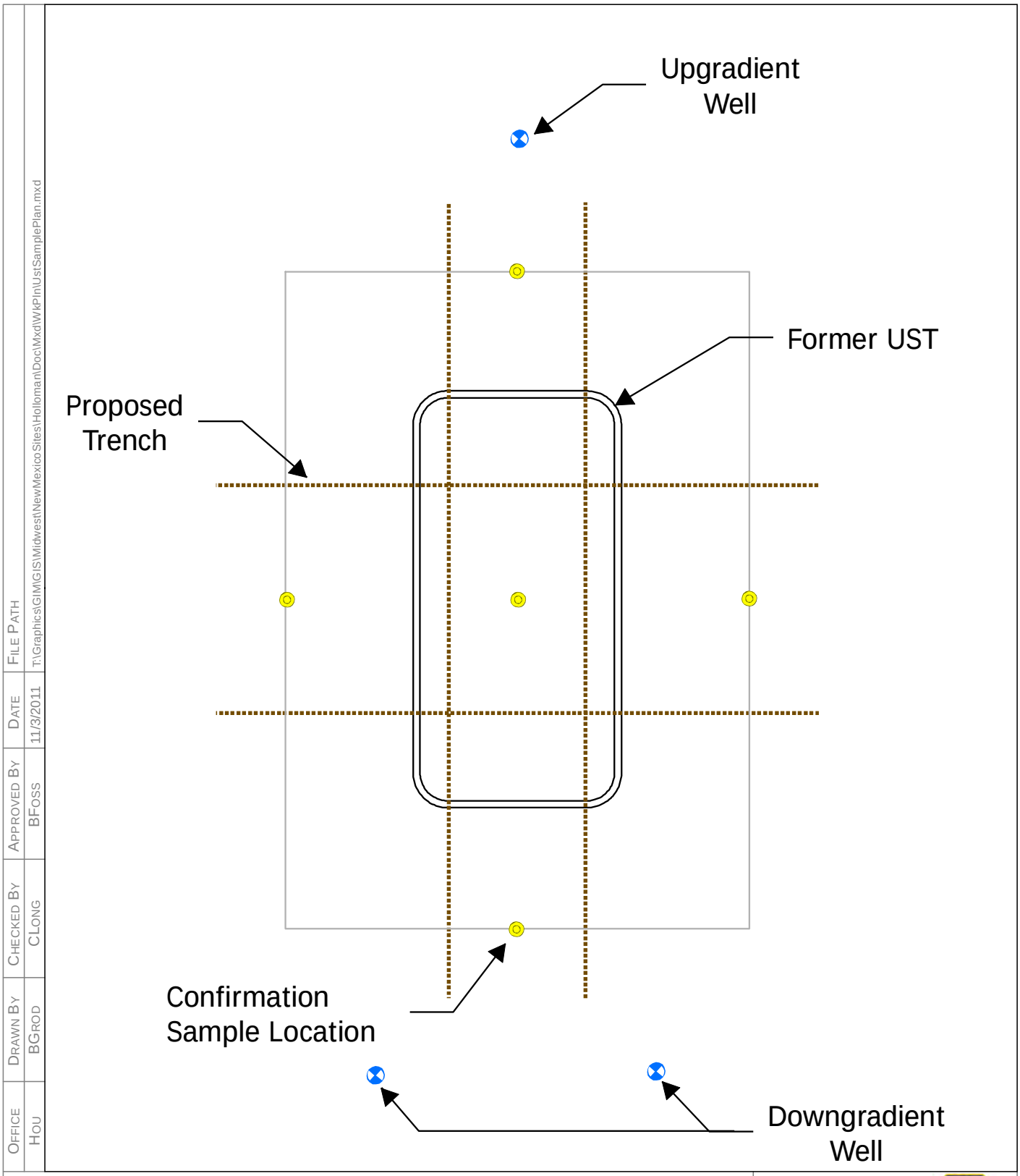

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Legend

- Proposed Monitoring Well
- Confirmation Sample Location
- Grid
- Trench Transect
- UST

N

WGS 84 UTM Zone 13N
Meters

0 2.5 5
Meters

0 10 20
Feet

Figure 3-1

General
Underground Storage Tank
Sampling Plan

Holloman AFB, NM

BACK OF FIGURE

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • February 2012 • WERC-09-13-019

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • February 2012 • WERC-09-13-019

4.0 FIELD INVESTIGATION METHODS

The field investigation methods that will be implemented as a part of the RFI are presented in this section. These methods will support the technical approach presented in Section 3 for the completion of the former UST site investigations.

4.1 Pre-Investigation Requirements

Several pre-investigation documents must be filed and approvals obtained, including a Civil Engineer Work Request (Air Force Form 332) approval, base digging permits with utility clearances, site security clearances, and facility manager notification of the intended operations. All contractors must coordinate project requests for base installation support services through the 49th CES/CEV.

Prior to the start of activities, a pre-investigation–kick-off meeting and site walk-through will be conducted with the AFCEE resident engineer, Holloman AFB personnel, and the contractor's site manager, to plan for equipment access, equipment staging, decontamination area layout, potential site hazards, and emergency evacuation routes. In addition, the project schedule and planned activities will be reviewed.

Personnel, equipment, and resources necessary to implement the corrective action activities described in this RFI Work Plan will be mobilized to the site. Site setup will occur at each of the five former UST sites. Safety fencing and warning signs will be used where needed to indicate the danger of entering a work zone. Setup also includes establishing a location for material storage and other equipment staging areas.

4.1.1 Air Force Form 332

Prior to initiating any field work activities, a completed and approved Air Force Form 332 (Civil Engineer Work Request) will be obtained. This form requires authorization of construction work at Holloman AFB and is required for the initiation of any construction-type work, such as the work activities planned for this RFI. In addition to the required approval signatures, the work request form is to include a description of the field activities that will take place, location map, and justification for the work to be accomplished.

4.1.2 Base Digging Permit and Utility Clearances

Prior to the submittal of the base digging permits (Air Force Form 103, Base Civil Engineering Work Clearance Request), the drilling and trenching locations will be clearly delineated by the contractor with marker flags, stakes, or paint, as appropriate to the surface material. Utility clearance approvals will be completed by the appropriate Holloman AFB utility office (e.g., telephone, sewer, water, natural gas, etc.) and by the New Mexico One

Call utility clearance system. Upon receipt of the approved digging permit and utility clearances, the contractor's site manager or other authorized contractor project personnel will complete a site walk-through confirming the base digging permit authorization.

In addition, Shaw requires a site survey to be performed prior to the start of drilling activities to search for signs of other buried or overhead utilities in accordance with Shaw Safety Policy EIG-HS-308.03 *Underground/Overhead Utility Contact Prevention* (Appendix C). Each borehole location will be hand dug, hand augered, or vacuum excavated (i.e., air knife) to a minimum of 5 feet bgs.

4.2 Field Activities

4.2.1 Investigation Methodology Requirements

Field activities will be performed in accordance with this RFI Work Plan and the QPP (Shaw, 2012), which references Shaw's SOPs for soil boring advancement, soil sampling, soil sample description, groundwater sampling, sample management, equipment decontamination, and chain-of-custody procedures, and other field activities. The specific Shaw SOPs for this RFI are listed below:

- EI-FS-001 Field Logbook
- EI-FS-002 Field Logsheet
- EI-FS-003 Chain of Custody Documentation – Paper
- EI-FS-005 Custody Seals
- EI-FS-006 Sample Labeling
- EI-FS-010 Sample Homogenization
- EI-FS-011 Compositing
- EI-FS-012 Shipping and Packaging of Non Hazardous Samples
- EI-FS-014 Decontamination of Contact Sampling Equipment
- EI-FS-020 Data Usability Review
- EI-FS-101 Trowel/Spoon Surface Soil Sampling
- EI-FS-103 Soil Sampling using a Soil Probe or Core-Type Sampler
- EI-FS-105 Soil Preserved Vial VOCs
- EI-FS-107 Roll-Off Sampling
- EI-FS-108 Water Level Measurement
- EI-FS-109 Bailer

- EI-FS-110 Well Purging
- EI-FS-111 Low Flow Sampling
- EI-FS-116 Sampling of Drums and Other Containers
- EI-FS-203 Jar Headspace Screening
- EI-GS001 Split-Spoon Soil Sampling
- EI-GS021 Standards for Conducting Direct Push Drilling and Soil Sampling
- EI-GS025 Standards for Soils Logging
- EI-GS028 Trench Logging
- EI-GS031 Standards for Design and Installation of Groundwater Monitoring Wells
- EI-GS037 Standards for Conducting Well Development
- EI-GS308.03 Underground/Overhead Utility Contact Prevention
- EI-PS104 Qualification of Sources
- EI-Q005 Inspection
- EI-Q007 Nonconformance Reporting

These SOPs are provided in Appendix C of this work plan. In addition to the information provided in the referenced SOPs, further details regarding soil sampling, groundwater sampling, soil and groundwater sample identification, surveying, and site restoration are presented below.

4.2.2 Trenching

Once the sites have been cleared and set up, exploratory trenching will be performed using a backhoe or hydraulic excavator to locate and visually identify the former UST locations. Trenching will also be conducted to determine the lateral and vertical extent of potential petroleum hydrocarbon contamination in soil. Shaw is prepared to perform concrete cutting, demolition, removal, and replacement should the investigation require access to areas completed in concrete. All work will be conducted and information documented in accordance with Shaw SOP EI-GS028 *Trench Logging* (Appendix C).

At each former UST site, initial trenching will be conducted along four straight-line transects as shown on Figure 3-1. The trenches will be excavated with a backhoe or another excavator capable of reaching up to 20 feet bgs with a minimum width of a 1-foot bucket. Trench depths and lengths will be kept as shallow and short as possible to minimize disruption of the land surface. Spoils from the trench will be placed next to the trench on plastic, and returned to the trench after required information is obtained. Air monitoring using an OVA will be

conducted during trenching as part of the contamination delineation. Under no circumstances will any personnel be authorized to enter a trench. Surveying stakes will be placed and labeled to identify the corners of former UST locations for surveying, as described in Section 4.2.9. All pertinent information will be recorded in a field log book in accordance with Shaw SOP EI-FS-001 *Field Logbook* (Appendix C).

Additional evidence of the presence of USTs that could be observed during trenching may include tank saddles, soil staining and odors, remnant piping, backfill material, and dissimilar soil profiles. The extent of soil trenching will be determined based on field observation, site conditions, and physical restrictions, including visual observation of stained soil, field screening of the excavated soil, proximity of existing underground utilities, surface structures, and proximity of building foundations. Direct push technology (DPT) will be used to supplement trenching should contamination depth or extent exceed equipment capabilities, or if physical impediments are encountered (e.g., buildings), in accordance with Shaw SOP EI-FS-103 *Soil Sampling Using a Soil Probe or Core-Type Sampler* (Appendix C).

Open trenches will be lined with plastic sheeting to prevent contact between rainwater and contaminated soil. Whenever suitable, soil berms will be used to control storm water. Rainwater will be pumped out of the trenches and contained for disposal prior to trench backfilling. Groundwater encountered in the excavation will be pumped from the excavation and contained for disposal prior to backfilling. During trench backfill, the soil will be placed at 1- to 2-foot lifts, compacted using the bucket, and compacted at ground surface using the machine's tires (or tracks).

4.2.3 Groundwater Sampling

Groundwater sampling will be conducted at the installed monitoring wells (three wells per site) after the wells are properly developed. Monitoring wells will be sampled using the low-flow sampling techniques detailed in Shaw SOP EI-FS-111 *Low-flow/Micro-purge Well Sampling* (Appendix C), in accordance with NMED's guidance document entitled *Use of Low-Flow and Other Non-Traditional Sampling Techniques for RCRA Compliant Groundwater Monitoring* (NMED, 2001). Groundwater purging and sampling will be conducted according to the following steps:

1. Measure water levels to the nearest 0.01 feet prior to purging each monitoring well. Water levels should be monitored and recorded at 5-minute intervals during purging to ensure that minimal drawdown is occurring in the well (Shaw SOP EI-FS-108 *Water Level Measurements*; Appendix C).

2. Begin purging the well at a low-flow rate of 100–500 milliliters per minute in accordance with Shaw SOP EI-FS-110 *Well Purging* (Appendix C).

3. Monitor and record indicator parameters (pH, SC, oxidation reduction potential, dissolved oxygen, turbidity, and temperature) every 5 minutes until stabilization is achieved. The well is considered to be stable when the indicator parameters have stabilized (± 10 percent, ± 0.3 pH units) over three consecutive readings.

4. Collect groundwater samples. Groundwater samples for VOC analysis should be collected first. If the well consistently purges dry, an alternate purge method will be necessary.

Water quality indicator measurements will be collected and recorded during purging of the monitoring wells, using a field-calibrated water quality meter. Field instruments used to measure water quality parameters will be calibrated in accordance with methods specified by the manufacturer and will be recorded on calibration record forms (Appendix B). Purge water will be collected in drums and handled as investigation-derived waste (IDW).

Groundwater samples will be collected within 24 hours of purging if the monitoring well is purged to dryness. Sampling methods will be documented on the field forms. Field forms are provided in Appendix B. Groundwater will be collected in the containers shown on Table 3-3, and analyzed for TPH-GRO, TPH-DRO, TPH-ORO, TAL metals, SVOCs, VOCs, and TDS.

4.2.4 Soil and Groundwater Sample Identification

Each field sample will be assigned a unique field identification (ID) number. Sample identification will consist of a combination of the six alphanumeric site identifier, two-digit sample type, consecutive sample number for each sample type, and date.

SITEID-ST-NNNN-MMDDYY,

where:

SITEIDs are the US numbers for the UST sites

ST (sample type): CS for confirmation soil
GW for groundwater
BH for borehole soil

NNNN is a unique and consecutive number for soil samples beginning at 0001; or the well number for groundwater collected from monitoring wells/borehole soil samples

MMDDYY is the date in month/day/year form, with two digits per each.

For example, the 3rd confirmation soil sample collected on February 29, 2012, at UST site US-C502 would have sample number: USC502-CS-0003-022912.

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • February 2012 • WERC-09-13-019

The groundwater sample collected from monitoring well MW02 on March 25, 2012, at UST site US-C515 would have sample number: USC515-GW-MW02-032512.

4.2.5 Safety

Throughout the course of this work, safety measures will be implemented in accordance with the SSHP (Shaw, 2012) and with Holloman AFB policies to protect site workers and any other personnel in the area, and to secure the sites during and after work is complete for the day. Daily tailgate safety meetings will be held with the entire field crew at the start of each workday to identify potential on-site safety hazards, create safety awareness, and to discuss emergency procedures. Additional meetings will be held whenever new personnel enter the site to perform work and if site conditions change such that new potential safety hazards become apparent or imminent. If left open overnight, excavations will be secured appropriately, using hazard marking tape, cones, or barricades. During soil excavation and handling, care will be taken by the equipment operator to minimize the release of dust.

At a minimum, the exclusion zone at each site will be secured with caution tape, with traffic cones surrounding the site perimeter. In accordance with the digging permit and utility clearances, the size of each site exclusion zone will be determined by the size of the digging and support equipment, and the sampling locations. Open boreholes will not be left unattended without first securing the immediate area surrounding the borehole, and covering the opening so that it does not become a hazard. Open trenches and excavations will never be left unattended.

4.2.6 Personal Protective Equipment

Personnel directly involved in equipment decontamination will wear appropriate personal protective equipment (PPE) as specified in the SSHP (Shaw, 2012), which is provided in the QPP in Appendix A. Appropriate PPE will be selected based on the level of contamination present or suspected at the site. Care will be taken to ensure that the selected PPE protects decontamination workers from unnecessary contact with soil or decontamination fluids.

The following is a list of the minimum PPE required to perform decontamination activities:

- Safety glasses with splash shields or goggles and latex gloves will be worn during all cleaning operations. For decontamination activities involving large amounts of water, rain suits or aprons and rubber overboots will also be worn.
- No eating, smoking, drinking, chewing, or any hand-to-mouth contact will be permitted during cleaning operations.

Field equipment decontamination will be conducted in accordance with ASTM International (ASTM) standard practices, ASTM D5088-02: *Standard Practice for Decontamination of*

Field Equipment Used at Nonradioactive Waste Sites, (ASTM, 2008) and ASTM D5608-10: *Standard Practices for Decontamination of Field Equipment Used at Low Level Radioactive Waste Sites* (ASTM, 2010), as applicable.

4.2.7 Decontamination Procedures

The objective of the decontamination procedures is to minimize the potential for cross contamination. A designated decontamination area will be established for decontamination of heavy equipment and reusable sampling equipment. Heavy equipment will be decontaminated prior to leaving each UST site by steam cleaning or hot-water pressure washing. All decontamination procedures will be in accordance with Shaw SOP EI-FS-014 *Decontamination of Contact Sampling Equipment* (Appendix C).

Sampling or measurement equipment, including but not limited to, split-spoons, DPT rods, and stainless steel scoops will be decontaminated in accordance with the following steps before each sampling event:

1. Brush equipment with a wire or other suitable brush, if necessary, to remove large particulate matter.
2. Rinse with potable tap water.
3. Wash with non-phosphate detergent or other detergent approved by the NMED (examples include Liqui-Nox®) followed by a tap water rinse.
4. Rinse with 0.1 molar nitric acid (to remove trace metals, if necessary) followed by a tap water rinse.
5. Rinse with methanol (for VOCs, if applicable) followed by a tap water rinse.
6. Rinse with potable tap water.
7. Double rinse with deionized water.

Decontamination liquids will be contained and disposed as described in Section 4.2.8.

4.2.8 Waste Management

Waste management options in order of preference are reuse, recycling, treatment, and disposal. Waste may be classified as non-investigative waste or investigative waste, both of which are discussed below.

4.2.8.1 Non-Investigative Waste

Non-investigative waste, such as trash and office garbage, will be collected on an as-needed basis to maintain the site in a clean and orderly manner. This waste will be accumulated in plastic garbage bags and transported to the designated sanitary landfill or collection bin.

4.2.8.2 Investigation-Derived Waste

Wastes generated during this corrective measure will be segregated into the following categories:

- Suspected contaminated soil
- Concrete or asphalt rubble
- Decontamination liquids
- PPE, sampling debris, and plastic sheeting
- Well development/well purge water.

IDW will be properly containerized and temporarily stored at a location specified by Holloman AFB prior to transportation. Depending on the constituents of concern, fencing or other special marking may be required. Acceptable waste containers include sealed, U.S. Department of Transportation-approved, steel 55-gallon drums, small dumping bins with lids, or roll-off boxes with liners and covers. The containers will be transported in such a manner as to prevent spillage or particulate loss to the atmosphere. When required, sampling of the drums or roll-off boxes will be done in accordance with Shaw SOP EI-FS-116 *Sampling of Drums and Other Containers* or Shaw SOP EI-FS-107 *Roll-Off Sampling* (Appendix C), respectively.

The IDW will be segregated at the site according to matrix (solid or liquid) and how the IDW was derived (e.g., drill cuttings, drilling fluid, decontamination fluids, excavation, tank contents, and purged groundwater). Each container will be properly labeled with site identification, sampling point, depth, matrix, constituents of concern, and other pertinent information for handling.

4.2.8.3 Excavated Soil Stockpiles

Excavated soil stockpile sampling and analysis will be conducted to assess the suitability for reuse on site. The volume of an excavated soil stockpile will be estimated prior to sampling to determine the appropriate number of soil samples to collect. The volume in CY of the stockpile will be calculated using the following equations based on their shape:

Cone or Pyramid:

$$\text{Volume (CY)} = 0.037\ (1/3)\ (L)\ (W)\ (H)$$

Flat Rectangle:

$$\text{Volume (CY)} = 0.037\ (1/2)\ (L)\ (W)\ (H)$$

Where:

L = length in feet

W = width in feet

H = height in feet and

0.037 = the conversion from cubic feet to CY

For each stockpile, sample collection will be conducted at a frequency of one sample per 100 CY or as required by the disposal facility. A minimum of two samples per stockpile will be collected. Stockpile sample locations should be biased towards areas of highest suspected contamination, determined through field screening methods (visual or olfactory observations, OVA measurements, etc.), as described in Shaw SOP EI-FS-203 *Jar Headspace Screening* (Appendix C). A minimum of 6 inches of overlaying soil will be removed prior to collecting the stockpile samples. If compositing of stockpile samples is warranted, it will be done in accordance with Shaw SOP EI-FS-011 *Compositing* (Appendix C).

4.2.8.4 Waste Profile Sampling and Analysis

Sampling and analysis of IDW will be performed to characterize the wastes for disposal (Tables 3-1 through 3-3). Wastes will be segregated and disposed of based on their characteristics. The analytical requirements are specified by the receiving disposal facility. Wastes will be sampled and analyzed according to the receiving transportation, storage, and disposal facility.

4.2.9 Land Surveying

Land surveying of the locations of the trench excavations, confirmation soil sampling locations, monitoring well locations, and of the final site grading will be conducted by a New Mexico state-licensed surveyor. Elevation data will also be surveyed for monitoring wells and will include the top of the polyvinyl chloride riser, top of protective casing, and ground surface elevation at the well locations.

A qualified surveyor will perform the measurements with Trimble® Geometrics Pro XR global positioning system equipment or equivalent. Horizontal coordinates will be referenced to the State Plane Coordinate System, New Mexico Central and surveyed to an accuracy of $\pm$1.0 foot. Vertical elevations will be referenced to North American Datum 1983 coordinate system to an accuracy of $\pm$0.01 foot. Surveying data will be provided in a spreadsheet format for import into the Geographic Information System (GIS), and the data will also be incorporated into the report figures.

4.2.10 Geographic Information System Submittals

The purpose of geospatial information and electronic submittals is to manage GIS technology to effectively coordinate and integrate all pertinent data collected at Holloman AFB. This information can then be analyzed and used to manage project-related spatial data. Examples of data used within the GIS may include monitoring well locations, soil sampling locations, topography, and physiographic features such as roads, buildings, and streams. Where appropriate, GIS applications will be developed and used to integrate spatial data (maps) with tabulated data stored in databases. All applicable federal and U.S. Department of Defense GIS requirements will be followed. The GIS will be managed in accordance with Spatial Data Facilities, Infrastructure, and Environment standards.

The horizontal accuracy of any geospatial data created will be tested and reported in accordance with the National Standard for Spatial Data Accuracy, and the results will be recorded in the metadata. All data must have a datum in World Geodetic System of 1984 and a defined projection.

Environmental Resources Program Information Management System (ERPIMS) submittals will be performed within 90 days of sample collection and in a format as specified in the latest ERPIMS Data Loading Handbook using the latest version of the ERPIMS software utility (ERPTools).

4.3 Site Restoration

Upon completion of all field activities, the sampling locations will be restored to their original condition or that acceptable to the Holloman AFB representative. All activity areas shall be canvassed for trash, debris, etc. during working activities and at completion of field work.

5.0 PROJECT QUALITY ASSSURANCE

5.1 Field Documentation

Field logbooks summarizing daily activities or a field logsheet will be used to record sampling activities each day in accordance with Shaw SOP EI-FS-001 *Field Logbook* or Shaw SOP EI-FS-002 *Field Logsheet* (Appendix C), respectively. Sampling information will be legibly recorded on the field logsheet or in the field logbook using indelible ink. Entries in the field logs will include the following information:

- Name of author, date, and time of entry
- Location of activity
- Names and affiliations of personnel onsite
- Sample collection or measurement methods
- Number of samples collected
- Sample ID numbers
- Field observations and comments

Sufficient information will be recorded on the daily log or in the field logbook to reconstruct the sampling event, if necessary.

In addition, the following field documentation will be prepared or obtained and retained for project record keeping purposes (Appendix B contains examples of field forms):

- Daily tailgate safety meeting forms
- Field activity daily logs
- Field work variances
- Telephone/meeting logs
- Photographic log
- Sample collection forms
- Equipment calibration records
- Field audit/inspection records
- Well-purging logs
- Monitoring well survey data

5.2 Chain-of-Custody Documentation

Procedures to ensure the custody and integrity of the samples begin at the time of sampling and continue through transport, sample receipt, preparation, analysis and storage, data generation and reporting, and sample disposal. Records concerning the custody and condition of the samples are maintained in field and laboratory records.

5.2.1 Sample Custody

Shaw will maintain chain-of-custody records for all field and field QC samples. A sample is defined as being under a person's custody if any of the following conditions exist: (1) it is in their possession; (2) it is in their view, after being in their possession; (3) it was in their possession and they locked it up; or (4) it is in a designated secure area (an area which is controlled and restricted to authorized individuals or those accompanied by authorized individuals).

Samples will be accompanied by chain-of-custody records. When transferring the samples, individuals relinquishing and receiving the samples will sign, date, and note the time on the chain-of-custody record. The field sample coordinator will notify the laboratory coordinator when samples are shipped to the off-site laboratory for analysis.

The following minimum information concerning the sample in accordance with Shaw SOP EI-FS-003 *Chain-of-Custody Documentation* (Appendix C) will be documented on the chain-of-custody form:

- Source of sample (including name, location, and sample type)
- Designation of matrix spike/matrix spike duplicate
- Preservative used
- Analyses required
- Name of collector(s)
- Unique sample identification
- Date and time of sample collection
- Pertinent field data (pH, temperature, etc.)
- Custody transfer signatures, and dates and times of sample transfer from the field to the transporter or laboratory
- Bill of lading or transporter tracking number

Example chain-of-custody forms are attached to Shaw SOP EI-FS-003. Sampling information will be recorded on the chain-of-custody form legibly, using indelible ink. All samples will be uniquely identified, labeled, and documented in the field at the time of collection.

5.2.2 Sample Labels

Sample labels are necessary to prevent misidentification of samples. Each sample container will have a sample label attached. When necessary, the label will be protected from water and solvents with clear tape, except in the case of preweighed 40-milliter (mL) vials. Preweighed 40-mL vials will be placed in a food grade resealable plastic bag with the sample label written in indelible ink on the bag.

Sample labels will be filled out with indelible ink and affixed to each sample container provided by the laboratory in accordance with Shaw SOP EI-FS-006 *Sample Labeling* (Appendix C). Each sample container will be labeled with the following, at minimum:

- Sample ID number
- Sample collection date (month/date/year)
- Time of collection (24-hour clock)
- Project number
- Sampler's initials
- Analyses to be performed
- Preservative

5.3 Sample Packaging and Shipping Requirements

Sludge, soil, and groundwater samples will be packaged and shipped as nonhazardous environmental samples in accordance with Shaw SOP EI-FS-012 *Shipping and Packaging of Non Hazardous Samples* (Appendix C). This section summarizes the process of packaging and shipping samples.

Sample containers will be sealed and packed into plastic bags. Samples will be placed into a shipping cooler. Absorbent material will be placed (as-needed) in the bottom of the cooler to contain any spillage from sample breakage, meltwater, or condensation. Bubble wrap, bubble bags, or precut foam blocks will serve as cushioning material in each cooler. Ice will be double bagged in plastic bags to contain meltwater and packed with the samples to provide adequate cooling until receipt at the laboratory. Chain-of-custody documents will be sealed in waterproof bags and included in the shipping cooler, which will be sealed and secured

prior to being relinquished to the transport company. Samples will be packed and shipped to the laboratory via overnight carrier.

Custody seals will be placed at two separate cooler lid locations (front and back), to provide evidence that the lid has not been opened prior to receipt by the lab in accordance with Shaw SOP EI-FS-005 *Custody Seals* (Appendix C). Custody seal information will be completed in indelible ink; the information on the custody seal will include the date and full signature of the person responsible for sealing the samples and cooler.

5.4 Sample Containers, Preservation, Holding Times, and Analytical Methods

Sample containers, preservation, holding times, and analytical methods are shown on Tables 3-1 through 3-3.

5.5 Quality Control Samples and Frequency

To ensure that the data collected meet project accuracy and precision objectives, the following field QC samples will be collected:

Sample Type	Trip Blank	Equipment Blank	Field Duplicate	MS/MSD
Investigative soil	1 per day VOCs are shipped	1 per UST site	1/10	1/20
Groundwater	1 per day VOCs are shipped	None	1/10	1/20

MS/MSD denotes matrix spike/matrix spike duplicate analysis.
UST denotes underground storage tank.
VOC denotes volatile organic compound.

The site-specific SAP/QAPP is provided in Appendix D. The site-specific SAP/QAPP uses the worksheets from the UFP-SAP/QAPP and contains more detailed, site-specific information.

5.6 Investigation Quality Control

Investigation and construction QC, including inspections, QC reporting, nonconformance reporting, and variance requests, will be performed using the controls identified in the Construction Quality Plan presented in the QPP (Appendix A) and in accordance with Shaw SOP EI-Q007 *Nonconformance Reporting* (Appendix C). The table below lists the definable features of work identified for the Group 3 UST Sites RFI activities on which inspections will be performed.

Feature No.	Definable Feature of Work	Responsible Organization	Work Document Reference
1	DPT and hand-auger soil sample collection, packaging, and shipping	Shaw	RFI Work Plan Section 3.2.1 and 5.3
2	Borehole abandonment	Shaw	RFI Work Plan Section 3.2.2
3	Groundwater sample collection, packaging, and shipping	Shaw	RFI Work Plan Section 3.2.2 and 5.3
4	Site and sample location survey	Shaw and subcontracted surveyor	RFI Work Plan Section 4.2.9
5	IDW management	Shaw	RFI Work Plan Section 4.2.8

DPT denotes direct push technology.
IDW denotes investigation-derived waste.
No denotes number.
RFI denotes RCRA Facility Investigation.
Shaw denotes Shaw Environmental & Infrastructure, Inc.

5.6.1 Geographic Information System

The horizontal accuracy of any geospatial data created will be tested and reported in accordance with the National Standard for Spatial Data Accuracy, and the results will be recorded in the metadata. All data must have a datum in World Geodetic System of 1984 and a defined projection.

Environmental Resources Program Information Management System (ERPIMS) submittals will be performed within 90 days of sample collection and in a format as specified in the latest ERPIMS Data Loading Handbook using the latest version of the ERPIMS software utility (ERPTools).

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • February 2012 • WERC-09-13-019

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • February 2012 • WERC-09-13-019

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6.0 SCHEDULE

This RFI Work Plan will serve as the primary overall working document for the project. The proposed schedule for this project is presented in Figure 6-1.

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • February 2012 • WERC-09-13-019

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • February 2012 • WERC-09-13-019

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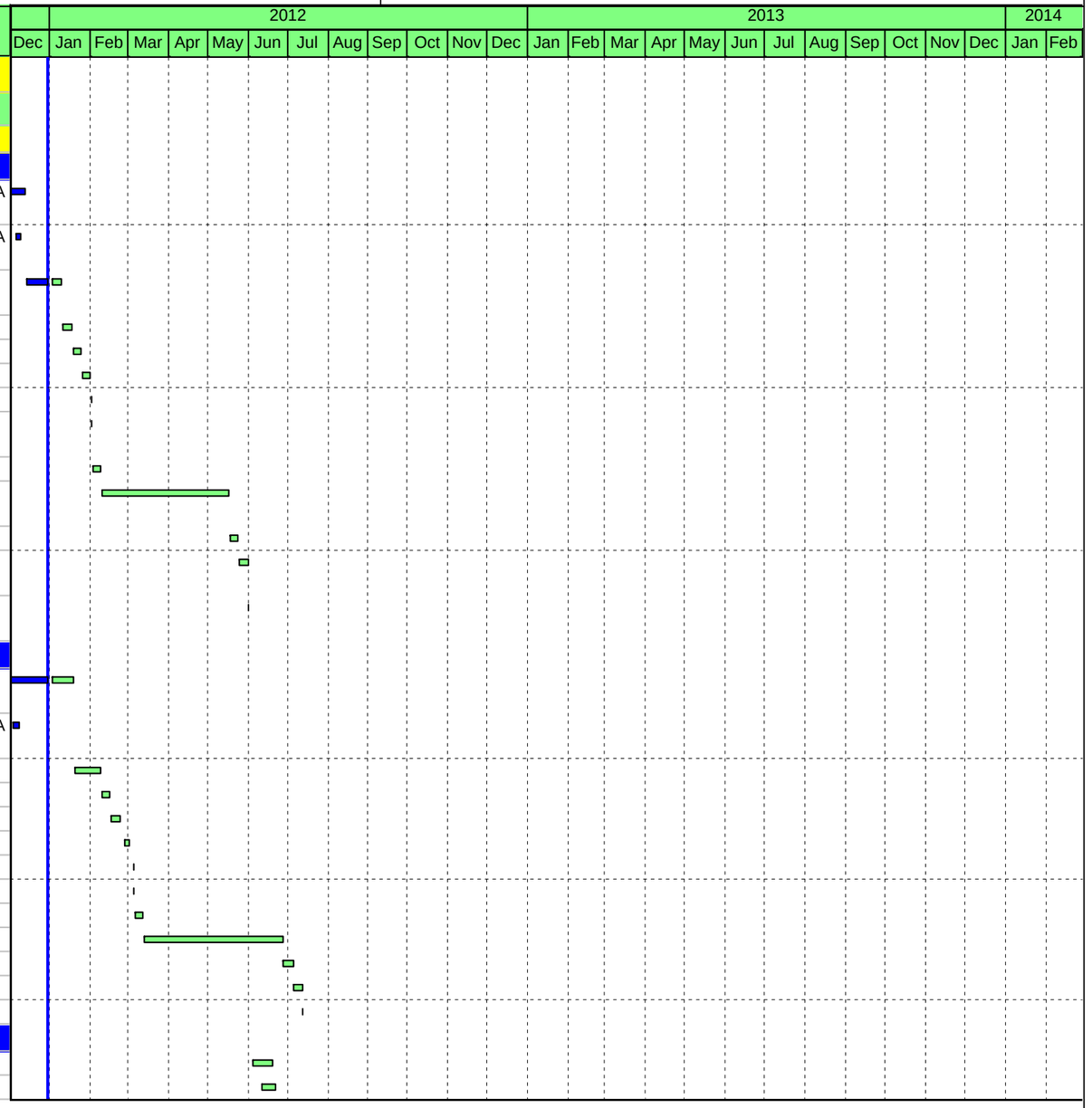
Activity ID	Activity Name	Original Duration	Start	Finish
Mid-Western Region Performance Based Remediation		492	25-Oct-11 A	07-Oct-13
HOLLOMAN AFB		492	25-Oct-11 A	07-Oct-13
GROUP 2 - 5 UST's (SC)		492	25-Oct-11 A	07-Oct-13
Voluntary Corrective Measures Request		152	25-Oct-11 A	01-Jun-12
JU10005	Prepare Working Copy Voluntary Corrective Measures Request	19	25-Oct-11 A	14-Dec-11 A
JU10000	Perform Records Search	3	07-Dec-11 A	09-Dec-11 A
JU10010QA	Air Force Review of Working Copy Voluntary Corrective Measures Request	15	15-Dec-11 A	10-Jan-12
JU10020	Comment Resolution	5	11-Jan-12	18-Jan-12
JU10030	Prepare Final Voluntary Corrective Measures Request	5	19-Jan-12	25-Jan-12
JU10040QA	Air Force Review Final and Sign Submittal Letter	5	26-Jan-12	01-Feb-12
JU10050	Distribute Submittal Letter & Documents to Regulators	1	02-Feb-12	02-Feb-12
JU10055PM	Payment for Final Voluntary Corrective Measures Request	1	02-Feb-12	02-Feb-12
JU10051	Payment of Regulatory Fees	5	03-Feb-12	09-Feb-12
JU10060	Regulators Review of Final Voluntary Corrective Measures Request	69	10-Feb-12	17-May-12
JU10070	Comment Resolution	5	18-May-12	24-May-12
JU10080	Prepare Revised Final Voluntary Corrective Measures Request	5	25-May-12	01-Jun-12
JU10090PM	Payment for Revised Final Voluntary Corrective Measures Request	1	01-Jun-12	01-Jun-12
RFI Work Plan		180	25-Oct-11 A	12-Jul-12
JU11005	RFI Work Plan (WP) Working Copy	19	25-Oct-11 A	19-Jan-12
JU11000	Perform Records Search	3	05-Dec-11 A	09-Dec-11 A
JU11010QA	Air Force Review of Working Copy RFI Work Plan	15	20-Jan-12	09-Feb-12
JU11020	Comment Resolution	5	10-Feb-12	16-Feb-12
JU11030	Prepare Final RFI Work Plan	5	17-Feb-12	24-Feb-12
JU11040QA	Air Force Review Final and Sign Submittal Letter	5	27-Feb-12	02-Mar-12
JU11050	Distribute Submittal Letter & Document to Regulators	1	05-Mar-12	05-Mar-12
JU11055PM	Payment for Final RFI Work Plan	1	05-Mar-12	05-Mar-12
JU11051	Payment of Regulatory Fees	5	06-Mar-12	12-Mar-12
JU11060	Regulators Review of Final RFI Work Plan	76	13-Mar-12	27-Jun-12
JU11070	Comment Resolution	5	28-Jun-12	05-Jul-12
JU11080	Prepare Revised Final RFI Work Plan	5	06-Jul-12	12-Jul-12
JU11090PM	Payment for Revised Final RFI Work Plan	1	12-Jul-12	12-Jul-12
Field Work		14	04-Jun-12	21-Jun-12
JU20001	Field Effort First Set of UST's	12	04-Jun-12	19-Jun-12
JU20002	Field Effort Second set of UST's	9	11-Jun-12	21-Jun-12



Remaining Level of Effort
Actual Level of Effort
Actual Work
Remaining Work
Critical Remaining Work
Milestone

Figure 6-1

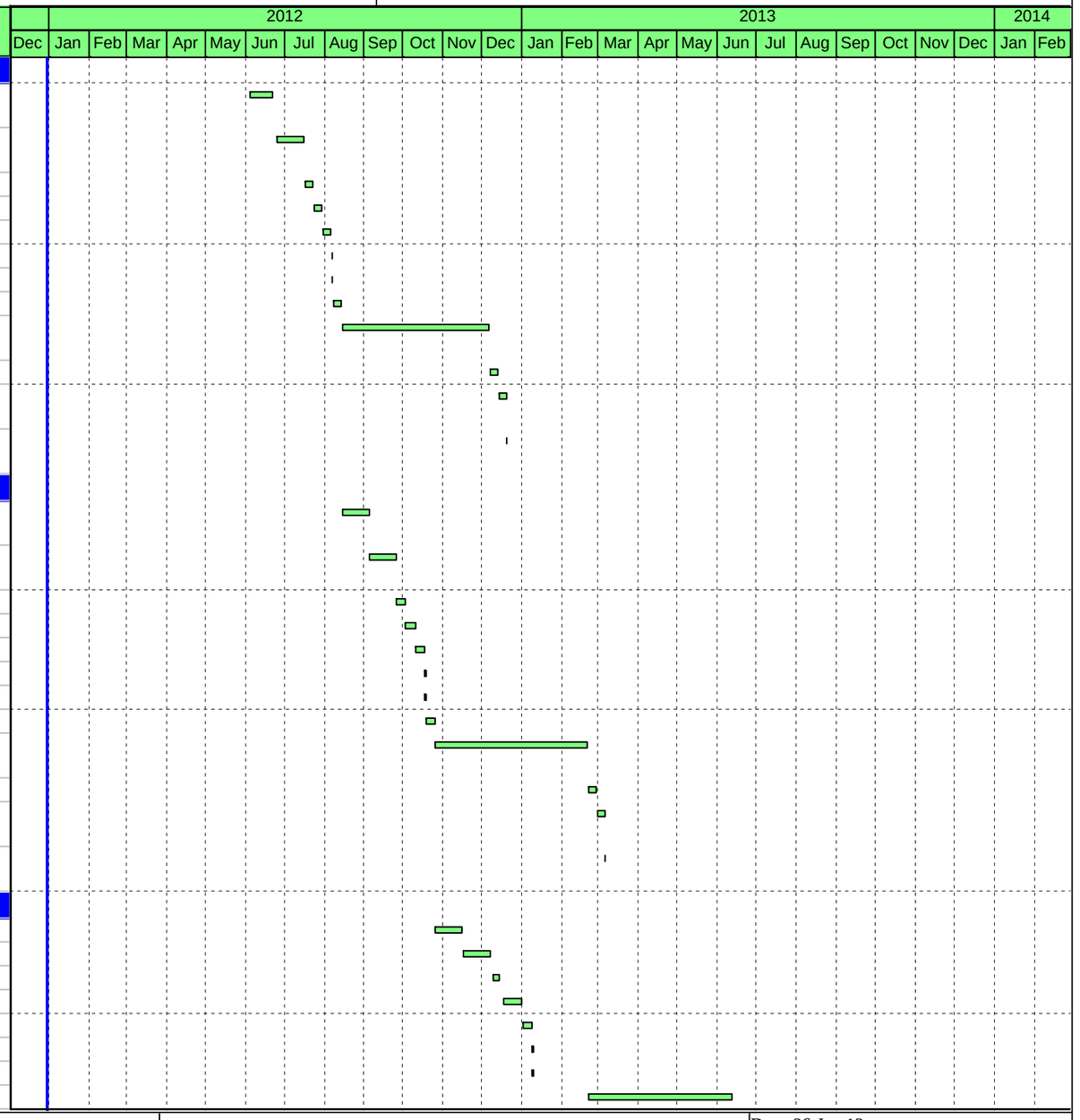
Project Schedule - Holloman AFB, New Mexico

Date: 26-Jan-12

DD: 31-Dec-11

Finish: 30-Dec-13

Activity ID	Activity Name	Original Duration	Start	Finish
Voluntary Corrective Measures Report		140	04-Jun-12	20-Dec-12
JU30000	Prepare Working Copy Voluntary Corrective Measures Report	15	04-Jun-12	22-Jun-12
JU30001QA	Air Force Review of Working Copy Voluntary Corrective Measures Report	15	25-Jun-12	16-Jul-12
JU30020	Comment Resolution	5	17-Jul-12	23-Jul-12
JU30030	Prepare Final Voluntary Corrective Measures Report	5	24-Jul-12	30-Jul-12
JU30040QA	Air Force Review Final and Sign Submittal Letter	5	31-Jul-12	06-Aug-12
JU30050	Distribute Submittal Letter & Document to Regulators	1	07-Aug-12	07-Aug-12
JU30055PM	Payment for Final Voluntary Corrective Measures Report	1	07-Aug-12	07-Aug-12
JU30051	Payment of Regulatory Fees	5	08-Aug-12	14-Aug-12
JU30060	Regulators Review of Final Voluntary Corrective Measures Report	79	15-Aug-12	06-Dec-12
JU30070	Comment Resolution	5	07-Dec-12	13-Dec-12
JU30080	Prepare Revised Final Voluntary Corrective Measures Report	5	14-Dec-12	20-Dec-12
JU30090PM	Payment for Revised Final Voluntary Corrective Measures Report	1	20-Dec-12	20-Dec-12
Corrective Action Completion Petition		139	15-Aug-12	06-Mar-13
JU40000	Prepare Working Copy Corrective Action Completion Petition	14	15-Aug-12	04-Sep-12
JU40001QA	Air Force Review of Working Copy Corrective Action Completion Petition	15	05-Sep-12	25-Sep-12
JU40020	Comment Resolution	5	26-Sep-12	02-Oct-12
JU40030	Prepare Final Corrective Action Completion Petition	5	03-Oct-12	10-Oct-12
JU40040QA	Air Force Review Final and Sign Submittal Letter	5	11-Oct-12	17-Oct-12
JU40050	Distribute Submittal Letter & Document to Regulators	1	18-Oct-12	18-Oct-12
JU40055PM	Payment for Final Corrective Action Completion Petition	1	18-Oct-12	18-Oct-12
JU40061	Payment of Regulatory Fees	5	19-Oct-12	25-Oct-12
JU40065	Regulators Review of Final Corrective Action Completion Petition	79	26-Oct-12	20-Feb-13
JU40070	Comment Resolution	5	21-Feb-13	27-Feb-13
JU40080	Prepare Revised Final Corrective Action Completion Petition	5	28-Feb-13	06-Mar-13
JU40090PM	Payment for Revised Final Corrective Action Completion Petition	1	06-Mar-13	06-Mar-13
Permit Modification		239	26-Oct-12	07-Oct-13
JU50001	Prepare Permit Mod Working Copy	15	26-Oct-12	15-Nov-12
JU50010QA	Air Force Review of Working Copy Permit Modification	15	16-Nov-12	07-Dec-12
JU50020	Comment Resolution	5	10-Dec-12	14-Dec-12
JU50030	Prepare Final Permit Mod	10	17-Dec-12	31-Dec-12
JU50040QA	Air Force Review Final and Sign Submittal Letter	5	02-Jan-13	08-Jan-13
JU50050	Distribute Submittal Letter & Document to Regulators	1	09-Jan-13	09-Jan-13
JU50055PM	Payment for Final Permit Modification	1	09-Jan-13	09-Jan-13
JU50060	Administrative Review for Completeness	79	21-Feb-13	12-Jun-13



Remaining Level of Effort
Actual Level of Effort
Actual Work
Remaining Work
Critical Remaining Work
Milestone

Figure 6-1

Project Schedule - Holloman AFB, New Mexico

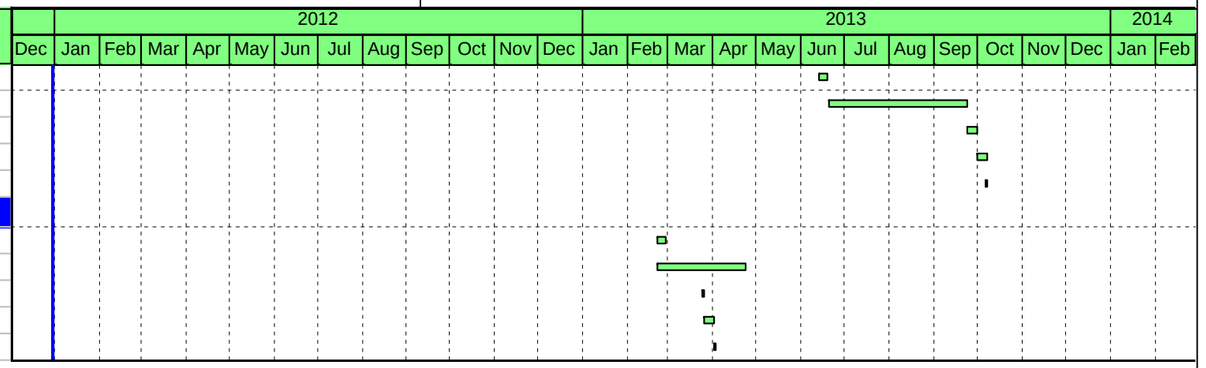
Shaw™ Shaw Environmental, Inc.

Date: 26-Jan-12

DD: 31-Dec-11

Finish: 30-Dec-13

Activity ID	Activity Name	Original Duration	Start	Finish
JU50061	Payment of Regulatory Fees	5	13-Jun-13	19-Jun-13
JU50065	Regulators Review of Final Permit Mod	66	20-Jun-13	23-Sep-13
JU50070	Comment Resolution	5	24-Sep-13	30-Sep-13
JU50080	Prepare Revised Final Permit Mod	5	01-Oct-13	07-Oct-13
JU50090PM	Payment for Revised Final Permit Mod	1	07-Oct-13	07-Oct-13
Public Meeting for Permit Modification		44	21-Feb-13	23-Apr-13
JU70000	Pre-Meeting Materials	5	21-Feb-13	27-Feb-13
JU70010	Public Meeting Public Review Period	44	21-Feb-13	23-Apr-13
JU70020	Public Meeting	1	25-Mar-13	25-Mar-13
JU70030	Public Meeting Transcript	5	26-Mar-13	01-Apr-13
JU70040PM	Payment for Public Meeting for Permit Mod	1	02-Apr-13	02-Apr-13



Remaining Level of Effort
Actual Level of Effort
Actual Work
Remaining Work
Critical Remaining Work
Milestone

Figure 6-1

Project Schedule - Holloman AFB, New Mexico

Shaw™ Shaw Environmental, Inc.

Date: 26-Jan-12

DD: 31-Dec-11

Finish: 30-Dec-13

BACK OF FIGURE

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • February 2012 • WERC-09-13-019

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Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • February 2012 • WERC-09-13-019

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • February 2012 • WERC-09-13-019

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Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • February 2012 • WERC-09-13-019

Appendix A
Quality Program Plan (compact disc)

Final
Quality Program Plan
Midwestern Region Performance Based Remediation

Prepared for U.S. Air Force Center for Engineering and the Environment
2261 Hughes Ave, Suite 155
Lackland AFB, Texas 78236

Prepared by Shaw Environmental & Infrastructure, Inc.
1401 Enclave Parkway, Suite 250
Houston, Texas 77077

Contract No. FA8903-09-D-8580, Task Order No. 0013
Project No. 144106
Rev 0
January 2012

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Summary Table of Contents

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-1

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-1

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Preface

Shaw Environmental & Infrastructure, Inc. (Shaw) has been contracted by the United States (U.S.) Air Force Center for Engineering and the Environment (AFCEE) for performance based remediation services at Cannon Air Force Base (AFB), Holloman AFB, Kirtland AFB, and Scott AFB under the Worldwide Environmental Restoration and Construction 2009 (WERC09), Basic Contract No. FA8903-09-D-8580, Task Order (TO) No. 0013. In accordance with the Statement of Objectives issued December 5, (AFCEE, 2011) and the TO awarded September 22, 2011, Shaw has prepared this General Work Plan to outline the work to be executed under this project.

The overall objective of this project is to reduce U.S. Air Force life-cycle costs while maximizing the number of site closures at Cannon AFB, Holloman AFB, Kirtland AFB, and Scott AFB. Individual sites will be addressed to meet one of three performance objectives: Site Closure with unrestricted reuse, Response Complete with restrictions, and Interim Stabilization Measures and draft Resource Conservation and Recovery Act (RCRA) Facility Investigation (RFI) for New Mexico installations and Time-Critical Removal Action under an action memorandum and draft Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Remedial Investigation for Scott AFB. This TO will follow Shaw's WERC09 procedures. The following chart indicates professional responsibilities, roles, and phone numbers of Shaw personnel:

Role	Responsibilities	Authorities
Spencer Patterson, PMP Program Manager	• Signs the contract • Provides senior corporate representation directly to the AFCEE and USAF, as needed • Ensures sufficient quality and quantities of all required physical resources • Ensures staffing continuity	• Ensures contract requirements are met • Oversees execution of the contract • Exercises stop-work authority for safety or quality concerns (company policy)

Role	Responsibilities	Authorities
Kathleen Romalia, PE, PMP Project Manager	• Ensures project resources • Represents Shaw as COR single point of contact • Ensures sufficient quality and quantities of all required physical resources • Ensures staffing continuity • Directs and manages all aspects of project work in compliance with contract requirements • Controls all project cost, schedule, quality, performance, and subcontractors • In concert with the AFCEE and AFB installation, leads regulatory interaction • Maintains close communication and coordination with the AFCEE and USAF for the duration of the project, including monthly progress and cost reporting	• Ensures contract requirements are met • Oversees execution of the contract • Allocates and commits all team resources • Selects and assigns staff • Approves all expenditures • Terminates any employee or subcontractor not in conformance with corporate or contract requirements • Directs efforts to build a team relationship with regulatory stakeholders • Exercises stop-work authority for safety or quality concerns (company policy)
Installation Leads Senior Engineers Subramanyam "Van" Vangala, PE Joe Colella, PE Senior Scientist Dale Flores, PG William Foss, PG Christopher Long, PG	• Oversees overall preparation and submittal of deliverables • Supports Program/Project Manager with regulatory and COR interaction • Identifies task order resource requirements • Ensures operations are conducted in compliance with approved plans, RCRA permits, and regulatory requirements • Supports Program/Project Manager in ensuring technical quality and on-time delivery of work products within budget	• Approves project deliverables • Ensures safe, efficient, and compliant performance of subcontractors • Exercises stop-work authority for safety or quality concerns (company policy)

Role	Responsibilities	Authorities
David Mummert, CIH Certified Industrial Hygienist (Accountable to Shaw's Corporate H&S Vice President)	• Provides HASP • Conducts H&S training for onsite personnel • Establishes levels of personal protection • Provides H&S oversight to ensure safe performance of all work activities	• Enforces corporate H&S policies and procedures • Monitors and inspects site activities • Exercises stop-work authority for safety or quality concerns (company policy)
Craig Givens QA/QC Specialist (Accountable to Shaw's Corporate Director of Quality)	• Approves UFP-QAPP • Conducts QA/QC training for project personnel • Provides QC oversight to ensure performance requirements of all work activities	• Enforces corporate and project-specific QA/QC policies and procedures • Monitors and inspects site activities • Exercises stop-work authority for quality concerns.
Dezbah Tso–NM Tommy Sammons–IL Regulatory Specialist (Accountable to Shaw's Project Manager)	• Serves as lead point of contact for regulatory matters • Is responsible for the accuracy of hazardous waste identification, completion of waste profiles, completion of waste manifests, completion of all exception and discrepancy reports, and all other transportation and disposal reports • Is responsible for the hazardous materials and their proper storage, transportation, and disposal • Coordinates review and approval procedures for manifests • Develops compliance strategies for site activities • Ensures compliance with RCRA, as well as other pertinent regulatory requirements (SARA/CERCLA, OSHA, U.S. Department of Transportation) • Reviews deliverables for regulatory compliance	• Approves compliance strategies • Maintains stop-work authority for noncompliance • Exercises stop-work authority for safety or quality concerns (company policy)

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-1

Role	Responsibilities	Authorities
Maqsud Rahman Project Chemist (Accountable to Shaw's Project Manager)	• Ensures all chemistry-related goals of the program/project are attained • Consults as needed with Shaw and Army personnel • Monitors chemistry-related goals of the program against practices on project activities • Assists in the preparation of compliance monitoring reports	• Approves project plans for chemistry work • Requires modifications of chemistry to comply with standards • Maintains stop-work authority for noncompliance • Exercises stop-work authority for safety or quality concerns (company policy)
Scientists/Engineers (Accountable to Shaw's Project Manager)	• Assists in the preparation of project work plans, technical reports, and other project deliverables • Provides technical scientific and engineering support on remedial activities	• Exercises stop-work authority for safety or quality concerns (company policy)

The integrated master schedule for this TO was provided in the Project Management Plan. The Cannon AFB, Holloman AFB, Kirtland AFB, and Scott AFB work was funded on September 22, 2011 and the master schedule uses that date as the award date. The duration of the contract is 2 years, ending September 21, 2013.

The points of contact for this contract include the AFCEE Contracting Officer and Contracting Officer's Representative and the personnel at the AFBs. The contact information for these personnel is noted below:

Name	Title	Address	Contact Information
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Karen Walker	AGEISS Cannon AFB Support	AGEISS, Inc. 12414 Nacogdoches, Ste 200 San Antonio, Texas 78217	T: (210) 533-5100 F: (210) 533-5133 karenw@ageiss.com
Anita Lafuente	USAF AFSOC 27 SOCES/CEAN	Attn: Anita Lafuente 27SOCES/CEAN 506 N. DL Ingram Blvd. Cannon AFB, NM 88103-5006 Bldg 355	T: (575)784-1148 Anita.Lafuente@cannon.af.mil
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		Holloman AFB	
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Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-1

Name	Title	Address	Contact Information
		Scott AFB	
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Final
General Work Plan
Midwestern Region Performance Based Remediation

Prepared for U.S. Air Force Center for Engineering and the Environment
2261 Hughes Ave, Suite 155
Lackland AFB, Texas 78236

Prepared by Shaw Environmental & Infrastructure, Inc.
1401 Enclave Parkway, Suite 250
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Contract No. FA8903-09-D-8580, Task Order No. 0013
Project No. 144106
Rev 0
January 2012

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Table of Contents

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-2

Table of Contents (continued)

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-2

List of Figures

List of Tables

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-2

Acronyms and Abbreviations

AFB	Air Force Base
AFCEE	Air Force Center for Engineering and the Environment
ARAR	applicable or relevant and appropriate requirement
bgs	below ground surface
CAC	common access card
CACP	Corrective Action Complete Petition
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
COC	constituents of concern
COR	contracting officer's representative
CQP	Construction Quality Plan
CY	cubic yard(s)
DEQPPM	Defense Environmental Quality Program Policy Memorandum
DoD	U.S. Department of Defense
DOT	U.S. Department of Transportation
FS	Feasibility Study
GPS	global positioning system
GWP	General Work Plan
HSP	Health and Safety Plan
IAC	Illinois Administrative Code
IC	institutional control
IEPA	Illinois Environmental Protection Agency
IDW	investigation-derived waste
IRP	Installation Restoration Program
ISM	Interim Stabilization Measure
LUC	land use control
NCP	National Contingency Plan
NMAC	New Mexico Administrative Code
NMED	New Mexico Environment Department
NMSSL	New Mexico Soil Screening Level
PBR	performance-based remediation
PDF	portable document format
PMP	Project Management Plan
PPE	personal protective equipment
QAPP	Quality Assurance Project Plan
QPP	Quality Program Plan
RC	response complete (with restrictions)
RCRA	Resource Conservation and Recovery Act
RDW	remediation design waste
RFI	RCRA Facility Investigation
RI	Remedial Investigation
RPM	(Installation) Restoration Program Manager
RSL	Regional Screening Level

Acronyms and Abbreviations (continued)

SARA	Superfund Amendments and Reauthorization Act
SC	site closure (unrestricted reuse)
Shaw	Shaw Environmental & Infrastructure, Inc.
SOO	statement of objectives
TO	Task Order
UFP	Uniform Federal Policy
U.S.	United States
USEPA	U.S. Environmental Protection Agency
UST	underground storage tanks
VCM	Voluntary Corrective Measure

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-2

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-2

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Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-2

1.0 INTRODUCTION

A Quality Program Plan (QPP) is required for this project as noted in the Statement of Objectives (SOO) (Air Force Center for Engineering and the Environment [AFCEE], 2011). This General Work Plan (GWP), developed by Shaw Environmental & Infrastructure, Inc. (Shaw) using the AFCEE Model Work Plan (AFCEE, 1996) as guidance, comprises part of the QPP. The other component documents are the Site Safety and Health Plans (SSHPs) for each Air Force Base (AFB), Uniform Federal Policy (UFP)–Quality Assurance Project Plan (QAPP), and the Construction Quality Plan (CQP)

1.1 The U.S. Air Force Installation Restoration Program

The objective of the United States (U.S.) Air Force Installation Restoration Program (IRP) is to assess past hazardous waste disposal and spill sites at U.S. Air Force installations and to develop corrective measures consistent with the National Contingency Plan (NCP) for sites that pose a threat to human health and welfare or the environment. This section presents information on the program origins, objectives, and organization.

The 1976 Resource Conservation and Recovery Act (RCRA) is one of the primary federal laws governing the disposal of hazardous wastes. Sections 6001 and 6003 of RCRA require federal agencies to comply with local and state environmental regulations and provide information to the U.S. Environmental Protection Agency (USEPA) concerning past disposal practices at federal sites. RCRA Section 3012 requires state agencies to inventory past hazardous waste disposal sites and provide information to the USEPA concerning those sites.

In 1980, Congress enacted the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) (i.e., Superfund). CERCLA outlines the responsibility for identifying and remediating contaminated sites in the United States and its possessions. CERCLA legislation identifies the USEPA as the primary policy and enforcement agency regarding contaminated sites.

The 1986 Superfund Amendments and Reauthorization Act (SARA) extends the requirements of CERCLA and modifies CERCLA with respect to goals for remediation and the steps leading to the selection of a remedial process. Under SARA, technologies that provide permanent removal or destruction of a contaminant are preferable to action that only contains or isolates the contaminant. SARA also provides for greater interaction with public and state agencies and extends the USEPA's role in evaluating health risks associated with contamination. Under SARA, early determination of applicable or relevant and appropriate requirements (ARARs) is required, and the consideration of potential remediation alternatives is recommended at the initiation of a Remedial Investigation (RI)/Feasibility

Study (FS). SARA is the primary legislation governing corrective measure at past hazardous waste disposal sites.

Executive Order 12580, adopted in 1987, gave various federal agencies, including the U.S. Department of Defense (DoD), the responsibility to act as lead agencies for conducting investigations and implementing remediation efforts when they are the sole or a co-contributor to contamination on or off their properties.

To ensure compliance with CERCLA regulations and Executive Order 12580, the DoD developed the IRP, under the Defense Environmental Restoration Program, to identify potentially contaminated sites, investigate these sites, and evaluate and select corrective measures for potentially contaminated facilities. The DoD issued Defense Environmental Quality Program Policy Memorandum (DEQPPM) 80-6 regarding the IRP program in June 1980, and implemented the policies outlined in this memorandum in December 1980. The NCP was issued by USEPA in 1980 to provide guidance on the process by which (1) contaminant release could be reported, (2) contamination could be identified and quantified, and (3) corrective measures could be selected. The NCP describes the responsibility of federal and state governments and those responsible for contaminant releases.

The DoD formally revised and expanded the existing IRP directives and amplified all previous directives and memoranda concerning the IRP through DEQPPM 81-5, dated 11 December 1981. The memorandum was implemented by a U.S. Air Force message dated 21 January 1982.

The IRP is the DoD's primary mechanism for response actions on U.S. Air Force installations affected by the provisions of SARA. In November 1986, in response to SARA and other USEPA interim guidance, the U.S. Air Force modified the IRP to provide for an RI/FS program. The IRP was modified so that RI/FS studies could be conducted as parallel activities rather than serial activities. The program now includes ARAR determinations, identification and screening of technologies, and development of alternatives. The IRP may include multiple field activities and pilot studies prior to a detailed final analysis of alternatives. Over the years, requirements of the IRP have been developed and modified to ensure that DoD compliance with federal laws, such as RCRA, NCP, CERCLA, and SARA, can be met.

1.2 General Installation Information

This GWP applies to work performed under the Performance-Based Remediation Contract FA8903-09-D-8580, Task Order (TO) No. 0013 for firm-fixed price environmental remediation services issued by issued by the 772nd Enterprise Sourcing Squadron,

Lackland AFB on September 22, 2011. The work will be performed by Shaw at 80 sites at four AFBs within the USAF Midwestern Region: Scott AFB in Illinois and Cannon AFB, Holloman AFB, and Kirtland AFB in New Mexico. A brief description of each AFB follows.

1.2.1 Cannon AFB

Cannon AFB is located in Curry County, New Mexico, approximately 7 miles west of the City of Clovis (Figure 1-1) and occupies approximately 4,320 acres of land. The City of Clovis has a population of 37,775 according to the 2010 U.S. Census. Cannon AFB is situated in a nearly flat plain sloping gently (10 to 15 feet per mile) to the east and southeast. Elevations in the vicinity of Cannon AFB range from 4,250 feet to 4,350 feet above mean sea level. Cannon AFB dates to 1929, when Portair Field was established on the site as a civilian passenger terminal for early commercial transcontinental flights. In 1942 the Army Air Corps took control of the civilian airfield and it became known as the Clovis Army Air Base. In early 1945, Clovis Army Air Base was renamed Clovis Army Air Field, where flying, bombing, and gunnery classes continued until it was de-activated in May 1947. Clovis Army Air Field was reactivated in 1951 as Clovis AFB and reassigned to the Tactical Air Command. In 1957, the base was renamed Cannon AFB. Several Fighter-Bomber Groups and Tactical Fighter Wings have occupied the base since 1951. In June 2006, Cannon AFB transferred from the Air Combat Command and to the Air Force Special Operations Command.

1.2.2 Holloman AFB

Holloman AFB is situated in south central New Mexico, in the northwest central part of Otero County, approximately 75 miles north-northeast of El Paso, Texas (Figure 1-1). Holloman AFB has a population of 6,000 and occupies approximately 59,639 acres in the northeast quarter of Section 1, Township 17 South, Range 8 East. Private and public owned lands border the remainder of Holloman AFB. The major highway servicing Holloman AFB is Highway 70, which runs southwest from the town of Alamogordo and separates Holloman AFB from publicly owned lands to the south. Alamogordo, with has a population of 30,403 according to the 2010 U.S. Census, is located about 7 miles east of the base.

Holloman AFB was first established in 1942 as Alamogordo Army Air Field. From 1942 through 1945, Alamogordo Army Air Field served as the training grounds for over 20 different flight groups, flying primarily B-17s, B-24s, and B-29s. After World War II, most operation had ceased at the base. In 1947, Air Material Command announced the air field would be its primary site for the testing and development of unmanned aircraft, guided missiles, and other research programs. On January 13, 1948, the Alamogordo installation was renamed in honor of the late Colonel George V. Holloman; a pioneer in guided missile research. In 1968, the 49th Tactical Fighter Wing arrived at Holloman AFB and has

remained since. Today, Holloman AFB also serves as the training center for the German Air Force's Tactical Training Center.

1.2.3 Kirtland AFB

Kirtland AFB occupies approximately 51,558 acres in southeast Albuquerque, NM nestled against the Sandia and Manzano mountain ranges (Figure 1-1). Albuquerque has a population of 545,852 according to the 2010 U.S. Census. Kirtland AFB employs over 23,000 people, including more than 4,200 active duty personnel, 1,000 New Mexico Air National Guard, and 3,200 part-time reservists. Kirtland AFB is home to the 377th Air Base Wing, Kirtland's host organization, which supports about 76 federal government and 384 private sector units. Kirtland AFB is home to Air Force Nuclear Weapons Center and its subordinate wings, the 498th Armament Systems Wing and the 377th Air Base Wing. It is also home to the Defense Threat Reduction Agency, Air Force Safety Center, the Air Force Inspection Agency, the Air Force Operational Test and Evaluation Center, the 58th Special Operations Wing, Space Development and Test Wing, the New Mexico Air National Guard 150th Fighter Wing, the Directed Energy and Space Vehicle Directorates of the Air Force Research Laboratory, the Albuquerque office of the Department of Energy, the National Nuclear Security Administration, and Sandia National Laboratories.

1.2.4 Scott AFB

Scott AFB occupies approximately 3,545 acres in St. Clair County, Illinois, near Belleville, about 20 miles east of the St. Louis metropolitan area (Figure 1-2). Belleville has a population of 44,478 according to the 2010 U.S. Census. Scott AFB is home to 66 tenants including: U.S. Transportation Command, Air Mobility Command, the Military's Surface Deployment and Distribution Command, 18th Air Force, 932nd Airlift Wing (Reserve)'s 126th Air Refueling Wing (Guard), the Air Force Global Logistics Support Center, the Air Force Network Integration Center, the Defense Information Systems Agency, and the Defense Information Technology Contracting Organization. The primary mission of Scott AFB is global mobility support.

1.2.5 Permits

Each of the New Mexico installations has a RCRA Hazardous Waste Facility Permit that establishes the general and specific standards and activities for managing hazardous waste pursuant generally to Subtitle C of the RCRA, the New Mexico Hazardous Waste Act, and the New Mexico Hazardous Waste Management Regulations. Cannon AFB, Holloman AFB, and Kirtland AFB permits were finalized in 2003, 2004, and 2010, respectively (NMED, 2003; NMED, 2004; NMED, 2010). At the New Mexico installations, the New Mexico Environment Department (NMED) provides regulatory oversight.

Scott AFB, an Illinois installation, does not have a RCRA Hazardous Waste Facility Permit. Investigation and remediation at Scott AFB follows the CERCLA process with regulatory coordination by the Illinois Environmental Protection Agency (IEPA) Tiered Approach to Corrective Action Objectives in accordance with Title 35 Illinois Administrative Code (IAC) Part 742.

The RCRA permits and CERCLA regulations set forth the requirements for investigation, notification, corrective action, and reporting for the storage, management, and releases of hazardous wastes. The RCRA permits also define the action/cleanup levels that must be met for site closure.

1.3 Description of Current Project

This performance-based remediation (PBR) contract encompasses 80 sites across the four AFBs. The SOO (AFCEE, 2011) and TO declares the objective is to protect human health and environment during investigation of nature and extent of contamination while maximizing the number of site closures at the aforementioned AFBs. In order to meet the overall objective, the AFCEE identified three possible performance objectives to be achieved on a site-by-site basis from most-to-least preferable.

1. Site Closure with unrestricted reuse (SC)
2. Response Complete with restrictions (RC)
3. Interim Stabilization Measures (ISM)/draft RCRA Facility Investigation (RFI) Report for RCRA permitted installations in New Mexico

The types of sites at the four AFBs are wide ranging: spill sites, former underground storage tank (UST) sites, waste water ponds, septic systems, debris piles, and drainage ditches. The sites include both permitted (Solid Waste Management Units and Areas of Concern), and unpermitted sites. There are sites that are new (e.g. septic systems and debris piles), partially investigated (e.g. waste water pond and drainage ditch), and sites that have been investigated and/or partially remediated (former UST sites). The general approach for these 80 sites is to perform a document and record search on each site, prepare investigation work plan (RFI, or voluntary corrective measure, or RI), prepare subsequent report (RFI, completion, or RI), and if the site is remediated perform the process of changing the site status on the facility Permit. Table 1-1 presents a description for the sites at each AFB. The performance objectives and general approach for the 43 sites at Cannon AFB, 29 sites at Holloman AFB, 5 sites at Kirtland AFB, and 3 sites at Scott AFB are also presented in Table 1-1. Figure 1-1 presents the general location of the New Mexico AFBs and Figure 1-2 presents the location of the Illinois AFB.

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-2

The Project Management Plan (PMP) (Shaw, 2011) specifies the approach, deliverables, schedule, and resources, required for the planning, execution, and completion of this TO. The PMP delineates contract management requirements, issues, and controls to ensure timely and cost effective execution of this TO. The PMP is considered a living document and will be updated as needed to reflect significant changes in project execution.

1.4 Organization of the General Work Plan

This GWP specifies the general approach to ongoing investigation and remediation activities as well as permit modification activities. More detailed technical work plans will be developed for each task/site and will be submitted under separate cover. An introduction is presented in Section 1.0. A summary of existing information about the physiographic attributes at Cannon AFB, Holloman AFB, Kirtland AFB, and Scott AFB are presented in Section 2.0. General descriptions of expected project tasks for the work under this PBR are included in Section 3.0. The expected corrective measures are noted and described briefly in Section 4.0. Data handling, including assessment, recording, and reporting, is described in Section 5.0, with more detail provided in the UFP-QAPP. The project schedule is discussed in Section 6.0 and references are noted in Section 7.0. Following the GWP is a HSP for each AFB, the program UFP-QAPP, and the program CQP.

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-2

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002.2

Table 1-1
Site Description and Performance Summary Table

Site ID	Site Name	Proposed Performance Objective	Proposed Date of Achieving Performance Objective	Description of Technical Approach	Projected Closeout Date
Cannon AFB					
TU/US-C050	Inactive POL Storage Tank 4028B	Site Closure	October 2012	Prepare a Class III permit modification request to document NMED approval of CAC (CAC) without controls	4th Quarter 2012
RS-C103	North Playa Lake	ISM and Draft RFI	November 2012	Prepare ISM and RFI Work Plans, Perform ISM (up to 40 yd^3 of sediment removed),sampling, Prepare a draft RFI for Air Force review and approval	Indefinite, depends on USAF funding/future remedial actions
TU/US-C079	UST at Fire Training Area 1	Site Closure	October 2012	Prepare a Class III permit modification request to document NMED approval of CAC without controls	4th Quarter 2012
TU/US-C124	Inactive UST 1	Site Closure	October 2012	Prepare a Class III permit modification request to document NMED approval of CAC without controls	4th Quarter 2012
OW-C390	OWS 390	Site Closure	October 2012	Prepare a Class III permit modification request to document NMED approval of CAC without controls	4th Quarter 2012
TU/US-C002	Recovered Tank 108	Response Complete	December 2012	Prepare a Class III permit modification request to document NMED approval of CAC with controls	Indefinite, closed with controls
TU/US-C004	Recovered Tank 121	Response Complete	December 2012	Prepare a Class III permit modification request to document NMED approval of CAC with controls	Indefinite, closed with controls
TU/US-C006	Petroleum, Oil, or Lubricant Tank 129	Response Complete	December 2012	Prepare a Class III permit modification request to document NMED approval of CAC with controls	Indefinite, closed with controls
TU/US-C010	POL Tank 170	Site Closure	October 2012	Prepare a Class III permit modification request to document NMED approval of CAC without controls	4th Quarter 2012
TU/US-C125	Inactive UST 2	Site Closure	October 2012	Prepare a Class III permit modification request to document NMED approval of CAC without controls	4th Quarter 2012
WL-C098	Sanitary Sewer Line	Site Closure	October 2012	Prepare a Class III permit modification request to document NMED approval of CAC without controls	4th Quarter 2012
WL-C102	Wastewater Treatment Effluent Discharge	Response Complete	December 2012	Prepare a Class III permit modification request to document NMED approval of CAC with controls	Indefinite, closed with controls
SD-15	SWMU 34	Response Complete Permit Modification	December 2012 September 2013	Perform detailed records search, Prepare supplemental sampling work plan, Perform additional sampling, Prepare a summary report/CAC petition (CACP),Prepare a Class III permit modification request to document NMED approval of CAC with controls	Indefinite, closed with controls
FT-06	SWMU 78	Response Complete Permit Modification	December 2012 September 2013	Perform detailed records search, Prepare supplemental sampling work plan (if necessary) and Perform additional sampling, Prepare a summary report/CAC petition, Prepare a Class III permit modification request to document NMED approval of CAC with controls	Indefinite, closed with controls
SD-12	SWMU 85	Response Complete Permit Modification	December 2012 September 2013	Perform detailed records search, Prepare supplemental sampling work plan, Perform additional sampling, Prepare a summary report/CAC petition (CACP),Prepare a Class III permit modification request to document NMED approval of CAC with controls	Indefinite, closed with controls
SD-20	SWMU 95	Response Complete Permit Modification	December 2012 September 2013	Perform detailed records search, Prepare supplemental sampling work plan, Perform additional sampling, Prepare a summary report/CAC petition (CACP),Prepare a Class III permit modification request to document NMED approval of CAC with controls	Indefinite, closed with controls
FT-08	SWMU 107	Site Closure	January 2014	Perform detailed records search, Prepare supplemental sampling work plan, Perform additional sampling, Prepare a summary report/CAC petition (CACP),Prepare a Class III permit modification request to document NMED approval of CAC with controls	3rd Quarter 2013
SS-19	AOC A	Site Closure	January 2014	Perform detailed records search, Prepare supplemental sampling work plan, Perform additional sampling, Prepare a summary report/CAC petition (CACP),Prepare a Class III permit modification request to document NMED approval of CAC with controls	3rd Quarter 2013
MY-C031	SWMU 31	Response Complete Permit Modification	December 2012 September 2013	Perform detailed records search, Prepare supplemental sampling work plan, Perform additional sampling, Prepare a summary report/CAC petition (CACP),Prepare a Class III permit modification request to document NMED approval of CAC with controls	Indefinite, closed with controls
TU/US-C071	SWMU 71	Response Complete Permit Modification	January 2014	Perform detailed records search, Prepare supplemental sampling work plan, Perform additional sampling, Prepare a summary report/CAC petition (CACP),Prepare a Class III permit modification request to document NMED approval of CAC with controls	Indefinite, closed with controls

Table 1-1 (continued)
Site Description and Performance Summary Table

Site ID	Site Name	Proposed Performance Objective	Proposed Date of Achieving Performance Objective	Description of Technical Approach	Projected Closeout Date
Cannon AFB (continued)					
TA/AS-C091	SWMU 91	Site Closure	January 2014	Perform detailed records search, Prepare supplemental sampling work plan, Perform additional sampling, Prepare a summary report/CAC petition (CACP),Prepare a Class III permit modification request to document NMED approval of CAC with controls	3rd Quarter 2013
FT-C109	SWMU 109	Response Complete Permit Modification	December 2012 September 2013	Perform detailed records search, Prepare supplemental sampling work plan, Perform additional sampling, Prepare a summary report/CAC petition (CACP),Prepare a Class III permit modification request to document NMED approval of CAC with controls	Indeterminate, closed with controls
FT-C110	SWMU 1110	Response Complete Permit Modification	December 2012 September 2013	Perform detailed records search, Prepare supplemental sampling work plan, Perform additional sampling, Prepare a summary report/CAC petition (CACP),Prepare a Class III permit modification request to document NMED approval of CAC with controls	Indefinite, closed with controls
FT-C111	SWMU 111	Response Complete Permit Modification	December 2012 September 2013	Perform detailed records search, Prepare supplemental sampling work plan, Perform additional sampling, Prepare a summary report/CAC petition (CACP),Prepare a Class III permit modification request to document NMED approval of CAC with controls	Indefinite, closed with controls
FT-C112	SWMU 112	Response Complete Permit Modification	December 2012 September 2013	Perform detailed records search, Prepare supplemental sampling work plan, Perform additional sampling, Prepare a summary report/CAC petition (CACP),Prepare a Class III permit modification request to document NMED approval of CAC with controls	Indefinite, closed with controls
TU/US-C126	SWMU 126	Response Complete Permit Modification	December 2012 September 2013	Perform detailed records search, Prepare supplemental sampling work plan, Perform additional sampling, Prepare a summary report/CAC petition (CACP),Prepare a Class III permit modification request to document NMED approval of CAC with controls	Indefinite, closed with controls
OW-C127	SWMU 127	Response Complete Permit Modification	December 2012 September 2013	Perform detailed records search, Prepare supplemental sampling work plan, Perform additional sampling, Prepare a summary report/CAC petition (CACP),Prepare a Class III permit modification request to document NMED approval of CAC with controls	Indefinite, closed with controls
TA/AS-C129	SWMU 129	Response Complete Permit Modification	December 2012 September 2013	Perform detailed records search, Prepare supplemental sampling work plan, Perform additional sampling, Prepare a summary report/CAC petition (CACP),Prepare a Class III permit modification request to document NMED approval of CAC with controls	Indefinite, closed with controls
SD-13	Sanitary sewer lift station overflow pit	Site Closure	October 2012	Prepare a Class III permit modification request to document NMED approval of CAC without controls	4th Quarter 2012
DP-16	Solvent disposal site	Site Closure	October 2012	Prepare a class III permit modification request to document NMED approval of CAC without controls	4th Quarter 2012
LF-02	Landfill No. 2	Response Complete	December 2012	Prepare a Class III permit modification request to document NMED approval of CAC with controls	Indefinite, closed with controls
SD-12	Storm water collection point (South Playa)	Response Complete Permit Modification	December 2012 September 2013	Perform detailed records search, Prepare supplemental sampling work plan, Perform additional sampling, Prepare a summary report/CAC petition (CACP),Prepare a Class III permit modification request to document NMED approval of CAC with controls	Indefinite, closed with controls
SD-11	Engine test cell	Site Closure	October 2012	Prepare a Class III permit modification request to document NMED approval of CAC without controls	4th Quarter 2012
SD-11	Former overflow pit	Site Closure	October 2012	Prepare a Class III permit modification request to document NMED approval of CAC without controls	4th Quarter 2012
SD-11	Former leach field	Site Closure	October 2012	Prepare a Class III permit modification request to document NMED approval of CAC without controls	4th Quarter 2012
SD-11	Evaporation pond	Site Closure	October 2012	Prepare a Class III permit modification request to document NMED approval of CAC without controls	4th Quarter 2012
SD-11	Oil/water separator No. 5114	Site Closure	October 2012	Prepare a Class III permit modification request to document NMED approval of CAC without controls	4th Quarter 2012
SD-20	NE storm water drainage area	Response Complete Permit Modification	December 2012 September 2013	Perform detailed records search, Prepare supplemental sampling work plan, Perform additional sampling, Prepare a summary report/CAC petition (CACP),Prepare a Class III permit modification request to document NMED approval of CAC with controls	Indefinite, closed with controls
SD-17	Old entomology rinse area	Response Complete	December 2012	Prepare a Class III permit modification request to document NMED approval of CAC with controls	Indeterminate, closed with controls

Table 1-1 (continued)
Site Description and Performance Summary Table

Site ID	Site Name	Proposed Performance Objective	Proposed Date of Achieving Performance Objective	Description of Technical Approach	Projected Closeout Date
Cannon AFB (continued)					
FT-07	Fire Training Area No. 2	Site Closure	October 2012	Prepare a Class III permit modification request to document NMED approval of CAC without controls	4th Quarter 2012
OT-10	JP-4 fuel spill	Site Closure	October 2012	Prepare a Class III permit modification request to document NMED approval of CAC without controls	4th Quarter 2012
SS-18	Blown capacitors site	Site Closure	October 2012	Prepare a Class III permit modification request to document NMED approval of CAC without controls	4th Quarter 2012
FL-C070	Oil/water separator & leach field 326	Response Complete	October 2012	Prepare a Class III permit modification request to document NMED approval of CAC with controls	Indefinite, closed with controls
Holloman AFB					
OT-C530	Building 308	Site Closure	September 2013	Prepare a Voluntary Corrective Measures (VCM) Request, Close septic tanks in place in accordance with 20.7.3.307 NMAC, Prepare a VCM Report and a CAC petition, Prepare a class III permit modification request to document NMED approval of CAC without controls	3rd Quarter 2013
OT-C531	Buildings 920, 921, 922	Site Closure	September 2013	Prepare a VCM Request, Close septic tanks in place in accordance with 20.7.3.307 NMAC, Prepare VCM Report and CAC petition, Prepare a Class III permit modification request to document NMED approval of CAC without controls	3rd Quarter 2013
OT-C532	Building 924	Site Closure	September 2013	Prepare a VCM Request, Close septic tanks in place in accordance with 20.7.3.307 NMAC, Prepare a VCM Report and a CAC petition, Prepare a Class III permit modification request to document NMED approval of CAC without controls	3rd Quarter 2013
OT-C533	Building 1190	Site Closure	September 2013	Prepare a VCM Request, Close septic tanks in place in accordance with 20.7.3.307 NMAC, Prepare a VCM Report and a CAC petition, Prepare a Class III permit modification request to document NMED approval of CAC without controls	3rd Quarter 2013
OT-C534	Building 1194	Site Closure	September 2013	Prepare a VCM Request, Close septic tanks in place in accordance with 20.7.3.307 NMAC, Prepare a VCM Report and a CAC petition, Prepare a Class III permit modification request to document NMED approval of CAC without controls	3rd Quarter 2013
OT-C535	Building 1196	Site Closure	September 2013	Prepare a VCM Request, Close septic tanks in place in accordance with 20.7.3.307 NMAC, Prepare a VCM Report and a CAC petition, Prepare a Class III permit modification request to document NMED approval of CAC without controls	3rd Quarter 2013
OT-C536	Building 1199	Site Closure	September 2013	Prepare a VCM Request, Close septic tanks in place in accordance with 20.7.3.307 NMAC, Prepare a VCM Report and a CAC petition, Prepare a Class III permit modification request to document NMED approval of CAC without controls	3rd Quarter 2013
OT-C537	Building 1200	Site Closure	September 2013	Prepare a VCM Request, Close septic tanks in place in accordance with 20.7.3.307 NMAC, Prepare a VCM Report and a CAC petition, Prepare a Class III permit modification request to document NMED approval of CAC without controls	3rd Quarter 2013
OT-C538	Building 1201	Site Closure	September 2013	Prepare a VCM Request, Close septic tanks in place in accordance with 20.7.3.307 NMAC, Prepare a VCM Report and a CAC petition, Prepare a Class III permit modification request to document NMED approval of CAC without controls	3rd Quarter 2013
OT-C539	Building 1221	Site Closure	September 2013	Prepare a VCM Request, Close septic tanks in place in accordance with 20.7.3.307 NMAC, Prepare a VCM Report and a CAC petition, Prepare a Class III permit modification request to document NMED approval of CAC without controls	3rd Quarter 2013
OT-C540	Building 1251	Site Closure	September 2013	Prepare a VCM Request, Close septic tanks in place in accordance with 20.7.3.307 NMAC, Prepare a VCM Report and a CAC petition, Prepare a Class III permit modification request to document NMED approval of CAC without controls	3rd Quarter 2013
OT-C541	Building 1269	Site Closure	September 2013	Prepare a VCM Request, Close septic tanks in place in accordance with 20.7.3.307 NMAC, Prepare a VCM Report and a CAC petition, Prepare a Class III permit modification request to document NMED approval of CAC without controls	3rd Quarter 2013
OT-C542	Building 1166	Site Closure	September 2013	Prepare a VCM Request, Close septic tanks in place in accordance with 20.7.3.307 NMAC, Prepare a VCM Report and a CAC petition, Prepare a Class III permit modification request to document NMED approval of CAC without controls	3rd Quarter 2013
OT-C543	Building 1175	Site Closure	September 2013	Prepare a VCM Request, Close septic tanks in place in accordance with 20.7.3.307 NMAC, Prepare a VCM Report and a CAC petition, Prepare a Class III permit modification request to document NMED approval of CAC without controls	3rd Quarter 2013

Table 1-1 (continued)
Site Description and Performance Summary Table

Site ID	Site Name	Proposed Performance Objective	Proposed Date of Achieving Performance Objective	Description of Technical Approach	Projected Closeout Date
Holloman AFB (continued)					
OT-C544	Building 1176	Site Closure	September 2013	Prepare a VCM Request, Close septic tanks in place in accordance with 20.7.3.307 NMAC, Prepare a VCM Report and a CAC petition, Prepare a Class III permit modification request to document NMED approval of CAC without controls	3rd Quarter 2013
TU/US-C500	Building 300	ISM and Draft RFI	January 2013	Perform records search to obtain former UST location and removal information, Prepare an RFI Work Plan and VCM Work Plan, Perform investigation and soil removal, and collect confirmation samples, Prepare an RFI Report	Indefinite, depends on USAF funding and future remedial actions
TU/US-C501	Building 1113	ISM and Draft RFI	January 2013	Perform records search to obtain former UST location and removal information, Prepare an RFI Work Plan and VCM Work Plan, Perform investigation and soil removal, and collect confirmation samples, Prepare an RFI Report	Indefinite, depends on USAF funding and future remedial actions
TU/US-C502	Building 2395	Site Closure	October 2013	Perform records search for former UST location and removal information, Prepare VCM Request and RFI Work Plan, Perform investigation and soil removal, Prepare VCM/RFI Report; Prepare CAC petition and Class III permit modification request to document NMED approval of CAC without controls	3rd Quarter 2013
TU/US-C503	Building 221	ISM and Draft RFI	January 2013	Perform records search to obtain former UST location and removal information, Prepare an RFI Work Plan and VCM Work Plan, Perform investigation and soil removal, and collect confirmation samples, Prepare an RFI Report	Indefinite, depends on USAF funding and future remedial actions
TU/US-C504	Building 301	ISM and Draft RFI	January 2013	Perform records search to obtain former UST location and removal information, Prepare an RFI Work Plan and VCM Work Plan, Perform investigation and soil removal, and collect confirmation samples, Prepare an RFI Report	Indefinite, depends on USAF funding and future remedial actions
TU/US-C505	Building 1097	ISM and Draft RFI	January 2013	Perform records search to obtain former UST location and removal information, Prepare an RFI Work Plan and VCM Work Plan, Perform investigation and soil removal, and collect confirmation samples, Prepare an RFI Report	Indefinite, depends on USAF funding and future remedial actions
TU/US-C506	Building 901	ISM and Draft RFI	January 2013	Perform records search to obtain former UST location and removal information, Prepare an RFI Work Plan and VCM Work Plan, Perform investigation and soil removal, and collect confirmation samples, Prepare an RFI Report	Indefinite, depends on USAF funding and future remedial actions
TU/US-C507	Building 1272	Site Closure	October 2013	Perform records search to obtain former UST location and removal information, Prepare VCM Request and RFI Work Plan, Perform investigation and soil removal, Prepare VCM/RFI Report; Prepare CAC petition and Class III permit modification request to document NMED approval of CAC without controls	3rd Quarter 2013
TU/US-C508	Building 298	ISM and Draft RFI	January 2013	Perform records search to obtain former UST location and removal information, Prepare an RFI Work Plan and VCM Work Plan, Perform investigation and soil removal, and collect confirmation samples, Prepare an RFI Report	Indefinite, depends on USAF funding and future remedial actions
TU/US-C513	Building 898	ISM and Draft RFI	January 2013	Perform records search to obtain former UST location and removal information, Prepare an RFI Work Plan and VCM Work Plan, Perform investigation and soil removal, and collect confirmation samples, Prepare an RFI Report	Indefinite, depends on USAF funding and future remedial actions
TU/US-C514	Building 882	Site Closure	October 2013	Perform records search to obtain former UST location and removal information, Prepare VCM Request and RFI Work Plan, Perform investigation and soil removal, Prepare VCM/RFI Report; Prepare CAC petition and Class III permit modification request to document NMED approval of CAC without controls	3rd Quarter 2013
TU/US-C515	Building 889	Site Closure	October 2013	Perform records search to obtain former UST location and removal information, Prepare VCM Request and RFI Work Plan, Perform investigation and soil removal, Prepare VCM/RFI Report; Prepare CAC petition and Class III permit modification request to document NMED approval of CAC without controls	3rd Quarter 2013

Table 1-1 (continued)
Site Description and Performance Summary Table

Site ID	Site Name	Proposed Performance Objective	Proposed Date of Achieving Performance Objective	Description of Technical Approach	Projected Closeout Date
Holloman AFB (continued)					
TU/US-C516	Building 684	Site Closure	October 2013	Perform records search to obtain former UST location and removal information, Prepare VCM Request and RFI Work Plan, Perform investigation and soil removal, Prepare VCM/RFI Report; Prepare CAC petition and Class III permit modification request to document NMED approval of CAC without controls	3rd Quarter 2013
TU/US-C518	UST 7003	ISM and Draft RFI	January 2013	Perform records search for former UST location and removal information, Prepare an RFI Work Plan and VCM Work Plan, Perform investigation and soil removal, and collect confirmation samples, Prepare an RFI Report	Indefinite, depends on USAF funding and future remedial actions
Kirtland AFB					
CW-C571	Zia Park	ISM and Draft RFI	December 2012	Prepare an RFI Work Plan, Prepare an Accelerated Corrective Measures (ACM) Work Plan, Perform soil characterization and excavation of contaminated soil (if any) up to 40 yds^3, Prepare an RFI Report	Indefinite, depends on USAF funding and future remedial actions
OT-C572	Bldg 5700-1 (also known as Building 57001)	ISM and Draft RFI	December 2012	Prepare an RFI Work Plan, Prepare an Accelerated Corrective Measures (ACM) Work Plan, Perform soil characterization and excavation of contaminated soil (if any) up to 40 yds^3, Prepare an RFI Report	Indefinite, depends on USAF funding and future remedial actions
OT-C573	Asphalt Dump Area	ISM and Draft RFI	December 2012	Prepare an RFI Work Plan, Prepare an Accelerated Corrective Measures (ACM) Work Plan, Perform soil characterization and excavation of contaminated soil (if any) up to 40 yds^3, Prepare an RFI Report	Indefinite, depends on USAF funding and future remedial actions
SS-C574	Bldg 20676 Spill Site	Site Closure	September 2013	Prepare an ACM Work Plan, Perform soil characterization and excavation, Prepare an ACM Report, Prepare a CAC petition, Prepare a Class III permit modification request to document NMED approval of CAC without controls	3rd Quarter 2013
SS-C575	Transient Alert Pad	ISM and Draft RFI	December 2012	Prepare an RFI Work Plan, Prepare an Accelerated Corrective Measures (ACM) Work Plan, Perform soil characterization and excavation of contaminated soil (if any) up to 40 yds^3, Prepare an RFI Report	Indefinite, depends on USAF funding and future remedial actions
Scott AFB					
UK-C500	Building 39	Draft Remedial Investigation (RI)	January 2013	Prepare an RI Work Plan, Perform soil and groundwater characterization. Prepare an RI Report.	Indefinite, depends on USAF funding and future remedial actions
UK-C501	Scott Club	Draft RI	January 2013	Prepare an RI Work Plan, Perform soil and groundwater characterization, Prepare an RI Report.	Indefinite, depends on USAF funding and future remedial actions
UK-C510	South Ditch	Draft RI	January 2013	Prepare an RI Work Plan, Perform soil and groundwater characterization. Prepare an RI Report.	Indefinite, depends on USAF funding and future remedial actions

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-2

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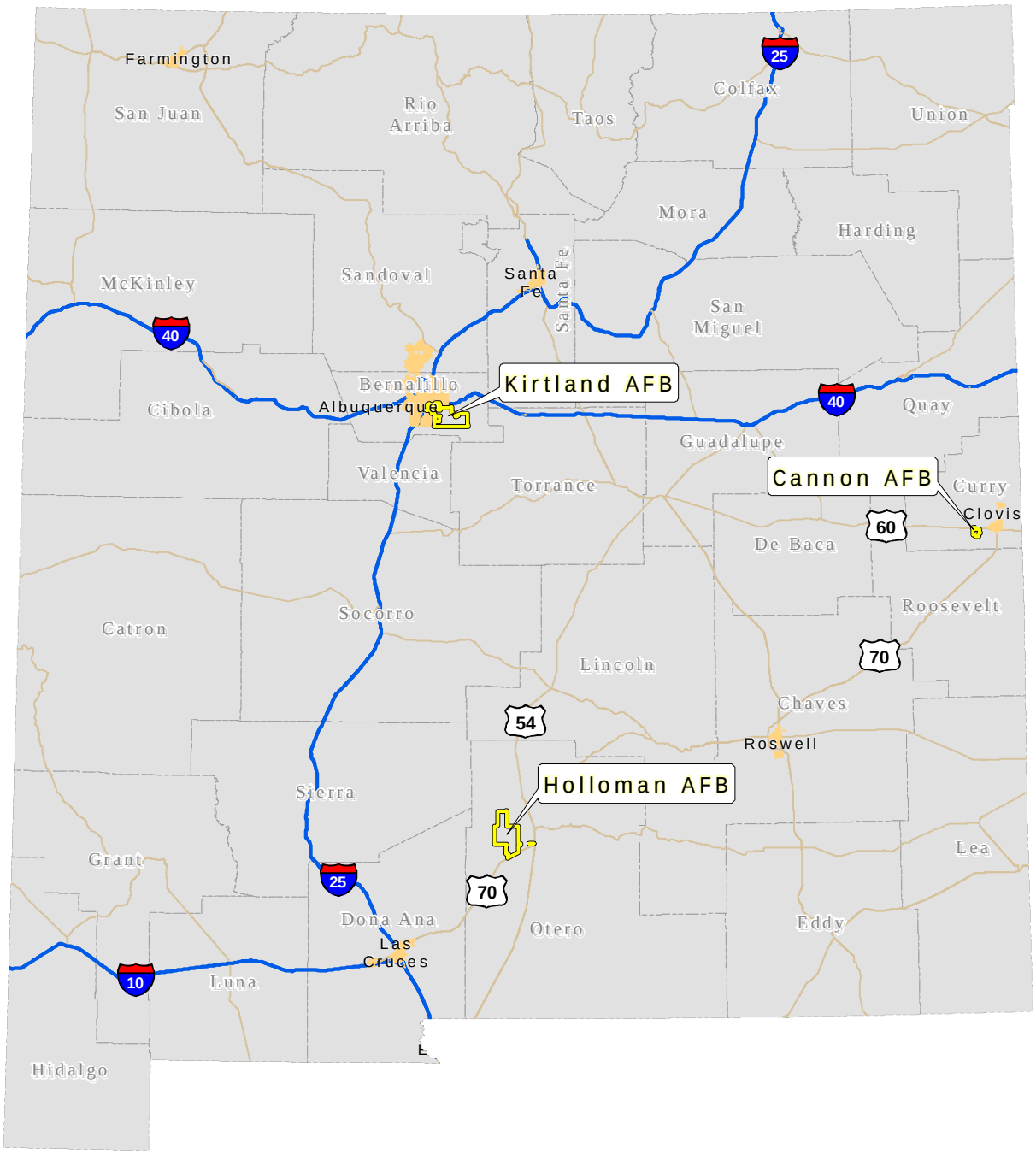

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New Mexico Site Locations

N

WGS 84 UTM ZONE 13N METERS

0 20 40 80
Kilometers

0 12.5 25 50
Miles

Shaw

Figure 1-1

New Mexico Locations

New Mexico

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-2

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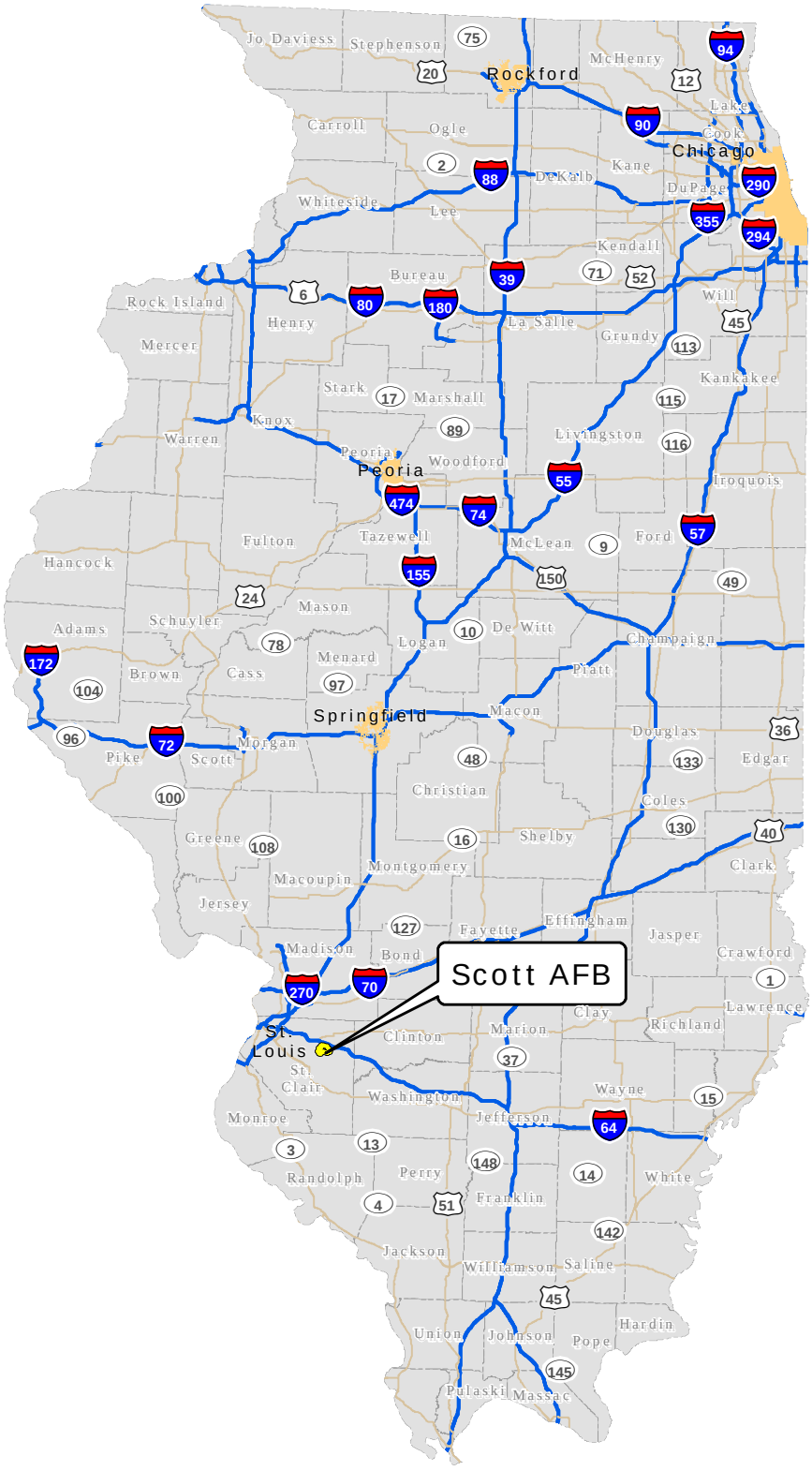

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Scott AFB Location

N

NAD 83 UTM Zone 16N
Meters

0 10 20 30 40 50
Kilometers

0 5.5 11 16.5 22 27.5
Miles

Shaw

Figure 1-2

Scott AFB Location

Illinois

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-2

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2.0 ENVIRONMENTAL SETTING

The environmental setting for each installation presents an overview of the land use and general geology and hydrogeology. Additional detail regarding primary contaminants, individual site status, and conditions will be presented in the installation technical work plans prepared for each site or groups of sites.

2.1 Current Land Use

Cannon AFB, Holloman AFB, Kirtland AFB, and Scott AFB are all active U.S. Air Force military installations.

2.2 Geology

2.2.1 Cannon AFB

Cannon AFB is located within the Southern High Plains physiographic region that extends from New Mexico into Texas. The Southern High Plains forms a plateau bounded on three sides by escarpments that separate the region from the Pecos River Valley to the west and the Canadian River Valley to the north. The Southern High Plains are semiarid, short grass prairie with an almost featureless surface. The observed slight topography variations are due to wind-blown sand dunes and thousands of playas that exist across the region. Windborne sediment was the dominant depositional process in the Southern High Plains.

The shallowest geologic unit in the vicinity of Cannon AFB is the Blackwater Draw Formation. This formation is variable in thickness and laterally extensive, covering much of the Southern High Plains region across New Mexico and extending to Texas. The Blackwater Draw Formation is sandy in the southwestern extent of the area and becomes progressively more clay-rich in the northeast. Deposition of the Blackwater Draw Formation was most likely by wind with the layers strongly modified through weathering. The Ogallala Formation, a deposit of sand and gravel stream sediments, underlies the Blackwater Draw Formation. The Ogallala Formation varies in thickness from 50 to 100 meters thick and hosts the Ogallala Aquifer, which supplies water to Cannon AFB.

2.2.2 Holloman AFB

Holloman AFB is located within the Tularosa Basin, which is the eastern most extent of the Basin and Range Province of the western United States. The San Andres, San Augustin, and Oscura Mountains border the Tularosa Basin on the west and the Sacramento Mountains form the eastern border of the basin. Tularosa Basin consists of thick sequences of Tertiary and Quaternary age alluvial and bolson fill deposits. These sediments are as much as

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-2

5,000 feet thick in some places and are predominantly silt, sand, gypsum, and clay weathering products from the surrounding mountain ranges (URS, 2010).

In general, the stratigraphy is represented by unconsolidated to partially consolidated, fine- to medium-grained sand with subordinate amounts of clay. Caliche occurs as discrete layers and nodules throughout the stratigraphic section. Although no faults are mapped within the immediate area of Holloman AFB, Quaternary faulting exists in the region. These faults occur within the unconsolidated bolson sediments, trend north to south, and are most common near the mountain fronts.

Near surface geologic conditions at Holloman AFB consist of sediments that are alluvial, eolian, and lacustrine or playa origin. The eolian and alluvial deposits are often indistinguishable because the wind simultaneously reworks alluvial fan sediments and deposits gypsum sands. Lacustrine and playa deposits contain medium to high plasticity clays containing gypsum crystals and other salts.

2.2.3 Kirtland AFB

Kirtland AFB is located within the Albuquerque Basin. The basin is approximately 90 miles long and 30 miles wide. Geologic features in the basin include travertine and unconsolidated and semi-consolidated piedmont deposits, as well as eolian, lacustrine, and stream channel deposits. The eastern portion of the installation is mountainous and is comprised of Precambrian metamorphic, igneous (primarily granite), and Paleozoic sedimentary rock.

The surficial geology at Kirtland AFB is characterized by recent deposits of sandy silt and silty sand, with minor amounts of clay and gravel, Ortiz gravel (e.g., alluvial piedmont sand and gravel deposits), and the Santa Fe Group (e.g., mixture of sand, silt, clay, gravel, cobbles, and boulders). Generally, the northern and western portions of Kirtland AFB are dominated by unconsolidated geologic units, and consolidated units dominate the eastern half of the installation. The geologic materials of primary importance within the Albuquerque Basin are the Santa Fe Group and the piedmont slope deposits. The Santa Fe Group consists of beds of unconsolidated to loosely consolidated sediments and interbedded volcanic rocks. Materials range from boulders to clay and from well-sorted stream channel deposits to poorly sorted slope wash deposits.

2.2.4 Scott AFB

Scott AFB is located in the Dissected Till Plains Section of the Central Lowland Physiographic Province, on the western edge of the Illinois Basin. The stratigraphy of the region consists of Quaternary unconsolidated sediments that are overlying Paleozoic sedimentary bedrock. The Quaternary materials consist of eolian, alluvial, and glacial

deposits. The bedrock is largely low permeability shale with thin, discontinuous beds of sandstone and limestone. Hydrogeology

2.2.5 Cannon AFB

In the area surrounding Cannon AFB, the general groundwater flow direction is from the northwest to the southeast with groundwater occurring under unconfined aquifer conditions. The lower part of the Ogallala Aquifer is the primary regional aquifer for both potable and irrigation water. Beneath the eastern portion of Cannon AFB, the depth to groundwater has been measured between 270 and 300 feet below ground surface (bgs), and the saturated thickness of the Ogallala Aquifer in this area ranges from 93 to 143 feet bgs.

Recharge to the Ogallala aquifer occurs primarily through precipitation. Due to the high evapotranspiration and low precipitation rates in the region, recharge likely only occurs during periods of high rainfall events when precipitation exceeds the soil infiltration capacity (such as during warmer months) or the evapotranspiration rate (such as during cooler months). Runoff flows to playas and the standing water present in the playas may allow deep percolation to the aquifer. Discharge from the Ogallala Aquifer occurs through well pumping and springs along the eroded margins of the formation.

2.2.6 Holloman AFB

Holloman AFB is located within the Tularosa Basin, a closed basin with no surface water drainage from outside the basin (URS, 2010). The surface hydrogeology at Holloman AFB is characterized by low precipitation, high evapotranspiration rates, and high soil infiltration. During the summer season, when thunderstorm activity is most common, playas within the basin may contain standing water. The arroyos that drain the surrounding mountain ranges usually contain water only after heavy precipitation events. Holloman AFB is crossed by several southwest-trending arroyos which control surface drainage in undeveloped areas.

Groundwater occurs in unconfined conditions in the unconsolidated bolson deposits beneath the installation. The aquifer is recharged by percolation of rainfall and stream infiltration through the coarse unconsolidated alluvial fan deposits along the western flank of the Sacramento Mountains. Depth to groundwater ranges from 270 feet bgs near the mountains to less than 5 feet at Holloman AFB. The groundwater flow direction at the installation is influenced by surface water flow along southwest trending arroyos. In general, the groundwater flow direction at Holloman AFB is west and southwest, depending on the proximity of the arroyos.

2.2.7 Kirtland AFB

Kirtland AFB is located within the Albuquerque Basin, which is also referred to as the Middle Rio Grande Basin. Generally, the upper unit of the Santa Fe Group contains the most

productive portion of the regional aquifer that supplies groundwater to the City of Albuquerque, Bernalillo County, and Kirtland AFB. The principle aquifer consists of unconsolidated and semi-consolidated sands, gravels, silts, and clays of the Santa Fe Group; alluvial fan deposits associated with the erosion of upland areas; and valley alluvium with stream development. Hydraulic conductivity values range from 0.25 feet per day to 50.0 feet per day because of large variations in the lithology of the basin-fill Santa Fe Group deposits.

2.2.8 Scott AFB

Scott AFB lies in an area of the Illinois Basin that does not have aquifers of regional significance. Water for Scott AFB and the surrounding communities of O'Fallon, Belleville, and Shiloh, is supplied by the Illinois American Water Company which obtains water from the Mississippi River. Some residential and agricultural users within a 10-mile radius of Scott AFB have wells that discharge a limited amount of water from shallow aquifers completed in the unconsolidated sediments overlying the bedrock.

Significant hydrologic units in the region include alluvium containing sand and gravel lenses, sand and gravel layers, and sandstone or other permeable strata within the bedrock. The water quality varies significantly across the region, with shallow sediments producing water of better quality than water derived from bedrock units. Precipitation is the primary source of groundwater recharge in the area.

Scott AFB is drained by Ash Creek, a major tributary of Silver Creek as well as several unnamed tributaries. Ash Creek is classified as "General Use" by the IEPA, which allows for uses such as agriculture, primary and secondary contact recreation, aquatic life propagation, and most industrial uses.

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-2

3.0 GENERAL PROJECT TASKS

Each task under this PBR will be in conformance with each New Mexico installation's RCRA permit and CERCLA requirements for Scott AFB. Each task will complete site characterization or improve site characterization information, and will support the performance objective of SC, RC, or ISM/draft RFI (draft RI for Scott AFB).

Project tasks at individual sites will vary based on the performance objective, installation location, and contaminants and contaminated media. Nature and extent of contamination in the investigated media will be determined for each site, as appropriate. Comparison of the validated analytical results for sampled media will be compared to the appropriate medium-specific screening values, as specified in each New Mexico installation's RCRA Permit and as specified by the IEPA for Scott AFB. In general, applicable screening levels for the New Mexico installations include the most recent values of:

- New Mexico soil screening levels (NMSSLs) (NMED, 2009) for residential exposure
- USEPA Regional soil Screening Levels (RSLs) (USEPA, 2011) for residential exposure
- New Mexico Water Quality Control Commission Standards for Ground Water (20.6.2.3103 New Mexico Administrative Code [NMAC])
- USEPA National Primary Drinking Water Standards, maximum contaminant limits (USEPA, 2010)
- New Mexico Water Quality Standards for Interstate and Intrastate Streams (20.6.4 NMAC)

The RCRA permit for each New Mexico AFB specifies how to employ the installation-specific screening levels and is summarized in Table 3-1. Holloman AFB and Kirtland AFB developed installation-specific background concentrations for metals in soil and groundwater that are approved by the NMED (NMED 1997; NMED 2011) and Cannon AFB developed installation-specific background concentrations for inorganics and pesticides in soil (NMED, 2006). These background concentrations will be included in the reports, as applicable.

The validated analytical results from Scott AFB will be compared to the IEPA Tiered Approach to Corrective Action Objectives Tier 1 values for soil and groundwater (35 IAC 742). Soil background concentrations for Scott AFB are obtained from the Scott Air Force Base *Final Background Investigation* (Scott Air Force Base [SAFB], 2008) and Illinois TACO Appendix A, Table G-Concentrations of Inorganic Chemicals in Background Soils,

and Table H-Concentrations of Polynuclear Aromatic Hydrocarbon Chemicals in Background Soils(35 IAC 742). Screening levels are presented in the UFP-QAPP.

Tasks are discussed in general terms here, and will be discussed in more detail for each site or groups of sites in the technical work plans. Project tasks can be divided into the following categories:

- General activities
- Administrative activities
- Groundwater investigation activities
- Soil investigation activities
- Surface water and sediment investigation activities

3.1 General Activities

General activities include contract transition, mobilizing and demobilizing, land use control (LUC)/institutional control (IC) activities, surveying, and managing wastes. Shaw has developed numerous procedures relevant to the work to be performed. Controlled copies of the procedures are available to all Shaw personnel on the Shaw Intranet. For the Midwestern Region PBR, relevant informational copies of the procedures have been loaded to the project SharePoint portal.

3.1.1 Mobilization and Demobilization

During mobilization, a site reconnaissance will be conducted before initiation of site-specific field activities. The following tasks are examples of those typically performed during a site reconnaissance:

- Field-verify planning document maps
- Locate surface water features, including groundwater seeps and surface water drainages
- Identify and verify proposed sampling locations
- Assess sample locations for overhead and subsurface utilities and other potential access problems for personnel and equipment
- Evaluate observations and update maps.

Site preparation tasks that will typically be completed during the mobilization include:

- Complete requirements for a surface water discharge permit or facility approval to discharge
- Construct decontamination area (discussed in more detail below)
- Verify office space, communications, vehicles, utilities, etc.
- Become familiar with the Cannon AFB, Holloman AFB, Kirtland AFB, and Scott AFB rules, policies, procedures, names of local points of contact, and emergency telephone numbers
- Verify locations of emergency equipment
- Determine digging permit and utility procedures
- Locate underground utilities for drilling boreholes or other intrusive excavations (discussed in more detail below).

Areas designated for intrusive sampling will be surveyed for the presence of underground utilities. Utility locations are determined using existing utility maps, and in the field, may be verified using a hand-held magnetometer or utility probe. Vehicle access routes to sampling locations will be determined prior to any field activity.

Buried utilities clearance will be in accordance with the approved applicable AFB HSP procedures and will include marking of known underground utilities by utility representatives and a third party utility locator as necessary. All identified underground utilities will be marked with stakes and/or paint. Prior to starting any intrusive activities, the Site Supervisor will review the markings with the utility and installation representatives. All utility location tasks will be documented in the field logbook to aid any subsequent utility clearance work. Specific procedures for utility clearance are provided in Shaw procedure GS016, "Standards for Use of Surface Geophysics for Utility and Subsurface Hazard Location and Clearance."

Decontamination areas will be used for drilling rigs and equipment. The decontamination area will be large enough to allow storage of cleaned equipment and materials prior to use, as well as to stage drums of decontamination waste. Solid wastes will be accumulated in 55-gallon drums, roll-off containers, or other suitable containers and subsequently transported to a waste storage area. Smaller decontamination areas for personnel and portable equipment will be provided as necessary. These locations will include basins or tubs to capture decontamination fluids, which will be transferred to a large accumulation tank or drums as necessary. Designated areas of decontamination and field support areas will be

indicated on site maps during preparation of task- or site-specific technical work plans. Prior to initiating field activities, warning signs or caution tape may be posted around the work areas limiting access to unauthorized personnel. All necessary sampling equipment and drilling rigs, if required, will be decontaminated in accordance with Shaw procedure GS014, "Standards for Drilling Equipment, Development Equipment, Heavy Equipment, and Well Material Decontamination."

Each work site or sampling location will be returned to its original condition to the extent possible. Efforts will be made to minimize impacts to work sites and sampling locations, particularly those in or near sensitive environments such as wetlands. Following the completion of work at a site, all drums, trash, and other waste will be removed. Decontamination and/or purge water and soil cuttings will be transported to the designated locations.

Any investigative site will be secured at the end of each day. All boreholes or other excavations will be filled, covered, or barricaded. The area will be clean of debris and all equipment properly stored and locked up as appropriate. Work schedules will be arranged to minimize the need to leave equipment or open excavations in residential areas.

Unused or surplus materials and supplies, stakes, flagging, and waste material will be removed as the work is completed at each field location. Flagging and stakes at boreholes, monitoring well locations, and surface water/sediment sample locations will only be removed after the locations have been surveyed. Site restoration will be coordinated with the facility point of contact to ensure that the restoration is conducted in accordance with Cannon AFB, Holloman AFB, Kirtland AFB, and Scott AFB requirements. All materials and equipment that are brought to Cannon AFB, Holloman AFB, Kirtland AFB, and Scott AFB will be removed at the conclusion of field activities.

3.1.2 Land Use Control/Institutional Control Activities

Measures that provide RC with restrictions include LUC and IC to protect human health and the environment. These measures include restriction of land use to non-residential uses, prohibition on shallow wells for drinking water, fencing to prevent casual access, and signage to warn literate individuals of potential hazards. Under this PBR, it is intended that some sites will have revised closures to allow for unrestricted use, and completion of remediation at some sites will also allow unrestricted reuse.

3.1.3 Surveying

Well locations and sampling locations associated with filling data gaps and remediation will be surveyed using global positioning system (GPS) in accordance with Shaw procedure

GS041, "Standards for Surface Geophysics," Attachment 12, and reported using the appropriate State horizontal and vertical datum.

3.1.4 Sample Handling

To ensure usability of sample results, samples must be handled properly and sufficient quality control samples collected to support data validation. These issues are addressed in detail in the UFP-QAPP.

3.1.5 Managing Wastes

Waste management options in order of preference are reuse, recycling, treatment, and disposal. General waste handling procedures will be in accordance with U.S. Department of Transportation (DOT) procedures for manifesting and disposal as described in Title 49 of the Code of Federal Regulations. Waste may be classified as non-investigative waste or investigative/remediation waste.

Non-investigative waste, such as litter and household garbage, will be collected on an as-needed basis to maintain each site in a clean and orderly manner. This waste will be containerized and transported to the designated sanitary landfill or collection bin. Acceptable containers will be sealed boxes or plastic garbage bags.

The Investigation-Derived Waste (IDW)/Remediation-Derived Waste (RDW) will be properly containerized and temporarily stored at a location specified by the Installation Restoration Program Manager (RPM), or designee, prior to transportation. IDW/RDW storage will be coordinated with the installation to control waste storage and accumulation in residential or publicly accessible areas. Depending on the constituents of concern (COC), fencing or other special marking may be required. The number of containers will be estimated on an as-needed basis. Acceptable containers will be sealed, DOT-approved, steel or poly 55-gallon drums, small dumping bins with lids, or roll-off boxes with liners and covers. The containers will be transported in such a manner as to prevent spillage or particulate loss to the atmosphere. To facilitate handling, roll-off boxes will be no more than 2/3 full when moved. When required, sampling of the drums or roll-off boxes will be done in accordance with the UFP-QAPP.

The IDW/RDW will be segregated at the site according to matrix (solid or liquid) and how the IDW/RDW was derived (e.g., drill cuttings, drilling fluid, decontamination fluids, excavation, tank contents, purged groundwater, and demolition debris). Each container will be properly labeled with site identification, sampling point, depth, matrix, COC, and other pertinent information for handling.

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-2

Sampling and analysis of project-generated wastes will be performed to characterize the wastes for disposal. The analytical requirements are specified by the receiving disposal facility. Wastes will be sampled and analyzed according to the receiving transportation, storage, and disposal facility. Wastes will be segregated and disposed of based on their characteristics.

Waste handling procedures for site-specific tasks may deviate from the procedures outlined in the UFP-QAPP. If required, deviations from the waste handling procedures will be documented in the task- or site-specific plans.

3.2 Administrative Activities

Administrative activities include obtaining permits, obtaining right-of-way access for off-site activities, and reporting and maintaining records for permit requirements. Administrative activities beyond record keeping will be performed only for sites where permits and right-of-way agreements are needed.

3.2.1 Obtaining Permits

Shaw will develop, coordinate, apply and pay fees for, comply with, and/or modify all federal, state, local, and other applicable permits required to meet the objectives under this PBR. Permits governing activities at the Cannon AFB, Holloman AFB, Kirtland AFB, and Scott AFB are will likely be short term excavation, hot work, and confined space entry permits.

3.2.2 Obtaining Right-of-Way Access

Shaw will develop, coordinate, apply and pay fees for, comply with, and/or modify access agreements, easements, licenses, and certificates required to meet the objectives. For easements, Shaw will prepare, negotiate, and pay for current easements, modifications to current easements, or for new easements that are needed for contractor developed remediation alternative (note that the Air Force will sign all easement agreements).

3.2.3 Managing Access

Work areas will be controlled to prevent unauthorized access and maintain safety and security of operations. Work area limits will be defined and maintained. In its simplest form, this may involve discussing the expected work areas for the day at the morning safety meeting. For more dangerous activities, such as excavations, this will take the form of a physical or visual barrier around the work area.

Personnel within work areas will be monitored. For civilian controlled areas, this may take the form of a daily report noting personnel present, or a sheet noting names and times of access and egress. For sites within a given AFB, assigned security badges and common

access cards (CACs) may be required. Shaw will obtain and monitor assigned security badges and CACs (used by both prime contractor and subcontractor personnel) for the duration of this contract. All security badges, CACs, and/or passes shall be returned to the RPM or designee upon expiration of the badge/CAC, upon completion of the project, or when possession of the badge/ CAC is no longer necessary (e.g., upon removal of contractor personnel from specific projects).

If sites are located near or under flight lines, Shaw will coordinate all flight line access with applicable AFB personnel as required to complete activities.

3.2.4 Maintaining Records

Shaw will maintain a library of documents at the site office as well as the corporate facility handling records. The library will contain records related to:

- Permits
- Right-of-way access
- Quality Project Plan
- Task- or site-specific technical work plans for active site work
- Field Activities
- Reports.

The Administrative Record for Cannon AFB, Holloman AFB, Kirtland AFB, and Scott AFB represents the final official record.

3.3 Groundwater Investigation Activities

Groundwater activities include installing wells, sampling groundwater, maintaining wells, abandoning wells, and extracting groundwater. Groundwater activities will be performed during site investigation activities at the AFBs. Procedures for installing wells, sampling groundwater, maintaining wells, and abandoning monitoring wells are found in the technical work plans for each site or group of sites.

3.4 Soil Investigation Activities

Soil activities include soil borings, soil excavation, and sampling. Soil sampling is addressed in the technical work plans for each site or group of sites.

3.5 Surface Water Investigation Activities

Surface water activities include the sampling of surface water and sediments. Surface water activities will likely only be performed at Cannon AFB and Scott AFB. Procedures for this sampling are the technical work plans for each site or group of sites.

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Table 3-1
RCRA Permit Required Cleanup Levels in Soil, Surface Water, and Groundwater at New Mexico Bases

Facility	Permit Reference	Environmental Medium	Applicable standards	Primary	Secondary	Tertiary
Kirtland AFB (Permit No. NM9570024423)	Part 6, 6.2.3.1	Groundwater other than perchlorate	NMWQCC and USEPA MCLs	Most stringent value	If no NMWQCC standard or USEPA MCL, USEPA RSL for tap water applies.	If no USEPA RSL for tap water, propose a cleanup level based on residential scenario, a total target human health excess cancer risk level of 10^{-5}, and for non-carcinogenic contaminants a Hazard Quotient of one (1.0).
	Part 6, 6.2.3.2	Groundwater with perchlorate	Site-specific proposed value or NMWQCC and USEPA MCLs, if either is established	Propose a cleanup level based on residential scenario, a total target human health excess cancer risk level of 10^{-5}, and for non-carcinogenic contaminants a Hazard Quotient of one (1.0).	NL	NL
	Part 6, 6.2.3.3	Soil other than PCBs and lead	Site-specific	Propose a cleanup level based on residential scenario, a total target human health excess cancer risk level of 10^{-5}, and for non-carcinogenic contaminants a Hazard Quotient of one (1.0).	Propose a cleanup level based a residential scenario using the most recent version of "Technical Background document for Development of Soil Screening Levels," from the NMED.	NL
	Part 6, 6.2.3.4	Soil with PCBs	Permit-listed	Cleanup level using the most recent version of "Risk-based Remediation of Polychlorinated Biphenyls at RCRA Corrective Action Sites," from the NMED for a residential scenario.	Default concentration of 1.00 mg/kg	Propose a risk-based level based on performing a human-health risk assessment for a residential scenario.
	Part 6, 6.2.3.5	Soil with lead	Permit-listed	400 mg/kg	NL	NL
	Part 6, 6.2.3.6	Surface water	Clean Water Act, NMWQCC, and State of New Mexico Standards for Interstate and Intrastate Surface Waters	Most stringent value	Propose an alternate abatement standard to the NMWQCC.	NL
Cannon AFB (Permit No. NM7572124454)	Attachment 7, 7.1.1	Groundwater other than radionuclides and perchlorate	NMWQCC and USEPA MCLs	Most stringent value	If no NMWQCC standard or USEPA MCL, USEPA RSL for tap water applies.	If no USEPA RSL for tap water, propose a cleanup level based on residential scenario, a total target human health excess cancer risk level of 10^{-5}, and for non-carcinogenic contaminants a Hazard Quotient of one (1.0).
	Attachment 7, 7.2.1	Surface water other than radionuclides and perchlorate	Clean Water Act, NMWQCC, and State of New Mexico Standards for Interstate and Intrastate Surface Waters	Most stringent value	NL	NL
	Attachment 7, 7.3.1	Soil other than PCBs, perchlorate, and radionuclides	NMSSLs and USEPA RSLs	NMSSLs listed in the most recent version of "Technical Background document for Development of Soil Screening Levels," from the NMED.	USEPA RSLs for residential soil for compounds designated as "n" (noncarcinogen effects), "max," and "sat," OR 10 times the USEPA RSL for compounds designated as "c" (carcinogen effects)	Propose a cleanup level based a residential scenario using the process, assumptions, and default values contained in "Assessing Human Health Risks Posed by Chemicals: Screening Level Risk Assessment" by NMED, dated March 2000.

Table 3-1 (continued)
RCRA Permit Required Cleanup Levels in Soil, Surface Water, and Groundwater at New Mexico Bases

Facility	Permit Reference	Environmental Medium	Applicable standards	Primary	Secondary	Tertiary
Cannon AFB (Permit No. NM7572124454) (continued)	Attachment 7, 7.3.2	Soil with PCBs	Permit-listed	Cleanup level using the most recent version of "Risk-based Remediation of Polychlorinated Biphenyls at RCRA Corrective Action Sites," from the NMED for a residential scenario.	Default concentration of 1.00 mg/kg	NL
Holloman AFB (Permit No. NM6572124422)	Permit Module 4, Appendix 4-F, III.1	Groundwater other than perchlorate	NMWQCC and USEPA MCLs	Most stringent value	NL	NL
	Permit Module 4, Appendix 4-F, III.1.2	Groundwater with perchlorate	Provisional reference dose for perchlorate.	NL	NL	NL
	Permit Module 4, Appendix 4-F, IV.1	Surface water	Clean Water Act, NMWQCC, and State of New Mexico Standards for Interstate and Intrastate Surface Waters	Most stringent value	NL	NL
	Permit Module 4, Appendix 4-F, V.1	Soil other than PCBs, perchlorate, or radionuclides	NMSSLs and USEPA RSLs	NMSSLs listed in the most recent version of "Technical Background document for Development of Soil Screening Levels," from the NMED.	USEPA RSLs for residential soil for compounds designated as "n" (noncarcinogen effects), "max," and "sat," OR 10 times the USEPA RSL for compounds designated as "c" (carcinogen effects)	Propose a cleanup level based a residential scenario using the process, assumptions, and default values contained in "Assessing Human Health Risks Posed by Chemicals: Screening Level Risk Assessment" by NMED, dated March 2000.
	Permit Module 4, Appendix 4-F, V.1.1	Soil with PCBs	Permit-listed	Cleanup level using the most recent version of "Risk-based Remediation of Polychlorinated Biphenyls at RCRA Corrective Action Sites," from the NMED for a residential scenario.	Default concentration of 1.00 mg/kg	NL

References:

National Primary Drinking Water Regulations, EPA 816-F-09-0004, May 2009, U.S. Environmental Protection Agency, Office of Ground Water and Drinking Water

New Mexico Water Quality Control Commission Standards for Ground Water of 10,000 mg/L TDS Concentration or Less, 20.6.2.3103 NMAC

New Mexico Water Quality Standards for Interstate and Intrastate Streams in New Mexico, 20.6.4 NMAC

Technical Background Document for Development of Soil Screening Levels, Revision 5.0, August 2009, Table A-1 Updated December 2009, New Mexico Environment Department, Hazardous Waste Bureau and Ground Water Quality Bureau, Voluntary Remediation Program

United States Environmental Protection Agency Regions 3, 6, and 9. (October 31, 2011). Regional Screening Levels for Chemical Contaminants at Superfund Sites. http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/index.htm

AFB denotes Air Force Base.

MCL denotes Maximum contaminant limit.

mg/kg denotes milligrams per kilogram.

mg/L denotes milligrams per liter.

NMAC denotes New Mexico Administrative Code.

NMED denotes New Mexico Environment Department.

NMSSL denotes New Mexico Soil Screening Level.

NMWQCC denotes New Mexico Water Quality Control Commission.

NL denotes none listed.

No. denotes number.

PCB denotes Polychlorinated biphenyls.

RCRA denotes Resource Conservation and Recovery Act.

RSL denotes Regional Screening Level.

TDS denotes total dissolved solids.

USEPA denotes U.S. Environmental Protection Agency.

4.0 CORRECTIVE MEASURES

Shaw will specify recommended corrective measures and interim stabilization measures at each site in its work plan. Corrective measures at Holloman AFB and Kirtland AFB will include activities designed to accelerate the expected timetable to completion and closure.

4.1 Corrective Measure Performance Objectives

The corrective measure performance objectives for individual sites will fall into the category of one of the three performance objectives noted in Section 1.3:

- SC (unrestricted reuse)
- RC (site has restrictions)
- Corrective action or investigation (ISM/draft RFI) in New Mexico or removal action or investigation (draft RI) for Scott AFB

For individual sites or grouped sites based on type of site, degree of media impacted, project objectives, and site similarity, a site-specific technical work plan will be created to guide activities designed to achieve the performance objective. In the site-specific technical work plans, more specific objectives will be developed and presented. Table 1-1 notes the performance objectives expected for each site. Depending on regulatory status, some sites (e.g., Cannon AFB sites) may not require individual technical work plans.

4.1.1 Soil Excavation

Excavating soil is expected to be used as a corrective measure at multiple sites at Holloman AFB, and Kirtland AFB. The specifics of excavation at these sites, particularly the limits of excavation, will be detailed in task- or site-specific technical work plans. Standard procedures for excavating soil are described here in this GWP. Excavating soil as a corrective measure generally consists of preparing the site, excavating the soil, transporting and disposing the soil, collecting confirmation samples, and restoring the site. Documenting the excavation through adequate field records is crucial to successful final reporting of soil excavation as a corrective measure.

The SOO limits soil excavation at any site to a maximum of 40 cubic yards (CY). Where SC was proposed for a site and more than 40 CY of excavation is required, excavation activities will cease, the extent of the excavation will be surveyed, and the excavated area will be backfilled with clean fill. The objective at these New Mexico sites will change from SC to ISM and draft RFI.

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-2

4.1.2 Site Preparation

A pre-construction meeting will be held for the installation (RPMs, AFCEE contracting officer's representative (COR), regulators, and Shaw) prior to the initiation of field activities. Prior to mobilization, Shaw will secure any applicable permits and notifications. Shaw will also secure utility clearance for water, sewer, gas, electric, and communication. A third-party utility locator and/or ground penetrating radar will be used to locate any underground utilities. The ground penetrating radar unit will be aided by an approved instrument that will induce current upon any underground utility lines (except fiber optic lines), thus allowing the utility line to be located using a signal receiver. Once all lines have been identified, pin flags/marking paint will be used to mark the utilities.

Shaw will inspect the intended excavation area to identify overhead electrical lines that may restrict removal activities and electrical poles within or near the excavation that have the potential to become unstable as soil is removed. As necessary, Shaw will shut down power, reroute power, remove poles, and/or ensure that the poles are guy-wired for stability. If power must be shut down, the power outage will be coordinated with all AFB operations.

A GPS will be used to delineate and mark the excavation areas. The potential areas of excavation will then be marked with survey stakes, pin flags, paint, or other appropriate marking. The areas to initially be excavated will be established prior to mobilization of the excavation personnel. Clearing of the vegetation in the excavation area will largely be conducted using conventional equipment. It is not anticipated there will be any unexploded ordnance. A decontamination station will be constructed as noted in Section 3.1.1.

4.1.2.1 Soil Excavation

Initial excavation limits will be established as described above. Excavated soils will be stockpiled and covered with plastic sheeting or placed in covered roll-off containers pending the results of waste characterization samples. Vertical excavation will stop if groundwater or bedrock is encountered.

Excavation and soil handling activities will be performed using engineering controls to minimize airborne particle generation and exposure pathways that might place workers at risk. Air monitoring will be conducted in work areas per the HSP to determine if airborne emissions exceed acceptable levels. Modified Level D personal protective equipment (PPE) and decontamination equipment is proposed as the expected level of PPE for soil excavation.

In the event of rainfall, storm water runoff from surrounding areas will be diverted, as feasible, away from the excavation. After the rainfall event, any storm water in the excavation will be pumped to a tank, allowed to settle, and then sampled and analyzed to

determine proper disposal. The Shaw soil excavation procedure is HS307 "Excavation and Trenching."

4.1.2.2 Confirmation Soil Sampling

Confirmation sampling will be conducted concurrently with excavation and will document that the remaining soils beyond the confirmation sample meet established cleanup goals. After the initial excavation, samples will be collected from the walls and floor at one sample per 400 square feet of the excavation and tested for the contaminants which the excavation intended to remove. Excavation would continue until concentrations in the soil are less than the cleanup goals. If contaminants are detected in the composite samples above their cleanup goals, the area will be excavated an additional 6 inches. This would continue until confirmation samples demonstrate the contaminants remaining in the soil are below their cleanup goal, until groundwater is encountered, or the maximum allowable removal volume of 40 CY is reached.

The Site Superintendent and Site Quality Assurance/Quality Control Specialist will mark the corners of the completed excavation for subsequent surveying. They will also measure and document the depths of excavation, including any depth variations across the excavation.

4.1.2.3 Site Restoration

Once the excavation has been completed, Shaw will restore the site and demobilize. Wastes will be managed as described in Section 3.1.5. As needed, backfill operations would proceed after excavation activities are complete. The areas would be backfilled with a clean fill. The clean fill will be obtained from an approved source and restored to surrounding conditions as approved by RPM, or their designated representative.

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-2

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5.0 DATA ASSESSMENT, RECORDS, AND REPORTING REQUIREMENTS

5.1 Data Assessment

Project data will be assessed and analyzed to identify accurate and valid data and to refine site models. Details of data assessment procedures are included in the UFP-QAPP.

5.2 Record Keeping

General records of field and laboratory activities will be maintained to document the project.

5.3 Reporting Requirements

Reporting requirements include both informal and formal reports, and may range from verbal notification up through project deliverables to fulfill permit requirements.

5.3.1 Informal Reports

Informal reports include day-to-day interaction between AFCEE or the installation RPM and Shaw personnel. Shaw will notify the AFCEE COR of critical issues that may affect the contract performance and/or human health and the environment. The types of issues that require notification include, but are not limited to, health risks, spills, notices of violations (received or anticipated), changes in critical personnel, and finding unexpected discoveries during field activities. For unanticipated discoveries during field activities, Shaw will report the discovery to the AFCEE COR and implement appropriate safety precautions. On critical issues, verbal notification should be made immediately, followed by written notification as soon as practical.

5.3.2 Formal Work Plans and Reports

Formal reports include project status reports, briefings, Voluntary Corrective Measures (VCM) Work Plans and Reports, ISM Work Plan, RFI or RI Work Plans and Reports, Corrective Action Complete Petitions, Class III Permit Modification Requests, Site Closure Reports, well abandonment documentation, and other periodic reporting.

5.3.2.1 Project Status

Project status will be communicated formally via status reports and conference calls as well as through the various technical deliverables for each site. Monthly status reports will document work in progress for each task, field activities performed during the month, the overall project schedule, any potential issues, and upcoming events such as field work and meetings. These reports will be provided to the AFCEE COR by the 10th of each month following the close of the month. The status reports will be provided electronically to U.S. Air Force by e-mail and paper copies will be sent out upon request.

5.3.2.2 Briefings

Briefings, in the form of conference calls, will be held as deemed necessary by the Shaw Project Manager to discuss the project status with the AFCEE COR. The Shaw Project Manager will be responsible for leading the conference call. Draft minutes of each conference call will be prepared by the Shaw Project Manager and distributed for review and comment. The Shaw Project Manager will incorporate comments and re-distribute the final minutes within 1 week of receiving the comments on the draft minutes. Call participants are responsible for transmitting comments on the draft minutes to the Shaw Project Manager in a timely fashion. Shaw will provide the agenda and meeting minutes electronically in Microsoft Word format or portable document format (PDF).

5.3.2.3 Periodic Reporting

Shaw will prepare periodic reports for ongoing monitoring activities or the completion of a phase of work throughout the contract period. These periodic reports include:

- Database uploads—Shaw will prepare and submit Environmental Resource Program Information Management System data every quarter throughout the period of performance.
- Construction Completion Reports—Document prepared at the completion of field activities to provide details of a corrective measure implemented in the field e.g. VCM Reports, RFI or RI Reports.
- Well Abandonment Report—Wells will be abandoned on an as-needed basis. Well abandonment reports will be prepared and filed with the appropriate regulatory agency on at least an annual basis in years when wells are abandoned. Well abandonment reports will also be provided for the RPM and will include reports filed with the regulatory agencies, and a summary of field activities including waste handling and site restoration documentation.

5.3.2.4 Corrective Action Complete Petitions and Class III Permit Modifications

Once a New Mexico site has achieved the cleanup goals and the NMED has approved the completion report, a summary report and Corrective Action Complete Petition (CACP) will be prepared. Upon approval of the CACP, Shaw will prepare a Permit Modification Request Letter for Class III Permit Modification and setup a Public Meeting with 30-day comment period. NMED will then perform an Administrative Review and prepare a Statement of Basis. NMED will then convene a Public Comment Period followed by NMED approval of the Class III Permit Modification. This approval will constitute SC.

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-2

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-2

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6.0 PROJECT SCHEDULE

The project schedule covers a period of 2 years, from issuance of the project contract in 2011 to completion of the project term of 2 years in 2013. The project objective to protect human health and environment during investigation of nature and extent of contamination while maximizing the number of site closures at Cannon AFB, Holloman AFB, Kirtland AFB and Scott AFB will have reduced the number of individual sites by 63 (43 SC sites and 20 RC sites). A printout of the integrated master schedule is included in the PMP (Shaw, 2011). Schedule updates will be included in monthly client status reports.

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-2

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Activity ID	Activity Name	Original Duration	Start	Finish
Mid-Western Region Performance Based Remediation		586	22-Sep-11 A	31-Dec-13
A1000	Notice to Proceed	0	22-Sep-11 A	
A1020	Notice to Proceed with Modification	0	23-Jan-12*	
A1010	Project Completion (Original POP)	0		30-Sep-13*
Project Management Plan & Site Management Plan		92	22-Sep-11 A	06-Feb-12
Project Management Plan (PMP)		92	22-Sep-11 A	06-Feb-12
AA10000	Prepare Draft PMP & Site Management Plan	21	22-Sep-11 A	21-Oct-11 A
AA10010QA	Air Force Review of Draft PMP & Site Management Plan	15	24-Oct-11 A	03-Nov-11 A
AA10085	Comment Resolution	5	04-Nov-11 A	10-Nov-11 A
AA10090	Prepare Final Project Management Plan & Site Management Plan	5	11-Nov-11 A	17-Nov-11 A
AA10100PM	Payment for Final Project Management Plan & Site Management Plan	1	19-Dec-11	19-Dec-11
AA60001	Project Management Plan Revision	10	23-Jan-12	03-Feb-12
AA60001PM	Payment for PMP Revision	1	06-Feb-12	06-Feb-12
Quality Program Plan (QPP)		68	22-Sep-11 A	30-Dec-11
AA20000	Prepare Draft QPP	43	22-Sep-11 A	23-Nov-11 A
AA20010QA	Air Force Review of Draft QPP	15	25-Nov-11 A	15-Dec-11
AA20085	Comment Resolution	5	16-Dec-11	22-Dec-11
AA20090	Prepare Final QPP	5	23-Dec-11	30-Dec-11
CANNON AFB		571	22-Sep-11 A	31-Dec-13
RFI Report for Site RS-C103(Grp1)		303	22-Sep-11 A	05-Dec-12
RFI Work Plan		206	22-Sep-11 A	18-Jul-12
DZ10000	Perform Records Search	30	22-Sep-11 A	04-Nov-11 A
DZ10005	RFI Work Plan (WP) Working Copy	18	04-Nov-11 A	05-Jan-12
DZ10010QA	Air Force Review of Working Copy RFI Work Plan	15	06-Jan-12	27-Jan-12
DZ10020	Comment Resolution	5	30-Jan-12	03-Feb-12
DZ10030	Prepare Final RFI Work Plan	10	06-Feb-12	17-Feb-12
DZ10040QA	Air Force Review Final and Sign Submittal Letter	8	21-Feb-12	01-Mar-12
DZ10050	Distribute Submittal Letter & Document to Regulators	1	02-Mar-12	02-Mar-12
DZ10055PM	Payment for Final RFI Work Plan	1	02-Mar-12	02-Mar-12
DZ10051	Payment of Regulatory Fees	5	02-Mar-12	08-Mar-12
DZ10060	Regulators Review of Final RFI Work Plan	82	09-Mar-12	03-Jul-12
DZ10070	Comment Resolution	5	05-Jul-12	11-Jul-12
DZ10080	Prepare Revised Final RFI Work Plan	5	12-Jul-12	18-Jul-12
DZ10090PM	Payment for Revised Final RFI Work Plan	1	18-Jul-12	18-Jul-12
Accelerated Corrective Measures Work Plan (ACM WP)		160	04-Nov-11 A	18-Jul-12
DZ11005	Prepare Working Copy ACM WP	22	04-Nov-11 A	05-Jan-12
DZ11010QA	Air Force Review of Working Copy ACM WP	15	06-Jan-12	27-Jan-12
DZ11020	Comment Resolution	5	30-Jan-12	03-Feb-12
DZ11030	Prepare Final ACM WP	10	06-Feb-12	17-Feb-12
DZ11040QA	Air Force Review Final and Sign Submittal Letter	8	21-Feb-12	01-Mar-12
DZ11050	Distribute Submittal Letter & Documents to Regulators	1	02-Mar-12	02-Mar-12
DZ11055PM	Payment for Final ACM WP	1	02-Mar-12	02-Mar-12
DZ11051	Payment of Regulatory Fees	5	02-Mar-12	08-Mar-12
DZ11060	Regulators Review of Final ACM WP	82	09-Mar-12	03-Jul-12
DZ11070	Comment Resolution	5	05-Jul-12	11-Jul-12
DZ11080	Prepare Revised Final ACM WP	5	12-Jul-12	18-Jul-12
DZ11090PM	Payment for Revised Final ACM WP	1	18-Jul-12	18-Jul-12
Field Activities		45	19-Jul-12	20-Sep-12
DZ20000	Sample Collection	5	19-Jul-12	25-Jul-12
DZ20010	Sample Analysis	15	26-Jul-12	15-Aug-12
DZ20011	ACM Removal Activities	10	23-Aug-12	06-Sep-12
DZ20012	ACM Confirmation Sampling	5	07-Sep-12	13-Sep-12
DZ20020	Sampling Completion Report	5	14-Sep-12	20-Sep-12
DZ20030PM	Payment for Sampling Completion Report	1	20-Sep-12	20-Sep-12
RFI Report		52	21-Sep-12	05-Dec-12
DZ30005	Prepare Working Copy RFI Report (Includes ACM Report)	22	21-Sep-12	23-Oct-12
DZ30010QA	Air Force Review of Working Copy RFI Report	15	24-Oct-12	13-Nov-12
DZ30020	Comment Resolution	5	14-Nov-12	20-Nov-12
DZ30030	Prepare Draft RFI Report	10	21-Nov-12	05-Dec-12
DZ30090PM	Payment for Draft RFI Report	1	05-Dec-12	05-Dec-12
Permit Modification for SC (17 Sites) (Grp2)		304	22-Sep-11 A	06-Dec-12

Remaining Level of Effort ◆ ◆ Milestone
Actual Level of Effort
Actual Work
Remaining Work
Critical Remaining Work

Mid-Western Region Peformance Based Remediation

Includes Scope Change Request 12 Dec 2011

Durations are based on a 5 day work week and allow for Federal Holidays.

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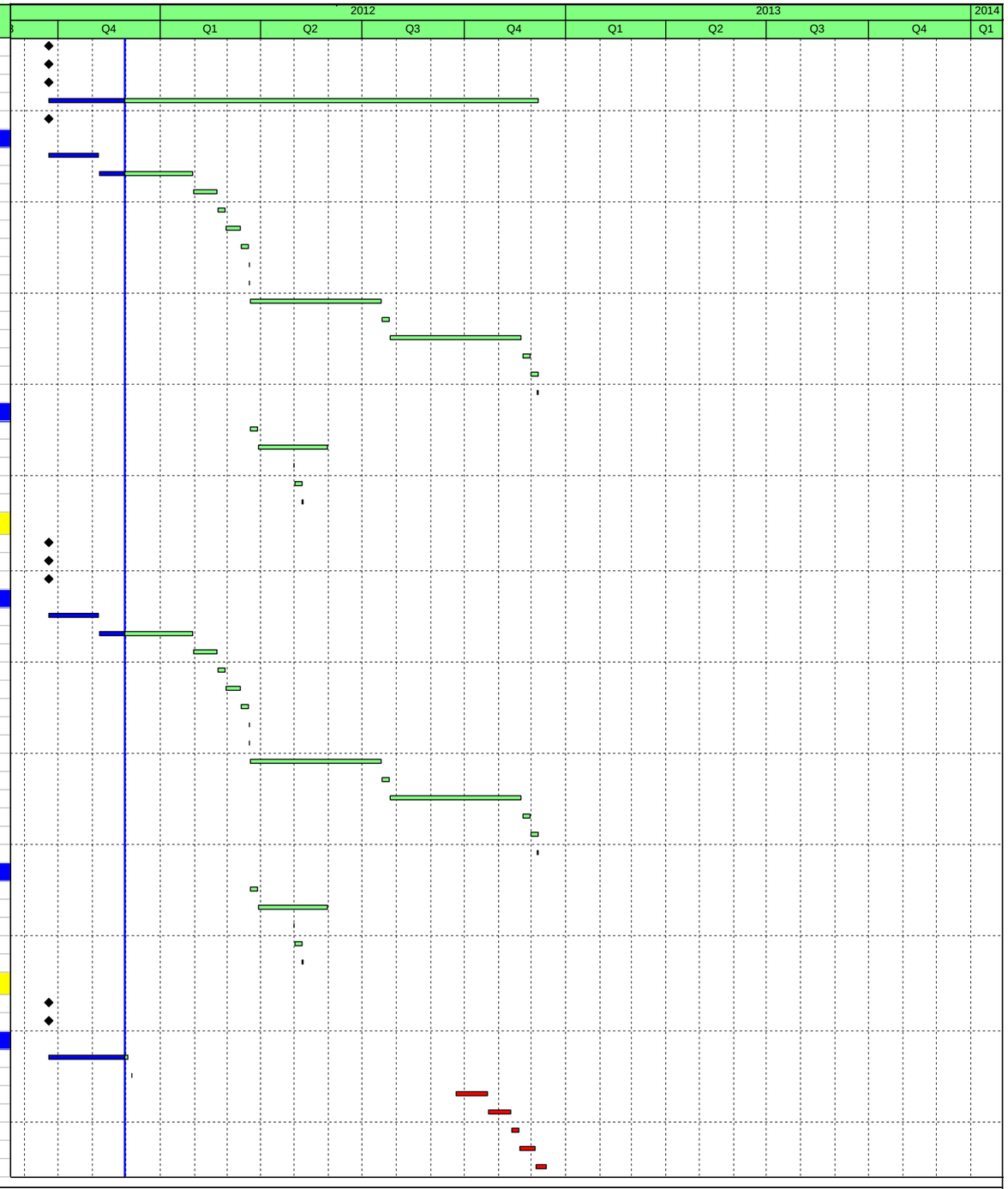
Date: 05-Jan-12

DD: 30-Nov-11

Activity ID	Activity Name	Original Duration	Start	Finish
EC02	TU/US-C079, OW-C390, TU/US-C010, TU/US-C125, WL-C098,	0	22-Sep-11 A	
EC03	SD-13, DP-16, SD-11 (SWMU 86), SD-11 (SWMU 87),	0	22-Sep-11 A	
EC04	SD-11 (SWMU 88), SD-11 (SWMU 89), SD-11 (SWMU 90), FT-07,	0	22-Sep-11 A	
EC05	OT-10, SS-18, TU/US-C050, & TU/US-C124	304	22-Sep-11 A	06-Dec-12
EC01	Permit Modifications for the Following Sites,	0	22-Sep-11 A	
Permit Modification		304	22-Sep-11 A	06-Dec-12
EC10000	Perform Records Search	31	22-Sep-11 A	06-Nov-11 A
EC10001	Prepare Permit Mod Working Copy	18	07-Nov-11 A	30-Jan-12
EC10010QA	Air Force Review of Working Copy Permit Modification	15	31-Jan-12	21-Feb-12
EC10020	Comment Resolution	5	22-Feb-12	28-Feb-12
EC10030	Prepare Final Permit Mod	10	29-Feb-12	13-Mar-12
EC10040QA	Air Force Review Final and Sign Submittal Letter	5	14-Mar-12	20-Mar-12
EC10050	Distribute Submittal Letter & Document to Regulators	1	21-Mar-12	21-Mar-12
EC10055PM	Payment for Final Permit Modification	1	21-Mar-12	21-Mar-12
EC10060	Administrative Review for Completeness	83	22-Mar-12	18-Jul-12
EC10061	Payment of Regulatory Fees	5	19-Jul-12	25-Jul-12
EC10065	Regulators Review of Final Permit Mod	83	26-Jul-12	21-Nov-12
EC10070	Comment Resolution	5	23-Nov-12	29-Nov-12
EC10080	Prepare Revised Final Permit Mod	5	30-Nov-12	06-Dec-12
EC10090PM	Payment for Revised Final Permit Mod	1	06-Dec-12	06-Dec-12
Public Meeting		49	22-Mar-12	30-May-12
EC20000	Pre-Meeting Materials	5	22-Mar-12	28-Mar-12
EC20010	Public Meeting Public Review Period	44	29-Mar-12	30-May-12
EC20020	Public Meeting	1	30-Apr-12	30-Apr-12
EC20030	Public Meeting Transcript	5	01-May-12	07-May-12
EC20040PM	Payment for Public Meeting	1	08-May-12	08-May-12
Permit Modification for RC (7 Sites)(Grp3)		304	22-Sep-11 A	06-Dec-12
ED02	TU/US-C002, TU/US-C004, TU/US-C006, WL-C102	0	22-Sep-11 A	
ED03	SD-17, LF-02, & FL-C070	0	22-Sep-11 A	
ED01	Permit Modifications for the Following Sites,	0	22-Sep-11 A	
Permit Modification		304	22-Sep-11 A	06-Dec-12
ED10000	Perform Records Search	31	22-Sep-11 A	06-Nov-11 A
ED10001	Prepare Permit Mod Working Copy	18	07-Nov-11 A	30-Jan-12
ED10010QA	Air Force Review of Working Copy Permit Modification	15	31-Jan-12	21-Feb-12
ED10020	Comment Resolution	5	22-Feb-12	28-Feb-12
ED10030	Prepare Final Permit Mod	10	29-Feb-12	13-Mar-12
ED10040QA	Air Force Review Final and Sign Submittal Letter	5	14-Mar-12	20-Mar-12
ED10050	Distribute Submittal Letter & Document to Regulators	1	21-Mar-12	21-Mar-12
ED10055PM	Payment for Final Permit Modification	1	21-Mar-12	21-Mar-12
ED10060	Administrative Review for Completeness	83	22-Mar-12	18-Jul-12
ED10061	Payment of Regulatory Fees	5	19-Jul-12	25-Jul-12
ED10065	Regulators Review of Final Permit Mod	83	26-Jul-12	21-Nov-12
ED10070	Comment Resolution	5	23-Nov-12	29-Nov-12
ED10080	Prepare Revised Final Permit Mod	5	30-Nov-12	06-Dec-12
ED10090PM	Payment for Revised Final Permit Mod	1	06-Dec-12	06-Dec-12
Public Meeting		49	22-Mar-12	30-May-12
ED20000	Pre-Meeting Materials	5	22-Mar-12	28-Mar-12
ED20010	Public Meeting Public Review Period	44	29-Mar-12	30-May-12
ED20020	Public Meeting	1	30-Apr-12	30-Apr-12
ED20030	Public Meeting Transcript	5	01-May-12	07-May-12
ED20040PM	Payment for Public Meeting	1	08-May-12	08-May-12
CACP & Permit Modification for SC (3 Sites)(Grp 4)		571	22-Sep-11 A	31-Dec-13
EF02	FT-08, SS-19, TA/AS-C091	0	22-Sep-11 A	
EF01	CACP & Permit Modifications for the Following Sites,	0	22-Sep-11 A	
Summary report / CACP		406	22-Sep-11 A	03-May-13
EF10000	Records Research (Task completed Dec. 2, 2011)	21	22-Sep-11 A	02-Dec-11
EF10055PM	Payment for Records Research (Task completed Prior Dec. 2, 2011)	1	06-Dec-11	06-Dec-11
EF30000	Prepare Working Copy Summary report / CACP	20	24-Sep-12	22-Oct-12
EF30001QA	Air Force Review of Working Copy Summary report / CACP	15	23-Oct-12	12-Nov-12
EF30020	Comment Resolution	5	13-Nov-12	19-Nov-12
EF30030	Prepare Final Summary report / CACP	10	20-Nov-12	04-Dec-12
EF30040QA	Air Force Review Final and Sign Submittal Letter	8	05-Dec-12	14-Dec-12



Remaining Level of Effort ◆ ◆ Milestone
Actual Level of Effort
Actual Work
Remaining Work
Critical Remaining Work

Mid-Western Region Peformance Based Remediation

Includes Scope Change Request 12 Dec 2011

Durations are based on a 5 day work week and allow for Federal Holidays.

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Date: 05-Jan-12

DD: 30-Nov-11

Activity ID	Activity Name	Original Duration	Start	Finish
EF30050	Distribute Submittal Letter & Document to Regulators	1	17-Dec-12	17-Dec-12
EF30055PM	Payment for Final Summary report / CACP	1	18-Dec-12	18-Dec-12
EF30051	Payment of Regulatory Fees	5	18-Dec-12	24-Dec-12
EF30060	Regulators Review of Final Summary report / CACP	80	26-Dec-12	19-Apr-13
EF30070	Comment Resolution	5	22-Apr-13	26-Apr-13
EF30080	Prepare Revised Final Summary report / CACP	5	29-Apr-13	03-May-13
EF30090PM	Payment for Revised Final Summary report / CACP	1	03-May-13	03-May-13
Permit Modification		255	26-Dec-12	31-Dec-13
EF40001	Prepare Permit Mod Working Copy	20	26-Dec-12	24-Jan-13
EF40010QA	Air Force Review of Working Copy Permit Modification	15	25-Jan-13	14-Feb-13
EF40020	Comment Resolution	5	15-Feb-13	22-Feb-13
EF40030	Prepare Final Permit Mod	10	25-Feb-13	08-Mar-13
EF40040QA	Air Force Review Final and Sign Submittal Letter	5	11-Mar-13	15-Mar-13
EF40050	Distribute Submittal Letter & Document to Regulators	1	18-Mar-13	18-Mar-13
EF40055PM	Payment for Final Permit Modification	1	19-Mar-13	19-Mar-13
EF40060	Administrative Review for Completeness	80	22-Apr-13	13-Aug-13
EF40061	Payment of Regulatory Fees	5	14-Aug-13	20-Aug-13
EF40065	Regulators Review of Final Permit Mod	80	21-Aug-13	16-Dec-13
EF40070	Comment Resolution	5	17-Dec-13	23-Dec-13
EF40080	Prepare Revised Final Permit Mod	5	24-Dec-13	31-Dec-13
EF40090PM	Payment for Revised Final Permit Mod	1	31-Dec-13	31-Dec-13
Public Meeting		49	22-Apr-13	28-Jun-13
EF50000	Pre-Meeting Materials	5	22-Apr-13	26-Apr-13
EF50010	Public Meeting Public Review Period	44	29-Apr-13	28-Jun-13
EF50020	Public Meeting	1	30-May-13	30-May-13
EF50030	Public Meeting Transcript	5	31-May-13	06-Jun-13
EF50040PM	Payment for Public Meeting	1	07-Jun-13	07-Jun-13
Permit Modification & Additional Sampling for RC (15 Sites)(Grp5)		500	22-Sep-11 A	17-Sep-13
14	MY-C031, TU/US-C071, FT-C109, FT-C110, FT-C111, FT-C112	0	22-Sep-11 A	
15	TU/US-C126, & OW-C127, SD-15, FT-06, SD-12 (SWMU 85), SD-12 (Storm-	0	22-Sep-11 A	
13	Permit Modifications & Additional Sampling for the Following Sites,	0	22-Sep-11 A	
16	water collection point-South Play),SD20(SWMU 95), SD-20(NE Stormwater	0	22-Sep-11 A	
17	drainage area), TA/AS-C129	0	22-Sep-11 A	
Work Plan		167	22-Sep-11 A	22-May-12
EG10000	Perform Records Search	22	22-Sep-11 A	24-Oct-11 A
EG10005	Prepare Working Copy Work Plan	20	25-Oct-11 A	15-Dec-11
EG10010QA	Air Force Review of Working Copy Work Plan	15	16-Dec-11	09-Jan-12
EG10020	Comment Resolution	5	10-Jan-12	17-Jan-12
EG10030	Prepare Final Work Plan	8	18-Jan-12	27-Jan-12
EG10040QA	Air Force Review Final and Sign Submittal Letter	5	30-Jan-12	03-Feb-12
EG10050	Distribute Submittal Letter & Document to Regulators	1	06-Feb-12	06-Feb-12
EG10055PM	Payment for Final Work Plan	1	06-Feb-12	06-Feb-12
EG10051	Payment of Regulatory Fees	5	07-Feb-12	13-Feb-12
EG10060	Regulators Review of Final Work Plan	60	14-Feb-12	08-May-12
EG10070	Comment Resolution	5	09-May-12	15-May-12
EG10080	Prepare Revised Final Work Plan	5	16-May-12	22-May-12
EG10090PM	Payment for Revised Final Work Plan	1	22-May-12	22-May-12
Field Activities		25	23-May-12	27-Jun-12
EG20000	Sample Collection	5	23-May-12	30-May-12
EG20010	Sample Analysis	15	31-May-12	20-Jun-12
EG20020	Sampling Completion Report	5	21-Jun-12	27-Jun-12
EG20030PM	Payment for Sampling Completion Report	1	27-Jun-12	27-Jun-12
Summary report / CACP		143	28-Jun-12	23-Jan-13
EG30000	Prepare Working Copy Summary report / CACP	15	28-Jun-12	19-Jul-12
EG30001QA	Air Force Review of Working Copy Summary report / CACP	15	20-Jul-12	09-Aug-12
EG30020	Comment Resolution	5	10-Aug-12	16-Aug-12
EG30030	Prepare Final Summary report / CACP	8	17-Aug-12	28-Aug-12
EG30040QA	Air Force Review Final and Sign Submittal Letter	5	29-Aug-12	05-Sep-12
EG30050	Distribute Submittal Letter & Document to Regulators	1	06-Sep-12	06-Sep-12
EG30055PM	Payment for Final Summary report / CACP	1	06-Sep-12	06-Sep-12
EG30051	Payment of Regulatory Fees	5	06-Sep-12	12-Sep-12
EG30065	Regulators Review of Final Summary report / CACP	80	13-Sep-12	08-Jan-13

Remaining Level of Effort ◆ Milestone

Actual Level of Effort

Actual Work

Remaining Work

Critical Remaining Work

Mid-Western Region Peformance Based Remediation

Includes Scope Change Request 12 Dec 2011

Durations are based on a 5 day work week and allow for Federal Holidays.

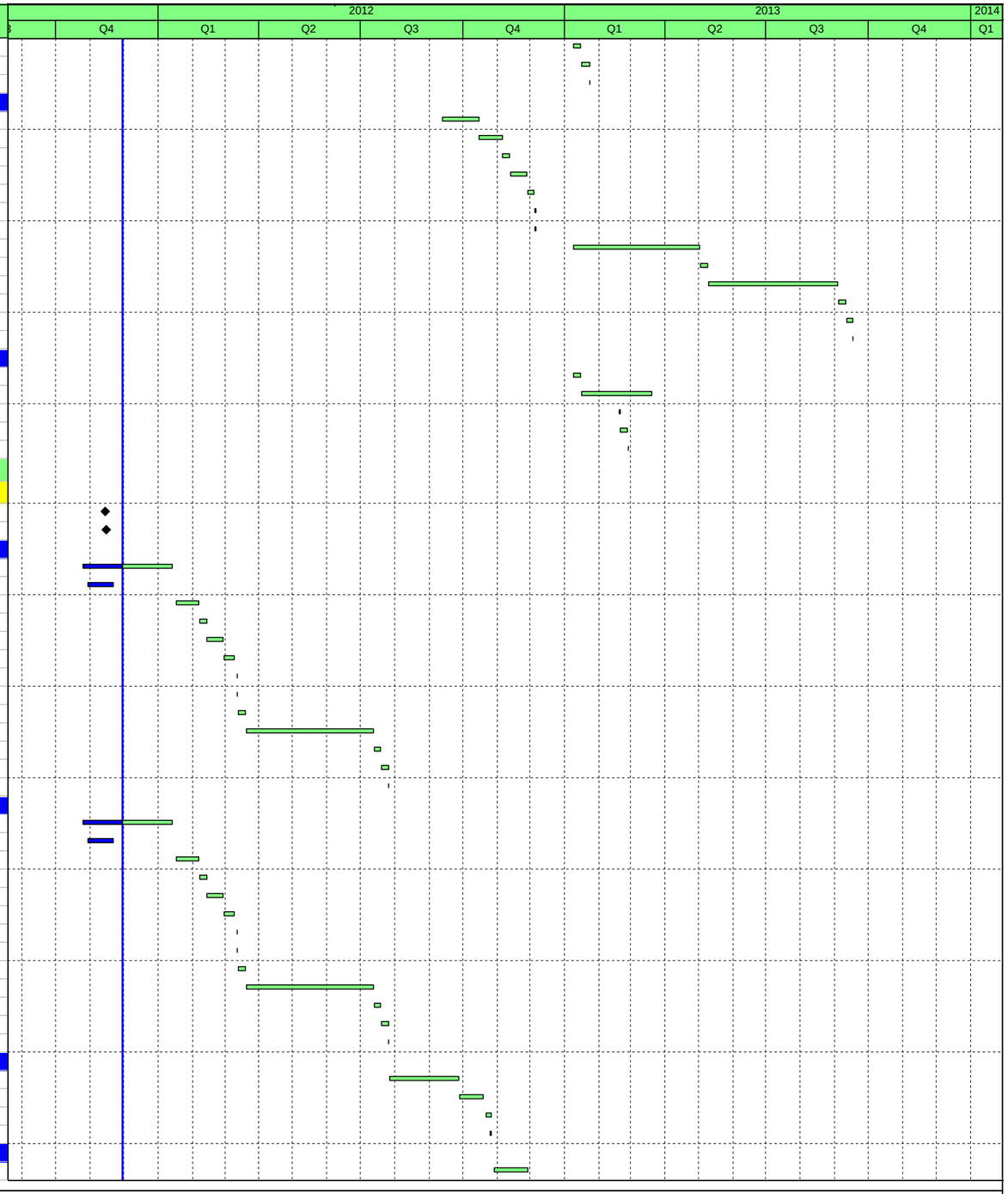
Shaw™

Shaw Environmental & Infrastructure, Inc.

Date: 05-Jan-12

DD: 30-Nov-11

Activity ID	Activity Name	Original Duration	Start	Finish
EG30070	Comment Resolution	5	09-Jan-13	15-Jan-13
EG30080	Prepare Revised Final Summary report / CACP	5	16-Jan-13	23-Jan-13
EG30090PM	Payment for Revised Final Summary report / CACP	1	23-Jan-13	23-Jan-13
Permit Modification		255	13-Sep-12	17-Sep-13
EG40001	Prepare Permit Mod Working Copy	22	13-Sep-12	15-Oct-12
EG40010QA	Air Force Review of Working Copy Permit Modification	15	16-Oct-12	05-Nov-12
EG40020	Comment Resolution	5	06-Nov-12	12-Nov-12
EG40030	Prepare Final Permit Mod	10	13-Nov-12	27-Nov-12
EG40040QA	Air Force Review Final and Sign Submittal Letter	5	28-Nov-12	04-Dec-12
EG40050	Distribute Submittal Letter & Document to Regulators	1	05-Dec-12	05-Dec-12
EG40055PM	Payment for Final Permit Modification	1	05-Dec-12	05-Dec-12
EG40060	Administrative Review for Completeness	80	09-Jan-13	02-May-13
EG40061	Payment of Regulatory Fees	5	03-May-13	09-May-13
EG40065	Regulators Review of Final Permit Mod	80	10-May-13	03-Sep-13
EG40070	Comment Resolution	5	04-Sep-13	10-Sep-13
EG40080	Prepare Revised Final Permit Mod	5	11-Sep-13	17-Sep-13
EG40090PM	Payment for Revised Final Permit Mod	1	17-Sep-13	17-Sep-13
Public Meeting Permit Modification		49	09-Jan-13	20-Mar-13
EG60000	Pre-Meeting Materials	5	09-Jan-13	15-Jan-13
EG60010	Public Meeting Public Review Period	44	16-Jan-13	20-Mar-13
EG60020	Public Meeting	1	19-Feb-13	19-Feb-13
EG60030	Public Meeting Transcript	5	20-Feb-13	26-Feb-13
EG60040PM	Payment for Public Meeting for Permit Mod	1	27-Feb-13	27-Feb-13
HOLLOMAN AFB		492	25-Oct-11 A	07-Oct-13
GROUP 3 - 9 UST's (ISM & Draft RFI)		306	25-Oct-11 A	11-Jan-13
21	TU/US-C500, TU/US-C501, TU/US-C503, TU/US-C504,TU/US-C505,	0	15-Nov-11 A	
22	TU/US-C506, TU/US-C508,TU/US-C513, TU/US-C518	0	15-Nov-11 A	
RFI Work Plan		190	25-Oct-11 A	26-Jul-12
JM10005	RFI Work Plan (WP) Working Copy	27	25-Oct-11 A	13-Jan-12
JM10000	Perform Records Search	2	30-Oct-11 A	22-Nov-11 A
JM10010QA	Air Force Review of Working Copy RFI Work Plan	15	17-Jan-12	06-Feb-12
JM10020	Comment Resolution	5	07-Feb-12	13-Feb-12
JM10030	Prepare Final RFI Work Plan	10	14-Feb-12	28-Feb-12
JM10040QA	Air Force Review Final and Sign Submittal Letter	8	29-Feb-12	09-Mar-12
JM10050	Distribute Submittal Letter & Document to Regulators	1	12-Mar-12	12-Mar-12
JM10055PM	Payment for Final RFI Work Plan	1	12-Mar-12	12-Mar-12
JM10051	Payment of Regulatory Fees	5	13-Mar-12	19-Mar-12
JM10060	Regulators Review of Final RFI Work Plan	81	20-Mar-12	12-Jul-12
JM10070	Comment Resolution	5	13-Jul-12	19-Jul-12
JM10080	Prepare Revised Final RFI Work Plan	5	20-Jul-12	26-Jul-12
JM10090PM	Payment for Revised Final RFI Work Plan	1	26-Jul-12	26-Jul-12
Voluntary Corrective Measures Request (VCMR)		190	25-Oct-11 A	26-Jul-12
JM11005	Prepare Working Copy VCMR	27	25-Oct-11 A	13-Jan-12
JM11000	Perform Records Search	3	30-Oct-11 A	22-Nov-11 A
JM11010QA	Air Force Review of Working Copy VCMR	15	17-Jan-12	06-Feb-12
JM11020	Comment Resolution	5	07-Feb-12	13-Feb-12
JM11030	Prepare Final VCMR	10	14-Feb-12	28-Feb-12
JM11040QA	Air Force Review Final and Sign Submittal Letter	8	29-Feb-12	09-Mar-12
JM11050	Distribute Submittal Letter & Documents to Regulators	1	12-Mar-12	12-Mar-12
JM11055PM	Payment for Final VCMR	1	12-Mar-12	12-Mar-12
JM11051	Payment of Regulatory Fees	5	13-Mar-12	19-Mar-12
JM11060	Regulators Review of Final VCMR	81	20-Mar-12	12-Jul-12
JM11070	Comment Resolution	5	13-Jul-12	19-Jul-12
JM11080	Prepare Revised Final VCMR	5	20-Jul-12	26-Jul-12
JM11090PM	Payment for Revised Final VCMR	1	26-Jul-12	26-Jul-12
Field Activities		64	27-Jul-12	26-Oct-12
JM20000	Field Work	44	27-Jul-12	27-Sep-12
JM20010	Sample Analysis	15	28-Sep-12	19-Oct-12
JM20020	Sampling Completion Report	5	22-Oct-12	26-Oct-12
JM20030PM	Payment for Sampling Completion Report	1	26-Oct-12	26-Oct-12
RFI Report		52	29-Oct-12	11-Jan-13
JM30005	Prepare Working Copy RFI Report	22	29-Oct-12	28-Nov-12



Remaining Level of Effort ◆ ◆ Milestone
Actual Level of Effort
Actual Work
Remaining Work
Critical Remaining Work

Mid-Western Region Peformance Based Remediation

Includes Scope Change Request 12 Dec 2011

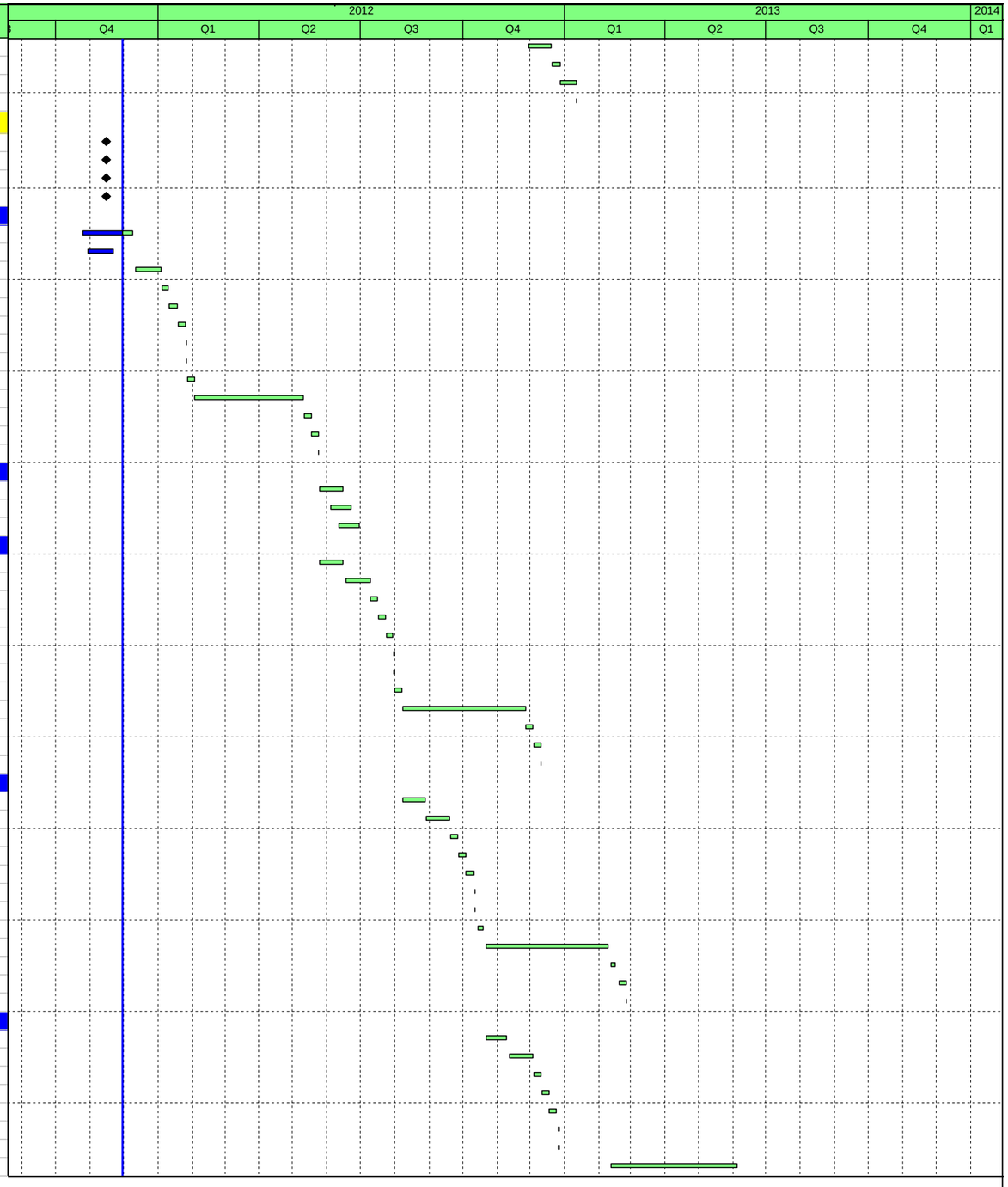
Durations are based on a 5 day work week and allow for Federal Holidays.

Shaw™
Shaw Environmental & Infrastructure, Inc.

Date: 05-Jan-12

DD: 30-Nov-11

Activity ID	Activity Name	Original Duration	Start	Finish
JM30010QA	Air Force Review of Working Copy RFI Report	15	29-Nov-12	19-Dec-12
JM30020	Comment Resolution	5	20-Dec-12	27-Dec-12
JM30030	Prepare Draft RFI Report	10	28-Dec-12	11-Jan-13
JM30090PM	Payment for Draft RFI Report	1	11-Jan-13	11-Jan-13
GROUP 1 - 15 Septic Systems (SC)		487	25-Oct-11 A	30-Sep-13
31	OT-C530, OT-C531, OT-C532, OT-C533, OT-C534,	0	15-Nov-11 A	
32	OT-C535, OT-C536, OT-C537, OT-C538, OT-C539,	0	15-Nov-11 A	
33	OT-C540, OT-C541, OT-C542, OT-C543, & OT-C54	0	15-Nov-11 A	
30	Achieve Site Closure for:	0	15-Nov-11 A	
Voluntary Corrective Measures Request (VCMR)		147	25-Oct-11 A	24-May-12
JR10005	Prepare Working Copy VCMR	27	25-Oct-11 A	09-Dec-11
JR10000	Perform Records Search	3	30-Oct-11 A	22-Nov-11 A
JR10010QA	Air Force Review of Working Copy VCMR	15	12-Dec-11	03-Jan-12
JR10020	Comment Resolution	5	04-Jan-12	10-Jan-12
JR10030	Prepare Final VCMR	5	11-Jan-12	18-Jan-12
JR10040QA	Air Force Review Final and Sign Submittal Letter	5	19-Jan-12	25-Jan-12
JR10050	Distribute Submittal Letter & Documents to Regulators	1	26-Jan-12	26-Jan-12
JR10055PM	Payment for Final VCMR	1	26-Jan-12	26-Jan-12
JR10051	Payment of Regulatory Fees	5	27-Jan-12	02-Feb-12
JR10060	Regulators Review of Final VCMR	69	03-Feb-12	10-May-12
JR10070	Comment Resolution	5	11-May-12	17-May-12
JR10080	Prepare Revised Final VCMR	5	18-May-12	24-May-12
JR10090PM	Payment for Revised Final VCMR	1	24-May-12	24-May-12
Field Work		25	25-May-12	29-Jun-12
JR20001	Field Effort First Set of Five Septic Tanks	15	25-May-12	15-Jun-12
JR20002	Field Effort Second set of Five Septic Tanks	15	04-Jun-12	22-Jun-12
JR20003	Field Effort Third set of Five Septic Tanks	15	11-Jun-12	29-Jun-12
Voluntary Corrective Measures Report (VCM Report)		137	25-May-12	10-Dec-12
JR30000	Prepare Working Copy VCM Report	15	25-May-12	15-Jun-12
JR30001QA	Air Force Review of Working Copy VCM Report	15	18-Jun-12	09-Jul-12
JR30020	Comment Resolution	5	10-Jul-12	16-Jul-12
JR30030	Prepare Final VCM Report	5	17-Jul-12	23-Jul-12
JR30040QA	Air Force Review Final and Sign Submittal Letter	5	24-Jul-12	30-Jul-12
JR30050	Distribute Submittal Letter & Document to Regulators	1	31-Jul-12	31-Jul-12
JR30055PM	Payment for Final VCM Report	1	31-Jul-12	31-Jul-12
JR30051	Payment of Regulatory Fees	5	01-Aug-12	07-Aug-12
JR30060	Regulators Review of Final VCM Report	76	08-Aug-12	26-Nov-12
JR30070	Comment Resolution	5	27-Nov-12	03-Dec-12
JR30080	Prepare Revised Final VCM Report	5	04-Dec-12	10-Dec-12
JR30090PM	Payment for Revised Final VCM Report	1	10-Dec-12	10-Dec-12
Corrective Action Completion Petition		137	08-Aug-12	25-Feb-13
JR40000	Prepare Working Copy Corrective Action Completion Petition	15	08-Aug-12	28-Aug-12
JR40001QA	Air Force Review of Working Copy Corrective Action Completion Petition	15	29-Aug-12	19-Sep-12
JR40020	Comment Resolution	5	20-Sep-12	26-Sep-12
JR40030	Prepare Final Corrective Action Completion Petition	5	27-Sep-12	03-Oct-12
JR40040QA	Air Force Review Final and Sign Submittal Letter	5	04-Oct-12	11-Oct-12
JR40050	Distribute Submittal Letter & Document to Regulators	1	12-Oct-12	12-Oct-12
JR40055PM	Payment for Final Corrective Action Completion Petition	1	12-Oct-12	12-Oct-12
JR40061	Payment of Regulatory Fees	5	15-Oct-12	19-Oct-12
JR40065	Regulators Review of Final Corrective Action Completion Petition	76	22-Oct-12	08-Feb-13
JR40070	Comment Resolution	5	11-Feb-13	15-Feb-13
JR40080	Prepare Revised Final Corrective Action Completion Petition	5	19-Feb-13	25-Feb-13
JR40090PM	Payment for Revised Final Corrective Action Completion Petition	1	25-Feb-13	25-Feb-13
Permit Modification		238	22-Oct-12	30-Sep-13
JR50001	Prepare Permit Mod Working Copy	15	22-Oct-12	09-Nov-12
JR50010QA	Air Force Review of Working Copy Permit Modification	15	12-Nov-12	03-Dec-12
JR50020	Comment Resolution	5	04-Dec-12	10-Dec-12
JR50030	Prepare Final Permit Mod	5	11-Dec-12	17-Dec-12
JR50040QA	Air Force Review Final and Sign Submittal Letter	5	18-Dec-12	24-Dec-12
JR50050	Distribute Submittal Letter & Document to Regulators	1	26-Dec-12	26-Dec-12
JR50055PM	Payment for Final Permit Modification	1	26-Dec-12	26-Dec-12
JR50060	Administrative Review for Completeness	80	11-Feb-13	04-Jun-13



Remaining Level of Effort ◆ ◆ Milestone
Actual Level of Effort
Actual Work
Remaining Work
Critical Remaining Work

Mid-Western Region Peformance Based Remediation

Includes Scope Change Request 12 Dec 2011

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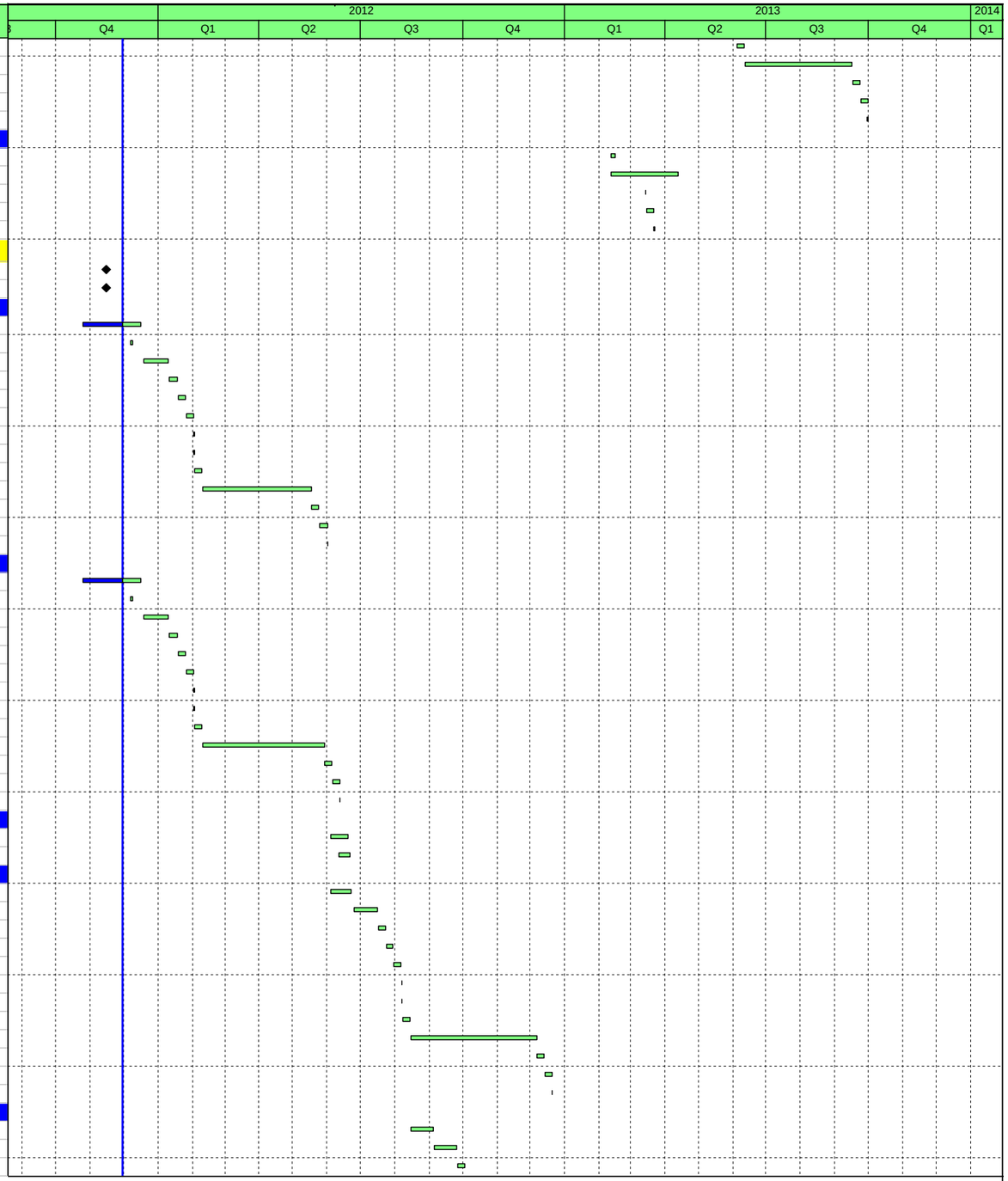
Shaw™
Shaw Environmental & Infrastructure, Inc.

Date: 05-Jan-12

DD: 30-Nov-11

Activity ID	Activity Name	Original Duration	Start	Finish
JR50061	Payment of Regulatory Fees	5	05-Jun-13	11-Jun-13
JR50065	Regulators Review of Final Permit Mod	67	12-Jun-13	16-Sep-13
JR50070	Comment Resolution	5	17-Sep-13	23-Sep-13
JR50080	Prepare Revised Final Permit Mod	5	24-Sep-13	30-Sep-13
JR50090PM	Payment for Revised Final Permit Mod	1	30-Sep-13	30-Sep-13
Public Meeting for Permit Modification		44	11-Feb-13	12-Apr-13
JR70000	Pre-Meeting Materials	5	11-Feb-13	15-Feb-13
JR70010	Public Meeting Public Review Period	44	11-Feb-13	12-Apr-13
JR70020	Public Meeting	1	14-Mar-13	14-Mar-13
JR70030	Public Meeting Transcript	5	15-Mar-13	21-Mar-13
JR70040PM	Payment for Public Meeting for Permit Mod	1	22-Mar-13	22-Mar-13
GROUP 2 - 5 UST's (SC)		492	25-Oct-11 A	07-Oct-13
40	Achieve Site Closure for:	0	15-Nov-11 A	
41	TU/US-C502, TU/US-C507, TU/US-C514, TU/US-C515, & TU/US-C516	0	15-Nov-11 A	
Voluntary Corrective Measures Request		152	25-Oct-11 A	01-Jun-12
JU10005	Prepare Working Copy Voluntary Corrective Measures Request	19	25-Oct-11 A	16-Dec-11
JU10000	Perform Records Search	3	07-Dec-11	09-Dec-11
JU10010QA	Air Force Review of Working Copy Voluntary Corrective Measures Request	15	19-Dec-11	10-Jan-12
JU10020	Comment Resolution	5	11-Jan-12	18-Jan-12
JU10030	Prepare Final Voluntary Corrective Measures Request	5	19-Jan-12	25-Jan-12
JU10040QA	Air Force Review Final and Sign Submittal Letter	5	26-Jan-12	01-Feb-12
JU10050	Distribute Submittal Letter & Documents to Regulators	1	02-Feb-12	02-Feb-12
JU10055PM	Payment for Final Voluntary Corrective Measures Request	1	02-Feb-12	02-Feb-12
JU10051	Payment of Regulatory Fees	5	03-Feb-12	09-Feb-12
JU10060	Regulators Review of Final Voluntary Corrective Measures Request	69	10-Feb-12	17-May-12
JU10070	Comment Resolution	5	18-May-12	24-May-12
JU10080	Prepare Revised Final Voluntary Corrective Measures Request	5	25-May-12	01-Jun-12
JU10090PM	Payment for Revised Final Voluntary Corrective Measures Request	1	01-Jun-12	01-Jun-12
RFI Work Plan		159	25-Oct-11 A	12-Jun-12
JU11005	RFI Work Plan (WP) Working Copy	19	25-Oct-11 A	16-Dec-11
JU11000	Perform Records Search	3	07-Dec-11	09-Dec-11
JU11010QA	Air Force Review of Working Copy RFI Work Plan	15	19-Dec-11	10-Jan-12
JU11020	Comment Resolution	5	11-Jan-12	18-Jan-12
JU11030	Prepare Final RFI Work Plan	5	19-Jan-12	25-Jan-12
JU11040QA	Air Force Review Final and Sign Submittal Letter	5	26-Jan-12	01-Feb-12
JU11050	Distribute Submittal Letter & Document to Regulators	1	02-Feb-12	02-Feb-12
JU11055PM	Payment for Final RFI Work Plan	1	02-Feb-12	02-Feb-12
JU11051	Payment of Regulatory Fees	5	03-Feb-12	09-Feb-12
JU11060	Regulators Review of Final RFI Work Plan	76	10-Feb-12	29-May-12
JU11070	Comment Resolution	5	30-May-12	05-Jun-12
JU11080	Prepare Revised Final RFI Work Plan	5	06-Jun-12	12-Jun-12
JU11090PM	Payment for Revised Final RFI Work Plan	1	12-Jun-12	12-Jun-12
Field Work		14	04-Jun-12	21-Jun-12
JU20001	Field Effort First Set of UST's	12	04-Jun-12	19-Jun-12
JU20002	Field Effort Second set of UST's	9	11-Jun-12	21-Jun-12
Voluntary Corrective Measures Report		140	04-Jun-12	20-Dec-12
JU30000	Prepare Working Copy Voluntary Corrective Measures Report	15	04-Jun-12	22-Jun-12
JU30001QA	Air Force Review of Working Copy Voluntary Corrective Measures Report	15	25-Jun-12	16-Jul-12
JU30020	Comment Resolution	5	17-Jul-12	23-Jul-12
JU30030	Prepare Final Voluntary Corrective Measures Report	5	24-Jul-12	30-Jul-12
JU30040QA	Air Force Review Final and Sign Submittal Letter	5	31-Jul-12	06-Aug-12
JU30050	Distribute Submittal Letter & Document to Regulators	1	07-Aug-12	07-Aug-12
JU30055PM	Payment for Final Voluntary Corrective Measures Report	1	07-Aug-12	07-Aug-12
JU30051	Payment of Regulatory Fees	5	08-Aug-12	14-Aug-12
JU30060	Regulators Review of Final Voluntary Corrective Measures Report	79	15-Aug-12	06-Dec-12
JU30070	Comment Resolution	5	07-Dec-12	13-Dec-12
JU30080	Prepare Revised Final Voluntary Corrective Measures Report	5	14-Dec-12	20-Dec-12
JU30090PM	Payment for Revised Final Voluntary Corrective Measures Report	1	20-Dec-12	20-Dec-12
Corrective Action Completion Petition		139	15-Aug-12	06-Mar-13
JU40000	Prepare Working Copy Corrective Action Completion Petition	14	15-Aug-12	04-Sep-12
JU40001QA	Air Force Review of Working Copy Corrective Action Completion Petition	15	05-Sep-12	25-Sep-12
JU40020	Comment Resolution	5	26-Sep-12	02-Oct-12



Remaining Level of Effort ◆ ◆ Milestone

Actual Level of Effort

Actual Work

Remaining Work

Critical Remaining Work

Mid-Western Region Peformance Based Remediation

Includes Scope Change Request 12 Dec 2011

Durations are based on a 5 day work week and allow for Federal Holidays.

Shaw™

Shaw Environmental & Infrastructure, Inc.

Date: 05-Jan-12

DD: 30-Nov-11

Activity ID	Activity Name	Original Duration	Start	Finish
JU40030	Prepare Final Corrective Action Completion Petition	5	03-Oct-12	10-Oct-12
JU40040QA	Air Force Review Final and Sign Submittal Letter	5	11-Oct-12	17-Oct-12
JU40050	Distribute Submittal Letter & Document to Regulators	1	18-Oct-12	18-Oct-12
JU40055PM	Payment for Final Corrective Action Completion Petition	1	18-Oct-12	18-Oct-12
JU40061	Payment of Regulatory Fees	5	19-Oct-12	25-Oct-12
JU40065	Regulators Review of Final Corrective Action Completion Petition	79	26-Oct-12	20-Feb-13
JU40070	Comment Resolution	5	21-Feb-13	27-Feb-13
JU40080	Prepare Revised Final Corrective Action Completion Petition	5	28-Feb-13	06-Mar-13
JU40090PM	Payment for Revised Final Corrective Action Completion Petition	1	06-Mar-13	06-Mar-13
Permit Modification		239	26-Oct-12	07-Oct-13
JU50001	Prepare Permit Mod Working Copy	15	26-Oct-12	15-Nov-12
JU50010QA	Air Force Review of Working Copy Permit Modification	15	16-Nov-12	07-Dec-12
JU50020	Comment Resolution	5	10-Dec-12	14-Dec-12
JU50030	Prepare Final Permit Mod	10	17-Dec-12	31-Dec-12
JU50040QA	Air Force Review Final and Sign Submittal Letter	5	02-Jan-13	08-Jan-13
JU50050	Distribute Submittal Letter & Document to Regulators	1	09-Jan-13	09-Jan-13
JU50055PM	Payment for Final Permit Modification	1	09-Jan-13	09-Jan-13
JU50060	Administrative Review for Completeness	79	21-Feb-13	12-Jun-13
JU50061	Payment of Regulatory Fees	5	13-Jun-13	19-Jun-13
JU50065	Regulators Review of Final Permit Mod	66	20-Jun-13	23-Sep-13
JU50070	Comment Resolution	5	24-Sep-13	30-Sep-13
JU50080	Prepare Revised Final Permit Mod	5	01-Oct-13	07-Oct-13
JU50090PM	Payment for Revised Final Permit Mod	1	07-Oct-13	07-Oct-13
Public Meeting for Permit Modification		44	21-Feb-13	23-Apr-13
JU70000	Pre-Meeting Materials	5	21-Feb-13	27-Feb-13
JU70010	Public Meeting Public Review Period	44	21-Feb-13	23-Apr-13
JU70020	Public Meeting	1	25-Mar-13	25-Mar-13
JU70030	Public Meeting Transcript	5	26-Mar-13	01-Apr-13
JU70040PM	Payment for Public Meeting for Permit Mod	1	02-Apr-13	02-Apr-13
KIRTLAND AFB		518	22-Sep-11 A	20-Sep-13
Site CW-C571(Zia Park)		295	21-Oct-11 A	30-Nov-12
RFI Work Plan		188	21-Oct-11 A	28-Jun-12
KA10000	Perform Records Search	22	21-Oct-11 A	21-Nov-11 A
KA10005	RFI Work Plan (WP) Working Copy	22	22-Nov-11 A	09-Dec-11
KA10010QA	Air Force Review of Working Copy RFI Work Plan	15	12-Dec-11	03-Jan-12
KA10020	Comment Resolution	5	04-Jan-12	10-Jan-12
KA10030	Prepare Final RFI Work Plan	10	11-Jan-12	25-Jan-12
KA10040QA	Air Force Review Final and Sign Submittal Letter	8	26-Jan-12	06-Feb-12
KA10050	Distribute Submittal Letter & Document to Regulators	1	07-Feb-12	07-Feb-12
KA10055PM	Payment for Final RFI Work Plan	1	07-Feb-12	07-Feb-12
KA10051	Payment of Regulatory Fees	5	07-Feb-12	13-Feb-12
KA10060	Regulators Review of Final RFI Work Plan	86	14-Feb-12	14-Jun-12
KA10070	Comment Resolution	5	15-Jun-12	21-Jun-12
KA10080	Prepare Revised Final RFI Work Plan	5	22-Jun-12	28-Jun-12
KA10090PM	Payment for Revised Final RFI Work Plan	1	28-Jun-12	28-Jun-12
Accelerated Corrective Measures Work Plan (ACM WP)		179	22-Nov-11 A	14-Aug-12
KA11005	Prepare Working Copy ACM WP	22	22-Nov-11 A	27-Jan-12
KA11010QA	Air Force Review of Working Copy ACM WP	15	30-Jan-12	17-Feb-12
KA11020	Comment Resolution	5	21-Feb-12	27-Feb-12
KA11030	Prepare Final ACM WP	10	28-Feb-12	12-Mar-12
KA11040QA	Air Force Review Final and Sign Submittal Letter	8	13-Mar-12	22-Mar-12
KA11050	Distribute Submittal Letter & Documents to Regulators	1	23-Mar-12	23-Mar-12
KA11055PM	Payment for Final ACM WP	1	23-Mar-12	23-Mar-12
KA11051	Payment of Regulatory Fees	5	23-Mar-12	29-Mar-12
KA11060	Regulators Review of Final ACM WP	86	30-Mar-12	31-Jul-12
KA11070	Comment Resolution	5	01-Aug-12	07-Aug-12
KA11080	Prepare Revised Final ACM WP	5	08-Aug-12	14-Aug-12
KA11090PM	Payment for Revised Final ACM WP	1	14-Aug-12	14-Aug-12
Field Activities		55	29-Jun-12	17-Sep-12
KA20000	Sample Collection	5	29-Jun-12	06-Jul-12
KA20010	Sample Analysis	15	09-Jul-12	27-Jul-12
KA20011	ACM Removal Activities	10	13-Aug-12	24-Aug-12

Remaining Level of Effort ◆ ◆ Milestone
Actual Level of Effort
Actual Work
Remaining Work
Critical Remaining Work

Mid-Western Region Peformance Based Remediation

Includes Scope Change Request 12 Dec 2011

Durations are based on a 5 day work week and allow for Federal Holidays.

Shaw™
Shaw Environmental & Infrastructure, Inc.

Date: 05-Jan-12

DD: 30-Nov-11

Activity ID	Activity Name	Original Duration	Start	Finish
KA20012	ACM Confirmation Sampling	5	27-Aug-12	31-Aug-12
KA20020	Sampling Completion Report	10	04-Sep-12	17-Sep-12
KA20030PM	Payment for Sampling Completion Report	1	17-Sep-12	17-Sep-12
RFI Report		52	18-Sep-12	30-Nov-12
KA30005	Prepare Working Copy RFI Report (Includes ACM Report)	22	18-Sep-12	18-Oct-12
KA30010QA	Air Force Review of Working Copy RFI Report	15	19-Oct-12	08-Nov-12
KA30020	Comment Resolution	5	09-Nov-12	15-Nov-12
KA30030	Prepare Draft RFI Report	10	16-Nov-12	30-Nov-12
KA30090PM	Payment for Draft RFI Report	1	30-Nov-12	30-Nov-12
Site OT-C572 (Building 5700-1)		305	21-Oct-11 A	14-Dec-12
RFI Work Plan		198	21-Oct-11 A	13-Jul-12
KB10000	Perform Records Search	22	21-Oct-11 A	21-Nov-11 A
KB10005	RFI Work Plan (WP) Working Copy	22	22-Nov-11 A	23-Dec-11
KB10010QA	Air Force Review of Working Copy RFI Work Plan	15	27-Dec-11	18-Jan-12
KB10020	Comment Resolution	5	19-Jan-12	25-Jan-12
KB10030	Prepare Final RFI Work Plan	10	26-Jan-12	08-Feb-12
KB10040QA	Air Force Review Final and Sign Submittal Letter	8	09-Feb-12	21-Feb-12
KB10050	Distribute Submittal Letter & Document to Regulators	1	22-Feb-12	22-Feb-12
KB10055PM	Payment for Final RFI Work Plan	1	22-Feb-12	22-Feb-12
KB10051	Payment of Regulatory Fees	5	22-Feb-12	28-Feb-12
KB10060	Regulators Review of Final RFI Work Plan	86	29-Feb-12	28-Jun-12
KB10070	Comment Resolution	5	29-Jun-12	06-Jul-12
KB10080	Prepare Revised Final RFI Work Plan	5	09-Jul-12	13-Jul-12
KB10090PM	Payment for Revised Final RFI Work Plan	1	13-Jul-12	13-Jul-12
Accelerated Corrective Measures Work Plan (ACM WP)		163	22-Nov-11 A	14-Aug-12
KB11005	Prepare Working Copy ACM WP	22	22-Nov-11 A	27-Jan-12
KB11010QA	Air Force Review of Working Copy ACM WP	15	30-Jan-12	17-Feb-12
KB11020	Comment Resolution	5	21-Feb-12	27-Feb-12
KB11030	Prepare Final ACM WP	10	28-Feb-12	12-Mar-12
KB11040QA	Air Force Review Final and Sign Submittal Letter	8	13-Mar-12	22-Mar-12
KB11050	Distribute Submittal Letter & Documents to Regulators	1	23-Mar-12	23-Mar-12
KB11055PM	Payment for Final ACM WP	1	23-Mar-12	23-Mar-12
KB11051	Payment of Regulatory Fees	5	23-Mar-12	29-Mar-12
KB11060	Regulators Review of Final ACM WP	86	30-Mar-12	31-Jul-12
KB11070	Comment Resolution	5	01-Aug-12	07-Aug-12
KB11080	Prepare Revised Final ACM WP	5	08-Aug-12	14-Aug-12
KB11090PM	Payment for Revised Final ACM WP	1	14-Aug-12	14-Aug-12
Field Activities		55	16-Jul-12	01-Oct-12
KB20000	Sample Collection	5	16-Jul-12	20-Jul-12
KB20010	Sample Analysis	15	23-Jul-12	10-Aug-12
KB20011	ACM Removal Activities	10	27-Aug-12	10-Sep-12
KB20012	ACM Confirmation Sampling	5	11-Sep-12	17-Sep-12
KB20020	Sampling Completion Report	10	18-Sep-12	01-Oct-12
KB20030PM	Payment for Sampling Completion Report	1	01-Oct-12	01-Oct-12
RFI Report		52	02-Oct-12	14-Dec-12
KB30005	Prepare Working Copy RFI Report (Includes ACM Report)	22	02-Oct-12	01-Nov-12
KB30010QA	Air Force Review of Working Copy RFI Report	15	02-Nov-12	23-Nov-12
KB30020	Comment Resolution	5	26-Nov-12	30-Nov-12
KB30030	Prepare Draft RFI Report	10	03-Dec-12	14-Dec-12
KB30090PM	Payment for Draft RFI Report	1	14-Dec-12	14-Dec-12
Site OT-C573 (Asphalt Dump Area)		295	21-Oct-11 A	30-Nov-12
RFI Work Plan		188	21-Oct-11 A	28-Jun-12
KC10000	Perform Records Search	22	21-Oct-11 A	22-Nov-11 A
KC10005	RFI Work Plan (WP) Working Copy	22	22-Nov-11 A	09-Dec-11
KC10010QA	Air Force Review of Working Copy RFI Work Plan	15	12-Dec-11	03-Jan-12
KC10020	Comment Resolution	5	04-Jan-12	10-Jan-12
KC10030	Prepare Final RFI Work Plan	10	11-Jan-12	25-Jan-12
KC10040QA	Air Force Review Final and Sign Submittal Letter	8	26-Jan-12	06-Feb-12
KC10050	Distribute Submittal Letter & Document to Regulators	1	07-Feb-12	07-Feb-12
KC10055PM	Payment for Final RFI Work Plan	1	07-Feb-12	07-Feb-12
KC10051	Payment of Regulatory Fees	5	07-Feb-12	13-Feb-12
KC10060	Regulators Review of Final RFI Work Plan	86	14-Feb-12	14-Jun-12

Remaining Level of Effort ◆ ◆ Milestone
Actual Level of Effort
Actual Work
Remaining Work
Critical Remaining Work

Mid-Western Region Peformance Based Remediation

Includes Scope Change Request 12 Dec 2011

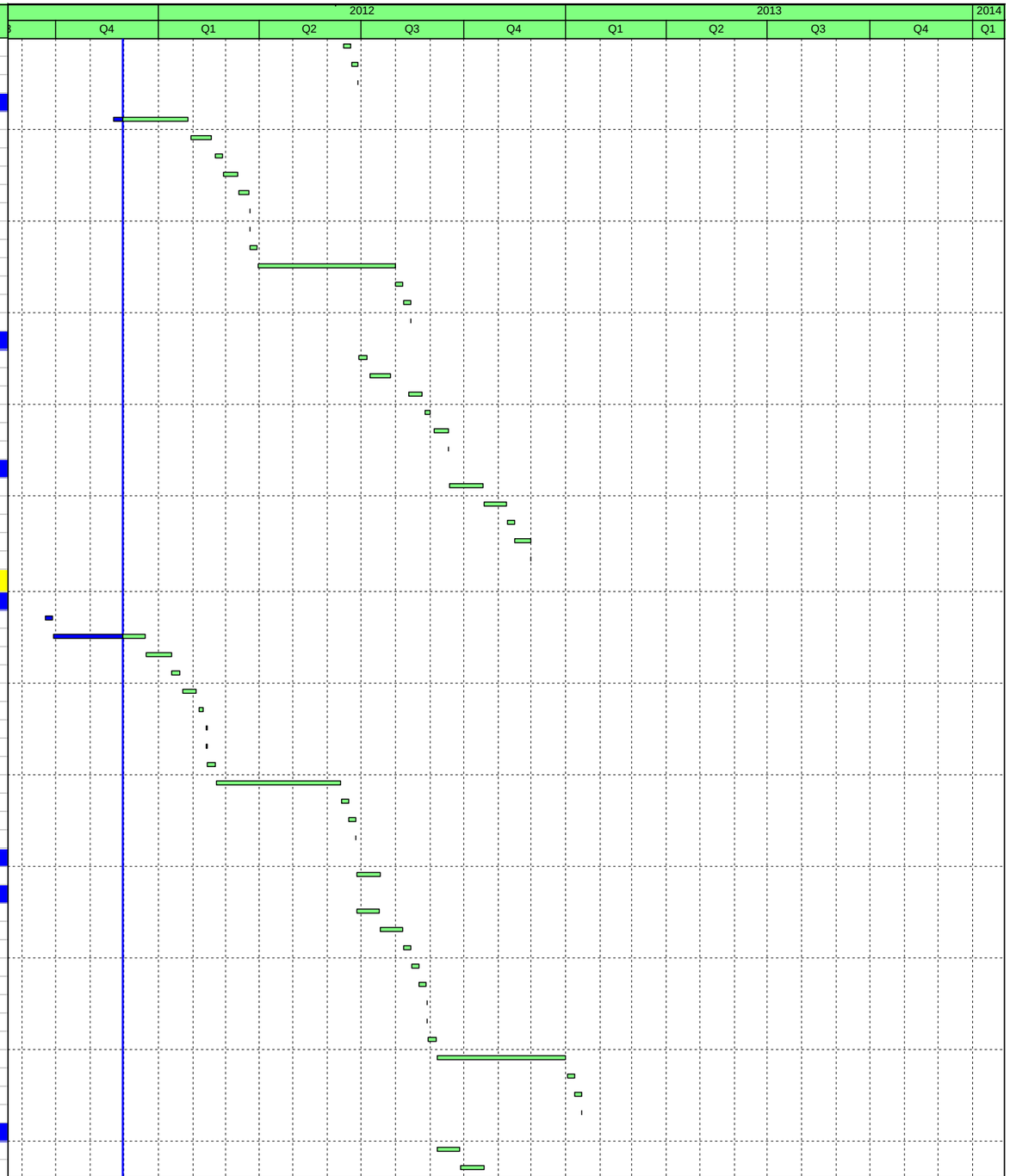
Durations are based on a 5 day work week and allow for Federal Holidays.

Shaw™
Shaw Environmental & Infrastructure, Inc.

Date: 05-Jan-12

DD: 30-Nov-11

Activity ID	Activity Name	Original Duration	Start	Finish
KC10070	Comment Resolution	5	15-Jun-12	21-Jun-12
KC10080	Prepare Revised Final RFI Work Plan	5	22-Jun-12	28-Jun-12
KC10090PM	Payment for Revised Final RFI Work Plan	1	28-Jun-12	28-Jun-12
Accelerated Corrective Measures Work Plan (ACM WP)		179	22-Nov-11 A	14-Aug-12
KC11005	Prepare Working Copy ACM WP	22	22-Nov-11 A	27-Jan-12
KC11010QA	Air Force Review of Working Copy ACM WP	15	30-Jan-12	17-Feb-12
KC11020	Comment Resolution	5	21-Feb-12	27-Feb-12
KC11030	Prepare Final ACM WP	10	28-Feb-12	12-Mar-12
KC11040QA	Air Force Review Final and Sign Submittal Letter	8	13-Mar-12	22-Mar-12
KC11050	Distribute Submittal Letter & Documents to Regulators	1	23-Mar-12	23-Mar-12
KC11055PM	Payment for Final ACM WP	1	23-Mar-12	23-Mar-12
KC11051	Payment of Regulatory Fees	5	23-Mar-12	29-Mar-12
KC11060	Regulators Review of Final ACM WP	86	30-Mar-12	31-Jul-12
KC11070	Comment Resolution	5	01-Aug-12	07-Aug-12
KC11080	Prepare Revised Final ACM WP	5	08-Aug-12	14-Aug-12
KC11090PM	Payment for Revised Final ACM WP	1	14-Aug-12	14-Aug-12
Field Activities		55	29-Jun-12	17-Sep-12
KC20000	Sample Collection	5	29-Jun-12	06-Jul-12
KC20010	Sample Analysis	15	09-Jul-12	27-Jul-12
KC20011	ACM Removal Activities	10	13-Aug-12	24-Aug-12
KC20012	ACM Confirmation Sampling	5	27-Aug-12	31-Aug-12
KC20020	Sampling Completion Report	10	04-Sep-12	17-Sep-12
KC20030PM	Payment for Sampling Completion Report	1	17-Sep-12	17-Sep-12
RFI Report		52	18-Sep-12	30-Nov-12
KC30005	Prepare Working Copy RFI Report (Includes ACM Report)	22	18-Sep-12	18-Oct-12
KC30010QA	Air Force Review of Working Copy RFI Report	15	19-Oct-12	08-Nov-12
KC30020	Comment Resolution	5	09-Nov-12	15-Nov-12
KC30030	Prepare Draft RFI Report	10	16-Nov-12	30-Nov-12
KC30090PM	Payment for Draft RFI Report	1	30-Nov-12	30-Nov-12
Site SS-C574 (Building 20676 Spill Site)		518	22-Sep-11 A	20-Sep-13
Accelerated Corrective Measures Work Plan		206	22-Sep-11 A	26-Jun-12
KD10000	Perform Records Search	5	22-Sep-11 A	28-Sep-11 A
KD10005	Prepare Working Copy ACM WP's	15	29-Sep-11 A	20-Dec-11
KD10010QA	Air Force Review of Working Copy ACM Work Plan	15	21-Dec-11	12-Jan-12
KD10020	Comment Resolution	5	13-Jan-12	20-Jan-12
KD10030	Prepare Final Accelerated Corrective Measures Work Plan	10	23-Jan-12	03-Feb-12
KD10040QA	Air Force Review Final and Sign Submittal Letter	5	06-Feb-12	10-Feb-12
KD10050	Distribute Submittal Letter & Documents to Regulators	1	13-Feb-12	13-Feb-12
KD10055PM	Payment for Final Accelerated Corrective Measures Work Plan	1	13-Feb-12	13-Feb-12
KD10051	Payment of Regulatory Fees	5	14-Feb-12	21-Feb-12
KD10060	Regulators Review of Final Accelerated Corrective Measures Work Plan	79	22-Feb-12	12-Jun-12
KD10070	Comment Resolution	5	13-Jun-12	19-Jun-12
KD10080	Prepare Revised Final Accelerated Corrective Measures Work Plan	5	20-Jun-12	26-Jun-12
KD10090PM	Payment for Revised Final Accelerated Corrective Measures Work Plan	1	26-Jun-12	26-Jun-12
Field Work		15	27-Jun-12	18-Jul-12
KD20000	Field Effort	15	27-Jun-12	18-Jul-12
Corrective Measures Completion Report		139	27-Jun-12	15-Jan-13
KD30000	Prepare Working Copy Corrective Measures Completion Report	14	27-Jun-12	17-Jul-12
KD30001QA	Air Force Review of Working Copy Corrective Measures Completion Report	15	18-Jul-12	07-Aug-12
KD30020	Comment Resolution	5	08-Aug-12	14-Aug-12
KD30030	Prepare Final Corrective Measures Completion Report	5	15-Aug-12	21-Aug-12
KD30040QA	Air Force Review Final and Sign Submittal Letter	5	22-Aug-12	28-Aug-12
KD30050	Distribute Submittal Letter & Document to Regulators	1	29-Aug-12	29-Aug-12
KD30055PM	Payment for Final Corrective Measures Completion Report	1	29-Aug-12	29-Aug-12
KD30051	Payment of Regulatory Fees	5	30-Aug-12	06-Sep-12
KD30060	Regulators Review of Final Corrective Measures Completion Report	79	07-Sep-12	31-Dec-12
KD30070	Comment Resolution	5	02-Jan-13	08-Jan-13
KD30080	Prepare Revised Final Corrective Measures Completion Report	5	09-Jan-13	15-Jan-13
KD30090PM	Payment for Revised Final Corrective Measures Completion Report	1	15-Jan-13	15-Jan-13
Corrective Action Completion Petition		140	07-Sep-12	29-Mar-13
KD40000	Prepare Working Copy Corrective Action Completion Petition	15	07-Sep-12	27-Sep-12
KD40001QA	Air Force Review of Working Copy Corrective Action Completion Petition	15	28-Sep-12	19-Oct-12



Remaining Level of Effort
Actual Level of Effort
Actual Work
Remaining Work
Critical Remaining Work
Milestone

Mid-Western Region Peformance Based Remediation

Includes Scope Change Request 12 Dec 2011

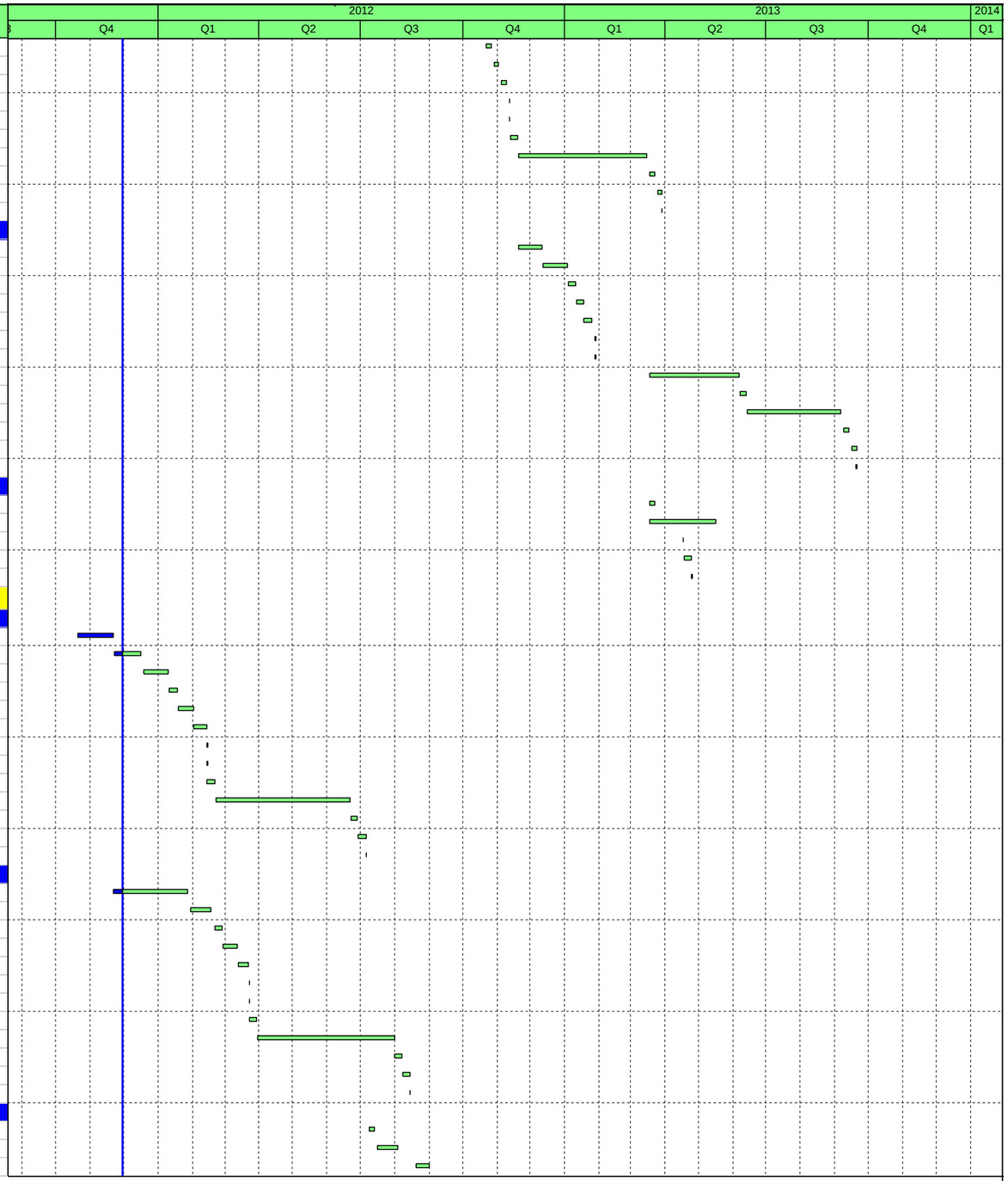
Durations are based on a 5 day work week and allow for Federal Holidays.

Shaw Environmental & Infrastructure, Inc.

Date: 05-Jan-12

DD: 30-Nov-11

Activity ID	Activity Name	Original Duration	Start	Finish
KD40020	Comment Resolution	5	22-Oct-12	26-Oct-12
KD40030	Prepare Final Corrective Action Completion Petition	5	29-Oct-12	02-Nov-12
KD40040QA	Air Force Review Final and Sign Submittal Letter	5	05-Nov-12	09-Nov-12
KD40050	Distribute Submittal Letter & Document to Regulators	1	12-Nov-12	12-Nov-12
KD40055PM	Payment for Final Corrective Action Completion Petition	1	12-Nov-12	12-Nov-12
KD40061	Payment of Regulatory Fees	5	13-Nov-12	19-Nov-12
KD40065	Regulators Review of Final Corrective Action Completion Petition	79	20-Nov-12	15-Mar-13
KD40070	Comment Resolution	5	18-Mar-13	22-Mar-13
KD40080	Prepare Revised Final Corrective Action Completion Petition	5	25-Mar-13	29-Mar-13
KD40090PM	Payment for Revised Final Corrective Action Completion Petition	1	29-Mar-13	29-Mar-13
Permit Modification		211	20-Nov-12	20-Sep-13
KD50001	Prepare Permit Mod Working Copy	15	20-Nov-12	11-Dec-12
KD50010QA	Air Force Review of Working Copy Permit Modification	15	12-Dec-12	03-Jan-13
KD50020	Comment Resolution	5	04-Jan-13	10-Jan-13
KD50030	Prepare Final Permit Mod	5	11-Jan-13	17-Jan-13
KD50040QA	Air Force Review Final and Sign Submittal Letter	5	18-Jan-13	25-Jan-13
KD50050	Distribute Submittal Letter & Document to Regulators	1	28-Jan-13	28-Jan-13
KD50055PM	Payment for Final Permit Modification	1	28-Jan-13	28-Jan-13
KD50060	Administrative Review for Completeness	58	18-Mar-13	06-Jun-13
KD50061	Payment of Regulatory Fees	5	07-Jun-13	13-Jun-13
KD50065	Regulators Review of Final Permit Mod	59	14-Jun-13	06-Sep-13
KD50070	Comment Resolution	5	09-Sep-13	13-Sep-13
KD50080	Prepare Revised Final Permit Mod	5	16-Sep-13	20-Sep-13
KD50090PM	Payment for Revised Final Permit Mod	1	20-Sep-13	20-Sep-13
Public Meeting for Permit Modification		44	18-Mar-13	16-May-13
KD70000	Pre-Meeting Materials	5	18-Mar-13	22-Mar-13
KD70010	Public Meeting Public Review Period	44	18-Mar-13	16-May-13
KD70020	Public Meeting	1	17-Apr-13	17-Apr-13
KD70030	Public Meeting Transcript	5	18-Apr-13	24-Apr-13
KD70040PM	Payment for Public Meeting for Permit Mod	1	25-Apr-13	25-Apr-13
Site SS-C575 (Transient Alert Pad)		300	21-Oct-11 A	07-Dec-12
RFI Work Plan		193	21-Oct-11 A	06-Jul-12
KE10000	Perform Records Search	22	21-Oct-11 A	22-Nov-11 A
KE10005	RFI Work Plan (WP) Working Copy	22	23-Nov-11 A	16-Dec-11
KE10010QA	Air Force Review of Working Copy RFI Work Plan	15	19-Dec-11	10-Jan-12
KE10020	Comment Resolution	5	11-Jan-12	18-Jan-12
KE10030	Prepare Final RFI Work Plan	10	19-Jan-12	01-Feb-12
KE10040QA	Air Force Review Final and Sign Submittal Letter	8	02-Feb-12	13-Feb-12
KE10050	Distribute Submittal Letter & Document to Regulators	1	14-Feb-12	14-Feb-12
KE10055PM	Payment for Final RFI Work Plan	1	14-Feb-12	14-Feb-12
KE10051	Payment of Regulatory Fees	5	14-Feb-12	21-Feb-12
KE10060	Regulators Review of Final RFI Work Plan	86	22-Feb-12	21-Jun-12
KE10070	Comment Resolution	5	22-Jun-12	28-Jun-12
KE10080	Prepare Revised Final RFI Work Plan	5	29-Jun-12	06-Jul-12
KE10090PM	Payment for Revised Final RFI Work Plan	1	06-Jul-12	06-Jul-12
Accelerated Corrective Measures Work Plan (ACM WP)		179	22-Nov-11 A	14-Aug-12
KE11005	Prepare Working Copy ACM WP	22	22-Nov-11 A	27-Jan-12
KE11010QA	Air Force Review of Working Copy ACM WP	15	30-Jan-12	17-Feb-12
KE11020	Comment Resolution	5	21-Feb-12	27-Feb-12
KE11030	Prepare Final ACM WP	10	28-Feb-12	12-Mar-12
KE11040QA	Air Force Review Final and Sign Submittal Letter	8	13-Mar-12	22-Mar-12
KE11050	Distribute Submittal Letter & Documents to Regulators	1	23-Mar-12	23-Mar-12
KE11055PM	Payment for Final ACM WP	1	23-Mar-12	23-Mar-12
KE11051	Payment of Regulatory Fees	5	23-Mar-12	29-Mar-12
KE11060	Regulators Review of Final ACM WP	86	30-Mar-12	31-Jul-12
KE11070	Comment Resolution	5	01-Aug-12	07-Aug-12
KE11080	Prepare Revised Final ACM WP	5	08-Aug-12	14-Aug-12
KE11090PM	Payment for Revised Final ACM WP	1	14-Aug-12	14-Aug-12
Field Activities		55	09-Jul-12	24-Sep-12
KE20000	Sample Collection	5	09-Jul-12	13-Jul-12
KE20010	Sample Analysis	15	16-Jul-12	03-Aug-12
KE20011	ACM Removal Activities	10	20-Aug-12	31-Aug-12



Remaining Level of Effort ◆ ◆ Milestone
Actual Level of Effort
Actual Work
Remaining Work
Critical Remaining Work

Mid-Western Region Peformance Based Remediation

Includes Scope Change Request 12 Dec 2011

Durations are based on a 5 day work week and allow for Federal Holidays.

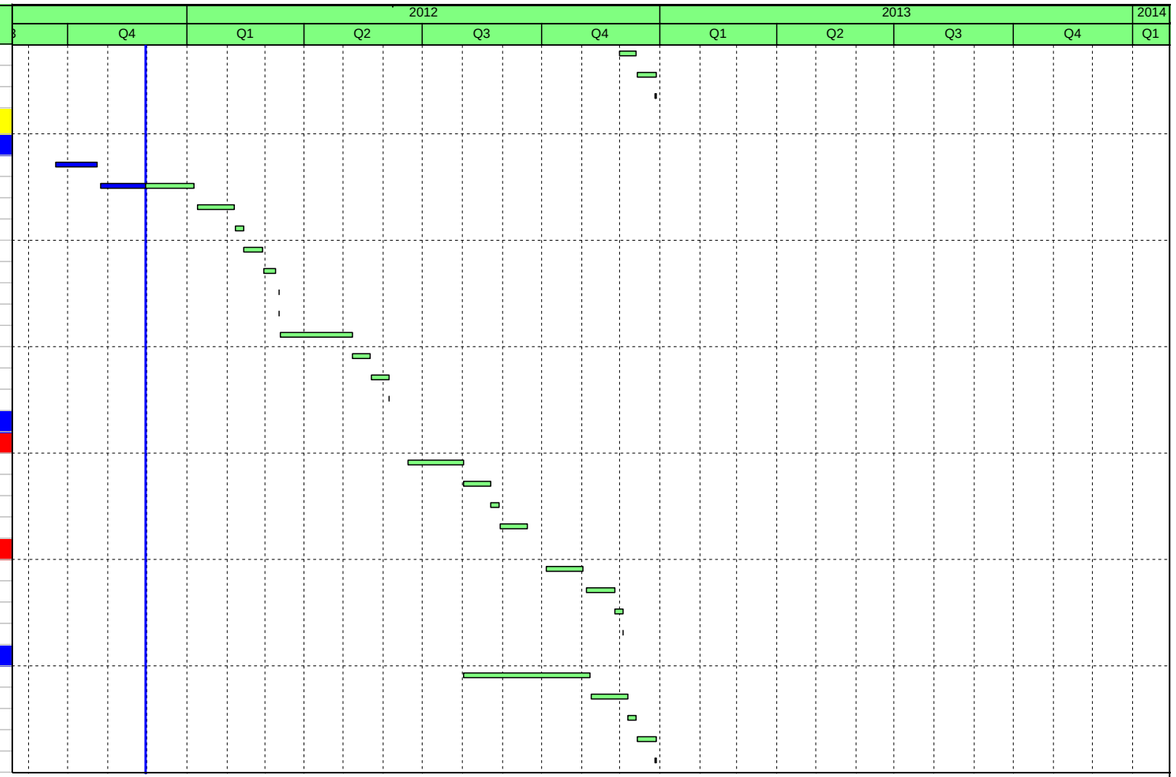
Shaw™
Shaw Environmental & Infrastructure, Inc.

Date: 05-Jan-12

DD: 30-Nov-11

Activity ID	Activity Name	Original Duration	Start	Finish
KE20012	ACM Confirmation Sampling	5	04-Sep-12	10-Sep-12
KE20020	Sampling Completion Report	10	11-Sep-12	24-Sep-12
KE20030PM	Payment for Sampling Completion Report	1	24-Sep-12	24-Sep-12
RFI Report		52	25-Sep-12	07-Dec-12
KE30005	Prepare Working Copy RFI Report (Includes ACM Report)	22	25-Sep-12	25-Oct-12
KE30010QA	Air Force Review of Working Copy RFI Report	15	26-Oct-12	15-Nov-12
KE30020	Comment Resolution	5	16-Nov-12	23-Nov-12
KE30030	Prepare Draft RFI Report	10	26-Nov-12	07-Dec-12
KE30090PM	Payment for Draft RFI Report	1	07-Dec-12	07-Dec-12
SCOTT AFB		334	22-Sep-11 A	28-Dec-12
Site UK-C500 (Building 39) Draft RI Report		333	23-Sep-11 A	28-Dec-12
RI Work Plan		193	23-Sep-11 A	08-Jun-12
SA10000	Perform Records Search	22	23-Sep-11 A	25-Oct-11 A
SA10005	RI Work Plan (WP) Working Copy	20	26-Oct-11 A	23-Dec-11
SA10010QA	Air Force Review of Working Copy RI Work Plan	20	27-Dec-11	25-Jan-12
SA10020	Comment Resolution	5	26-Jan-12	01-Feb-12
SA10030	Prepare Draft RI Work Plan	10	02-Feb-12	15-Feb-12
SA10040QA	Air Force Review Final and Sign Submittal Letter	8	16-Feb-12	28-Feb-12
SA10050	Distribute Submittal Letter & Document to Regulators	1	29-Feb-12	29-Feb-12
SA10055PM	Payment for Draft RI WP	1	29-Feb-12	29-Feb-12
SA10060	Regulators Review of Draft RFI Work Plan	40	01-Mar-12	25-Apr-12
SA10070	Comment Resolution	10	26-Apr-12	09-May-12
SA10080	Prepare Final RI Work Plan	10	10-May-12	23-May-12
SA10090PM	Payment for Final RI Work Plan	1	08-Jun-12	08-Jun-12
Field Activities		66	08-Jun-12	11-Sep-12
Phase 1		40	08-Jun-12	03-Aug-12
SA20000	Sample Collection	15	08-Jun-12	28-Jun-12
SA20010	Sample Analysis	20	29-Jun-12	27-Jul-12
SA20020	Sampling Completion Report	5	30-Jul-12	03-Aug-12
Phase 2		41	16-Jul-12	11-Sep-12
SA20540	Sample Collection	15	16-Jul-12	03-Aug-12
SA20550	Sample Analysis	20	06-Aug-12	31-Aug-12
SA20560	Sampling Completion Report	5	04-Sep-12	10-Sep-12
SA20030F	Payment for Sampling Completion Report	1	11-Sep-12	11-Sep-12
RI Report		85	28-Aug-12	28-Dec-12
SA30005	Prepare Working Copy RI Report	45	28-Aug-12	31-Oct-12
SA30010QA	Air Force Review of Working Copy RI Report	20	01-Nov-12	29-Nov-12
SA30020	Comment Resolution	10	30-Nov-12	13-Dec-12
SA30030	Prepare Draft RI Report	10	14-Dec-12	28-Dec-12
SA30090PM	Payment for Draft RI Report	1	28-Dec-12	28-Dec-12
Site UK-C501(Scott Club) Draft RI Report		334	22-Sep-11 A	28-Dec-12
RI Work Plan		195	22-Sep-11 A	11-Jun-12
SB10000	Perform Records Search	22	22-Sep-11 A	24-Oct-11 A
SB10005	RI Work Plan (WP) Working Copy	20	26-Oct-11 A	04-Jan-12
SB10010QA	Air Force Review of Working Copy RI Work Plan	20	05-Jan-12	02-Feb-12
SB10020	Comment Resolution	5	03-Feb-12	09-Feb-12
SB10030	Prepare Draft RI Work Plan	5	10-Feb-12	16-Feb-12
SB10040QA	Air Force Review Final and Sign Submittal Letter	8	17-Feb-12	29-Feb-12
SB10050	Distribute Submittal Letter & Document to Regulators	1	01-Mar-12	01-Mar-12
SB10055PM	Payment for Draft RI WP	1	01-Mar-12	01-Mar-12
SB10060	Regulators Review of Draft RI Work Plan	40	02-Mar-12	26-Apr-12
SB10070	Comment Resolution	5	27-Apr-12	03-May-12
SB10080	Prepare Final RI Work Plan	5	04-May-12	10-May-12
SB10090PM	Payment for Final RI Work Plan	1	11-Jun-12	11-Jun-12
Field Activities		45	11-May-12	16-Jul-12
SB20000	Sample Collection	20	11-May-12	08-Jun-12
SB20010	Sample Analysis	20	11-Jun-12	09-Jul-12
SB20020	Sampling Completion Report	5	10-Jul-12	16-Jul-12
SB20030PM	Payment for Sampling Completion Report	1	16-Jul-12	16-Jul-12
RI Report		114	18-Jul-12	28-Dec-12
SB30005	Prepare Working Copy RI Report (Including Time Critical Removal Action Report)	74	18-Jul-12	31-Oct-12
SB30010QA	Air Force Review of Working Copy RI Report	20	01-Nov-12	29-Nov-12

Activity ID	Activity Name	Original Duration	Start	Finish
SB30020	Comment Resolution	10	30-Nov-12	13-Dec-12
SB30030	Prepare Draft RI Report	10	14-Dec-12	28-Dec-12
SB30090PM	Payment for Draft RI Report	1	28-Dec-12	28-Dec-12
Site UK-C510 (South Ditch) Draft RI Report		334	22-Sep-11 A	28-Dec-12
RI Work Plan		191	22-Sep-11 A	05-Jun-12
SC10000	Perform Records Search	22	22-Sep-11 A	24-Oct-11 A
SC10005	RI Work Plan (WP) Working Copy	20	26-Oct-11 A	06-Jan-12
SC10010QA	Air Force Review of Working Copy RI Work Plan	20	09-Jan-12	06-Feb-12
SC10020	Comment Resolution	5	07-Feb-12	13-Feb-12
SC10030	Prepare Draft RI Work Plan	10	14-Feb-12	28-Feb-12
SC10040QA	Air Force Review Final and Sign Submittal Letter	8	29-Feb-12	09-Mar-12
SC10050	Distribute Submittal Letter & Document to Regulators	1	12-Mar-12	12-Mar-12
SC10055PM	Payment for Draft RI WP	1	12-Mar-12	12-Mar-12
SC10060	Regulators Review of Draft RI Work Plan	40	13-Mar-12	07-May-12
SC10070	Comment Resolution	10	08-May-12	21-May-12
SC10080	Prepare Final RI Work Plan	10	22-May-12	05-Jun-12
SC10090PM	Payment for Final RI Work Plan	1	05-Jun-12	05-Jun-12
Field Activities		115	20-Jun-12	03-Dec-12
Phase 1		65	20-Jun-12	20-Sep-12
SC20000	Sample Collection	30	20-Jun-12	01-Aug-12
SC20010	Sample Analysis	15	02-Aug-12	22-Aug-12
SC20020	Sampling Completion Report	5	23-Aug-12	29-Aug-12
SC20040	Well Installation	15	30-Aug-12	20-Sep-12
Phase 2		40	05-Oct-12	03-Dec-12
SC20540	Sample Collection & Well Installation	20	05-Oct-12	02-Nov-12
SC20550	Sample Analysis	15	05-Nov-12	26-Nov-12
SC20560	Sampling Completion Report	5	27-Nov-12	03-Dec-12
SC20030I	Payment for Sampling Completion Report	1	03-Dec-12	03-Dec-12
RI Report		103	02-Aug-12	28-Dec-12
SC30005	Prepare Working Copy RI Report	68	02-Aug-12	07-Nov-12
SC30010QA	Air Force Review of Working Copy RI Report	20	08-Nov-12	06-Dec-12
SC30020	Comment Resolution	5	07-Dec-12	13-Dec-12
SC30030	Prepare Draft RI Report	10	14-Dec-12	28-Dec-12
SC30090PM	Payment for Draft RI Report	1	28-Dec-12	28-Dec-12



Remaining Level of Effort
Actual Level of Effort
Actual Work
Remaining Work
Critical Remaining Work
◆ Milestone

Mid-Western Region Peformance Based Remediation

Includes Scope Change Request 12 Dec 2011

Durations are based on a 5 day work week and allow for Federal Holidays.

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Final
Site Safety and Health Plan
Cannon Air Force Base
Clovis, New Mexico

Prepared for U.S. Air Force Center for Engineering and the Environment
2261 Hughes Ave., Suite 155
Lackland Air Force Base, Texas 78236-9861

Prepared by Shaw Environmental & Infrastructure, Inc.
1401 Enclave Parkway, Suite 250
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Contract No. FA8903-09-D-8580, Task Order No. 0013
Project No. 144106
Revision 0
January 2012

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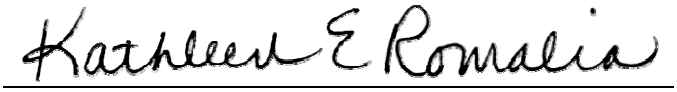
Final
Site Safety and Health Plan
Cannon Air Force Base
Clovis, New Mexico

Midwest Region Performance Based Remediation
Contract No. FA8903-09-D-8580
Task Order No. 0013

Revision 0
January 2012

Developed by:		January 6, 2012
	David L Mummert, CIH Shaw Program Health and Safety Manager	Date
Reviewed/ Concurred by:		January 6, 2012
	Kathleen Romalia Shaw Project Manager	Date
Reviewed/ Concurred by:		January 6, 2012
	Spencer Patterson, PE Shaw Program Manager	Date
Reviewed/ Concurred by:		January 6, 2012
	William Foss Shaw Installation Lead	Date
Reviewed/ Concurred by:		January 6, 2012
	James Vigerust Jr. Shaw Site Safety Officer	Date

Site Safety and Health Plan Disclaimer

This Basewide Site Safety and Health Plan (SSHP) has been designed for the methods presently contemplated by Shaw Environmental & Infrastructure, Inc. (Shaw) for execution of the proposed work. Therefore, the SSHP may not be appropriate if the work is not performed by or using the methods presently contemplated by Shaw.

In addition, as the work is performed, conditions different from those anticipated may be encountered and the SSHP may have to be modified through SSHP Amendments. Therefore, Shaw makes no representations of warranties as to the adequacy of the SSHP, except for warranties specifically stated in the SSHP itself.

Table of Contents

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Draft • Revision 0 • November 2011 • WERC-09-13-002-3

Table of Contents (continued)

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Draft • Revision 0 • November 2011 • WERC-09-13-002-3

Table of Contents (continued)

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Draft • Revision 0 • November 2011 • WERC-09-13-002-3

Table of Contents (continued)

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Draft • Revision 0 • November 2011 • WERC-09-13-002-3

Table of Contents (continued)

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Draft • Revision 0 • November 2011 • WERC-09-13-002-3

List of Figures

List of Tables

List of Appendices

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Draft • Revision 0 • November 2011 • WERC-09-13-002-3

Acronyms and Abbreviations

°F	degrees Fahrenheit
ACGIH	American Conference of Governmental Industrial Hygienists
ACM	Asbestos Containing Material
AFB	Air Force Base
AFCEE	Air Force Center for Engineering and the Environment
AHA	Activity Hazard Analysis
AIDS	acquired immunodeficiency syndrome
ANSI	American National Standards Institute
APR	air purifying respirator
ATSDR	Agency for Toxic Substances and Disease Registry
BTEX	benzene, toluene, ethylbenzene, and xylenes
C	ceiling
CIH	Certified Industrial Hygienist
CM	Construction Manager
CERCLA	Comprehensive Environmental Compensation, Responsibility, and Liability Act
CFR	Code of Federal Regulation
CNS	central nervous system
COR	Contracting Officer's Representative
CPR	cardiopulmonary resuscitation
CRZ	Contamination Reduction Zone
DEET	N,N-Diethyl-m-toluamide
DEHP	Bis (2-ethylhexyl) phthalate
DNAPL	dense nonaqueous phase liquid
DOD	Department of Defense
EHS	environmental, health, and safety
EMS	Emergency Medical Service
EPA	Environmental Protection Agency
EZ	Exclusion Zone
FDTA	Fire Department Training Area
FFA	Federal Facility Agreement
FLRS	Flight Line Refueling System
GI	Gastrointestinal Tract
HARP	hazard assessment and resolution process
HAZWOPER	Hazardous Waste Operations and Emergency Response
HBV	hepatitis B virus
HIV	human immunodeficiency virus
HSM	Health and Safety Manager
HTRW	Hazardous, Toxic, and Radioactive Waste
IDLH	immediately dangerous to life and health
IRP	Installation Restoration Program
JSA	Job Safety Analysis
LEL	lower explosive limit

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Draft • Revision 0 • November 2011 • WERC-09-13-002-3

Acronyms and Abbreviations (continued)

LNAPL	light non-aqueous phase liquid
MD	Medical Doctor
MEC	munitions and explosives of concern
mg/m^3	milligram(s) per cubic meter
MPH	Master of Public Health
MSA	Mine Safety Administration
MSDS	Material Safety Data Sheet
MTBE	Methyl tert-butyl ether
ND	not determined
NFPA	National Fire Protection Association
NIOSH	National Institute for Occupational Safety and Health
OSHA	Occupational Safety and Health Administration
PAH	polyaromatic hydrocarbon
PCE	tetrachloroethene
PEL	permissible exposure limit
PFD	personal flotation device
PNS	Peripheral Nervous System
PPE	personal protective equipment
ppm	part(s) per million
PVC	polyvinyl chloride
QC	quality control
RA	Remedial Action
RCRA	Resource Conservation and Recovery Act
RI/FS	Remedial Investigation/Feasibility Study
ROD	Record of Decision
SAR	supplied air respirator
SEI	Shaw E & I
Shaw	Shaw Environmental & Infrastructure, Inc.
SSHO	Site Safety and Health Officer
SSHP	site safety health plan
STEL	short-term exposure limit
TLV	threshold limit value
TWA	time-weighted average
URT	upper respiratory tract
USACE	U.S. Army Corps of Engineers
USAF	United States Air Force
U.S.	United States
WERC09	Worldwide Environmental Restoration and Construction 2009

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Draft • Revision 0 • November 2011 • WERC-09-13-002-3

1.0 INTRODUCTION

This Basewide Site Safety and Health Plan (SSHP) describes the safety and health guidelines developed by Shaw Environmental & Infrastructure, Inc. (Shaw) to protect Shaw personnel, subcontractors, Government personnel, and members of the public involved in the Air Force Center for Engineering and the Environment (AFCEE) project for the Worldwide Environmental Restoration and Construction 2009 (WERC09), performed under Contract No. FA8903-09-D-8580, Task Order 0013, at Cannon Air Force Base (AFB) Clovis, New Mexico. This SSHP is intended to encompass the general scope of authority, responsibilities for accident and incident prevention and provide basic guidelines for implementing, enforcing, and monitoring safe work practices and procedures.

This SSHP is prepared in accordance with the standards established by the United States (U.S.) Occupational Safety and Health Administration (OSHA) for regulated sites. Specifically, this SSHP complies with the appropriate standards contained in 29 Code of Federal Regulations (CFR) 1910.120; 29 CFR 1926.65; the *Safety and Health Requirements Manual EM 385-1-1* (U.S. Army Corps of Engineers [USACE], 2008); and *Safety and Occupational Health Requirements for Hazardous, Toxic, and Radioactive Waste (HTRW) Activities ER 385-1-92* (USACE, 2007). The safety and health measures presented are in effect for the duration of the project. This document is intended for use by Shaw personnel and subcontractors. All personnel working on the project sites are required to abide by these measures. Where not specifically mentioned, all personnel are required to comply with the applicable regulations contained in 29 CFR 1910, 29 CFR 1926, the *Safety and Health Requirements Manual EM 385-1-1* (USACE, 2008);, and the health and safety rules of the Government installation that concern related activities. Each person working on this project must sign the SSHP Acknowledgment Form (Appendix A). The procedures and guidelines contained herein are based upon the best available information at the time of the plan's preparation. Any revisions to this plan will be made with the knowledge and concurrence of Shaw and AFCEE. Revisions to this SSHP will be included as a SSHP Amendment (Appendix B). This SSHP used in conjunction with the Activity Hazard Analyses (Appendix C) and SSHP Addenda, if applicable (Section 1.1) will also serve as the project's:

- Accident Prevention Plan;
- Emergency Response Plan;
- Emergency Action Plan; and
- Fire Prevention Plan.

1.1 Site Safety and Health Plan Addenda

A SSHP Addendum will be prepared for activities that are necessary to complete the project, but not covered by this SSHP, as necessary. The SSHP Addenda will be specific to the work to be accomplished and will provide the following:

- Scope of work.
- Chemical hazards specific to the scope of work.
- Activity Hazard Analyses (AHA) (described in Section 3.14 of this document), which identify the specific hazards associated with the scope of work and the measures required to control those hazards.
- Personal protective equipment (PPE) requirements for the specific activities.
- Monitoring requirements.

All SSHP Addenda will become a component of this SSHP. The SSHP Addenda will be attached to this SSHP as Appendix B.

1.2 Site Background

Cannon AFB is located in Curry County, New Mexico, approximately 7 miles west of the City of Clovis. The base is situated on approximately 4,320 acres of land that was originally farmland. Cannon AFB is situated in a nearly flat plain sloping gently (10 to 15 feet per mile) to the east and southeast. Elevations in the vicinity of Cannon AFB range from 4,250 feet to 4,350 feet above mean sea level (URS, 2010). Cannon AFB dates to 1929, when Portair Field was established on the site as a civilian passenger terminal for early commercial transcontinental flights. In 1942 the Army Air Corps took control of the civilian airfield and it became known as the Clovis Army Air Base. In early 1945, the Base was renamed Clovis Army Air Field, where flying, bombing, and gunnery classes continued until the Base was deactivated in May 1947. The base was reassigned to the Tactical Air Command and formally reactivated as Clovis AFB in 1951 and was renamed Cannon AFB in 1957. Several Fighter-Bomber Groups and Tactical Fighter Wings have occupied the Base since 1951. In June 2006, Cannon AFB transferred from the Air Combat Command and to Air Force Special Operations Command. The current land use of off-base property surrounding Cannon AFB is agricultural, primarily for cattle and crops grown for cattle. Environmental restoration activities, schedules, and necessary documentation for Cannon AFB are based on the corrective action requirements of Cannon AFB's RCRA Part B Hazardous Waste Permit No. NM7572124454 dated October 14, 2003 administered by the New Mexico Environment Department (NMED, 2003).

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Draft • Revision 0 • November 2011 • WERC-09-13-002-3

1.3 Safety and Health Policy Statement

This section presents Shaw's Safety and Health Policy Statement for all Shaw employees, clients and partners and Shaw's corporate-wide objective of zero accidents for all projects.

"Shaw Environmental & Infrastructure, Inc. expects all of our employees, clients, and partners to uphold the highest environmental, health, and safety (EHS) standards to promote a positive and proactive safety attitude and to exhibit a heightened awareness of their surroundings both on and off the job. We must identify risks and hazards and implement appropriate controls in order to provide an injury-free work environment where people, equipment, and the environment are not placed at unreasonable threat of injury or damage. We will continually strive to be good citizens in our own community, as well as in every community in which we operate.

The Environmental Health and Safety Program and the components of our Occupational Health & Safety Management System have been developed to guide us in our daily activities. We also commit ourselves to continual improvement in EHS management. Further, I ask that you include our EHS process in all aspects of your work, assist in the maintenance of our process, and communicate this policy to all persons working for or on behalf of Shaw with the intent that they are made aware of their individual EHS obligations.

Through compliance with this policy, we will all actively participate in this process and advocate this philosophy. Together, we can accomplish our goals and exceed the minimum requirements provided by applicable laws and regulations, thus resulting in all stakeholders being proud to be a part of a team that truly values the importance of health, safety, and respect for the environment. Accordingly, we will maintain the position as a recognized leader in all of our business endeavors through a stewardship-based approach for our fellow employees, the environment, and the communities in which we live and work.

We are committed to the spirit and intent of this EHS policy statement and the laws, rules, and regulations to which we subscribe at its foundation."

George Bevan
President Shaw Environmental & Infrastructure, Inc.

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Draft • Revision 0 • November 2011 • WERC-09-13-002-3

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Draft • Revision 0 • November 2011 • WERC-09-13-002-3

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2.0 ORGANIZATION, QUALIFICATIONS, AND RESPONSIBILITIES

There will be numerous personnel required to complete the tasks for this project. The necessary personnel will be on-site Shaw project personnel, various subcontractors, off-site project team members, and government employees. All project personnel share the responsibility for safely completing project activities.

2.1 On-Site Personnel

All on-site personnel are responsible for continuous adherence to safety and health procedures during the performance of assigned work. In no case may work be performed in a manner that conflicts with the inherent safety and environmental precautions outlined in this SSHP. After due warning personnel violating safety procedures will be dismissed from the site and possibly terminated from further work.

Any person who observes unsafe acts or conditions or other safety problems has "Stop Work Authority" and shall immediately report the deficiency to supervisory personnel. If there is any dispute with regard to safety and health, on-site staff will attempt to resolve the issue and if the issue cannot be resolved on-site, they will consult off-site technical staff and supervisors for assistance. The specific task or operation in question shall remain discontinued until the issue is resolved.

2.2 Project Manager

The Project Manager, Kathleen Romalia, shall be the point of contact for AFCEE for the Cannon AFB project. She has ultimate authority and responsibility for the establishment and maintenance of project administration control procedures. The Project Manager issues communications to AFCEE on the project status. The Project Manager, through the Installation Lead, oversees the activities of all Shaw personnel, ensures compliance with the scope of work environmental activities, and controls project consistency. Additionally, the Project Manager is ultimately responsible for the development, implementation, and enforcement of the comprehensive Safety and Health Program.

2.3 Installation Lead

The Installation Lead, Bill Foss, shall be the point of contact for all field activities and shall report directly to the Project Manager. He will ensure that all activities are conduct in a safe manner and shall communicate all unsafe conditions to the Project Manager. The Installation Lead oversees the activities of all Shaw personnel, ensures compliance with the scope of work environmental activities, and controls project consistency.

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Draft • Revision 0 • November 2011 • WERC-09-13-002-3

2.4 Construction Manager

The Construction Manager is responsible for the field implementation and enforcement of this SSHP. The Construction Manager is also responsible for working with the Site Safety and Health Officer (SSHO) on a daily basis and maintaining contact with the Project Manager and Program Health and Safety Manager (HSM) for matters regarding project health and safety. The Construction Manager reports to the Project Manager.

2.5 Program Health and Safety Manager

The Program HSM, David Mummert, Certified Industrial Hygienist (CIH), is responsible for the following actions:

- Develop, maintain, and oversee implementation of this SSHP
- Visit the project, as needed, to audit the effectiveness of the SSHP
- Remain available for project emergencies
- Develop modifications to this SSHP as needed
- Evaluate occupational exposure monitoring/air sampling data and adjust SSHP requirements as necessary
- Approve this SSHP by signature

2.6 Site Safety and Health Officer

The Site Safety and Health Officer (SSHO) James Vigerust is the primary safety official and emergency response coordinator at the project. On a daily basis will assure operations are conducted in accordance with the SSHP, AFCEE requirements, and OSHA regulations. The SSHO reports, project-wide, to the Project Manager during execution of project activities, but reports directly to the Program HSM with functional issues. The SSHO has the authority to suspend operations at the project due to noncompliance. An alternate SSHO will be assigned by the primary SSHO when is not available on-site.

The SSHO has the overall responsibility to conduct exposure monitoring and/or air sampling and to select and/or adjust PPE use. The SSHO shall have the authority and is responsible for the following actions:

- Be present during operations to implement the SSHP
- Inspect site activities to identify safety and occupational health deficiencies and correct them

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Draft • Revision 0 • November 2011 • WERC-09-13-002-3

- Coordinate changes/modifications to the SSHP with the HSM, Construction Manager, Project Manager, and Contracting Officer's Representative (COR)
- Conduct project-specific training

Inspections completed by the SSHO will also be used to determine if operations are being conducted in accordance with the SSHP, AFCEE requirements, and OSHA regulations. These inspections shall be documented; deficiencies to be corrected shall be noted as an action item list and provided to the HSM for follow-up. Daily safety inspections shall be documented on the Daily Safety Inspection Report (Appendix D). Copies of the inspections will be provided to AFCEE, if requested.

Other SSHO responsibilities include the following:

- General Safety and Health Program administration.
- On-site contact for regulatory agencies on matters of safety and health.
- Establish employee exposure monitoring notification programs.
- Investigate significant accidents and illnesses and implement corrective action plans.
- Implement all safety procedures and operations on site.
- Observe work party members for symptoms of on-site exposure or stress.
- Arrange for the availability of on-site emergency medical care and first aid, as necessary.
- Determine evacuation routes, verify that an effective means of emergency communication is always available while workers are on site, establish and post local emergency telephone numbers, and arrange emergency transportation.
- Establish work zones.
- Present tailgate safety meetings and maintain attendance logs and records.
- Verify that the respiratory protection program is implemented, when necessary.
- Verify that decontamination procedures meet established criteria, when necessary.
- Monitor employee work hours and limit those work hours that are excessive.

In addition to having the prerequisite 40-hour OSHA Hazardous Waste Operations and Emergency Response (HAZWOPER) training and updated 8-hour HAZWOPER Refresher

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Draft • Revision 0 • November 2011 • WERC-09-13-002-3

certifications, 8 hour Site Supervisor Certification the SSHO must also have completed the 30-hour OSHA construction safety class.

2.7 Subcontractor Personnel

Both Shaw and subcontractors share the responsibility for the safety and health of their employees. Subcontractors are also responsible for complying with the standards established in this SSHP, the guidelines established in Shaw Procedure No. HS011, "Health & Safety Rules for Contractors"; *Safety and Health Requirements Manual EM 385-1-1* (USACE, 2008); and all other project safety requirements. Subcontractors shall be pre-qualified according to the requirements of Shaw Procedure No. SOP-T-PR-301, "Qualification of Sources." The following are some of the requirements that apply to subcontractors:

- All subcontractors under the direction of Shaw will report to the Construction Manager.
- An assigned safety representative for each subcontractor shall be present on any day that work is being performed. The name of the assigned safety representative shall be conveyed to the Construction Manager.
- Subcontractors shall submit all training and medical surveillance documents to Shaw prior to mobilization.
- Planned operations for the day shall be verbally conveyed to the Construction Manager at the beginning of each day.
- All subcontractor employees working on site shall sign the Site Entry Log (Appendix D) at the beginning and end of each workday.
- All subcontractor personnel shall attend a project safety orientation prior to beginning work on site.
- All subcontractor personnel shall attend the morning tailgate safety meeting and prepare Job Safety Analyses. If scheduling precludes attendance at the Shaw meeting, then subcontractors shall hold and document their own safety meeting. Safety meeting documentation, using the Safety Meeting/Training Log form (Appendix D), is to be submitted to the SSHO.
- All accidents, fires, injuries, illnesses, and spills shall be immediately reported to the SSHO.
- Heavy equipment is to be inspected prior to use at the project site by a competent mechanic using the USACE Safety Inspection Checklist for Construction Equipment (Appendix D). Heavy equipment shall be inspected daily by the

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Draft • Revision 0 • November 2011 • WERC-09-13-002-3

equipment operator using the Daily Equipment Inspection form (Appendix D). Inspection documentation is to be submitted to the SSHO.

- Vehicles, such as trucks and automobiles are to be inspected daily by the individual driving using the Vehicle Inspection form (Appendix D). Inspection documentation is to be submitted to the SSHO weekly.
- Subcontractors are required to frequently inspect work sites for safety deficiencies and correct all deficiencies. Documentation of these inspections, as well as the corrective actions implemented, is to be submitted to the SSHO. The Project Safety Inspection Report (Appendix D), Daily Safety Inspection Report (Appendix D), or equivalent shall be used.

2.8 Visitors and Other On-Site Personnel

Visitors and other on-site personnel shall check in with the SSHO in order to verify that all appropriate entry requirements are met. All visitors will be briefed by the SSHO on the hazards to be expected on the site(s) and the safety and health controls required (i.e., hardhat, foot protection, etc.). The SSHO will verify that all visitors entering the site are properly protected and are wearing or provided with the appropriate PPE. A stock of common PPE (i.e., hard hats, eye protection, hearing protection, reflective vests, etc.) shall be maintained at the project for use by visitors. Visitors are responsible for providing their own respiratory protection, if required, as Shaw cannot provide respiratory protection to visitors. The SSHO will provide an escort for all visitors while on site.

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Draft • Revision 0 • November 2011 • WERC-09-13-002-3

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Draft • Revision 0 • November 2011 • WERC-09-13-002-3

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3.0 ACCIDENT PREVENTION PLAN

This section addresses general safety areas specified in Appendix A of the *Safety and Health Requirements Manual EM 385-1-1* (USACE, 2008), as components of the Accident Prevention Plan.

3.1 Project Safety Goal

Safety is Shaw's highest priority. Shaw and project personnel have targeted a goal of zero injuries, illnesses, and environmental incidents for the duration of this project. Additionally, there is a goal in place for experiencing zero vehicle incidents. All activities shall be conducted in a manner that supports these goals.

3.2 Indoctrination of New Employees

Both Shaw and subcontractor personnel are required to attend a safety orientation meeting prior to commencing work. Safety orientation meetings shall be documented and kept on file. Refer to Section 9.4 for an outline of the information that is conveyed to all personnel.

3.3 Fire Prevention and Protection

This section details fire prevention and protection procedures/resources to be used at each project.

3.3.1 Workplace Fire Hazards

The primary fire hazards at each project consist of fueling operations, storage of fuels, other flammable liquids at the project sites, and welding and cutting activities.

3.3.2 Potential Ignition Sources

The potential ignition sources at the project include smoking materials, welding/cutting equipment, vehicle/equipment exhaust, catalytic converters, and engine block surfaces. Personnel shall also be alert for other ignition sources such as, static electricity, lightning, and electrical equipment.

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Draft • Revision 0 • November 2011 • WERC-09-13-002-3

3.3.3 Fire Control Systems, Equipment, and Procedures

Depending on the nature and extent of any fire, the following fire control systems and equipment shall be evaluated or provided at the project:

- The Cannon AFB Fire Department shall be contacted prior to beginning new operations at the project site. The Cannon AFB Fire Department shall also be contacted at the conclusion of operations.
- Fire extinguishers shall be provided at work areas. Project vehicles and heavy equipment shall also be equipped with fire extinguishers.
- A Cannon AFB Hot Work Permit is required before a flame or spark-producing activity is to commence with work on base property.(Section 4.2.3).
- The AHA for fueling operations shall be followed (Appendix C14, "*Fueling Operations*").
- Flammable and oxidizing materials shall be stored in marked (No Smoking, Matches, or Open Flame) flammable materials storage areas with fire extinguishers available.
- Smoking shall only be permitted in designated areas. Personnel shall never discard cigarette butts into the environment while working at the project.
- All fires, no matter how small, shall be reported to the Cannon AFB Fire Department, immediately.
- Project personnel are only permitted to extinguish small fires in their incipient stages.
- Fighting fires is prohibited by project personnel and shall only be performed by fire department personnel (Section 11.5).

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Draft • Revision 0 • November 2011 • WERC-09-13-002-3

3.3.4 Fire Control Equipment Maintenance Responsibilities

The SSHO is responsible for performing the monthly inspections (documented on the Emergency Eyewash Station/Fire Extinguisher Inspection Checklist [Appendix D]) and obtaining annual service for all Shaw fire extinguishers used at the project. Subcontractors are responsible for performing the monthly inspections and obtaining annual service for their fire extinguishers used at the project. Vehicle and heavy equipment operators are responsible for the inspection of fire extinguishers on vehicles/equipment.

3.4 Housekeeping

Housekeeping shall be a priority at each project site. The following provisions are specified to maintain a high standard of housekeeping:

- The importance of housekeeping and the expectations that good housekeeping shall be maintained will be regular topics of the morning safety meetings.
- Job sites and work areas shall be cleaned up on a daily basis.
- Subcontractors are required to maintain good housekeeping practices.
- Dumpsters and adequate waste/trash receptacles shall be provided as necessary in sufficient quantities in active work areas and are to be emptied regularly. Potentially contaminated waste shall be segregated from sanitary waste for proper characterization and/or disposal. Hazardous waste containers shall be labeled according to applicable regulations.
- Housekeeping is an operational/safety item, which shall be regularly considered during routine inspections.
- Nails shall be bent over or removed from scrap lumber immediately.

3.5 Mechanical Equipment Inspections

Before any machinery or mechanized equipment is placed in use, it shall be inspected and tested in accordance with the manufacturer's recommendations and requirements of the *Safety and Health Requirements Manual EM 385-1-1* (USACE, 2008) and shall be certified in writing by a competent person to meet the manufacturer's recommendations and requirements of the manual. Subsequent re-inspections will be conducted at least annually thereafter. These inspections shall be documented on the USACE Safety Inspection Checklist for Construction Equipment (Appendix D). All safety deficiencies noted during the inspection shall be corrected prior to the equipment being placed in service at the project. If at any time the machinery or mechanized equipment is removed and subsequently returned to the project (other than equipment removed for routine off-site operations as part of the project), it shall be re-inspected and recertified prior to use. All heavy equipment shall be inspected by each operator prior to use on the project and shall then be inspected on a daily basis. Daily inspections shall be documented on the Daily Equipment Inspection form (Appendix D). Deficiencies in the equipment shall be noted on the form. All inspection documentation shall be submitted to the SSHO prior to using the equipment if safety deficiencies are observed and at the end of the day if no safety deficiencies are observed.

The SSHO shall immediately evaluate the inspection forms and determine if the equipment is in need of immediate repairs and if it should be "red tagged" and taken out of service. If the

equipment is taken out of service, then the equipment shall not be used until the SSHO is satisfied that the necessary repairs have been made. For minor deficiencies that do not compromise the safe operation of the equipment, repairs shall be made at the discretion of the equipment owner. All inspection records are to be kept on file in the Shaw field office.

3.6 First Aid and Medical Facilities

The following addresses first aid and medical facilities:

- Effective emergency communication devices must always be available while personnel are present at the site.
- Employees working alone in a remote location or away from other workers shall be provided an effective means of emergency communications. This means of communication could include a cellular phone, two-way radios, hard-line telephones or other acceptable means. The selected communication must be readily available (easily within the immediate reach) of the employee and must be tested prior to the start of work to verify that it effectively operates in the area/environment. An employee check-in/check-out communication procedure shall be developed to assure employee safety (see Section 4.4.1, Lone Worker Procedure).
- Emergency telephone numbers shall be posted at all Shaw-controlled telephones (Section 11.2).
- A large first aid kit shall be provided and maintained at the project. The first aid kit shall be inspected weekly by the SSHO. A seal may be placed on first aid kits to allow for less frequent inspections, such as, if the seal is not broken, then an inspection is not required. There shall be a small first aid kit available in all project vehicles. First aid kits in project vehicles do not need to be inspected if the factory plastic wrapping is intact. First aid kits shall be inspected using the First Aid Kit Inspection Log (Appendix D).
- The nearest hospital for the project is:

  Plains Regional Medical Center
  2100 Martin Luther King Boulevard
  Clovis, New Mexico - (575) 769-7577

  The distance to the hospital is approximately 6 miles from the Cannon AFB, with a travel time of approximately 9 minutes. The route map to the hospital is depicted in Figure 2.

- The nearest CORE Health Networks medical for the project is:

  Concentra Medical Center
  1619 South Kentucky, Suite F600
  Amarillo, TX 79102 (806) 373-2200

  The distance to the clinic is approximately 109.2 miles from Cannon AFB, with a travel time of approximately 1 hour, 51 minutes. The route map to the clinic is depicted in Figure 3.

- Shaw employees shall utilize the CORE clinic for injuries that do not require assistance or transport by Emergency Medical Services.

The route maps to the clinic and hospital shall be available in all project vehicles; however, the facility to care for serious medical emergencies shall be determined by the Emergency Medical Services (EMS) responding to the incident. At a minimum, the SSHO and at least one other on-site employee, including subcontractors, shall be certified in first aid and cardiopulmonary resuscitation (CPR) during intrusive activities. First aid and CPR training/certification must be made by a reputable provider, such as, the American Red Cross or American Heart Association.

3.7 Sanitation

The following provisions shall be made to address sanitation:

- Portable toilets shall be provided, as necessary, at convenient locations at the project site. Arrangements shall be made for the routine servicing and cleaning of these units.
- Safe drinking water is to be provided at each project site and provisions shall be made as necessary to provide safe drinking water at individual field locations. One-serving size individual bottle of water or disposable sanitary cups shall be provided along with receptacles for their disposal. All outlets dispensing non-potable water (under Shaw or subcontractor control) shall be posted with appropriate warning signs. Systems furnishing non-potable water and systems furnishing potable water shall be constructed to remain completely independent of each other.
- Portable washing facilities shall be provided as necessary at project sites and in Contamination Reduction Zones (CRZ). Portable washing facilities shall consist of, at a minimum, soap, water, and paper towels.

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Draft • Revision 0 • November 2011 • WERC-09-13-002-3

3.8 Illumination

Adequate lighting shall be provided to perform all activities in a safe manner. Work shall be scheduled, when possible, during daylight hours. When work is performed before sunrise, after sunset, inside buildings, or within other structures, the minimum lighting requirements specified in Table 7-1 of the *Safety and Health Requirements Manual EM 385-1-1* (USACE, 2008) shall be provided.

3.9 Engineering and Administrative Controls

The use of engineering and administrative controls shall be the preferred method of controlling or eliminating hazards. Only in cases where the use or application of engineering and administrative controls is deemed to be not feasible, then PPE may be used.

3.10 Signs, Labels, and Tags

Hazard warning signs shall be used to define specific hazards of a nature, such that failure to designate them may lead to accidental injury to workers or the public, or both, or to property damage. All new and replacement signs shall be in accordance with the requirements contained in 29 CFR 1910.145.

All containers of hazardous materials shall be labeled as to contents and the associated hazards. Hazard warning labels, whether on containers or equipment, shall not be removed by employees without the permission of the SSHO.

Tags shall be used as a means to prevent accidental injury or illness to employees who are exposed to hazardous or potentially hazardous conditions, equipment, or operations, which are out of the ordinary, unexpected, or not readily apparent. Tags shall be used until the identified hazard is eliminated or the hazardous operation is completed. Tags need not be used where signs, guarding, or other positive means of protection are being used. All equipment that is in need of repair for safety-related reasons shall be tagged as “Out of Service” until the equipment has been satisfactorily repaired.

3.11 Safety Promotions

The following methods for promoting accident prevention will be enacted:

- Accident prevention will be a regular topic discussed at safety meetings.
- All personnel will be encouraged to sign a Zero Accident Pledge poster (Appendix D) that is to be posted at the project.
- A Safety Incentive Award Program shall be implemented to reward safe employee behavior.

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Draft • Revision 0 • November 2011 • WERC-09-13-002-3

3.12 Accident Reporting

All accidents, regardless of their severity, shall be reported to the Construction Manager, SSHO, Project Manager, HSM, and COR. Other provisions for accident reporting and investigation are addressed later in this SSHP (Section 13.4).

3.13 Scope of Work

Shaw is responsible for all efforts needed to support the selected remediation efforts at the Cannon AFB. Activities include, but are not limited to the following:

- Mobilization & Demobilization.
- General Site Activities.
- Collect Surface Soil Samples.
- Collect Subsurface Soil Samples.
- Collect Surface Water and Ground Water Samples.
- Well Drilling and Well Installation.
- Surface Soil Removal.
- Backfill Excavations.
- Surveying.
- Site Restoration.
- Soil Borrow Material Import (Loading, Transportation, & Dumping).
- Equipment Decontamination.

Scopes of work for the individual project sites will be verified prior to fieldwork initiation. If a specific activity is not covered by this SSHP an SSHP Addendum shall be completed, reviewed and approved as stated in Section 1.1, Site Safety and Health Plan Addenda.

3.14 Activity Hazard Analysis

AHAs identify potential safety, health, and environmental hazards associated with specific tasks and provide protective measures for personnel, the community, and the environment. The AHAs have been developed for all major tasks performed for the project and included in this SSHP as Appendix C. An AHA shall also be prepared when new tasks are added, the job situation changes, or when it becomes necessary to alter safety requirements. Work will not proceed on a particular task/phase until the AHA has been reviewed with the work crews. The AHAs shall be reviewed and modified by the Construction Manager and SSHO (with

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Draft • Revision 0 • November 2011 • WERC-09-13-002-3

input from field employees and subcontractors). The AHAs shall be reviewed and modified throughout the workday, as necessary, to address changing site conditions, operations, or changes of competent/qualified person(s). The AHAs shall also be reviewed and modified during the daily tailgate safety meetings and Job Safety Analysis (JSA) meetings. Modifications will be handwritten in ink on the specific AHA. Additions or modifications to the AHAs, which are less conservative or allow for a downgrade in PPE requirements, must have written approval from the HSM.

The names of the competent/qualified person(s) required for a particular activity, (*i.e.*, excavations, scaffolding, fall protection, and other activities) as specified by OSHA shall be identified and included in the AHA. If more than one competent/qualified person will be used on the AHA, a list of names will be included as an attachment to the AHA. Those listed shall be competent and qualified for the type of work involved and familiar with current site safety issues. If a new competent/qualified person (not on the original list) is added, the list shall be updated (this is an administrative action not requiring an updated AHA). The new person shall acknowledge in writing that he/she has reviewed the AHA and is familiar with current site safety issues. Additions or changes to this SSHP must be attached as an SSHP Amendment (Appendix B). Any amendment to this SSHP must have written approval from the HSM.

3.15 Job Safety Analysis

JSAs are an effective management technique for identifying hazardous conditions and unsafe acts in the workplace. A JSA is intended to analyze the individual steps or activities, which together create a job or specific work duty, and to detect any actual or potential hazards that may be present. Each crew must complete a JSA for each task that will be accomplished for that day, as required by Shaw Procedure No. HS045, "Job Safety Analysis." The JSA shall be revised, as necessary, when unforeseen circumstances arise or work site conditions change. Any revisions shall be immediately communicated with the affected site workers. If the need to complete an unplanned task becomes necessary at any point throughout the day, a new JSA shall be prepared to cover that task. The JSAs shall be completed using the JSA Checklist Form and JSA Worksheet Form, both of which can be found in Appendix D.

3.16 Hazard Assessment Resolution Process

Hazard Assessment Resolution Process (HARP) is brief, paperless, general risk assessment made by employees in each work area. The objective of HARP is to identify and eliminate or control potential real-time workplace hazards, which could lead to an accident.

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Draft • Revision 0 • November 2011 • WERC-09-13-002-3

HARP requires workers to continuously be aware of the immediate work environment so as to detect conditions unanticipated by our work planning. This involves a three-step process:

1. Assess the hazard(s) and risk(s) to identify what could go wrong and what is the worst thing that could happen.
2. Analyze the situation to determine how to reduce the risks. Evaluate each identified risk and implement the appropriate safeguards to control the hazards.
3. Act to ensure safe operations:
   - Take the necessary steps to complete the job safely.
   - Follow written standards and procedures (SSHP, AHAs, JSAs, etc.).
   - Do not proceed until it is safe.

In performing the HARP, focus attention on surroundings, equipment, tools, PPE, and critical steps prior to focusing on the task; consider the chemical, physical, and environmental hazards associated with the task.

Risk reduction is a critical component of HARP. The following risks shall be avoided:

- Hurrying.
- Presume the job is routine or simple.
- Belief that nothing bad can happen.
- Not talking about precautions with coworkers.
- Not raising a "gut feel."

The appropriate hazard resolution and corrective actions must take place before proceeding with the task:

- Communicate hazards and precautions to take with coworkers and supervisor.
- Eliminate or control the hazards. The implementation of administrative controls is sometimes effective, i.e., marking the hazard with warning tape, signs, or tags.
- If the risk is unacceptable or if a hazard cannot be satisfactorily controlled, then stop work and contact the SSHO or HSM.

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Draft • Revision 0 • November 2011 • WERC-09-13-002-3

3.17 Safety Observation Program

Safety observations are behavior-based and provide a systematic feedback process between line personnel and supervision to proactively identify opportunities for safety improvement in work areas.

Employees engaged in work activities are often the most knowledgeable about the hazards of their work and can provide valuable feedback on unsafe conditions and unsafe practices, which may require corrective action.

The Safety Observation Program is a tool for employees to provide information on actual or potential safety hazards that they observe in their workplace, which if left unreported may result in an accident and or injury. This program also provides a mechanism for recommending corrective actions.

The Shaw Safety Observation Program:

- Identifies practices that could cause accidents, injuries, or damage.
- Identifies specific needs for coaching and training.
- Checks the adequacy of the SSHP, AHAs, JSAs, and compliance with general site rules and other procedures.
- Monitors the effectiveness of training.

The SSHO must develop a schedule for conducting safety observations. A general guideline for the number of observations in a week is one observation per 100 work hours on the project. The schedule for observation(s) shall be communicated to site personnel.

The volunteer conducting the safety observation shall record their findings on the Safety Observation Reporting Card, as required by Shaw Procedure No. HS026, “Safety Observation Procedure”. Tasks or items that require follow-up because of serious risk potential must be addressed immediately by the SSHO. Items with lesser risk should be discussed in the next tailgate safety meeting. The action items and corrective actions, including dates and responsible person(s) shall be documented on the Safety and Occupational Health Deficiency Tracking Log (Appendix D), maintained, and available for inspection.

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Draft • Revision 0 • November 2011 • WERC-09-13-002-3

3.18 Safety and Health Bulletin Board

A safety and health bulletin board shall be maintained in an area commonly accessed by workers at the Field Office. The bulletin board shall be maintained current, in clear view of on-site workers, and protected against the elements and unauthorized removals. The SSHO shall evaluate the content of the bulletin board each week, at a minimum, and update if necessary. It shall contain at least the following safety and health information:

- Map denoting the route to the nearest emergency care facility.
- Emergency telephone numbers.
- Copy of the most up-to-date SSHP shall be mounted on or adjacent to the bulletin board or state the location, which will be accessible on the site by all workers.
- Copy of current SSHP Addenda shall be mounted on or adjacent to the bulletin board or state the location, which will be accessible on the site by all workers.
- Copy of current AHA(s) shall be mounted on or adjacent to the bulletin board or state the location, which will be accessible on the site by all workers.
- OSHA Form 300A shall be posted in accordance with OSHA requirements and mounted on or adjacent to the bulletin board or state the location, which will be accessible on the site by all workers.
- Copy of Safety and Occupational Health Deficiency Tracking Log (Appendix D) shall be mounted on or adjacent to the bulletin board or state the location where it will be accessible by all workers upon request.
- Safety and health promotional posters (includes Environmental, Health, and Safety Mission Vision Poster [Appendix D]).
- Date of last lost workday injury.
- OSHA Safety and Health Poster.

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Draft • Revision 0 • November 2011 • WERC-09-13-002-3

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Draft • Revision 0 • November 2011 • WERC-09-13-002-3

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4.0 PROJECT HAZARDS AND HAZARD CONTROL MEASURES

There are potential chemical, physical, and environmental hazards present at the project sites. The anticipated hazards at the project sites and the recommended control measures are presented in this section. A site-specific hazard assessment of each remedial area will be performed by the SSHO to assess exposure potential to site workers from contaminants, physical hazards, remedial activities and environmental stressors. Additional information on specific hazards and control measures are outlined in the AHAs and SSHP Addenda when developed.

4.1 Chemical Hazards

Potential exposure exists to personnel through all routes (i.e., dermal contact, inhalation of dust and vapors, and ingestion). The exposure potential will be clearly identified in the SSHP Addendum hazard assessment. The use of engineering and administrative controls, where practical, along with PPE and proper decontamination procedures are required when performing work with contaminated media.

These various hazardous inorganic and inorganic chemicals have been identified as potentially being present as contaminants in soils and waters at the Cannon AFB SITES. The majority of these chemicals are related to past fuel releases, leaking underground storage tanks, and maintenance operations which occurred at the site i.e. solvents. These chemicals are considered toxic and some are identified as being carcinogenic. The chemicals potentially present at the five Cannon AFB sites are summarized below:

- ***Particulates not otherwise regulated/Particulates not otherwise specified.*** Particulates not otherwise regulated target the eyes, skin, and upper respiratory system. Symptoms of exposure include irritation to the eyes, skin, throat and upper respiratory system. (Permissible exposure limit [PEL]-time-weighted average [TWA]: 15 milligrams per cubic meter [mg/m^3] [total]; 5 mg/m^3 – [respirable fraction]; immediately dangerous to life and health [IDLH]: not determined; threshold limit value [TLV]-TWA: 10 mg/m^3 [inhalable particles]; 3 mg/m^3 – [respirable particles]).
- ***BTEX.*** The term BTEX refers to a combination of benzene, toluene, ethylbenzene and xylene. The presence of this material may indicate petroleum hydrocarbon contamination. The individual compounds are discussed in this section.
- ***Benzene.*** Benzene targets the eyes, skin, respiratory system, blood, central nervous system (CNS), and bone marrow. Symptoms of exposure include irritation

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Draft • Revision 0 • November 2011 • WERC-09-13-002-3

eyes, skin, nose, respiratory system; dizziness; headache, nausea, staggered gait; anorexia, lassitude (weakness, exhaustion); dermatitis; bone marrow depression; (potential occupational carcinogen). Benzene is a confirmed human carcinogen (ACGIH, 2011). (PEL-TWA: 1 part per million [ppm], short-term exposure limit [STEL]: 5 ppm; IDLH: Carcinogen [500 ppm]; TLV-TWA: 0.5 ppm, 2.5 ppm TLV-STEL with a skin notation.) TLV Basis: Leukemia (ACGIH, 2011).

- ***Toluene.*** Toluene targets the CNS, skin, eyes, liver, kidneys, and respiratory system. Symptoms of exposure include irritated eyes and nose, headaches, dizziness, lassitude, confusion, euphoria, muscle fatigue, insomnia, anxiety, liver and kidney damage, lacrimation, paresthesia, dermatitis, and dilated pupils (NIOSH, 2007). Toluene is not classifiable as a human carcinogen (ACGIH, 2011). (PEL-TWA: 200 ppm, PEL-ceiling [C]: 300 ppm, PEL-10-minute maximum peak in any 3 hours: 500 ppm, IDLH: 500 ppm; TLV-TWA: 20 ppm) TLV Basis: visual impairment; female reproductive; pregnancy loss (ACGIH, 2011).

- ***Ethylbenzene.*** Ethylbenzene targets the central nervous system, skin, eyes, and respiratory system. Symptoms of exposure include irritated eyes, skin, and mucous membranes; headaches, narcosis, dermatitis, and coma. Ethylbenzene is a confirmed animal carcinogen with unknown relevance to humans (ACGIH, 2011). (PEL-TWA: 100 ppm; IDLH: 800 ppm [10 percent lower explosive limit {LEL}]; TLV-TWA: 100 ppm, TLV-STEL: 125 ppm.) TLV Basis - Critical Effect(s): upper respiratory tract and eye irritation; CNS impairment (ACGIH, 2011).

- ***Xylenes.*** Xylenes target the eyes, skin, respiratory system, central nervous system, gastrointestinal tract, blood, liver, and kidneys. Symptoms of exposure include irritation to the eyes, skin, nose, throat; dizziness, excitement, drowsiness, in-coordination, staggering gait; corneal vacuolization; anorexia, nausea, vomiting, abdominal pain; dermatitis. Xylenes are not classifiable as human carcinogens (ACGIH, 2011). (PEL-TWA: 100 ppm; IDLH: 900 ppm; TLV-TWA: 100 ppm, TLV-STEL: 150 ppm.) TLV Basis: upper respiratory tract and eye irritation; CNS impairment (ACGIH, 2011).

- ***Polyaromatic Hydrocarbons (PAHs)*** PAHs, also known as coal tar pitch volatiles, are a collection of polycyclic aromatic hydrocarbons associated with burning of organic material, and coal and petroleum refining. PAHs can cause eye, nose and throat irritation. Skin exposure with concurrent sunlight exposure can cause severe sunburn. Some of the individual constituents are human carcinogens. (PEL-TWA: 0.2 mg/m^3, IDLH: Carcinogen [80 mg/m^3]; TLV-TWA: 20.2 $mg/m^3$5 ppm) TLV Basis: Cancer (ACGIH, 2011).

4.1.1 Hydrogen Sulfide and Methane

There is potential for hydrogen sulfide gas and methane to be present in the landfills or identified remedial areas due to the decomposition of various materials. The hazards of hydrogen sulfide and methane gas are summarized in the following:

- ***Hydrogen sulfide.*** Hydrogen sulfide is a colorless gas with a strong odor of rotten eggs. Note: The sense of smell becomes rapidly fatigued and cannot be relied upon to warn of the continuous presence of hydrogen sulfide. Hydrogen sulfide targets the eyes, respiratory system, and central nervous system. Symptoms of exposure include irritation of the eyes and respiratory system; apnea; coma; convulsions; eye disturbances and damage; dizziness; headache; lassitude; irritability; insomnia; and gastrointestinal disturbances (NIOSH, 2007). (PEL-C: 20 ppm; IDLH: 100 ppm; TLV-TWA: 1 ppm, TLV-STEL: 5 ppm) TLV Basis: upper respiratory tract irritation; CNS impairment (ACGIH, 2011).
- ***Methane.*** Methane is a colorless, odorless gas. The material is highly flammable. It has very low degree of toxicity however is recognized as a simple asphyxiant (i.e., excludes oxygen from the air). No exposure indices have been developed for this material.

4.1.2 Unknown Chemical Containers

If reactive chemicals, chemical containers, gas cylinders, drums, or barrels are encountered, the field crew shall immediately stop work, exit the area, and contact the Construction Manager or SSHO and the HSM. Operations will be resumed only after the appropriate controls have been implemented.

4.1.3 Asbestos

While there is no mention of asbestos containing materials (ACM), there is potential for ACM to be encountered during project activities. If suspected ACM is identified (brake shoes, insulation, floor tiles, ceiling tiles, siding, shingles, pipes, etc.), the field crew shall immediately stop work, exit the area, and contact the Construction Manager or SSHO and the HSM. Operations will be resumed only after the appropriate controls have been implemented. Normal dust control measures will limit low concentrations of asbestos fibers from becoming an inhalation hazard.

4.1.4 Raw Sewage

The potential for contacting raw sewage during project activities has not been determined. Potential work around or near sewage lines will be evaluated by the Construction Manager and SSHO prior to work beginning in that specific area.

4.1.5 Munitions and Explosives of Concern

The presence of Munitions and Explosives of Concern (MEC) has not been identified in project documents. If suspected or known MEC is encountered, the field crew shall immediately stop work, leave the exclusion zone (EZ), and contact the Construction Manager or SSHO and the HSM (Section 6.1). The MEC shall not be probed, touched, or handled by unauthorized personnel under any circumstance. The basic guidelines for MEC safety are listed below:

- Do not continue to move towards suspected MEC.
- Once you recognize a MEC hazard, do not move any closer.
- Stop all work.
- Make all radio transmissions at least 100 meters away from a MEC hazard.
- Do not try to remove anything that is on or near MEC.
- Do not touch, move, or disturb the MEC.
- Stay away from MEC.
- Mark a MEC hazard area properly so that other personnel will stay away from it.
- Evacuate all nonessential personnel from a MEC hazard area.
- Report through your chain of command all MEC hazards that affect operations.

Specific emergency procedures for MEC encounters are included in Section 11.7.

4.1.6 Radiological Hazards

No radiological hazards have been identified with anticipated project activities. If a suspected radiological hazard is identified (radium painted dials, vacuum tubes, trefoil symbols, etc.), the field crew shall immediately stop work, exit the area, and contact the Construction Manager or SSHO and the HSM.

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Draft • Revision 0 • November 2011 • WERC-09-13-002-3

4.1.7 Operational Chemicals/Hazard Communication Program

Hazardous chemicals will be brought to project sites for use in activities supporting the planned work. These chemicals are used as fuels, construction materials, solvents, cements, cleaning solutions, paints, etc. The use of operational chemicals is regulated by OSHA under the Hazard Communication Standard (29 CFR 1910.1200). A written hazard communication program has been established as Shaw Procedure No. HS060, "Hazard Communication Program," which includes the following elements:

- ***Container Labeling***—Project personnel will ensure that all containers are labeled according to their contents. This requirement will apply to containers from manufacturers and those produced on site by operations. The labels on all incoming and outgoing containers will be checked for identity, hazard warning, and the name and address of the responsible party.
- ***Material Data Safety Sheets (MSDS)***—MSDSs will be provided on site for each hazardous chemical used or known to be present at the site.
- ***Employee Information and Training***—Employees will receive annual chemical hazard safety training, supplemented by informal daily safety meetings. Project-specific chemical hazards will be communicated to employees through an initial site orientation meeting and daily safety meetings. Employees may request copies of specific MSDSs by completing the "Employee Request for Material Safety Data Sheet (MSDS)" form provided in Appendix D.

The written hazard communication program will be available at the project site for personnel review and provides requirements for the safe use of operational chemicals. Proper ventilation and PPE shall be used when working with operational chemicals. Air monitoring may be performed as needed to assess and control exposures resulting from the use of operational chemicals. An inventory list of the operational chemicals (Hazardous Chemical Inventory List) used and an MSDS for operational chemicals shall be completed by the SSHO, placed in Appendix E or a stand-alone document, and made available at the project site. A copy of the Inventory and MSDSs shall be provided to Cannon AFB Fire Department upon request.

4.2 Physical Hazards

There will be numerous physical hazards associated with site operations that require consideration. Some of these physical hazards are as follows:

- Noise and hearing conservation;
- Slips, trips, and falls;

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Draft • Revision 0 • November 2011 • WERC-09-13-002-3

- Fires, explosions, and hot work;
- Use of ladders and scaffolding;
- Use of small tools;
- Use of cutting tools;
- Use of heavy and mechanized equipment;
- Operation of motor vehicles;
- Material handling;
- Hazardous energies (i.e., electrical, mechanical, and pressure);
- Air compressor use;
- Portable generator use;
- Intrusive activities;
- Excavation;
- Confined space entry;
- Dust;
- Use of pressure washers and steam washers;
- Excessive work hours;
- Working over or near water; and
- Workplace reproductive hazards.

4.2.1 Noise and Hearing Conservation

There will be many sources of noise at each project site. Noise may be generated from the use of equipment and tools. Hearing loss, resulting from occupational exposure to noise, can be prevented. Shaw Procedure No. HS402, "Hearing Conservation Program," shall be implemented at each project site whenever there is employee noise exposures equal to or exceeds an 8-hour TWA of 85 decibels, A-scale. As part of the criteria for a hearing conservation program, audiometric testing of personnel must be conducted annually. The SSHO shall conduct noise surveys as necessary to determine if engineering controls should be implemented and/or if hearing protection is adequate. Personnel shall wear hearing protection when working with or around heavy equipment, power tools, as noise monitoring indicates, or in areas posted as such. Warning signs shall be posted in areas where noise (greater than 85 decibels) necessitates the use of hearing protection.

4.2.2 Slips, Trips, and Falls

The following details procedures to prevent slips, trips, and falls:

- Personnel shall keep work areas clean and orderly. Tools, equipment, and materials shall be used and stored in a fashion to minimize tripping hazards.
- Debris shall not be left lying around in any place, particularly in areas where personnel walk.
- Spills shall be cleaned up immediately.
- Personnel are prohibited from walking or working on surfaces or equipment that is not intended as walking or working surfaces.
- Personnel shall take extra precautions, such as establishing firm handholds, wearing suitable footwear, and walking slowly when walking on surfaces during wet, snowy, or icy weather.
- Walking and working surfaces shall be properly maintained during inclement winter weather, as feasible.
- Personnel shall not jump from elevated places or equipment.
- Personnel using hand and mechanical tools shall position themselves properly and consider the events if a tool slips or suddenly moves.
- Electrical extension cords and electrical wiring shall be kept clear of walking and working areas and/or covered, buried, or otherwise secured.
- Running is prohibited on job sites unless under emergency conditions.
- Employees exposed to fall hazards shall be protected by standard guardrail, catch platforms, temporary floors, safety nets, personal fall protection devices, or the equivalent. No employee may be exposed to a fall of over 6 feet without being adequately protected.
- Shaw Procedure No. HS301, “Fall Protection,” shall be followed when there is a fall hazard of 6 feet or greater.

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Draft • Revision 0 • November 2011 • WERC-09-13-002-3

4.2.3 Hot Work

Hot work (e.g., welding, burning, and cutting) conducted on site shall comply with the following requirements: Cannon AFB has a Hot Work Program that is independent of Shaw. All hot work done on base shall comply with the base program. Cannon AFB follows the Chapter 9 and 10 requirements of the *Safety and Health Requirements Manual EM 385-1-1* (USACE, 2008). The SSHO is the contact with the fire department for hot work permits.

- Shaw Procedure No. HS314, "Hot Work in Hazardous Locations," shall be followed whenever there is spark/ignition producing activities in progress at the project site.
- The SSHO shall establish areas approved for welding, cutting, and other hot work.
- The SSHO is responsible for authorizing welding, cutting, and other hot work in areas not specifically designed or approved for such operations (Hot Work Permit).
- All personnel shall be protected from welding radiation, flashes, sparks, molten metal, and slag.
- All welding, burning, and cutting equipment shall be inspected daily by the operator. Defective equipment shall be tagged and removed from service, replaced or repaired, and re-inspected before again being placed in service.
- All welders, cutters, and their supervisors shall be properly trained in the safe operation of their equipment, safe welding/cutting practices, and welding/cutting respiratory and fire protection.
- The handling of compressed gas cylinders shall comply with the requirements established in Shaw Procedure No. HS304, "Compressed Gas Cylinders."
- Cutting, welding, or other hot work shall be permitted only in areas that are or have been made fire safe.
- Cutting or welding shall not be permitted in the following situations:
  - In areas not authorized by the SSHO.
  - In the presence of explosive atmospheres (i.e., mixtures of flammable gases, vapors, liquids, or dusts with air), or explosive atmospheres that may develop inside uncleaned or improperly prepared drums, tanks, or other containers, and equipment that has previously contained such materials.

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Draft • Revision 0 • November 2011 • WERC-09-13-002-3

  - In any area where combustible gas indicator readings are in excess of 10 percent of the lower explosive limit.
  - On storage or process vessels or lines in service that contain flammable or combustible liquids, gases, vapors, or solids.

- Before any welding, cutting, or other hot work is permitted, the area shall be inspected by the SSHO to verify that the following requirements have been met:
  - Cutting and welding equipment to be used shall be in safe operating condition and in good repair.
  - Where practical, all combustible material shall be relocated at least 35 feet away from the hot work site. Where relocation is impractical, combustibles shall be protected with flameproof covers or otherwise shielded.
  - At a minimum, two fully charged and operable fire extinguishers, appropriate for the type of possible fire (4-A:60-B:C), shall be available at each work area.
  - A fire watch shall be required whenever hot work is performed in hazardous locations.
  - Combustible gas indicator readings shall be taken to verify the work area is free of combustible gases and vapors.
  - The work area is free of toxic contaminants at concentrations in excess of established TLVs or all personnel who will work in the area have been provided respiratory protection and protective apparel appropriate for the degree of exposure.
  - When hot work is to be performed on tanks or other vessels that contain or have contained flammable or combustible liquids, the vessel shall be properly isolated, purged, cleaned, or inerted as appropriate, to reduce the concentrations of flammable/combustible vapors to safe levels.
  - A Hot Work Permit (Appendix D) shall be completed by the SSHO, reviewed with personnel who will perform the hot work, and posted near the job site.
  - A Hot Work Permit is good only for the date issued and valid only for the 8-hour shift for which it is issued. If the work area is completely vacated by personnel, such as, during lunch, a new permit may need to be issued.

- If at any time during the hot work operation a change in conditions at the work site is suspected, such as a release of flammable gases or vapors in the work area, work shall be stopped immediately and the SSHO shall be notified. Such work stoppage invalidates the Hot Work Permit, and a new permit shall be completed after inspections and tests have been performed by the SSHO.
- No erasures or changes of dates on Hot Work Permits shall be permitted.

4.2.4 Use of Ladders and Scaffolds

Ladders and scaffolding shall only be used at each project under the following conditions:

- Ladder use shall comply with Shaw Procedure No. HS302, "Ladder Safety."
- Scaffold erection and use shall comply with all applicable OSHA regulations. A trained competent person shall supervise all scaffold erection and use.

4.2.5 Use of Small Tools

Hand and power tools shall be used, inspected, and maintained in accordance with the manufacturer's instructions and recommendations and will be used only for the purpose for which designed. A copy of the manufacturer's instructions and recommendations shall be maintained at the project site. The following requirements shall be adhered to:

- Tools designed to accommodate guards will be equipped with such guards when in use.
- Tools shall be inspected to ascertain safe operating conditions and are to be kept clean and free of accumulated dirt.
- Electric power tools and extension cords shall be used with ground fault circuit interrupter.
- Portable power cords will be designated as hard usage or extra hard usage and shall not be used if damaged, patched, oil-soaked, worn, or frayed.
- Connections on pneumatic lines shall be secured with a safety lashing.
- Explosive-actuated tools will meet the design requirements of American National Standards Institute (ANSI) A10.3 and only be operated by a qualified operator.
- Explosive-actuated tools and charges shall be secured at all times to prevent unauthorized possession or use.

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Draft • Revision 0 • November 2011 • WERC-09-13-002-3

- Explosive-actuated tools shall not be loaded until just prior to the intended firing time; neither loaded nor empty tools are to be pointed at any employees; hands shall be kept clear of the open barrel end.
- Hand tools, such as hammers and chisels, shall be inspected and dressed if necessary to remove mushroomed heads, which may separate and become projectile hazards.

4.2.6 Use of Cutting Tools

Proper cutting tools, such as scissors, snips, side cutters, etc., are to be used when possible in lieu of box cutters or knives. Furthermore, if box cutters are determined to be the appropriate tool for the job, the only type that should be used is the design that has a self-retracting blade capability. Employees must utilize appropriate PPE (leather gloves) to allow for further protection. There are many cutting tool manufacturers that offer a variety of safety knives, which are available for all types of cutting. The SSHO shall evaluate each cutting task in order to determine that the safest and most appropriate cutting tool is used. The SSHO shall also provide training in the proper use of the selected cutting tool. The following evaluation shall be made for each cutting task:

- Determine that hand knives are actually the most practical tool for the task. Where possible, use the safest cutting tool for the job (e.g., scissors, snips, or wire strippers).
- If a knife happens to be the correct tool, keep the knife sharp and clean. A dull blade can cause accidents because more force is needed to cut an object. However, a knife or any other unprotected blade tool must be the last resort when choosing a cutting tool.
- Maintain a supply of either replacement knives and/or blades and make them readily available.
- Cut away from yourself, ending the knife stroke away from your body. Hold the item you are cutting firmly, and do not cut downwards and towards your body. Cut into the air or onto hard surface.
- Confirm that appropriate PPE (e.g., gloves) specific to the task is available to employees and used when the possibility of injury exists.

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Draft • Revision 0 • November 2011 • WERC-09-13-002-3

- Personal knives (e.g., pocketknives) shall not be considered as a tool for any type of work-related cutting. Employees are required to ask for a cutting tool from their supervisor, thereby resulting in an additional review of using the right cutting tool for the job.
- The SSHO is to inspect material cutting activities to verify that leather gloves are being used to protect hands.

4.2.7 Use of Heavy and Mechanized Equipment

Excavators, front-end loaders, drill rigs, direct-push rigs, and other types of specialized equipment may be used to accomplish the work at the project. The use of this equipment can be dangerous. Extra care shall be exercised in its use and while working in the vicinity of this equipment.

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Draft • Revision 0 • November 2011 • WERC-09-13-002-3

4.2.7.1 Heavy Construction Equipment

Various types of heavy construction equipment will be used for project activities. All operators of this equipment shall be familiar with the requirements for inspection and operation of the equipment that they will be using. Before equipment is placed into use and on a daily basis, the operator is to inspect and verify that it is in safe operating condition, as described in Section 3.5. The following guidelines shall be adhered to while operating heavy construction equipment:

- Equipment shall not be operated in a manner that will endanger persons or property nor will the safe operating speeds or loads be exceeded.
- Getting on or off of equipment while it is in motion is prohibited.
- Equipment shall be operated in accordance with the manufacturer's instructions and recommendations.
- Determinations of road conditions and structures shall be made in advance to verify that clearances and load capacities are safe for the passage of equipment.
- All machinery or equipment shall be shut down and positive means taken to prevent its operation while repairs or manual lubrications are being done. Equipment designed to be serviced while running is exempt from this requirement.
- Buckets, blades, dump bodies, and similar equipment will be either fully lowered or blocked when being repaired or when not in use. All controls shall be in a neutral position, with the engines stopped and brakes set, unless work being performed on the machine requires otherwise, per manufacturer recommendations.

- No guard, safety appliance, or device shall be removed from machinery or equipment, or made ineffective except for making immediate repairs, lubrications, or adjustments, and then only after the power has been shut off. All guards and devices will be replaced immediately after completion of repairs and adjustments and before power is turned on.
- Mechanized equipment shall be shut down prior to and during fueling operations. Closed systems, with automatic shut-off, which prevent spillage if connections are broken, may be used to fuel diesel powered equipment left running.
- Each piece of heavy equipment and other similar equipment shall be equipped with at least one dry chemical or carbon dioxide fire extinguisher with a minimum rating of 10-B:C.
- Personnel shall not work, pass under, or ride in the buckets or booms of loaders in operation.
- All self-propelled construction equipment, whether moving alone or in combination, shall be equipped with a reverse signal alarm.
- Seat belt use is required while operating equipment.

Spotters for the operator shall be the only personnel allowed in the vicinity of the heavy equipment. Spotters shall stay out of the boom radius area. Personnel needing to approach heavy equipment while operating shall observe the following protocols:

- Wear Class 2 high visibility vests meeting ANSI specifications
- Make eye contact with the operator (and spotter)
- Signal the operator to cease heavy equipment activity
- Approach the equipment only after the operator has given signal to do so.

4.2.7.2 Mechanized Equipment – Use of Quick Connect/Disconnect Systems

The manufacturer's specifications and operating manuals for hydraulic equipment and attachments utilizing quick connect/disconnect systems shall be followed. After completing a switch in attachments, the equipment operator shall take the actions necessary to verify the quick connect/disconnect system is positively engaged.

4.2.7.3 Hydraulic Excavators, Wheel Loaders, Track Loaders, and Backhoe/Loaders Used to Transport or Hoist Loads with Rigging

When hydraulic excavating equipment is to be used to transport or hoist loads utilizing hooks, eyes, slings, chains, or other rigging, the following requirements shall apply:

- A Lift Plan Worksheet (Hydraulic Equipment) (Appendix D) shall be completed.
- Operations involving the use of hydraulic excavating equipment and rigging to transport or hoist loads require different operator skills and considerations than the standard excavating operations routinely performed with hydraulic excavating equipment. An AHA specific to the transporting or hoisting operation shall be prepared (Appendix C15, "*Rigging and Lifting with Hydraulic Equipment*"). The AHA shall include, but not be limited to the following:
  - Written proof of qualifications of equipment operators, riggers, and others involved in the transporting and hoisting operations.
  - Performance of the operational test described in section 16.N.01 (b) of the *Safety and Health Requirements Manual EM 385-1-1* (USACE, 2008).
  - Proper operating procedures in accordance with the equipment manufacturers operating manual.
  - Proper use and on site availability of manufacturer's load rating capacities or charts.
  - Proper use of rigging, including positive latching devices to secure the load and rigging.
  - Rigging inspection by completing a "Rigging Inspection Checklist (Appendix D).
  - Use of tag lines to control the load.
  - Communications.
  - Establishment of a sufficient swing radius (equipment, rigging, and load).
  - Stability of surfaces beneath the hydraulic excavating equipment.
- An operational test with the selected hydraulic excavating equipment will be performed in the presence of the Government Designated Authority, if available. The operational test shall consist of a demonstration that the test load and selected rigging can be safely lifted, maneuvered, controlled, stopped, and landed. The operational test shall be representative of the complete cycle of the proposed transporting or hoisting operation, including configuration, orientation, and

positioning of the excavating equipment and the use of identical rigging. The test load shall be equivalent to the maximum anticipated load, but shall not exceed 100 percent of the manufacturer's load rating capacity for the excavating equipment as configured. Written documentation of the performance of the operational test outlining test procedures and results shall be maintained at the on-site project office.

- All rigging and rigging operations shall comply with the requirements of Section 15 of the *Safety and Health Requirements Manual EM 385-1-1* (USACE, 2008). Hooks, eyes, slings, chains, or other rigging shall not be attached to or hung from the teeth of a bucket during the transporting or hoisting of a load by hydraulic excavating equipment.
- After the completion and acceptance of an operational test described in 16.S.01 (b) *Safety and Health Requirements Manual EM 385-1-1* (USACE, 2008), if repairs, major maintenance, or reconfiguration are required to be performed on the hydraulic excavating equipment or attachments, another operational test as described in 16.S.01 (b) shall be performed to demonstrate that the completed repairs are satisfactory and that the test load and selected rigging can be safely lifted, maneuvered, controlled, stopped, and landed.
- Loads shall be lifted the minimum height necessary to clear the ground or other obstacles and carried as low as possible when the equipment is traveling.
- Loads shall not be lifted over personnel.
- Adequate clearances shall be maintained from electrical sources.
- Hydraulic excavating equipment shall not be used to hoist personnel. The riding of personnel on loads, hooks, hammers, buckets, or any other hydraulic excavating equipment attachment is prohibited.

4.2.7.4 Drill Rig /Direct-Push Safety

All drilling operations are to comply with Shaw Procedure No. HS316, "Drill Rig Operations." All members of the drill/direct-push crew(s) shall receive site-specific training prior to beginning work. The Shaw Field Team Leader must have successfully completed Shaw's in-house training pertinent to competent person drilling oversight training. The Field Team Leader is required not only to have successfully completed competent person drilling oversight training, but to have an appropriate educational background, coupled with field experience and the authority to make changes to correct deficiencies, or to stop the job if need be. The driller is responsible for the safe operation of the drill/direct-push rig, as well as the crew's adherence to the requirements of this SSHP. The driller is to verify that all safety equipment is in proper condition and is properly used. The members of the crew shall follow

all instructions provided by the manufacturer of the drill/direct-push rig, wear the required PPE, and be aware of all hazards and control procedures. The drill/direct-push crews shall participate in the daily tailgate safety meeting and be aware of all emergency procedures.

All drilling/direct-push activities must comply with Shaw Procedure No. HS308, "Underground/Overhead Utility Contact Prevention." After all mark-outs have been completed and documented on the Utility Mark-Out Documentation form (Appendix D), each bore or probe-hole location must be advanced by hand digging, probing, posthole digging, and/or air knifed to 5 feet below ground surface. Should the local geology be prone to refusal or should there be any other reason the above methods cannot be used to ensure the 5 feet clearance, ground-penetrating radar or other methods would then be required to ensure the boring or probe hole is cleared (5 feet minimum). Besides utilization of ground penetrating radar or other methods mentioned above, anytime the 5 feet clearance cannot be obtained, the SSHO must obtain a written variance from the Regional Vice President (or equivalent level such as Operations Director for Federal Business Line) or designee. This would include a telephone call to both the Regional Vice President and Regional Health and Safety Manager and signed approval by all parties involved. The Pre-drilling/Boring/Geoprobe Checklist and the Direct-Push Rig Inspection Checklist and/or Drill Rig Inspection Checklist (Appendix D) must be completed prior to drilling, boring, or direct-push activity.

4.2.8 Operation of Motor Vehicles

All Shaw owned, leased, or rented vehicle operations shall comply with the requirements of Shaw Procedure No. HS800, "Motor Vehicle Operation: General Requirements" and Shaw Procedure No. HS810, "Commercial Motor Vehicle Operation and Maintenance." Shaw vehicles shall be inspected on a daily basis. Additionally, all Shaw vehicles shall be inspected prior to any trip, which is 50 miles or greater. Vehicle inspections shall be documented on the Vehicle Inspection form (Appendix D).

Subcontractors operating motor vehicles at projects shall comply with all federal, state, and local traffic regulations. Subcontractors shall only use vehicles that are in good condition and safe to operate. Subcontractors shall inspect their vehicles on a daily basis and submit the inspection documentation to the SSHO. Vehicle inspections shall be documented on the Vehicle Inspection form (Appendix D).

All personnel shall drive defensively and wear seat belts while vehicles are in motion. All personnel must observe the maximum-posted speed limits on the base roadways and parking lots. Vehicles must not be parked closer than 15 feet from fire hydrants. Vehicle must pull over to the right side of the road when approached by emergency vehicles – remain stopped

until the emergency vehicles have safely passed. All Shaw employees are required to attend a defensive driving training course.

Operators of vehicles may only use cellular telephones with hands-free devices while the vehicle is in motion. Operators of vehicles are not permitted to send text messages while the vehicle is in motion. Prior to using a hand-held cellular telephone, drivers shall find a safe place to bring their vehicle to a stop. This requirement does not preclude passenger(s) from using cellular telephones while the vehicle is in motion. The use of headphones and earphones for music or radio is prohibited while operating a motor vehicle.

Since backing accidents at these types of projects are frequent, the following guidelines shall be observed:

- Backing of vehicles shall be avoided when possible.
- Extra care shall be taken to back vehicles when unavoidable.
- Back up slowly and back up the shortest distance necessary to accomplish the maneuver.
- When parking vehicles, vehicles shall be backed into the space whenever possible.
- Before entering a vehicle, which has been parked, the driver should first physically perform a 360 degree walk around the vehicle to observe all areas and especially the area behind the vehicle.
- Spotters shall be used to back vehicles whenever possible or necessary.

4.2.9 Material Handling

Various materials and equipment may be handled manually during project operations. Care should be taken when lifting and handling heavy or bulky items to avoid back injuries. The following fundamentals address the proper lifting techniques that are essential in preventing back injuries:

- Size, shape, and weight of the object to be lifted shall first be considered. No individual employee is permitted to lift any object that weighs over 60-pounds. Multiple employees or the use of mechanical lifting devices is required for objects over the 60-pound limit.
- Anticipated path to be taken by the lifter should be inspected for the presence of slip, trip, and fall hazards.
- Feet shall be placed far enough apart for good balance and stability (typically shoulder width).

- Worker shall get as close to the load as possible. Legs shall be bent at the knees.
- Back shall be kept as straight as possible and abdominal muscles should be tightened.
- Twisting motions should be avoided when performing manual lifts.
- To lift the object, the legs are straightened from their bending position.
- Take small turning steps without twisting the knees or the back if it is necessary to turn with the load.
- A worker shall never carry a load that cannot be seen over or around.
- When placing an object down, the stance and position are identical to that for lifting. The legs are bent at the knees and the object lowered.

When two or more workers are required to handle the same object, coordination is essential for sharing the weight between the individuals carrying the load and to make a uniform lift. When carrying the object, each worker, if possible, shall face the direction in which the object is being carried. In handling bulky or heavy items, the following guidelines shall be followed to avoid injury to the hands and fingers:

- A firm grip on the object is essential; leather gloves shall be used as necessary.
- Hands and the object shall be free of oil, grease, and water, which might prevent a firm grip. Fingers shall be kept away from any points that could cause them to be pinched or crushed, especially when setting the object down.
- Item shall be inspected for metal slivers, sharp or jagged edges, burrs, and rough or slippery surfaces prior to being lifted.

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Draft • Revision 0 • November 2011 • WERC-09-13-002-3

4.2.10 Hazardous Energies (Electrical, Mechanical, and Pressurized Systems)

All portable electrical equipment and extension cords shall be protected with a ground fault circuit interrupter as part of the circuit. Applicable OSHA standards for electrical power, 29 CFR 1926 Subpart K and Section 11 of the *Safety and Health Requirements Manual EM 385-1-1* (USACE, 2008) apply.

Only qualified electricians may work on electrical circuits. Qualified personnel shall be trained with the proper use of the special precautionary techniques, PPE, including arc-flash, insulating and shielding materials, and insulated tools and test equipment.

Live parts to which an employee might be exposed shall be put into an electrically safe work condition (de-energized) before an employee works on or near them, unless it can be

demonstrated that de-energizing introduces additional or increased hazards or is infeasible due to equipment design or operational limitations. This rule applies to all electrical work, including changing a light bulb.

Where work is performed in locations containing uninsulated energized overhead lines that are not guarded or isolated, precautions shall be taken to prevent employees from contacting such lines directly with any unguarded parts of their body or indirectly through conductive materials, tools, or equipment. Refer to Table 2 when working near overhead power lines. Where the work to be performed is such that contact with uninsulated energized overhead lines is possible, the lines shall be de-energized and visibly grounded at the point of work, or suitably guarded.

Employees working in areas where electrical hazards are present shall be provided with, and shall use PPE that is designed and constructed for the specific part of the body to be protected and for the work to be performed, as required by Section 130.7 of National Fire Protection Association (NFPA) 70 E (2011), *Standard for Electrical Safety in the Workplace*. Refer to Appendix G.

Employees shall use insulated tools and/or handling equipment when working inside the Limited Approach Boundary of exposed live parts where tools or handling equipment might make accidental contact. Insulated tools shall be protected from damage to the insulating material.

Before starting each electrical job, the qualified employee in charge shall conduct a job briefing with the employees involved. The briefing shall cover such subjects as hazards associated with the job, work procedures involved, special precautions, energy source controls, and PPE requirements.

Only hard or extra-hard usage extension cords shall be used. Extension cords, power tools, and lighting equipment shall be inspected before each use, protected from damage, and kept out of wet areas.

The handling of compressed gas cylinders shall comply with the requirements established in Shaw Procedure No. HS304. All pressure vessels shall be designed, inspected, and tested in accordance with ASTM International standards.

Lockout/tagout procedures are to be implemented during servicing or maintenance of machines and equipment to preclude the unexpected release of stored energy or inadvertent energizing. These procedures are contained in Shaw Procedure No. HS315, “Control of Hazardous Energy Sources,” and comply with the requirements established in 29 CFR

1926.417. The appropriate logs and forms found in Appendix D and listed below shall be completed for all lockout/tagout:

- Lockout Log;
- Lockout/Tagout for Compressed Air and Gases;
- Lockout/Tagout for Electrical Equipment;
- Lockout/Tagout for Hydraulic Equipment;
- Lockout/Tagout for Steam, Water, and Fluid Lines; and
- Lockout/Tagout Procedure for Specific Equipment.

Subcontractors may implement their own lockout/tagout procedure if the SSHO has approved its use and verifies that it is no less protective than the Shaw Procedure.

4.2.11 Air Compressor Use

Refer to the air compressor manufacturer's instructions for safe operation. Prior to use, the Checklist – Portable Air Compressor (Appendix D) shall be completed. Never use an air compressor in enclosed or partially enclosed spaces due to the quick buildup of high levels of carbon monoxide. The concentration of carbon monoxide shall be monitored when using air compressors in areas of poor ventilation. The concentration of carbon monoxide in the work area shall not be allowed to exceed 25 ppm.

All air compressors and hoses shall be inspected before use, operated, and maintained by designated, qualified personnel. All air compressors shall be equipped with a pressure gauge and relief valve, and only be operated at design pressures. Chicago fittings shall be secured together with tie-wire or equivalent and secured with safety lashings.

Before refueling the air compressor, shut it off and let it cool down. Gasoline spilled on hot engine parts could ignite. A 20-B:C fire extinguisher shall be readily available in locations where an air compressor is being used.

Use hearing protection when working near an air compressor.

4.2.12 Portable Generator Use

Refer to the generator manufacturer's instructions for safe operation. Never use a generator in enclosed or partially enclosed spaces due to the quick buildup of high levels of carbon monoxide. The concentration of carbon monoxide shall be monitored when using generators in areas of poor ventilation. The concentration of carbon monoxide in the work area shall not be allowed to exceed 25 ppm.

Keep the generator dry and do not use in rain or wet conditions. To protect from moisture, operate it on a dry surface under an open, canopy-like structure. Dry your hands, if wet, before touching the generator. Use a heavy duty, outdoor-rated extension cord that is rated (in watts or amps) at least equal to the sum of the connected appliance loads. Check that the entire cord is free of cuts or tears and that the plug has all three prongs, especially a grounding pin. Ground generators by using a hand-inserted ground-rod, if recommended by the manufacturer.

Before refueling the generator, turn it off and let it cool down. Gasoline spilled on hot engine parts could ignite. A 20-B:C fire extinguisher shall be readily available in locations where a generator is being used.

Use hearing protection when working near a generator.

4.2.13 Intrusive Activities

Intrusive activities are defined as any activity that produces a man-made cut, cavity, trench, or depression into the earth's surface formed by earth removal or any activity that results in an object placed into the earth below the surface. These activities include excavating, drilling, augering, boring, shoveling, fence post driving, driving stakes, etc. Intrusive activities can be dangerous and can result in severe personal injury or death. Intrusive activities can also cause significant property damage to utilities, structures, and operational equipment. Breaching underground utilities can result in electrocution from damaged electrical lines, fires from broken fuel/gas lines, and disruption of telephone service. All intrusive activities must comply with Shaw Procedure No. HS308.

Before any intrusive activity begins, positive steps shall be taken to determine if the area contains underground utilities or overhead hazards. It is important to understand that underground utilities may be found in areas that have been properly investigated and thought not to have utilities present. Personnel shall always be alert for marking tape, wires, pipes, previously disturbed soils, crushed stone or sand bedding/backfill, containers, discolored soil, MEC, or anything else unusual.

The Intrusive Activities Clearance Procedure shall be followed. The procedure is designed to identify and protect underground installations or indicate that none exists. Intrusive activity shall not begin until the SSHO has signed off on the Intrusive Activities Permit form (Appendix D).

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Draft • Revision 0 • November 2011 • WERC-09-13-002-3

The SSHO will:

- Prepare a map indicating the area(s) where intrusive activity is planned to occur.
- Perform the necessary reviews.
- Contact Cugach, the base utility locating service, at least 3 business days prior to intrusive activities.
- Verify that all underground installations have been located, physically marked, and then noted on the map.
- Mark all overhead utilities with kilovolts rating on the map. Refer to Table 2 and Section 4.2.10 when working near overhead power lines.
- Notify the appropriate agencies, such as the COR and property owners (when applicable)
- Complete the Utility Mark-Out Documentation form (Appendix D)
- Issue the Intrusive Activities Permit.

A safety meeting shall be held and a JSA completed by all personnel involved in the intrusive activities prior to initiating work.

4.2.14 Excavation

When performing excavation activities, Shaw Procedure No. HS307, "Excavation and Trenching" and Shaw Procedure No. HS308, "Underground/Overhead Utility Contact Prevention" shall be followed. Any excavation 5 feet deep or greater, into which persons will enter and perform work, shall be shored, sloped, or otherwise made safe for entry. Excavations less than 5 feet in depth in which a competent person, as defined in 29 CFR 1926.650, examines and determines there to be no potential for cave-in, do not require protective systems. Certain excavations and trenches are considered confined spaces that require a confined space entry permit (Section 4.2.15).

Daily inspections of the excavation shall be made using an Excavation Inspection form (Appendix D) and a Soils Classification Worksheet (Appendix D) completed by a competent person as defined in 29 CFR 1926.650. All excavated materials shall be placed at least 2 feet from the edge of the excavation. Perimeter protection shall be provided for unattended excavations as specified in Section 25.B of the *Safety and Health Requirements Manual EM 385-1-1* (USACE, 2008). Open excavations shall be lighted at night, although, Shaw will attempt to minimize the need to perform intrusive activities at night. The SSHO shall evaluate the exposure of the excavation to employees, the public, vehicles, and equipment. This evaluation shall be used in determining the class of perimeter protection.

All project personnel shall participate in the site-specific training session and be instructed on the following requirements:

- Before commencing intrusive activities such as excavating, etc., the existence and location of underground pipes, electrical equipment, communication lines, gas lines, etc. shall be determined and documented. Only hand digging is permitted within 3 feet of underground high voltage, product, or gas lines. Once the line is exposed, heavy equipment can be used but must remain at least 3 feet from the exposed line.
- Operations shall be suspended, ignition sources eliminated, and the area shall be ventilated if the concentration of flammable/combustible vapors reach or exceed 10 percent of the lower explosive limit. A combustible gas indicator shall be used to make this determination.
- If excavating equipment is being operated in the vicinity of overhead power lines, Table 2 will be used to determine safe working distances.
- Personnel entry into any excavation 5 feet deep or greater is only permitted if the necessary protective systems are in place. Employees shall wear a harness with a lifeline securely attached to it when entering excavations classified as confined spaces or that otherwise present the potential for emergency rescue.
- Employees shall not work in excavations in which there is accumulated water, or in excavations in which water is accumulating, unless adequate precautions have been taken to protect employees against the hazards posed by water accumulation. If water is controlled or prevented from accumulating by the use of water removal equipment, the process shall be monitored by a competent person to ensure proper operation.
- Excavations greater than 4 feet in depth, which require personnel to enter, shall have sufficient means of entry and egress (e.g., stairs, ladders, and ramps). Ladders will be provided and secured as necessary. Ladders shall extend at least 3 feet above grade. Means of entry/egress shall not require personnel to travel laterally more than 25 feet.

4.2.15 Confined Space Entry

A confined space is defined as a space large enough and so configured that an employee can bodily enter and perform assigned work, has limited means for entry or exit, and is not designed for continuous employee occupancy. Confined space work may pose additional hazards such as chemical exposures, flammable/explosive atmospheres, electrocution, oxygen deficiency, etc. Shaw Environmental, Inc. has detailed training for confined space

entry: only properly trained personnel shall supervise and participate in confined space entry procedures or serve as standby attendants.

Entering a trench greater than 5 feet deep, entering a sewer, or entering a tank may be potential confined space entries. Personnel shall never enter a confined space without a permit issued by the SSHO. If personnel are uncertain about whether their activity involves a confined space entry, they shall stop work and notify their supervisor or the SSHO. Shaw Procedure No. HS300, "Confined Spaces," shall be followed for all confined space entries, if such an activity is needed.

All confined spaces are initially considered permit required. Under certain conditions, a space may be re-classified as a non-permit, confined space provided the SSHO approves the reclassification and the space meets the criteria outlined in Shaw Procedure No. HS300.

Shaw Procedure No. HS300 identifies the tug signals that may be used during entry as referenced on the Entry Permit for Permit-Required Confined Space (Appendix D).

4.2.15.1 Rescue and Emergency Services

Shaw recommends the use of non-company rescue services whenever possible. In certain instances, such as unavailability of a qualified outside provider, Shaw employees can participate in rescues if they have been provided the required equipment and training.

4.2.15.2 Outside Rescue Services

Prior to designating a non-company rescue service, an evaluation of their capabilities must be conducted. This documented evaluation can be conducted by an entry supervisor or a health and safety representative. The Rescue Service Evaluation form (Appendix D) can be used to document this evaluation. The rescue service must be certified by the evaluator as capable of performing rescues prior to being identified as the rescue service provider.

Each selected rescue service will be informed of the hazards they may encounter at the location. They will also be provided access to all Permit-Required Confined Spaces from which a rescue may be necessary.

4.2.15.3 Shaw Rescue Services

Shaw personnel assigned to provide emergency entry and rescue services will be trained annually in the proper use of personal protective and rescue equipment. Such training will include a simulated rescue exercise. Shaw rescue services will be evaluated using the Rescue Service Evaluation form (Appendix D) and must be certified by the evaluator as capable of performing rescues prior to being identified as the rescue service provider.

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Draft • Revision 0 • November 2011 • WERC-09-13-002-3

4.2.16 Dust

The generation of dust and fugitive emissions shall be prevented when possible and controlled when necessary. Work practices shall be adjusted in a manner to minimize dust generation, such as lowering excavation rates, not letting soils free-fall from equipment buckets, and traveling slow on dirt roads. Personnel shall avoid working in dust by positioning themselves upwind of dust generating activities. Excessive dust shall be controlled by suppression with water from an AFCEE-approved source. Dust that is not controlled may necessitate the use of respiratory protection.

4.2.17 Use of Pressure Washers or Steam Washers

The use of steam/pressure washers shall comply with Shaw Procedure No. HS303, "Pressurized Water Cleaning and Cutting Equipment." All personnel using steam/pressure washers shall wear Level D – Modified PPE, at a minimum. Eye, face, and shin/metatarsal protection is mandatory.

The pressure/steam washer shall be inspected before each use. The manufacturer's instruction manual shall be used to guide the inspection process.

Personnel shall be trained in the use of the washing equipment. All personnel working in the equipment decontamination area shall be trained in the emergency shut-off procedures for the equipment being used. The minimum amount of steam/pressure that will complete the job should be used. Pressure washers exceeding 3,000 pounds per square inch shall not be used without the approval of the HSM.

The spray from such equipment shall only be directed at surfaces to be cleaned and never at body parts or other personnel; high-pressure water can easily cut through skin and flesh. Personnel working in the immediate area shall also use eye, face, and shin/metatarsal protection.

Personnel shall keep a firm grip on the wand and not point it at anything that is not being washed. Pressure washer operators must maintain good footing. The trigger on the wand shall never be wired/fixed open. Operators are to take adequate breaks to avoid fatigue.

Hot surfaces shall be avoided. Pressure or steam washing equipment shall be shut off and allowed to cool prior to refueling.

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Draft • Revision 0 • November 2011 • WERC-09-13-002-3

4.2.18 Excessive Work Hours

The following workday duration limitations for hours worked on the projects are in effect:

- Personnel working on projects, including those who are operating hoisting equipment or mobile construction equipment, may work up to 12 hours at the site, which includes travel time to housing, but excludes non-compensated time. This workday duration is subject to reduction by the other requirements and factors described below. The 12-hour limit is primarily due to motor vehicle driving restrictions.
- Personnel shall not operate motor vehicles after being in a duty status (regardless of their role or function) for more than 12 hours during any 24-hour period without at least 8 consecutive hours of rest. A minimum of 8 consecutive hours shall be provided for rest in each 24-hour period.
- No employee may drive continuously for more than 10 hours in any single on-duty period. (Continuous period of more than 10 hours in any 24-hour period without at least 8 consecutive hours of rest.)

For each project effort, the SSHO is responsible for adjusting the workday duration within the limits set above.

The following factors will be considered by the SSHO for adjusting the workday duration:

- Time of year (e.g., reduce workday duration because there is less daylight in winter).
- Temperature/weather (e.g., reduce workday duration when the temperature is very cold, very hot, or very windy).
- Type of work (e.g., reduce workday duration for personnel involved in physically demanding phases of work).
- Individual personnel limitations (e.g., reduce workday duration for personnel with minor head colds or suffering from temporary effects of allergies).

For any questions regarding the implementation of this policy, contact the HSM.

4.2.19 Transportation

Many of the individual sites are located in areas of high vehicle, equipment, and pedestrian traffic. When working in these areas extra caution should be used because of the unpredictable nature of vehicular traffic. Barriers should be placed around work areas, shielding workers from vehicular traffic and blocking pedestrian traffic from entering the

work area. Flaggers should always be used if any portion of the roadway is blocked or if barriers are inadequate or unfeasible. Flaggers are required to be trained on proper hand signals, signage, state regulations, and U.S. Department of Transportation regulations as applicable.

4.2.20 Working Over or Near Water

Working over or near water is not anticipated for proposed activities under the WERC09 contract.

4.3 General Work Rules

While all the procedures outlined in this SSHP are required, the following list presents general work rules that must be strictly enforced by the Construction Manager and Subcontractor Supervisors:

- Loose jewelry, clothing, or long hair is not permitted on or near equipment with moving parts.
- Personnel shall not enter a restricted area unless authorized.
- All work zones, as established on the site, shall be observed. All required PPE shall be worn prior to entering these zones.
- Legible and understandable labels shall be affixed prominently to the containers of waste materials.
- An emergency eyewash unit shall be located immediately adjacent to employees who handle hazardous or corrosive materials, such as battery acid, etc. All operations involving the potential for eye injury, splash, etc. shall have eyewash units locally available and capable of delivering at least 0.4 gallons per minute for at least 15 minutes. The eyewash unit maintenance shall be documented on the Emergency Eyewash Station/Fire Extinguisher Inspection Checklist (Appendix D)
- If on-site activities continue later than dusk, adequate lighting shall be provided.
- Field activities shall be suspended during severe weather such as thunderstorms, lightning, and winter storm warnings.
- Damaged PPE shall be immediately repaired or replaced, as appropriate.
- Personnel shall thoroughly wash their hands and face before eating, smoking, or drinking.
- Unauthorized removal of materials from the project is prohibited.

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Draft • Revision 0 • November 2011 • WERC-09-13-002-3

- Possession of controlled substances and prohibited items, such as alcohol, illicit drugs, firearms, and weapons while working on site is strictly prohibited.
- Operations involving the potential for fire hazards shall be conducted in a manner as to minimize the risk of fire.
- Overhead and underground utility hazards shall be identified and/or located prior to conducting operations.

4.3.1 Disciplinary Actions

A successful safety program is achieved by assigning qualified personnel, providing the necessary training and orientation, adequately planning for the work and following the plans, adhering to the policies and procedures, reinforcing positive behavior, and rewarding safe performance. A mechanism is also necessary to consistently apply disciplinary action to employees who jeopardize the safety of themselves and their coworkers by not following the established plans, policies, and procedures. Therefore, Shaw Guide – 004, "Guidelines for Standard Safety Disciplinary Actions," is applicable and in effect for this project (Appendix G).

4.4 Buddy System

The "buddy system" will be used at all times while working on-site—this requires that personnel maintain visual, voice, cellular telephone, or radio communication.

4.4.1 Lone Worker Procedure

Occasionally, only one worker may be present at the project to perform routine operations such as performing paperwork in the office. During these routine operations, there will be no "buddy" present on site. Even though there will be no buddy present on site at these times, communications must still be maintained. The lone field worker shall carry a cellular telephone or two-way radio on their person, at all times, while working at the project site (a landline telephone will suffice if the worker is in an office). Arrangements shall be made by the lone field workers, with at least one other person (monitor),and the SSHO to affect hourly communications. This hourly communication shall convey the following information:

- Present location.
- Present status.
- Anticipated activities and location of anticipated activities (include routes of expected travel).

- Estimated duration of anticipated activities.
- Identify other anticipated activities, projected travel routes, and activity locations if the lone field worker will complete the initial task prior to making the next scheduled contact with the other employee.

The lone field worker should initiate the hourly communication to the monitor at a pre-designated time (e.g., the top of the hour). If the monitor does not receive the status call at the pre-designated time, then the monitor shall try to establish communications with the lone employee. If the lone field employee answers, then the update shall be made and the schedule of calls shall continue. If the lone field employee does not answer, the monitor shall try again in 5 minutes. If contact is not made on the second try, then the monitor shall notify the local emergency services, such as police. All information provided from the last communication (see above) shall be provided to the emergency services. Additionally, the telephone number of the monitor (or other means of contact) shall be provided to the emergency services.

Upon mobilization to the project, the SSHO shall verify that emergency communications are established for all activities.

Important: This procedure applies to routine tasks only. Non-routine tasks require the buddy system to be in effect.

4.5 Environmental Hazards

In addition to chemical and physical hazards, there are environmental hazards that may be present. For the purposes of this SSHP, the environmental hazards are comprised of extreme ambient temperatures, insects, spiders, rodents, poisonous plants, and sunburn. Since some people are more sensitive or allergic to various biological hazards, the Allergy/Sensitivity Questionnaire (Appendix D) may be voluntarily completed by personnel during site orientation training. This form is used to alert the SSHO of these sensitivities so that additional precautions may be made.

4.5.1 Heat Stress

Heat stress is of concern for worker safety during the summer months or when working in areas containing steam lines or other heat generating equipment. Heat stress is caused by a number of interacting factors, including environmental conditions, clothing, PPE, workload, and individual characteristics. Heat stress can cause physical discomfort, loss of efficiency, or personal illness/injury.

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Draft • Revision 0 • November 2011 • WERC-09-13-002-3

Individuals vary in their susceptibility to heat stress. Factors that may predispose individuals to heat stress include the following:

- Lack of physical fitness and/or obesity.
- Insufficient acclimation.
- Age.
- Dehydration.
- Alcohol and/or drug use.
- Infection.
- Sunburn.
- Diarrhea.
- Chronic disease.
- Medical conditions and/or the use of some medications, such as beta-blockers for high blood pressure.

The amount and type of PPE worn, directly influences reduced work tolerance and the increased risk of heat stress. Personal protective equipment adds weight, bulk, reduces the body's capability for physiological thermoregulation (i.e., evaporation, convection, and radiation), and increases energy expenditure.

4.5.1.1 Signs and Symptoms of Heat Stress

If the body's physiological processes fail to maintain a normal body temperature because of excessive heat, a number of physical reactions can occur – ranging from mild to fatal.

These physical reactions to excessive heat include the following:

- Heat rash is caused by continuous exposure to heat and humidity and aggravated by chafing clothes. Heat rash decreases the body's ability to tolerate heat in addition to being a nuisance.
- Heat cramps are caused by profuse perspiration with inadequate electrolytic fluid replacement. Heat cramps cause painful muscle spasms and pain in the extremities and abdomen.
- Heat exhaustion is caused by increased stress on various organs to meet increased demand to cool the body. Heat exhaustion causes shallow breathing; pale, cool, moist skin; profuse sweating; and dizziness.

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Draft • Revision 0 • November 2011 • WERC-09-13-002-3

- Heat stroke is the most severe form of heat stress. Heat stroke symptoms include hot, dry skin; no perspiration; nausea; dizziness; confusion; strong, rapid pulse; coma; and sometimes death. Heat stroke is a serious medical emergency. The affected person shall be cooled down rapidly and medical attention must be given immediately (Section 4.5.1.4 for heat stroke first aid treatment).

The ACGIH states that excessive heat stress may be marked by one or more of the following symptoms, and an individual's exposure to heat stress should be discontinued when any of the following occur (2011):

- Sustained (several minutes) heart rate is in excess of 180 beats per minute minus the individual's age in years (180 minus age) for individuals with assessed normal cardiac performance; or
- Body core temperature is greater than 101.3 degrees Fahrenheit (°F) for medically selected and acclimatized personnel; or greater than 100.4°F in unselected, unacclimatized workers; or
- Recovery heart rate at 1 minute after a peak work effort is greater than 120 beats per minute; or
- There are symptoms of sudden and severe fatigue, nausea, dizziness, or lightheadedness.

An individual may be at greater risk of heat stress if the following symptoms occur:

- Profuse sweating is sustained over several hours.
- Weight loss over a shift is greater than 1.5 percent of body weight.
- 24-hour urinary sodium excretion is less than 50 millimoles (ACGIH, 2011).

4.5.1.2 Heat Stress Prevention

The following practices will help prevent heat stress:

- Acclimatize workers to hot working conditions.
- Provide plenty of liquids to replace the body fluids lost by perspiration. Fluid intake should be forced because, under conditions of heat stress, the normal thirst mechanism is not adequate to bring about a voluntary replacement of lost fluids.
- Provide personal cooling devices.
- Conduct strenuous field operations in the early morning and provide shade when possible.

- Train personnel to recognize the signs and symptoms of heat stress, its prevention, and treatment.
- Rotate personnel to various job duties and establish adequate work/rest cycles.
- Provide shade or shelter during rest periods.

4.5.1.3 Heat Stress Treatment

Workers expressing the symptoms of heat stress shall notify the SSHO immediately. At the onset of heat related illness, activities must be halted and treatment initiated. Early detection and treatment of heat stress helps to prevent further serious illness or injury. Individuals that have experienced heat related illness could become more sensitive and predisposed to additional future heat stress related problems.

Heat exhaustion can be alleviated by having the affected person rest in a cool, shaded location and have them drink cool water. To cool down the affected person's body:

- Remove impermeable PPE.
- Remove worker from direct sunshine.
- Apply copious amounts of cool, not cold, water on them.
- Have them drink cool water, not cold, if conscious.

4.5.1.4 Heat Stroke Treatment

Heat stroke is a true medical emergency. In a heat stroke situation, the body must be cooled immediately to prevent severe injury or death – medical attention must be immediately obtained. The following shall be performed if heat stroke is suspected:

- Transportation of the victim to a medical facility must not be delayed – seek immediate medical attention.
- Apply cold packs, if available; place under the arms, around the neck, or any other place where they can cool large surface blood vessels.
- If transportation to a medical facility is delayed, reduce body temperature by immersing victim in a cool water bath (however, be careful not to over-chill the victim once body temperature is reduced below 102°F). If this is not possible, continuously douse victim with cool water and fan for evaporative cooling.

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Draft • Revision 0 • November 2011 • WERC-09-13-002-3

4.5.1.5 Acclimatization

Physiologically adjusting or acclimatizing personnel to hot conditions is extremely important. Supervisors shall provide the necessary time for adequate worker acclimatization, due to each individual's physical condition and his or her ability to work in hot and humid environments.

4.5.1.6 Physiological Monitoring

Adequate work/rest periods shall be implemented as necessary to prevent heat stress on personnel. However, since individuals vary in their susceptibility to heat stress, Shaw will also utilize physiological monitoring to aid in measuring each individual's response to heat stress. The initiation of physiological monitoring will be required when employees are working in environments exceeding 90°F ambient air temperatures. Physiological monitoring is also required when ambient temperatures exceed 70°F and impermeable garments are worn. Ambient air temperatures shall be recorded on the Ambient Air Temperature Log (Appendix D) when ambient temperatures exceed 70°F. The two physiological parameters that each individual will monitor are as follows:

- Heart Rate—Each individual will count his/her radial (wrist) pulse as early as possible during each rest period. If the heart rate of any individual exceeds 75 percent of their calculated maximum heart rate (maximum heart rate equals 200 minus age) at the beginning of the rest period, then the work cycle will be decreased by one-third. The rest period will remain the same. An individual is not permitted to return to work until his/her sustained heart rate is below 75 percent of their calculated maximum heart rate.
- Body Temperature—Each individual will measure his/her body temperature with an intra-aural (ear) thermometer, as directed by the thermometer manufacturer's instructions, as early as possible in the first rest period. If the temperature exceeds 99.6°F at the beginning of the rest period, then the work cycle shall be decreased by one-third. The rest period will remain the same.

An individual is not permitted to return to work if his/her temperature exceeds 100.4°F. Physiological monitoring data will be recorded on the Employee Physiological Monitoring Record for Heat Stress (Appendix D).

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Draft • Revision 0 • November 2011 • WERC-09-13-002-3

4.5.1.7 Training

Personnel, including subcontractor employees, who may be exposed to hot working environments shall be trained on the following:

- Employees:
  - Sources of heat stress, influence of protective clothing, and importance of acclimatization.
  - How the body handles heat.
  - Heat-related illnesses and their recognition (signs and symptoms).
  - Preventive/corrective measures.
  - Individual factors, such as age, weight, gender, level of acclimatization, etc. that may predispose some workers to heat stress.
  - Medical conditions and use of prescription drugs, such as beta blockers, that may modify a worker's ability to adapt physiologically to heat stress.
  - Physiological monitoring, record keeping of oral temperature/pulse, and establishment of work-rest regimes.
  - First aid procedures.
- Supervisors:
  - Physiological monitoring, record keeping of oral temperature/pulse, and establishment of work-rest regimes.
  - First aid procedures.

4.5.2 Ticks and Tick-Borne Diseases

Working in tall grass, especially in or at the edge of wooded areas, increases the potential for ticks to bite workers. Ticks can be particularly numerous in the spring and fall. Ticks are vectors of many different diseases including Rocky Mountain spotted fever, Q fever, ehrlichiosis, tularemia, Colorado tick fever, Lyme, and Lyme like disease. Ticks attach to the skin and intravenously feed on blood, creating an opportunity for disease transmission.

The symptoms of tick-borne diseases are high fever, head and joint aches, nausea, and vomiting. Additionally, persons infected with Rocky Mountain spotted fever may develop a red, spotty rash. Symptoms of tularemia may also include occasional cough, chest pain, swollen lymph glands, and severe pneumonia. Lyme disease usually (60 to 80 percent of the cases) presents a distinctive bull's eye rash at the site of the bite in addition to flu-like

symptoms and swollen lymph nodes. If tick-borne diseases are not properly treated with the appropriate antibiotic(s), then arthritis, heart disease, brain/nerve disorders, liver damage, and kidney damage are possible.

Wearing long-sleeved, light-colored shirts, light-colored trousers tucked into the socks, and the use of insect repellent containing N,N-Diethyl-m-toluamide (DEET) help prevent tick bites.

Periodically during the workday, employees should inspect themselves for the presence of ticks. If a tick is discovered, the following procedure should be used to remove it:

- Do not try to detach a tick with your bare fingers; bacteria from a crushed tick may be able to penetrate even unbroken skin. Fine-tipped tweezers should be used.
- Grip the tick as close to your skin as possible and gently pull it straight away from you until it releases its hold.
- Do not twist the tick as you pull and do not squeeze its body. That may actually inject bacteria into your skin.
- Thoroughly wash your hands and the bite area with soap and water, and then apply an antiseptic to the bite area.
- Save the tick in a small container noting the date and the location on the body of the bite.
- Notify the SSHO and HSM of any tick bites as soon as possible.

All personnel sustaining a tick bite should consult a physician. Consult http://www.osha.gov for more information concerning ticks and tick-borne illnesses.

4.5.3 Chiggers

Chiggers may be a problem while working at some project locations. Chiggers, also known as “red-bugs” or “harvest mites,” are the immature stages of a tiny red mite. They inhabit areas of tall grass, associated with low, wet spots, ponds and stream banks, wild berry patches, and forest underbrush. The larvae attach themselves to the clothing of people or to the fur of passing animals. Before settling down to feed, chiggers move to a constriction, such as sock tops, waistbands, or armpits. Feeding chiggers inject a salivary fluid, which dissolves the host’s cells, and then they suck up the liquefied tissue. Within a few hours, small, reddish, intensely itching welts appear. These bites may continue to itch for several days up to 2 weeks after the chigger is dislodged. Following are suggestions that should provide some protection from chiggers:

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Draft • Revision 0 • November 2011 • WERC-09-13-002-3

- Stay out of areas where chiggers are likely to be present including wood lots, pastures, roadside ditches, or other areas with tall grasses and weeds. Chiggers are especially common in moist low-lying areas.
- Wear loose-fitting clothing (if possible) when working outdoors. Vehicles should be frequently vacuumed to reduce the number of chiggers that may have been deposited.
- Apply a repellent containing DEET to shoes, socks, and trousers before entering chigger-infested areas. Caution: some individuals may be sensitive to DEET – always read and follow label directions.
- Immediately after possible exposure to chiggers, take a bath, thoroughly scrubbing the body with hot soapy water. This will kill or dislodge many of the chiggers. The clothes that were worn when the bite(s) occurred should be placed in a plastic bag for temporary storage until they can be laundered.
- When bites begin to itch, one course of treatment is to apply rubbing alcohol, followed by one of the nonprescription local anesthetics. A baking soda paste, calamine lotion, or product such as “After-Bite” or “Chigarid” also will help reduce discomfort. Avoid scratching bites since this only increases irritation and may lead to a secondary infection of the bite.

4.5.4 Rodents

Potential exists for exposure to microbiological hazards such as viruses that may be present in rodent feces. Hantavirus pulmonary syndrome is a deadly disease transmitted by infected rodents through urine, droppings, or saliva. Humans can contract the disease when they breathe in the aerosolized virus. Hantavirus pulmonary syndrome was first recognized in 1993, and has since been identified throughout the United States. The Hantavirus is known to be present in New Mexico. The HSM shall be contacted prior to working in areas where rodent droppings have been observed and may be disturbed. No work shall be performed in areas where rodent droppings are observed until the appropriate precautions have been taken.

4.5.5 Poisonous Plants

Three or five leaves radiating from a stem identify poison ivy, poison oak, and poison sumac. Poison ivy is in the form of a vine (and sometimes low-lying) while oak and sumac are bush-like. All of these plants can produce a delayed allergic reaction. The plant tissues have an oleoresin, urushiol, which is active in live, dead, and dried parts. The urushiol may be carried through smoke, dust, contaminated articles, and the hair of animals. Additionally, when operating a chain saw to clear brush in the winter or early spring, saw dust may be contaminated with enough urushiol to cause a severe rash. Symptoms usually occur 24 to

48 hours after exposure resulting in rashes that itch and blister. Should exposure to any of these plants occur, perform the following:

- First, cleanse exposed skin with generous amounts of isopropyl (rubbing) alcohol. (Avoid returning to the area of the poison ivy on the same day. Alcohol removes your skin's protection along with the urushiol and any new contact will cause the urushiol to penetrate twice as fast.)
- Second, wash skin with water. (Water temperature does not matter; if you're outside, it's likely only cold water will be available.)
- Third, take a regular shower with soap and warm water. Do not use soap before this point because "soap will tend to pick up some of the urushiol from the surface of the skin and move it around."
- Clothes, shoes, tools, and anything else that may have been in contact with the urushiol should be wiped off with alcohol and water. Be sure to wear gloves or otherwise cover your hands while doing this and then discard the hand covering.

The Food and Drug Administration considers over-the-counter topical corticosteroids (commonly called hydrocortisones under brand names such as Cortaid and Lanacort) safe and effective for temporary relief of itching associated with poison ivy. The best preventative measure for poisonous plants is recognition and avoidance. The use of disposable gloves and Tyvek® coveralls is recommended to help prevent skin contact with these plants.

4.5.6 Flying Insects

Flying insects such as mosquitoes, wasps, hornets, and bees may be encountered while working at project sites. Personnel who are allergic to bee stings should notify their supervisor and the SSHO. A voluntary Allergy/Sensitivity Questionnaire (Appendix D) may be completed by employees to help identify personnel who are allergic or sensitive to insect bites or stings. Mosquito bites can be effectively prevented by the use of insect repellants containing DEET. Insect repellant containing DEET shall be available to personnel while working on site. Additionally, special insecticide preparations, such as Repel Permanone, shall be available for treating worker's clothing. Commercially prepared ointments for treatment of insect bites and bee stings shall be available on site. All personnel shall immediately report any bee stings to their supervisor and the SSHO.

4.5.7 Spiders

Personnel shall be alert to the potential for spider bites. Spiders sometimes establish residence in dark places, stored clothing, and PPE. It is advisable for personnel to inspect

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Draft • Revision 0 • November 2011 • WERC-09-13-002-3

clothing and PPE for spiders prior to donning. If a spider bite is sustained, personnel shall report it to the SSHO.

4.5.8 Snakes

In North America the venomous snakes are rattlesnakes, copperheads, water moccasins and coral snakes. In New Mexico, rattlesnakes and copperheads are the most prevalent venomous snakes. Snakes typically are found in underbrush and tall grassy areas. Do not attempt to catch a snake.

If a person is bitten by a snake, wash and immobilize the injured area, keeping it lower than the heart if possible. Seek medical attention immediately and notify the SSHO.

4.5.9 Sunburn

Personnel working in direct sunlight, are encouraged to wear wide-brim hats (where hard hats are not a requirement) and apply sunscreen to all unprotected skin surfaces. The benefits of preventing sunburn and skin cancer are self-evident. Sunscreen will be provided for use by project personnel while working on site.

4.5.10 Inclement Weather

Inclement weather can pose hazards to project personnel. The Construction Manger or SSHO will evaluate weather conditions each day and take the appropriate precautions to minimize the hazards associated with the weather. Additional information on severe weather is provided in Section 11.9.

4.5.11 High Winds

If high winds are anticipated or underway, the following precautions shall be taken:

- Secure lightweight or loose items.
- Avoid handling items with large surface areas, such as plywood and polyethylene sheeting.
- Use caution and keep a firm grip when opening doors.
- Wear dust proof goggles if dust and soil particles are airborne.
- If cranes are being used, follow manufacturer recommendations for operating in wind.

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Draft • Revision 0 • November 2011 • WERC-09-13-002-3

4.5.12 Heavy Rain

Most outdoor activities will be suspended during heavy rain. Personnel shall not work outdoors if heavy rain is accompanied by lightning (Section 11.9.2). Personnel shall exit all excavations until inspected by a competent person; excavations shall be inspected with a higher frequency during periods of heavy rain. Electric tools and equipment shall not be used outdoors while raining, unless designed for use under wet conditions.

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Draft • Revision 0 • November 2011 • WERC-09-13-002-3

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Draft • Revision 0 • November 2011 • WERC-09-13-002-3

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5.0 PERSONAL PROTECTIVE EQUIPMENT

When engineering and administrative controls are not feasible or adequate to protect personnel from the hazards associated with project activities, PPE use will be required.

5.1 Levels of Protection

The following are general and typical descriptions of the PPE that will be required during project activities. The EPA terminology for levels of PPE is used: Levels A, B, C, and D.

5.1.1 Level A Protection

Level A protection use is not anticipated during this project.

5.1.2 Level B Protection

Level B protection use is not anticipated during this project; however, Level B protection use may be required during activities when engineering controls are necessary but ineffective at maintaining the concentration of hazardous substances to below action levels in the work area and/or breathing zone of personnel. Level B protection use may also be required for Confined Space Entries. The HSM shall be contacted prior to all Confined Space Entries.

Level B PPE, in general, consists of the following:

- Supplied air respirator (SAR): airline respirators with 5-minute egress bottles or self-contained breathing apparatus.
- Work clothing as prescribed by weather.
- Hard hats meeting ANSI Z89.1 specifications.
- Safety-toed work boots meeting ANSI Z41 specifications.
- Nitrile surgical gloves (inner or double layer).
- Chemical gloves (outer, as necessary).
- Disposable Tyvek® coveralls with hoods, elastic wrists, and ankles (as necessary).
- Tychem® SL coveralls with hoods, elastic wrists, and ankles (if contact with light non-aqueous phase liquid [LNAPL] or dense nonaqueous phase liquid [DNAPL] is possible).
- Tychem® QC coveralls with hoods, elastic wrists, and ankles (if contact with slightly contaminated groundwater or slightly contaminated wet soil is possible).

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Draft • Revision 0 • November 2011 • WERC-09-13-002-3

- Chemical resistant boot covers and/or outer boots (polyvinyl chloride [PVC]/latex/neoprene when there is potential for shoe/boot contact with contaminated soil or water).
- Hearing protection (if necessary or required).
- High visibility vests (when working near vehicular traffic).
- Splash shield (if necessary).
- Type III or Type V personal flotation device (PFD) (when working next to or over water and a drowning hazard exists).
- Work gloves, such as leather, cotton, or other material that provides cut/abrasion resistance (as necessary).

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Draft • Revision 0 • November 2011 • WERC-09-13-002-3

5.1.3 Level C Personal Protective Equipment

Level C PPE shall be worn by personnel if air monitoring action levels are exceeded, or as directed by the SSHO. Level C protection generally consists of the following PPE:

- Full-face air purifying respirator (APR) with NIOSH-approved combination high efficiency particulate air/organic vapor cartridges.
- Work clothing as prescribed by weather.
- Hard hats meeting ANSI Z89.1 specifications.
- Safety-toed work boots meeting ANSI Z41 specifications.
- Nitrile surgical gloves (inner or double layer).
- Chemical gloves (outer, as necessary).
- Disposable Tyvek® coveralls with hoods, elastic wrists, and ankles (as necessary).
- Tychem® SL coveralls with hoods, elastic wrists, and ankles (if contact with LNAPL or DNAPL is possible).
- Tychem® QC coveralls with hoods, elastic wrists, and ankles (if contact with slightly contaminated groundwater or slightly contaminated wet soil is possible).
- Chemical resistant boot covers and/or outer boots (PVC/latex/neoprene when there is potential for shoe/boot contact with contaminated soil or water).
- Hearing protection (if necessary or required).
- High visibility vests (when working near vehicular traffic).
- Splash shield (if necessary).

- Type III or Type V PFD (when working next to or over water and a drowning hazard exists).
- Work gloves, such as leather, cotton, or other material that provides cut/abrasion resistance (as necessary).

5.1.4 Level D – Modified Protection

Level D – modified PPE shall be worn by personnel for certain tasks or as directed by the SSHO. Level D – modified protection generally consists of the following PPE:

- Work clothing as prescribed by weather.
- Hard hats meeting ANSI Z89.1 specifications.
- Safety-toed work boots meeting ANSI Z41 specifications.
- Safety glasses with side shields meeting ANSI Z87.1 specifications.
- Nitrile surgical gloves (inner or double layer).
- Chemical gloves (outer, as necessary).
- Disposable Tyvek® coveralls with hoods, elastic wrists, and ankles (as necessary).
- Tychem® SL coveralls with hoods, elastic wrists, and ankles (if contact with LNAPL or DNAPL is possible).
- Tychem® QC coveralls with hoods, elastic wrists, and ankles (if contact with slightly contaminated groundwater or slightly contaminated wet soil is possible).
- Chemical resistant boot covers and/or outer boots (PVC/latex/neoprene when there is potential for shoe/boot contact with contaminated soil or water).
- Hearing protection (if necessary or required).
- High visibility vests (when working near vehicular traffic).
- Splash shield (if necessary).
- Type III or Type V PFD (when working next to or over water and a drowning hazard exists).
- Work gloves, such as leather, cotton, or other material that provides cut/abrasion resistance (as necessary).

Employees working in areas where electrical hazards are present shall be provided with, and shall use, protective equipment as required by Section 130.7 of NFPA 70 E (2004) that is

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Draft • Revision 0 • November 2011 • WERC-09-13-002-3

designed and constructed for the specific part of the body to be protected and for the work to be performed.

5.1.5 Level D Protection

Level D protection is the minimum level of protection that will be used for activities at the project. Level D PPE shall, at a minimum, consist of:

- Safety-toed work boots meeting ANSI Z41 specifications.
- Safety glasses with side shields meeting ANSI Z87.1 specifications.
- Hard hats meeting ANSI Z89.1 specifications.
- Hearing protection (if necessary or required).
- High visibility vests (when working near vehicular traffic).
- Type III or Type V PFD (when working next to or over water and a drowning hazard exists).
- Work gloves, such as leather, cotton, or other material that provides cut/abrasion resistance (as necessary).

5.2 Respiratory Protection

Respiratory protection equipment shall be NIOSH-approved and respirator use will conform to ANSI Z88.2 and OSHA 29 CFR 1910.134 requirements. Shaw Procedure No. HS601, "Respiratory Protection Program," details the medical qualification and training requirements, as well as the selection, use, inspection, cleaning, maintenance, storage, and fit testing of respiratory protection equipment. This procedure complies with the requirements contained within 29 CFR 1910.134.

All personnel (including visitors) using respiratory protection, shall possess a written opinion by the medical examiner of the person's ability to use the necessary respiratory protective equipment and shall have successfully passed a respirator fit test (Section 5.2.3) in accordance with Shaw Procedure No. HS601 within the last 12 months. Fit testing and any training related to respiratory protection for site personnel will be documented on the Training Acknowledgment Form (Appendix D).

5.2.1 Respirator Cartridge Change-out Schedule

The cartridge change-out schedule is largely based on the concentrations of the site contaminants. The cartridge change-out schedule shall be determined for each task by the HSM or SSHO and documented on the Job Safety Analysis. In general, workers will change

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Draft • Revision 0 • November 2011 • WERC-09-13-002-3

the filter cartridges when breathing resistance is noted or when workers notice any odor, irritation, or discomfort. Cartridges shall be changed at a minimum of once per day.

5.2.2 Respirator Inspection and Cleaning

Respirators shall be checked periodically by a qualified individual and inspected before each use by the wearer. All respirators and associated equipment will be decontaminated and hygienically cleaned after each use.

5.2.3 Respirator Fit Testing

Annual respirator fit tests are required of all personnel wearing negative-pressure respirators. The test will use isoamyl acetate or irritant smoke. The fit test must be for the style and size of the respirator to be used. Quantitative fit-testing is required for use of respirators in chemical environments where the respirator effective use limit exceeds 10 (exposure of 1 ppm inside the respirator for 10 ppm outside the respirator). Therefore, quantitative fit-testing is dependent on the PEL/TLV of the chemical substance involved. Quantitative fit-testing is required for potential exposure to airborne particulate levels that exceed 10 times the established PEL/TLV.

5.2.4 Facial Hair

No personnel who have facial hair, which interferes with the respirator's sealing surface, will be permitted to wear a respirator and will not be permitted to work in areas requiring respirator use.

5.2.5 Corrective Lenses

Normal eyeglasses cannot be worn under full-face respirators because the temple bars interfere with the respirator's sealing surfaces. For workers requiring corrective lenses, special spectacles designed for use with respirators will be provided.

5.2.6 Medical Certification

Only workers who have been certified by a physician as being physically capable of respirator usage will be issued a respirator. Personnel unable to pass a respiratory fit test or without medical clearance for respirator use will not be permitted to enter or work in areas on site that require respiratory protection. Employees will receive a written physicians opinion that they are fit for general hazardous waste operations as per 29 CFR 1910.120(f)(7).

5.3 Activity-Specific Levels of Protection

The required level of personal protection is specific to the activity being conducted and are outlined in Table 3. Levels of PPE are subject to change or to modification. Upgrading of

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Draft • Revision 0 • November 2011 • WERC-09-13-002-3

PPE may occur when air monitoring action levels are exceeded or when specified by the SSHO. Levels of PPE shall not be downgraded without prior approval from the HSM.

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Draft • Revision 0 • November 2011 • WERC-09-13-002-3

6.0 SITE CONTROL AND WORK ZONES

The purpose of site control is to minimize chemical exposures to workers, protect the public from hazards due to site activities, and prevent vandalism. The work areas that pose chemical and physical hazards to personnel may be regarded as regulated or restricted. To prevent both exposures to unprotected personnel and migration of contamination due to tracking by personnel or equipment, work areas known to contain contamination will be clearly identified.

Shaw Environmental, Inc. will designate work zones at the project as suggested in *Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities* (NIOSH et al., 1985). Regulated work areas are divided into the following three zones:

- EZ;
- CRZ; and
- Support Zone

6.1 Exclusion Zone

The EZ is, in general, the area where chemical, physical, or other hazards occur/exist during project work. All employees are required to follow the established procedures when working in these areas. Fencing, banner tape, signs, or other appropriate means will identify the location of each EZ. An Exclusion Zone Entry log shall be maintained by the SSHO.

6.2 Contamination Reduction Zone

Personnel and equipment decontamination will be performed in the CRZ. All personnel and equipment entering or leaving an EZ will pass through the CRZ in order to prevent cross contamination and for the purpose of accountability. Personal protective equipment will be removed in the CRZ, cleaned, and properly stored or disposed of. All water generated from equipment and personal decontamination will be contained on site and disposed of in an appropriate manner.

6.3 Support Zone

The Support Zone, or clean zone, will be the area outside the EZ and CRZ and within the geographic perimeters of the site. The Support Zone is used for staging of materials, parking of vehicles, office facilities, sanitation facilities, and receipt of deliveries. Eating, drinking, and smoking will only be allowed in this area.

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Draft • Revision 0 • November 2011 • WERC-09-13-002-3

6.4 Project Site Security

All equipment shall be locked when project personnel are not present.

6.5 Site Entry Requirements

In order to allow an individual into regulated areas of the site (i.e., EZ and CRZ) he/she must meet the following requirements:

- Documentation of completing training requirements as described in Section 9.0 (including review of this SSHP and signing off as such).
- Documentation of completing medical surveillance requirements as described in Section 10.0.
- Respiratory fit testing, as necessary (Section 5.2.3).
- Attend the site-specific safety orientation training session (Section 9.4).
- Review the specific AHA(s) (Appendix C).
- Obtain authorization from SSHO.
- Don the appropriate PPE.
- Sign the site entry log.

6.6 Posting Site

Appropriate warning signs shall be strategically placed to give adequate warning and caution of hazards, instructions, and directions to workers and non-project personnel.

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Draft • Revision 0 • November 2011 • WERC-09-13-002-3

7.0 PERSONAL HYGIENE AND DECONTAMINATION

Decontamination of equipment and personnel will be performed to limit the migration of contaminants off site and between work zones. Decontamination will generally occur at the edge of an EZ. This section describes the necessary procedures for personnel and equipment decontamination. In general, everything that enters the EZ at the site shall either be decontaminated or properly discarded upon exit from the EZ. All personnel shall enter and exit an EZ through a CRZ.

7.1 Personnel Decontamination

Personnel decontamination consists of discarding disposable PPE, cleaning reusable PPE, and washing the hands and face. All personnel shall wash hand and face prior to eating, drinking, or using tobacco products.

7.1.1 Decontamination Procedures for Level D – Modified Personal Protective Equipment

In general, the personnel decontamination procedure for activities conducted in Level D – modified consists of personnel discarding disposable PPE, washing reusable PPE, then washing hands and face. In some circumstances, disposable wet napkins may be used in the field to wash hands and face until personnel have access to potable water.

7.1.2 Decontamination Procedures for Level C Personal Protective Equipment

The general decontamination sequence for activities conducted at Level C is as follows:

- Wash and rinse outer gloves and boots;
- Remove and rinse hard hat;
- Remove tape at wrist, boot, and hood interface;
- Remove outer gloves and boot covers;
- Remove APR, discard cartridges (if necessary), clean APR;
- Remove coveralls;
- Remove inner gloves; and
- Wash hands and face.

Disposable gloves and coveralls will be removed by turning inside out. Ground cloths, gloves, boot covers, coveralls, and APR cartridges will be placed into plastic trash bags and

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Draft • Revision 0 • November 2011 • WERC-09-13-002-3

stored at the CRZ for disposal. Respirators shall be cleaned with potable water in the field after each use and shall be washed at the end of the day using a soap and water wash followed by disinfecting. Respirators shall be inspected before each use for damage, missing parts, and proper function. Other reusable protective equipment worn by personnel performing field activities will be rinsed with potable water after each use and will be cleaned at the end of each day in the manner described by the manufacturer. Reusable PPE items will be air dried and properly stored. Air purifying respirators shall be thoroughly dried and placed in plastic bags for storage.

7.1.3 Decontamination Procedures for Level B Personal Protective Equipment

The general decontamination sequence for activities conducted at Level B is as follows:

- Remove SAR;
- Stage mask and/or harness and bottle for cleaning;
- Wash outer gloves and boots;
- Rinse outer gloves and boots;
- Remove tape at wrist, boot, and hood interface;
- Remove outer gloves and boot covers;
- Remove and rinse hard hat;
- Remove coveralls;
- Move to respirator wash area; wash mask and other respirator components;
- Remove inner surgical gloves and discard; and
- Wash hands and face.

Disposable gloves and coveralls will be removed by turning inside out. Ground cloths, gloves, coveralls, and gloves will be placed into plastic trash bags and stored at the CRZ for disposal. Respirators shall be cleaned with potable water in the field after each use and shall be washed at the end of the day using a soap and water wash followed by disinfecting and rinsing. Respirators shall be inspected before each use for damage, missing parts, and proper function. Other reusable PPE worn by personnel performing field activities will be rinsed with potable water after each use and will be cleaned at the end of each day in the manner described by the manufacturer. Reusable PPE items will be air dried and properly stored. All SAR masks shall be thoroughly dried and placed in plastic bags for storage.

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Draft • Revision 0 • November 2011 • WERC-09-13-002-3

7.2 Suspected Contamination

Any employee suspected of experiencing skin or clothing contact with a hazardous chemical is to remove affected clothing (as modesty permits and exposure warrants), thoroughly wash the affected area(s), and don clean clothes. Following this, he/she shall report to the SSHO.

7.3 Procedures for Equipment Decontamination

Equipment contacting contaminated soil or water will be pressure washed, dry brushed, wet-wiped, or washed with detergent and water. All wash waters will be collected for treatment or disposal, as required. Equipment decontamination will be conducted prior to removing equipment from the work area. The SSHO (or designee) will inspect all equipment leaving the site for adequacy of decontamination (visually clean unless otherwise specified).

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Draft • Revision 0 • November 2011 • WERC-09-13-002-3

7.4 Decontamination Equipment and Supplies

Decontamination equipment and supplies may consist of, but are not limited to, the following:

- Potable water;
- Washtubs;
- Non-phosphate detergent, such as Alconox;
- Brushes, hand sprayers;
- Pressure or steam washer;
- Paper towels;
- Plastic sheeting;
- 5-gallon buckets with lids;
- Garbage bags;
- 55-gallon drums or similar container for collection of decontamination fluids; and
- Labels or paint sticks for marking contents of containers.

7.5 Procedures for Emergency Decontamination

In the event of an accident and if immediate medical treatment is required to save a life, decontamination should be delayed until the victim is stabilized. Proceed with decontamination if it can be performed without interfering with essential life-saving techniques or first aid. If a worker has been exposed to corrosive materials such as sample preservative or battery acid, decontamination must be performed immediately. If an

emergency due to a heat related illness develops, protective clothing should be removed from the victim as soon as possible to reduce further stress.

If decontamination can be done:

- Wash, rinse, and/or remove protective clothing and equipment.

  Note: In the event that corrosive materials get in the eyes, first aid personnel should begin to administer a 15-minute eye irrigation with water while Emergency Medical Service (EMS) personnel are responding to the incident. Similarly, if a corrosive material is on an injured employee's skin, first aid personnel should flush the material off of the skin in conjunction with other first aid procedures being administered. Emergency Medical Service personnel should always be summoned as quickly as possible so as not to delay professional medical treatment.

If decontamination cannot be done:

- Alert medical personnel to potential contamination and instruct them about specific decontamination procedures, if necessary.
- Provide site personnel familiar with the incident at the medical facility.

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Draft • Revision 0 • November 2011 • WERC-09-13-002-3

8.0 ENVIRONMENTAL AND AMBIENT AIR MONITORING PROGRAM

Environmental and ambient air monitoring shall be conducted to determine the concentrations of toxic/flammable/combustible vapors and gases, oxygen, noise levels, and meteorological conditions. Ambient air monitoring is primarily used to verify that administrative controls, engineering controls, and PPE are effectively preventing harmful exposures to project personnel. Meteorological data shall be obtained as necessary for determining if physiological monitoring should be activated. The results of monitoring shall be conveyed to project personnel.

8.1 Types of Monitoring

The following monitoring will be performed as necessary:

- Real-time air monitoring
- Time-integrated personal air sampling
- Noise surveys/noise dosimetry

Refer to Table 4, "Direct Reading Air Monitoring Requirements."

8.1.1 Real-Time Air Monitoring

Real-time air monitoring will be conducted during intrusive work (drilling and excavation) in areas that are known or suspected to have chemical contamination or in areas where dust is generated. This type of monitoring will also be performed for soil and waste handling, and in special circumstances such as confined space entry, hot work (permitting), or during spills. The SSHO may use the following real-time instrumentation during the project:

- Photoionization detector for volatile organic compounds monitoring.
- Oxygen meter to measure for oxygen deficient/enriched atmospheres.
- Combustible gas indicator for flammable/combustible atmospheres.
- Hydrogen sulfide meter for measuring hydrogen sulfide concentrations.
- Carbon monoxide meter when internal combustion engines are operated near confined spaces while personnel are working in those spaces and in or near other poorly ventilated areas.
- Colorimetric tubes when working in areas that may potentially contain vinyl chloride and/or benzene.

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Draft • Revision 0 • November 2011 • WERC-09-13-002-3

- Aerosol monitor for measuring dust concentrations from dust generating activities.
- HazmatCAD with Chemical Agent detectors for site with possible CWM

8.1.1.1 Photoionization Detector

A Photovac 2020 photoionization detector, or equivalent, shall be used to determine the concentration of volatile organic compounds in the breathing zone of personnel. Lamp strength will be determined based on the primary contaminants of concern at each remedial site. Monitoring using this instrument will be conducted in the breathing zone of personnel who are performing intrusive work or in some instances, prior to and during confined space entry, during hot work or cleanup of chemical or fuel spills.

8.1.1.2 Combustible Gas Indicator/Oxygen Meter/Hydrogen Sulfide Meter/Carbon Monoxide Meter

An MSA Model FiveStar, or equivalent, shall be used to determine the concentration of flammable gases, oxygen, hydrogen sulfide, and carbon monoxide in the breathing zone of personnel prior to and during activities that include confined space entry, hot work and or cleanup of chemicals or fuel spills.

8.1.1.3 Colorimetric Detector Tubes

Colorimetric tubes may be used to characterize acid/base exposure potentials primarily to benzene and vinyl chloride. As appropriate, the HSM will designate the use of these measurement devices. Based on the chemical of concern identified for the Cannon AFB, monitoring for vinyl chloride and benzene may be required at sites where chlorinated and fuel-related volatile organic compounds are known to exist.

The proposed type of colorimetric tubes will be the Drager Multi Glass Detector Model 21/31or Accuro. Colorimetric indicator tubes (detector tubes) that consist of a glass tube impregnated with an indicating chemical. The tube is connected to a piston or bellow pump to draw a know volume of air through the tube. Contaminant reacts with the indicator chemical in the tube, producing a change in color whose length is proportional to the contaminant concentration. The glass tube has degradations in ppm to match the length of stain. A preconditioning filter may precede the detector tube to remove interfering contaminants.

8.1.1.4 Real-Time Aerosol Monitor

Real-time aerosol monitors (MIE pDR-1000 or equivalent) shall be used to monitor dust emissions during and excavation and soil handling activities or other dust generating activities. The real-time aerosol monitors will be placed in the work area (near areas where ground personnel are working) and at the downwind site perimeter. The selected placement

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Draft • Revision 0 • November 2011 • WERC-09-13-002-3

of these instruments may need to be adjusted throughout the workday to compensate for changes of wind direction.

8.1.2 Real-Time Air Monitoring Action Levels

This section discusses the establishment of action levels of potential vapor and/or gas readings and dust concentrations which are measurable by real-time air monitoring instruments identified above. These action levels are presented in further detail in Table 4, "Direct Reading Air Monitoring Requirements."

Unexpected instrument readings at or above action levels generally warrant the following:

- All personnel will stop work in the area, exit the work area, and assemble upwind.
- Additional monitoring shall be performed to substantiate previous readings
- Implement engineering controls, as feasible.
- Upgrade level of PPE as specified or contact the HSM.

If previous readings are substantiated, engineering controls, such as increasing ventilation, shall be implemented to maintain air quality within specified levels or personnel shall upgrade to the specified level of protection (Table 3, "Task Protection Levels"). If engineering controls, such as increased ventilation, cannot maintain atmospheres to within acceptable qualities, then the HSM shall be contacted prior to continuing work activities.

8.1.2.1 Photoionization Detector Real-Time Action Levels

In general, site-specific volatile organic compound action levels will be established in addendums to this SSHP as the work plans are prepared. The action levels will be based on the most current data available for the media(s) of concern and will be protective of the personnel working at the sites. In the absence of a site-specific addendum for a particular location, the following action levels and response actions for volatile organic compounds will apply:

- Volatile organic chemical concentration greater than 2 ppm but less than 10 ppm sustained for 1 minute, in the breathing zone. Stop work and evaluate the hazard. Increase the monitoring frequency, provide engineering controls and upgrade PPE.
- Volatile organic chemicals concentration greater than 10 ppm but less than 50 ppm sustained for 5 seconds, in the breathing zone. Stop work, evaluate the hazard, and contact the HSM.

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Draft • Revision 0 • November 2011 • WERC-09-13-002-3

- Volatile organic chemicals concentration greater than 50 ppm sustained for 1 second, in the breathing zone. Stop work, evaluate the hazard, and contact the HSM.

8.1.2.2 Combustible Gas Indicator/Oxygen Meter/Hydrogen Sulfide Meter/Carbon Monoxide Meter

The following action levels are established for the collected air monitoring data:

- ***Combustible Gas.*** Greater than 10 percent of LEL, confirmed instantaneous reading requires personnel to evacuate work area, eliminate ignitions sources, and provide engineering controls such as increasing ventilation.
- ***Carbon Monoxide (work area).*** Sustained carbon monoxide readings exceeding 15 ppm requires personnel to evacuate work area and provide engineering controls such as increasing ventilation or re-positioning internal combustion engine exhausts downwind from work area.
- ***Hydrogen Sulfide (work area).*** Sustained hydrogen sulfide instrument readings exceeding 1 ppm requires personnel to evacuate work area and provide engineering controls such as increasing ventilation.
- ***Carbon Monoxide (work area):*** greater than 15 ppm, confirmed instantaneous reading requires personnel to evacuate work area and provide engineering controls such as increasing ventilation.

8.1.2.3 Colorimetric Detector Tubes

The following action levels are established for the collected air monitoring data:

- ***Vinyl Chloride (work area).*** Greater than 1 PPM, confirmed instantaneous reading requires personnel to evacuate work area and provide engineering controls such as increasing ventilation.
- ***Benzene (work area).*** Greater than 0,25 PPM, confirmed instantaneous reading requires personnel to evacuate work area and provide engineering controls such as increasing ventilation.

8.1.2.4 Real-Time Aerosol Monitor

The real-time aerosol monitors will be set to alarm when the instantaneous aerosol concentration reaches 1 mg/m^3. The alarm will be used to indicate that additional dust control is necessary.

The real-time aerosol monitors are capable of collecting and integrating the aerosol concentrations throughout the workday into a TWA. Aerosol monitors shall be visually

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Draft • Revision 0 • November 2011 • WERC-09-13-002-3

checked on an hourly basis during soil excavation, soil handling, and other dust generating activities to verify that the TWA remains below 1 mg/m^3. Aerosol monitors registering TWA aerosol concentrations at or above 2.5 mg/m^3 require that workers upgrade to Level C PPE and indicate that additional dust control measures are necessary. Failure to control workday TWA dust concentrations to below 2.5 mg/m^3 shall necessitate ceasing dust generating activities and contacting the Project Manager and HSM for implementing alternate work practices.

The full work shift time integrated concentrations will be evaluated at the conclusion of each workday to verify aerosol concentrations are maintained below action levels.

8.1.3 Personal Air Sampling (Time-Integrated)

Time-integrated air sampling may be performed at the discretion of the HSM, if air-monitoring action levels are exceeded (Section 8.1.2). Air samples will be collected and analyzed following OSHA or NIOSH methods. An American Industrial Hygiene Association accredited laboratory shall be used to analyze all personal air samples. The analytical results shall be reported as a TWA concentration for comparison against the OSHA PEL and ACGIH TLV.

8.1.4 Noise Surveys/Noise Dosimetry

The SSHO shall conduct noise monitoring with a Sound Level Meter when it is suspected that equipment is producing noise at sound pressure levels greater than 80 decibels. Areas that are surveyed at sound pressure levels greater than 85 decibels shall be posted as a noise hazard area. Actual employee exposures for personnel working in noise hazard areas shall then be determined with a noise dosimeter. The equipment/area shall then be evaluated to determine if it is feasible to implement engineering controls.

8.2 Calibration, Handling, and Maintenance

All monitoring equipment will be maintained and calibrated by according to the manufacturer's recommendations. Care shall be given by the operator to the handling of instruments so that the accuracy and fitness for use are maintained. Calibration checks on real-time monitoring instruments shall be performed using standards, which are National Institute of Standards and Testing traceable. Calibration for all instruments will be performed and documented before and after each use. Only properly functioning instrumentation shall be used. Instrument maintenance shall be tracked on the Master List of Measuring and Test Equipment form (Appendix D).

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Draft • Revision 0 • November 2011 • WERC-09-13-002-3

8.3 Record Keeping

The SSHO is responsible for maintaining all air and noise monitoring records. The SSHO shall also obtain copies of air and noise monitoring records generated by subcontractors for inclusion into project files. The following records shall be maintained:

- Date, time, location, and operations performed.
- Meteorological data.
- Equipment identification, calibration data.
- Monitoring/sampling data.
- Engineering controls used to reduce exposure.
- Description of PPE worn.

Specifically, the following air and noise monitoring data and calibration records (Appendix D) shall be maintained, controlled, and retrievable at all times by the SSHO:

- Air Monitoring Data Record.
- Air Sampling Data Record.
- Colorimetric Detector Tube Log.
- Employee Notification of Industrial Hygiene Monitoring Results.
- Real Time Aerosol Monitoring Log.
- Noise Dosimeter Field Data Log.
- Noise Survey Field Data Log.
- Sound Level Meter/Noise Dosimeter Calibration Log.

These records shall be maintained in the field office files by the SSHO and stored in the permanent project files. Any Employee Notification of Industrial Hygiene Monitoring Results records for Shaw personnel will be forwarded to the Shaw HSM for inclusion in personnel files when appropriate. Any Employee Notification of Industrial Hygiene Monitoring Results records for subcontractor personnel will be forwarded to the Subcontractor Human Resources Department (or equivalent safety records personnel) for inclusion in personnel files when appropriate.

8.4 Quality Assurance/Quality Control

Monitoring instruments shall be properly maintained and calibrated before and after use. The calibration and field maintenance of monitoring instruments shall be performed against known standards and manufacturer specifications. Instruments shall be calibrated to plus or minus 5 percent against the known standards. If instruments cannot be calibrated within this tolerance or if operation becomes erratic, then the instruments shall not be used and dispatched for maintenance by qualified and authorized technicians.

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Draft • Revision 0 • November 2011 • WERC-09-13-002-3

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Draft • Revision 0 • November 2011 • WERC-09-13-002-3

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9.0 TRAINING REQUIREMENTS

This section describes general training, safety meetings, site-specific training, hazard communication, first aid and CPR, and other additional training, certification, and licenses needed to work on the project sites.

9.1 General Training

The SSHO is responsible for informing all site personnel and all visitors of the contents of this SSHP and ensuring that each person signs off on the Site Safety and Health Plan Acknowledgment Form (Appendix A). Documentation of certification of training requirements will be reviewed by the SSHO, placed in the project files, and submitted to AFCEE (as required).

9.2 Hazardous Waste Operations Training

All site personnel working in regulated areas at this project will meet the minimum training requirements as specified in 29 CFR 1926.65 and 29 CFR 1910.120. The following criteria are used to determine the level of training required:

- Personnel engaged in hazardous substance removal or other activities, which expose or potentially expose them to hazardous substances and health hazards shall receive a minimum of 40 hours of instruction off site and 3 days of supervised field experience.
- Personnel who perform limited activities at the site and are not potentially exposed to contaminant levels above the PEL shall receive a minimum of 24 hours of instruction off site, and 1 day of supervised field experience.

9.2.1 40-Hour Training

The following is a general list of topics covered in the 40-hour course:

- General site safety.
- Chemical, physical, and environmental hazards.
- Key management positions responsible for site safety and health.
- Safety, health, and other hazards (including noise).
- PPE.
- Work practices by which employees can minimize risks from hazards.
- Safe use of engineering controls and equipment on site.

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Draft • Revision 0 • November 2011 • WERC-09-13-002-3

- Medical surveillance requirements including recognition of signs and symptoms of exposure.
- Hazard communication (Worker Right-to-Know).
- Engineering controls and safe work practices.
- Components of the site Safety and Health Program.
- Decontamination practices for personnel and equipment.
- Confined space entry procedures.
- Emergency response procedures.

9.2.2 24-Hour Training

The same topics presented in the 40-hour course are reviewed in the 24-hour course but with less time and detail spent on each topic.

9.2.3 Supervisory Training

Field supervisory personnel including the SSHO will receive 8 additional hours of specialized training. The following topics are discussed:

- Overall safety and health program.
- PPE program.
- Spill containment program.
- Health hazard monitoring procedures and techniques.

9.2.4 Refresher Training

Personnel covered by Sections 9.2.1 and 9.2.2 are required to complete 8 hours of refresher training annually on the following topics:

- Safe work practices.
- Chemical hazard awareness.
- Hearing conservation.
- Hazard communication.
- Respirator refresher.
- Confined space entry refresher.

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Draft • Revision 0 • November 2011 • WERC-09-13-002-3

9.2.5 Supervised Field Experience

Personnel covered by Section 9.2.1 will receive a minimum of 3 days actual field experience under the direct supervision of a trained, experienced supervisor. A minimum of 1 day is required for personnel who fall under the requirements of Section 9.2.2.

9.2.6 Visitor Training

Site access by personnel making deliveries or performing repairs to utilities, public or government officials, visitors, or local residents will be limited to support areas only. These persons will not be required to comply with the medical and training requirements as defined in this SSHP. Support Zone access will be limited to designated work, delivery, or observation areas to minimize any potential exposure to site contaminants. Site observation areas will be located upwind from the EZ. Weather conditions or other site activities may restrict access to these areas. Authorization for limited site access will be determined on a case-by-case basis by the SSHO in consultation with the HSM, Project Manager, the PDA, and the AFCEE. These personnel will be escorted on site and will be strictly prohibited from entering the EZ or CRZ.

9.3 Safety Meetings

Employees shall be provided continuing safety and health training to enable them to perform their work in a safe manner.

9.3.1 Morning Safety Meetings

The SSHO shall conduct a safety meeting at the beginning of each shift. The topics discussed at this daily "tailgate" safety meeting shall include safety and health considerations for the day's activities, pertinent aspects of JSAs, necessary PPE, problems encountered, and new operations. Attendance records and meeting notes shall be documented on the Safety Meeting/Training Log form (Appendix D) and are maintained with the project files. At the conclusion of each shift, a debriefing for site employees will be held, if necessary.

9.4 Site-Specific Training

All personnel, including subcontractors, working at the project sites and falling within the scope and application of 29 CFR 1926.65 and 29 CFR 1910.120 shall attend a site-specific orientation covering the following topics:

- Purpose and review of this SSHP including emergency response procedures as outlined in Section 11.0.
- The pertinent provisions for safety and health contained in *Safety and Health Requirements Manual EM 385-1-1* (USACE, 2008).

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Draft • Revision 0 • November 2011 • WERC-09-13-002-3

- Review of applicable AHAs (Appendix C).
- MEC awareness as appropriate.
- Names of personnel responsible for site safety.
- The provisions for medical care and facilities and the names of CPR and first aid trained personnel assigned to the project.
- Morning safety and preparatory meeting procedures.
- Safety and health hazards on site and the means to control/eliminate those hazards.
- Responsibilities for accident prevention and maintaining safe and healthful work environments.
- Stop Work authority.
- Procedures for reporting and correcting unsafe conditions or practices.
- Responsibilities for reporting all accidents and illnesses.
- PPE (use and care).
- Location of safety equipment (i.e., fire extinguishers, first aid kits, eyewash stations, etc.).
- Standard operating procedures, safety rules, and safe work practices for the project.
- Work zones and site control measures.
- Hazard Communication Program (includes discussion of MSDSs on site).
- Lead or asbestos awareness training (as appropriate).
- Hot work procedures.
- Lockout/tagout procedures.
- Fall protection.
- Fire prevention.
- Housekeeping.

The content of the training will be derived from information contained within this SSHP.

9.5 Hazard Communication

All personnel performing field activities involving hazardous operational chemicals shall receive basic hazard communication training, which involves a review of the Shaw written

hazard communication program, MSDSs, container labeling, chemical health hazards, and chemical hazard control procedures. Personnel shall be notified of the hazards of chemical contamination on site (if present) by a review of Section 4.1 of this SSHP. Material Safety Data Sheets for additional materials brought on site shall be reviewed with personnel prior to the use.

9.6 First Aid and Cardiopulmonary Resuscitation

There shall be at least two persons trained and certified in both American Red Cross first aid techniques and CPR on site whenever there are two or more employees working at the project. Those Shaw employees who are trained in first aid techniques and CPR will meet both the training and vaccination requirements of Shaw Procedure No. HS512, "Handling of Blood or Other Potentially Infectious Material."

9.7 Additional Training, Certification, and Licenses

In addition to the training, certification, and licensing previously detailed, the following shall also be required:

- All personnel operating motor vehicles shall hold a valid operator's license.
- All crane operators shall be designated as qualified meeting the specifications in the *Safety and Health Requirements Manual EM 385-1-1* (USACE, 2008). Qualification is to be renewed every 3 years.
- Personnel operating powered industrial trucks (forklifts) shall have a certificate designating them as a qualified operator.
- Any employee operating a power-actuated tool shall be qualified as an operator of that tool as specified by the manufacturer. Recertification, if any, shall be obtained as specified by the manufacturer.
- Confined space entry, attendant, and supervisory personnel shall be trained and certified as specified in 29 CFR 1910.146. Confined space rescue personnel shall be trained and certified as specified in 29 CFR 1910.146 and shall practice rescues (from similar types of confined spaces) on an annual basis.
- The certification and recertification requirements for first aid (3 years) and CPR (1 year) are applicable. First aid and CPR training/certification must be made by a reputable provider.
- Personnel working from ladders shall be initially trained as specified in Shaw Procedure No. HS302, "Portable Ladder Safety."

- Personnel inspecting cranes shall have a certificate designating them as a competent person.
- Personnel inspecting excavations shall have a certificate designating them as a competent person.
- Personnel supervising scaffold erection shall have a certificate designating them as a competent person.
- Personnel operating arc-welding equipment shall have a certificate designating them as a qualified operator.
- Personnel operating gas welding and cutting equipment shall have a certificate designating them as a qualified operator.
- Personnel may only use portable fire extinguishers to extinguish small fires, if the employee has been trained and the employee is confident that the small fire can be safely extinguished.

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Draft • Revision 0 • November 2011 • WERC-09-13-002-3

10.0 MEDICAL SURVEILLANCE

Shaw utilizes the services of an Occupational Medicine physician for the medical surveillance requirements of all projects. Dr. William Nassetta (below) reviews all Shaw medical examinations and is available for medical consultation on an "as needed" basis.

Dr. William Nassetta, MD, MPH
CORE Health Networks
12091 Bricksome Avenue
Suite B
Baton Rouge, Louisiana 70816
1-(877) EHS-SHAW (1-877-347-7429)
(225) 614-9561 (office)
(225) 295-4846 (fax)

Subcontractors should also utilize the services of an occupational medicine physician of their choice to meet any medical surveillance requirements.

10.1 Medical Examination

As required by Shaw Procedure No. HS100, "Medical Policies and Procedures," all personnel on site with the potential for exposure to contamination will have successfully completed a pre-placement or periodic/updated physical examination, as required by OSHA regulations.

10.1.1 Pre-Placement Examination

On-site personnel with the potential for exposure to contamination shall undergo a pre-placement examination that complies with 29 CFR 1926.65, 29 CFR 1910.120, and *Safety and Health Requirements Manual EM 385-1-1* (USACE, 2008) requirements for hazardous waste site operations and hazardous, toxic, and radioactive waste activities. Specifically, the following on-site personnel shall be required to participate in this medical surveillance program:

- All employees who are or may be exposed to hazardous substances or health hazards at or above the established PEL, above the published exposure levels for these substances, without regard to the use of respirators, for 30 days or more than a year.
- All employees who wear a respirator for 30 days or more a year or as required by 29 CFR 1910.134.

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Draft • Revision 0 • November 2011 • WERC-09-13-002-3

- All employees who are injured, become ill, or develop signs or symptoms due to possible overexposure involving hazardous substances or health hazards from an emergency response or hazardous waste operation.
- Members of HAZMAT teams.

Pre-placement medical examinations consist of the following:

- Medical and occupational history questionnaire, which includes information on past gastrointestinal, hematological, renal, cardiovascular, reproductive, immunological, and neurological problems.
- Physical examination.
- Chest X-ray (no more frequently than every 4 years).
- Blood pressure.
- Complete blood count and differential to include hemoglobin and hematocrit determinations, red cell indices, and smear of peripheral morphology.
- Blood urea nitrogen and serum creatinine.
- Sequential Multiple Analyzer Computer Profile (SMAC 24).
- Pulmonary function test.
- Audiogram.
- Electrocardiogram for employees over 35 years old or when other complications indicate the necessity.
- Stress test (as directed by the occupational physician based on electrocardiogram/pulmonary function testing).
- Visual acuity.
- Urinalysis, as necessary, for metals.

The medical surveillance provided to the employee includes a written opinion by the medical examiner of the employee's ability to use the necessary respiratory protective equipment. Any employee found to have a medical condition, which could directly or indirectly be aggravated by exposure to any chemical substance present, or by the use of respiratory equipment will not be employed for the project. A copy of the medical examination shall be provided at the employee's request.

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Draft • Revision 0 • November 2011 • WERC-09-13-002-3

The employee will be informed of any medical conditions that would result in work restriction or that would prevent them from working at hazardous waste sites.

10.1.2 Annual Exam

Site personnel may be required to receive an annual, updated exam meeting the requirements of 29 CFR 1926.65 and 29 CFR 1910.120. The results of these exams are compared to previous results and the baseline physical to determine if any medical effects due to exposure have occurred. Appropriate actions shall be taken as recommended by the physician should the results indicate an exposure; otherwise, employees are cleared for continued work.

In general, an annual exam is required when the employee meets at least one of the following criteria:

- All employees who are or may be exposed to hazardous substances or health hazards at or above the established PEL, above the published exposure levels for these substances, without regard to the use of respirators, for 30 days or more than a year.
- All employees who wear a respirator for 30 days or more than a year or as required by 29 CFR 1910.134.
- All employees who are injured, become ill or develop signs or symptoms due to possible overexposure involving hazardous substances or health hazards from an emergency response or hazardous waste operation.
- Members of HAZMAT teams.

When an annual examination is required, the frequency shall be at least once every 12 months unless the attending physician believes a longer interval (not greater than biennially) is appropriate.

10.1.3 Exit Exam

Shaw offers exit physical exams (optional) for all employees involved in the medical surveillance program that are leaving the company for any reason.

10.1.4 Other Exams

Periodically, the need arises to conduct medical examinations at times other than those previously discussed. These include reassignment in accordance with 29 CFR 1910.120 (f)(3)(i)(C) and 29 CFR 1926.65 (f)(3)(i)(C), if an employee develops signs or symptoms of illnesses relating to work place exposure, if the physician determines examinations needing to be conducted more often than once a year, and whenever an employee sustains a lost time injury or develops a lost time illness.

10.1.5 Hearing Conservation Program

Personnel, including subcontractors, shall participate in a continuing, effective hearing conservation program, as described in 29 CFR 1910.95 (c), whenever employee noise exposures equal or exceed an 8-hour TWA sound level of 85 decibels measured on the A scale (slow response) or, equivalently, a dose of 50 percent.

10.2 Subcontractor Requirements

Subcontractors shall certify that their employees have successfully completed a physical examination by a qualified physician on the Training Acknowledgment Form (Appendix D), when applicable. The physical examinations shall meet the requirements of 29 CFR 1926.65 and 29 CFR 1926.103. The subcontractor requirements for physical examination are the same as for Shaw employees (Section 10.1).

10.3 Medical Records

Medical and personal exposure monitoring records will be maintained according to the requirements of 29 CFR 1926.65 and 29 CFR 1910.120 and will be kept for a minimum of 30 years. The confidentiality of employee medical records shall be maintained. The written medical opinion from the occupational physician is kept in site files.

10.4 Medical Restrictions

When a medical care provider identifies a need to restrict work activity, the employee's home office will communicate the restriction to the employee SSHO and HSM. The terms of the restriction will be discussed with the employee and the SSHO. Every attempt will be made to keep the employee working, while not violating the terms of the medical restriction.

10.5 Drug and Alcohol Testing

Shaw is firmly committed to providing employees a safe and healthful workplace, and to providing clients and the public safe and efficient services. Employee involvement with the use, possession, or sale of alcohol, illegal drugs, or any substance represented as a controlled substance creates an impediment toward meeting these commitments and is prohibited.

At no time while on duty may employees use or be under the influence of alcohol, narcotics, intoxicants, or similar mind-altering substances. Employees found under the influence of or consuming such substances will be immediately removed from the job site, as specified in the *Safety and Health Requirements Manual EM 385-1-1* (Section 01.C.02) (USACE, 2008).

All employees of Shaw and its subcontractors are subject to drug and alcohol testing as described in Shaw Procedure No. HS101, "Drug and Alcohol Testing."

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Draft • Revision 0 • November 2011 • WERC-09-13-002-3

11.0 EMERGENCY RESPONSE PLAN AND CONTINGENCY PROCEDURES

An emergency is defined as a sudden, generally unexpected occurrence demanding immediate action. Emergencies at project sites include accidents, injuries requiring medical care, fires, explosions, spills and significant releases of hazardous substances to the environment, and extreme weather events. Upon mobilization to the project, the Construction Manager shall provide a means for effective emergency communications (landline telephone, cellular phone) prior to commencing site activities.

In the event that an emergency arises, the appropriate immediate response must be taken by the first person to recognize the situation. The field crew shall immediately notify the Construction Manager or SSHO of the incident, and the appropriate emergency service organization shall be contacted. A list of emergency contacts is provided in Table 5. A copy of the emergency telephone numbers and directions to the nearest selected CORE Health Networks network clinic and hospital shall be posted at the project site.

The Project Manager, HSM, and the COR shall be notified of any accident, injury, or illness.

In the case of injury or illness, a trained person will render the proper emergency first aid care. First aid equipment shall be available at the area of fieldwork. Personnel will be notified as to the locations of first aid equipment during the initial safety briefing session.

If the injury or illness is from exposure to a hazardous substance, the MSDS shall be provided to the medical personnel. Material Safety Data Sheets are provided for operational chemicals. The MSDS details first aid procedures to follow in the event an exposure occurs.

Unless the emergency event is extreme and obvious, the decision to cease all field activities and evacuate the site shall be made by the Construction Manager or SSHO. Field personnel will report to the pre-designated area, if possible.

11.1 Personnel Roles/Lines of Authority

The responsibilities of specific project individuals and the coordination of emergency service personnel are defined in the following subsections.

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Draft • Revision 0 • November 2011 • WERC-09-13-002-3

11.1.1 Construction Manager

At all times during scheduled work activities, a Construction Manager or SSHO will be present on site. This individual will be responsible for implementing these procedures and determining appropriate response actions. Specific responsibilities for the Construction Manager include the following:

- Evaluating and assessing emergency incidents or situations.
- Coordinating response activities on site.
- Informing field personnel of the potential hazards associated with the site.
- Summoning emergency response personnel.
- Notifying the Project Manager and HSM of an emergency situation.
- Verifying that all emergency equipment is routinely inspected and functional.
- Informing the appropriate emergency response agencies of the provisions made herein.
- Evaluating the safety of site personnel in the event of an emergency and providing evacuation coordination if necessary.

The Construction Manager or SSHO will direct all emergency response activities conducted or managed by Shaw.

11.2 List of Emergency Contacts and Notification

Emergency and non-emergency numbers are listed in Table 5. The Cannon AFB Fire Department shall be contacted prior to initiating site activities. They shall be frequently advised and notified about upcoming site activities and potential emergencies. This shall be done to ascertain response capabilities and to obtain a response commitment.

The Construction Manager and SSHO will be notified immediately in the event of an emergency. The Construction Manager or SSHO will immediately evaluate the incident and, if necessary, notify emergency response personnel. If not previously notified, the COR will be advised of the situation. Telephone numbers for emergency contact personnel are listed in Table 5 of this SSHP. The list will be maintained with current contacts and telephone numbers, and provided in all project vehicles.

The information provided to the emergency contact should include the nature of the incident and the exact location. Specifically, the information should include the following:

- Name and telephone number of the individual reporting the incident.
- Location and type of incident.
- Nature of the incident.
- Number and nature of medical injuries.
- Potential for additional risks or dangers.
- Potential off-site risks or dangers.
- Movement or direction of spill/vapor/smoke.
- Response actions currently in progress.
- Estimate of quantity of any released materials.
- Status of incident.
- Other pertinent information.

When reporting spills only (Cannon AFB Fire Department), the following information is to be provided:

- Name and telephone number of person making notification.
- Exact location, cause and time of spill or emergency.
- Type and description of emergency.
- Estimate of amount and type of material spilled.
- Extent of actual or potential environmental damage.
- Injuries or property damage, if any.
- Possible hazards to off-post human health and environment.
- Immediate response actions taken.

11.3 Medical Emergency Response

Minor injuries will be treated on site by qualified first aid/CPR providers. Injuries and illnesses that do not require immediate medical care shall be treated at the selected medical care facilities. The EMS shall be summoned in the event of moderate to severe physical injury, which requires immediate emergency care. In all cases, the Construction Manager or

SSHO shall accompany the injured worker to the appropriate medical care facility. Figure 2 indicates the location of the nearest hospital. Figure 3 indicates the location of the nearest CORE Health Networks network clinic. The route to the selected CORE Health Networks network clinic and the hospital shall be available in all project vehicles.

11.4 Personal Exposure or Injury

The following procedures will be implemented in the event of a personal injury (other than first aid only).

11.4.1 Serious Injuries Requiring Transport by Ambulance

The Construction Manager or SSHO will provide any necessary support to emergency responders.

Upon the realization that an individual(s) needs medical care with transport by ambulance, the following procedure will be used when applicable:

- Administer first aid and contact the Construction Manager or SSHO to arrange for dispatch of the EMS.
- Notify the HSM.
- Provide an individual to meet the EMS at the project site entrance, to minimize time in locating the injured worker(s).
- Wait for emergency care, document the event, and maintain communication with the Construction Manager or SSHO.

In the event of a chemical exposure, the following procedures shall be followed after summoning the EMS:

- **Skin Contact:**
  - Flush with water
  - Remove clothing, flush skin
  - Obtain prompt medical attention, as necessary
- **Inhalation:**
  - Remove the person from the area
  - Administer first aid/CPR, as needed
  - Obtain immediate medical attention

- **Ingestion:**
  - Contact the Poison Center for immediate treatment, then obtain immediate medical attention
  - Inducing vomiting may cause further injury to the victim; follow instructions from the MSDS and/or Poison Center
- **Eye Contact:**
  - Flush eyes immediately with water for a minimum of 15 minutes
  - Obtain immediate medical attention

11.5 Fire Control

In the event of a fire or explosion at the site, the following actions shall be implemented:

- Evacuate all personnel to a safe location upwind or crosswind of the incident. Contact the Construction Manager or SSHO.
- Concurrently with the above, contact the Cannon AFB Fire Department.
- If personnel are present who have had training in the use of fire extinguishers, use available fire extinguishers to extinguish small fires, if the fire can be safely extinguished.
- Alert EMS about the possibility of fire victims, as appropriate.
- Document the incident in the field logbook and follow the procedures for incident reporting in Section 13.4.

11.6 Spill Prevention and Control

This spill prevention and control section sets forth the procedures for the coordination of and response to potential spills/discharges of hazardous materials or wastes.

11.6.1 Preemptive Measures

The following measures shall be taken to minimize the possibility of spills/discharges:

- Site controls are to be maintained so that only authorized personnel have access to work areas.
- Site personnel will be advised of appropriate spill/discharge control measures.

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Draft • Revision 0 • November 2011 • WERC-09-13-002-3

- Appropriate secondary containment structures will be used for storage of hazardous materials and wastes on site.
- Storage containment shall be examined daily.

11.6.2 Spill Response

If a hazardous material or waste release is observed at the site, the Construction Manager or SSHO will be immediately notified. The Cannon AFB Fire Department shall then be notified by the Construction Manager or SSHO. An assessment will be made of the magnitude and potential impact of the release. If it is safe to do so, trained site personnel will attempt to locate the source of the release, prevent further release, and contain the spilled and/or affected materials as follows:

- The spill or release area will be approached from upwind.
- Hazards will be identified based on available information from witnesses or material identification documents. The potential hazards will be evaluated to determine the proper personal protection levels, methods, and equipment necessary for response.
- Eliminate possible ignition sources for flammable material spills (e.g., turn power off, no smoking).
- As necessary, the release area will be evacuated, isolated, and secured.
- Eliminate routes to water by closing/blocking floor drains and storm drains.
- Work zones, including a decontamination station, shall be set up.
- If possible, spill containment will initially be made without entering the immediate hazard area.
- Entry to the release area will be made by personnel with the PPE, training, methods, and equipment necessary to perform the work. Hazardous spill containment and collection will be performed as follows:
  - Contain the spill with absorbent socks, booms, granules, or construction of temporary dikes.
  - Control the spill at the source by closing valves, plugging leaks, up righting containers, over packing containers, or transferring contents of a leaking container.

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Draft • Revision 0 • November 2011 • WERC-09-13-002-3

  - Collect the spilled material with shovels, pumps, or heavy equipment as necessary.
  - Contaminated soil or gravel shall be cleaned up as directed by AFCEE. If the determination is made to drum the contaminated media, the spill will be dug out until no further contamination is visible and placed in 55-gallon open head steel drums. The drum then must be marked for proper disposal.

- The decontamination procedures established in Section 7.0 shall be used after the response is complete. Refer to Section 7.5 for information on procedures for emergency decontamination.

If site personnel cannot safely respond to an environmental release, evacuation of the area may be warranted. Upon their arrival at the site, the Construction Manager or SSHO will brief emergency responders of the status and any potential hazards.

11.7 Munitions and Explosives of Concern Discovery

In the event known or suspected MEC is encountered, the following procedures shall be implemented:

- Workers shall flag visibly, for example, up in a tree, next to where the MEC find is located by means of a rag or surveyors flagging. This will enable a MEC Specialist to locate the ordnance/explosive find later.
- Evacuate all personnel to a safe location upwind of the MEC. Contact the Construction Manager or SSHO.
- Secure area against trespassers.
- The Construction Manager or SSHO will notify the Project Manager and HSM.
- The Project Manager will notify the COR to determine the appropriate course of action.
- The work area will remain evacuated until clearance has been given from the Project Manager and COR.

11.8 Site Evacuation Procedures

Voice, radio, or cellular telephone communication may be used to alert site workers and provide special instructions on site evacuation. Personnel shall evacuate to a designated safe, upwind location and perform a “head count.” The Construction Manager or SSHO is to remain in frequent contact for proper execution of the evacuation procedures.

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Draft • Revision 0 • November 2011 • WERC-09-13-002-3

Situations requiring evacuation may include unusually severe weather conditions or fires. In the event of project evacuation, other than weather related, the Cannon AFB Fire Department will be notified immediately. A site emergency map that delineates evacuation routes, emergency air horn locations, first aid kit locations, and rally point(s) shall be included in each site-specific addendum once the or SSHO has physically evaluated the site.

11.9 Adverse Weather Conditions

Personnel should be aware of the possibility for the occurrence of severe weather such as lightning, thunderstorms, high winds, or winter storms/blizzards. Necessary precautions or response, directed by the Construction Manager or SSHO, will be taken in the event of severe weather. Personnel may be advised to leave the project site and take refuge at home or a motel when high winds, heavy rain, or snowstorms are predicted and imminent. Outdoor operations will be suspended when the potential for lightning occurs.

Local weather broadcasts will be monitored by the Construction Manager or SSHO, when the likelihood for severe weather exists. Generally, cellular telephone communication will be utilized to alert crews to threatening weather. A severe weather shelter shall be identified and the location communicated with the crew(s) upon project mobilization.

11.9.1 Tornado Safety

In the event of a tornado, personnel should take cover in a basement, ditch, culvert, or interior room of a strong building. Personnel shall identify the nearest tornado shelter at each active remote work location prior to beginning operations. When a tornado has been sighted, go to your shelter immediately. Stay away from windows, doors, and outside walls.

- In a small building, go to the basement or storm cellar. If there is no basement, go to an interior room on the lower level (bathrooms, closets, interior hallways).
- Interior hallways on the lowest floor are usually safest. Stay away from open spaces and windows.
- Get under a piece of sturdy furniture such as a workbench or heavy table or desk and hold on to it.
- Use arms to protect head and neck.
- If in a trailer or vehicle, get out immediately and go to a more substantial structure.
- If there is no shelter nearby, lie flat in the nearest ditch, ravine, or culvert with your hands shielding your head.

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Draft • Revision 0 • November 2011 • WERC-09-13-002-3

- If in a car, get out and take shelter in a nearby building. Do not attempt to out-drive a tornado since they are erratic and move swiftly.
- Personnel should be aware that ditches and culverts may fill up with water quickly and should only use these as shelters as a last resort.

11.9.2 Lightning Safety

Outdoor activities will be suspended when the potential for lightning occurs. The following measures, offered by the National Lightning Safety Institute of Louisville, Colorado shall be taken to minimize the possibility of injury to personnel by lightning:

- The Construction Manager or SSHO is responsible to monitor weather conditions.
- Upon seeing lightning or hearing thunder, outdoor activities shall be suspended and personnel shall be evacuated to safe areas (i.e., inside vehicles or buildings). When clouds with dark bases and wind speeds pick up, anticipate thunderstorms. Those who have been struck by lightning did not seek cover in a timely fashion.
- The Construction Manager or SSHO will continue to monitor weather conditions.
- Outdoor activities may resume 30-minutes after the last bolt of lightning was observed and the last clap of thunder was heard.

People who have been struck by lightning do not carry an electrical charge and are safe to handle. Apply first aid immediately, if you are qualified to do so. Get emergency help promptly.

SAFE AREAS INCLUDE:

- Fully enclosed metal-topped vehicles with windows up.
- Substantial and permanent buildings.

UNSAFE AREAS INCLUDE:

- Small structures including huts and rain shelters.
- Nearby metallic objects like fences, gates, instrumentation and electrical equipment, wires, and power poles.

The following shall be avoided when lightning is in the area:

- Trees.
- Water.

- Open fields.
- Using hard-wired telephones and headsets.

If hopelessly isolated from shelter during close-in lightning, adopt a low crouching position with feet together (up on toes, if possible) and hands on ears. If hair stands on end or rises on back of neck, a lightning strike is imminent.

Remember the warning phrase from the National Lightning Safety Institute: "If you can see it (lightning), flee it; if you can hear it (thunder), clear it."

11.10 Emergency Equipment

At a minimum, the following emergency equipment shall be maintained at the project site(s):

- Fire extinguishers.
- First aid kits.
- Blood-borne pathogen control supplies or kit.
- Emergency eyewash, if corrosive materials are being used.
- Spill control.
- Communication devices.

This equipment is to be inspected by the SSHO on a monthly basis to verify that they are in good condition, ready to use, and easily accessible. Note: a seal may be maintained on first aid kits to indicate if the kit has been accessed within the preceding week. The weekly inspection of the first aid kit will only be necessary if the seal has been broken.

11.11 Critique and Follow-up of Emergency Procedures

The CORE shall be verbally notified immediately and receive a written notification within 24 hours of all accidents or incidents including releases, fires, or explosions. The report shall include the following items:

- Name, organization, telephone number, and location of the contractor.
- Name and title of the person(s) reporting.
- Date and time of accident/incident.
- Location of accident/incident.
- Brief summary of accident/incident including pertinent details, such as, type of operation ongoing at time of accident.

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Draft • Revision 0 • November 2011 • WERC-09-13-002-3

- Cause of accident/incident, if known.
- Casualties.
- Details of any contamination.
- Estimated property damage, if applicable.
- Nature of damage, effect on contract schedule.
- Action taken by Shaw to maximize safety and security.
- Other damage or injuries sustained (public or private).

The Construction Manager and/or SSHO will investigate the cause of the incident to prevent its re-occurrence. The investigation should begin as soon as practical after the incident is under control but not later than the first workday after the incident. Investigations will follow the procedures described below:

- Interview witnesses and participants as soon as possible or practical.
- Determine the chronological sequence of events (opinions as to cause should not be solicited at this time).
- Note any movement, sounds, noises, or other sensory perceptions experienced by the participants or witnesses.
- Obtain weather data.
- Ascertain the location and position of all switches, controls, etc.
- Verify the condition of all safeguards.
- Determine if a revision to emergency procedures is warranted.

After the facts have been collected, causal factors should be identified and controlled/eliminated.

11.12 Hospital Information

The nearest local hospital for the project is:

Plains Regional Medical Center
2100 Martin Luther King Boulevard
Clovis, New Mexico - (575) 769-7577

The distance to the hospital is approximately 6 miles from the Cannon AFB, with a travel time of approximately 9 minutes. The route map to the hospital is depicted in Figure 2.

11.13 Medical Services Clinic Information

The CORE Health Networks network clinic for the project is:

Concentra Medical Center
1619 South Kentucky, Suite F600
Amarillo, TX 79102 (806) 373-2200

The distance to the clinic is approximately 109.2 miles from Cannon AFB, with a travel time of approximately 1 hour, 51 minutes. The route map to the clinic is depicted in Figure 3.

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Draft • Revision 0 • November 2011 • WERC-09-13-002-3

12.0 BLOOD-BORNE PATHOGEN EXPOSURE CONTROL PLAN

Blood-borne pathogens are microorganisms (i.e., bacteria, virus) sometimes present in blood and certain body fluids, which are capable of causing human disease or death. These pathogens can also be present on objects and surfaces that have had contact with infected blood or certain body fluids. Blood-borne pathogens are also capable of causing human disease or death to unprotected people who are exposed to infected blood or body fluids. Diseases caused by blood-borne pathogens include, but are not limited to, hepatitis A, hepatitis B, hepatitis C, malaria, acquired immunodeficiency syndrome (AIDS), and other sexually transmitted diseases. The most significant of these and of greatest concern are hepatitis B and AIDS.

Hepatitis B is a serious disease caused by the hepatitis B virus (HBV), which attacks the liver. The virus can cause lifelong infection, cirrhosis (scarring) of the liver, liver cancer, liver failure, and death. Exposure symptoms include fever, fatigue, nausea, vomiting, muscle aches, loss of appetite, and jaundice (yellowing of the eyes or skin). Hepatitis diagnosis is difficult because some symptoms are similar to the flu and may remain mild for an extended period. The HBV can remain infectious for up to 10 days, even in dried blood. Hepatitis B vaccine is available for all age groups to prevent HBV infection.

Human immunodeficiency virus (HIV) is the virus that causes AIDS. People with HIV have what is called HIV infection. Some of these people will develop AIDS because of their HIV infection. Humans may be infected with HIV for many years without experiencing any symptoms. Upon development of AIDS, symptoms may include weight loss, skin lesions, dry cough, fever, fatigue, diarrhea, swelling of the lymph glands, and death. Presently, no cure exists for HIV or AIDS, and no vaccination is currently available.

A hazard exists for blood and other bodily fluids to be infected with dangerous, infectious pathogens. Employees could become infected if they are exposed to these blood-borne pathogens.

The purpose of this Blood-borne Pathogen Exposure Control Plan is to provide the information, procedures, and requirements necessary to prevent employee exposure to blood-borne pathogens.

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Draft • Revision 0 • November 2011 • WERC-09-13-002-3

12.1 Regulatory, Requirement, and Policy Compliance

This Blood-borne Pathogen Exposure Control Plan has been prepared in compliance with:

- 29 CFR 1910.1030, Blood-borne Pathogens.
- *Safety and Health Requirements Manual EM 385-1-1,* Section A.03.06 (USACE, 2008).
- Shaw Procedure No. HS512, "Handling of Blood or other Infectious Material."

12.2 Exposure Determination

The OSHA requires employers to perform an exposure determination, identifying employees who may incur occupational exposure to blood or other potentially infectious materials. The exposure determination is made without regard to the use of PPE. For exposure determination purposes, employees are considered to be exposed, even if they wear PPE.

In general, it is anticipated that project activities will not present a high risk of employee exposure to blood or other body fluids. An exception to this would be under circumstances when personnel administer first aid care or CPR to injured workers and when personnel clean up areas and equipment that may have been exposed to blood because of the incident. In these cases, there is reasonable potential for employee skin, eye, mucous membrane, or potential contact with blood or other bodily fluids.

The OSHA requires a listing of job classifications with identification of tasks performed in which some employees may have potential for occupational exposure. This requirement is for employees to clearly understand the tasks that they may perform have a potential for occupational exposure to infectious materials. The job classifications and associated tasks with an exposure potential are as follows:

- Construction Manager—Administer first aid or CPR; decontaminate or disinfect surfaces and articles that have contacted infectious materials, and prepare biohazard waste for temporary storage and subsequent disposal.
- Site Safety and Health Officer—Administer first aid or CPR; decontaminate or disinfect surfaces and articles that have contacted infectious materials, and prepare biohazard waste for temporary storage and subsequent disposal.
- Subcontractor Supervisors—Administer first aid or CPR; decontaminate or disinfect surfaces and articles that have contacted infectious materials, and prepare biohazard waste for temporary storage and subsequent disposal.

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Draft • Revision 0 • November 2011 • WERC-09-13-002-3

- Laborer—Administer first aid or CPR; decontaminate or disinfect surfaces and articles that have contacted infectious materials, and prepare biohazard waste for temporary storage and subsequent disposal.

These employees have potential for exposure to blood-borne pathogens when administering first aid or CPR and when performing post-accident cleanup operations due to the following:

- Contact or absorption of blood or blood-contaminated objects through open or broken skin (i.e., cuts, scratches, and rashes).
- Blood splashes to their eyes, nose, or mouth, or other mucous membranes.
- Punctures through the skin with a contaminated sharp object (i.e., scissors).

Workers can reduce their risk of contacting blood-borne pathogens by implementing the recommended work practices (outlined in this plan) before, during, and after responding to emergency medical incidents primarily involving personal injuries.

12.3 Schedule of Implementation

The procedures in this Blood-borne Pathogen Exposure Control Plan are to be implemented immediately.

Implementation includes:

- Verifying personnel who are available to voluntarily provide first aid care and CPR hold a valid training certificate from a reputable training provider (American Red Cross or American Heart Association).

  The Construction Manager or SSHO is responsible for verifying that an appropriate number of personnel have been trained in and hold valid certification to perform first aid and CPR.

- Verifying that personnel voluntarily providing first aid care, CPR, post-accident clean-up operations, and biohazard waste handling have received the specialized training meeting the requirements of 29 CFR 1910.1030; *Safety and Health Requirements Manual EM 385-1-1*, Section A.03.06 (USACE, 2008); and Shaw Procedure No. HS512, “Handling of Blood or other Infectious Material.” This training is required for applicable personnel prior to the commencement of work and at least annually thereafter. This training shall cover the following elements:

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Draft • Revision 0 • November 2011 • WERC-09-13-002-3

- Copy of 29 CFR 1910.1030 and this procedure including an explanation of the contents.
- General explanation of the epidemiology and symptoms of blood-borne diseases.
- Explanation of the modes of transmission of blood-borne pathogens.
- Explanation of the appropriate methods for recognizing tasks and other activities that may involve exposure to blood and other potentially infectious materials.
- Explanation of the use and limitations of practices that will prevent or reduce exposure including appropriate engineering controls, work practices, and PPE.
- Information of the types, proper use, location, removal, handling, decontamination, and/or disposal of PPE.
- Explanation of the basis for selection of PPE.
- Information on the hepatitis B vaccine, including information on its efficacy, safety, and the benefits of being vaccinated.
- Information on the appropriate actions to take and persons to contact in an emergency
- Explanation of the procedure to follow if an exposure incident occurs including the method of reporting the incident and the medical follow-up that will be made available
- Information on the medical counseling that is provided for exposed individuals
- Explanation of required signs and labels

The Construction Manager or SSHO is responsible for verifying that this blood-borne pathogen training has occurred.

- Verifying that engineering controls are readily available at the project for use in an emergency. Engineering controls for this project include the following:
  - Red-bags for temporary storage of contaminated PPE and cleaning materials.
  - Appropriately labeled, 30-gallon hard-plastic container for the temporary storage of red-bagged waste.
  - Whisk-broom and dust pan for cleaning up contaminated broken glass.
  - Gallon container of Clorox® household bleach.

- Large utility sponge.
- Rolls of paper towels.
- Container of liquid disinfectant hand soap.
- "Biohazard" warning labels.
- Individually packaged disinfectant towelettes.
- CPR barriers.

The Construction Manager or SSHO is responsible for verifying that this inventory of engineering controls is readily available at the project site for emergency use.

Personal protective equipment is necessary to prevent employee exposures to infectious materials. The necessary PPE, which shall be maintained separately for use in an emergency include the following:

- P-100 Particulate filtering face-piece respirator (3-M 8293 or equivalent).
- Face shields with ratcheting head suspension.
- Safety glasses with clear lens.
- Disposable nitrile examination gloves.
- PVC Monkey Grip work gloves.
- Poly-coated or Saran-coated disposable Tyvek® coveralls with attached hood.
- Vinyl or latex disposable boot covers.
- Fluid-resistant surgical hoods.

The Construction Manager or SSHO is responsible for verifying that the above inventory of PPE is readily available at the project site for emergency use.

12.4 Work Practice Controls

Work practice controls reduce the likelihood of exposure by altering the manner in which a task is performed. The work practice controls outlined in this section are applicable to the administration of first aid and the subsequent cleanup operations.

Work practice controls shall be instituted whenever there is potential for employee contact with blood and bodily fluid. Situational examples where these controls are to be implemented include, but are not limited to:

- The voluntary administration of first aid care, such as application of bandages to minor or major cuts and abrasions of another person. This care may allow for contact with sores, wounds, broken skin, blood, or other bodily fluids.
- The voluntary administration of first aid care, such as providing CPR.
- Cleanup activities involving handling soiled articles (e.g., gauze, bandages, compresses, etc.) and the decontamination or disinfecting of surfaces and articles that have contacted potentially infectious materials, such as blood or other bodily fluids.
- Prepare biohazard waste for temporary storage and subsequent disposal.

Based upon professional judgment, an employee may choose to temporarily forego the use of PPE if the employee determines that the use of the PPE will further jeopardize his well-being or that of the injured worker. This limited application must be carefully evaluated and considered by the employee. If this situation does occur, Shaw will investigate and document the circumstances in an effort to provide alternative means to avoid further occurrence.

The following are specific work practice controls that shall be implemented in the above noted situations or whenever an employee determines that the implementation of these work practices is prudent or necessary:

- The appropriate PPE shall be donned prior to engaging in any activities that have the potential for employee contact with potentially infectious materials, such as blood or other bodily fluids.
- Hands and face will be washed as soon as possible after engaging in any activities that have the potential for employee contact with potentially infectious materials, such as blood or other bodily fluids. If wash facilities are not readily available, individually packaged disinfectant towelettes may be used in the interim.
- Eating, drinking, or smoking is not allowed in any work area where a potential exists for occupational exposure to blood-borne pathogens.
- Open wounds or cuts shall be promptly bandaged.
- Work surfaces and areas shall be cleaned and disinfected immediately after being contacted by potentially infectious materials. A 10 percent bleach solution (one part bleach added to nine parts water) shall be applied and allowed to have a

contact time of 15 minutes. Non-disposable articles, equipment, or materials contaminated with potentially infectious materials shall be similarly cleaned/disinfected prior to reuse.

- All bins, pails, cans, and similar receptacles intended for reuse, which have become contaminated with blood or other potentially infectious materials shall be cleaned and disinfected immediately after use.
- Broken glassware, which may be contaminated, shall not be picked up directly by hand. Broken glass shall be picked up using mechanical means, such as by using a whiskbroom and dustpan.
- All PPE shall be immediately removed upon leaving the potentially contaminated work area, or as soon as possible if visibly contaminated. The contaminated PPE shall be placed in a labeled "red-bag" and then placed in the 30-gallon container for temporary storage and subsequent disposal.
- Any clothing that has contacted blood or other potentially infectious fluids shall be removed as soon as possible.
- Any clothing that has contacted blood or infectious fluids shall be placed in a labeled "red-bag" and then placed in the 30-gallon container for temporary storage and subsequent disposal.

12.4.1 Universal Precautions

Universal precautions is a method of infection control, which operates on the assumption that all human blood and bodily fluids are to be treated as if they are known to be infectious for HIV, HBV, or other blood-borne pathogens. Universal precautions shall be observed to prevent contact with blood or other potentially infectious materials. Universal precautions consist of the following practices:

- All workers shall routinely use appropriate barrier precautions to prevent skin and mucous-membrane exposure when contact with blood or other bodily fluids is anticipated. Gloves should be worn for touching blood and bodily fluids, mucous membranes, or non-intact skin and for handling items or surfaces contaminated with blood or body fluids. Masks and protective eyewear or face shields shall be worn during procedures that are likely to generate droplets of blood or other body fluids to prevent exposure of mucous membranes of the mouth, nose, and eyes. Protective suits shall be worn during procedures that are likely to generate splashes of blood or other bodily fluids.

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Draft • Revision 0 • November 2011 • WERC-09-13-002-3

- Hands and other skin surfaces shall be washed immediately and thoroughly if contaminated with blood or other bodily fluids. Hands shall be washed immediately after gloves are removed, using a disinfectant soap.
- Cardiopulmonary resuscitation barriers or other ventilation devices should be available for use in areas in which the need for resuscitation is foreseeable.
- Workers who have exudative lesions or weeping dermatitis shall be excluded from handling potentially infectious materials until the condition resolves.
- Pregnant workers should be especially familiar with and strictly adhere to precautions to minimize the risk of transmission.

12.4.2 Personal Protective Equipment

The proper use of PPE is an effective work practice control. The following requirements for PPE are mandatory whenever there is potential for employee contact with blood and bodily fluid:

- Inspect PPE prior to use to verify it is in good working order and without defects.
- Blood or other potentially infectious materials.
- Disposable (single use) gloves, such as surgical or examination gloves shall be replaced when visibly soiled, torn, punctured, or when their ability to function as a barrier is compromised. Gloves should be changed as soon as possible after contact with blood or bodily fluids. After use, remove gloves from top to bottom inside out, not allowing unprotected skin to contact the exterior of the gloves. Hands and other skin surfaces shall be washed with disinfectant soap immediately after care has been rendered or clean up has been completed. Gloves reduce the incidence of blood contamination of hands, but they cannot prevent penetrating injuries caused by sharp objects. Do not reuse gloves once removed. A CPR barrier shall be used when administering CPR.
- Protection for the eyes, face, hands, body, feet, and against inhalation hazards shall be provided as appropriate for each job.
- Gloves shall be worn when employees have the potential for direct skin contact with or when handling items or surfaces soiled with blood, other potentially infectious materials, mucous membranes, and non-intact skin.
- Polyvinyl chloride work gloves may be disinfected for immediate reuse if the integrity of the glove is not compromised; however, gloves must be discarded if they are cracked, peeling, discolored, torn, punctured, or exhibit other signs of

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Draft • Revision 0 • November 2011 • WERC-09-13-002-3

deterioration. All gloves shall be discarded at the conclusion of the activity or at the end of the shift – whichever comes first.

- Masks and eye protection or chin-length face shields shall be worn whenever splashes, spray, splatter, droplets, or aerosols of blood or other potentially infectious materials may be generated and there is a potential for eye, nose, or mouth contamination.
- Fluid-resistant clothing (e.g., coated Tyvek® suits) shall be worn if there is a potential for splashing or spraying of blood or potentially infectious materials. Coated Tyvek® coveralls shall also be worn during cleanup activities involving decontamination or disinfecting of surfaces and articles that have contacted potentially infectious materials, and when preparing biohazard waste for temporary storage and subsequent disposal.
- Fluid-resistant clothing (e.g., coated Tyvek® suits) shall be worn if there is a potential for clothing becoming soaked with blood or other potentially infectious materials.
- Surgical caps or hoods shall be worn if there is a potential for splashing or splattering of blood or potentially infectious materials on the head.
- Fluid-proof coverings shall be worn if there is a potential for shoes or boots to contact blood or other potentially infectious materials.
- Disposable nitrile or vinyl gloves shall be worn for touching blood and bodily fluids requiring universal precautions, mucous membranes, or non-intact skin and for handling items or surfaces soiled with blood or bodily fluids to which universal precautions apply.

12.4.3 Waste Handling

All wastes generated because of administering emergency first aid care and the subsequent cleanup activities shall be placed in red-bags, labeled as a biohazard, and kept separately from other trash. Wastes used in medical emergency treatment (i.e., gloves, towels, and gauze) shall also be bagged and stored in an identical manner. Red-bagged, biohazard waste shall be placed in the 30-gallon collection container, labeled, and secured for temporary storage and disposal. Additional containers shall be obtained as needed and containers shall not be overfilled.

12.5 Biohazard Waste Disposal

A Shaw Transportation and Disposal Coordinator shall be contacted to arrange for proper disposal of biohazard wastes. The waste shall remain secured on site in labeled container(s)

until disposal arrangements have been made at an approved disposal facility. Disposal of the infectious waste container(s) shall be in accordance with applicable local, state, and federal regulations.

12.6 Medical Requirements

Employees receive medical evaluations in accordance with Shaw Procedure No. HS100, "Medical Policies and Procedures." The medical requirements of this exposure control plan include provisions for vaccinations to all exposed employees as well as for post-exposure procedures and evaluations. All employees with potential for occupational exposure to blood-borne pathogens shall receive the hepatitis B vaccination and tetanus vaccination prior to workplace exposure, unless they read and sign the Hepatitis B and Tetanus Vaccination Declination form (Appendix D).

12.6.1 Hepatitis B Vaccination

All potentially exposed employees will have made available to them, at no cost, a hepatitis B vaccination. Recombivax or Accelerated Recombivax vaccines shall be utilized. If the employee has previously received the hepatitis B vaccination and/or antibody testing reveals that the employee is immune, a new vaccination is not required. Employees may be subjected to occupational exposure immediately after receiving the first shot in the hepatitis B vaccination series. Antibody testing shall be performed 30-days after completing the hepatitis B vaccination series. Employees unable to develop immunity shall be precluded from further occupational exposure. If a physician recommends a booster dose(s), the doses shall be provided according to standard recommendations for medical practice. The employee will also receive training as to the vaccine's efficacy, safety, benefits, and consequences prior to administration. The vaccination series may also be initiated within 24-hours of an incident with exposure potential.

12.6.2 Tetanus Vaccination

All employees subject to this policy shall maintain current status documentation of their tetanus vaccination (current status for tetanus vaccination is within 5 years). All potentially exposed employees shall be offered a tetanus vaccination at no cost.

12.6.3 Post-Exposure Procedures and Evaluation

All exposure incidents shall be reported as required by Shaw Procedure No. HS020, "Accident Prevention Program: Reporting, Investigation and Review." The occupational medicine physician shall be advised in addition to standard notification procedures.

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Draft • Revision 0 • November 2011 • WERC-09-13-002-3

Following a report of an exposure incident, each involved employee shall be offered a confidential medical evaluation and follow-up, which includes at least the following elements:

- Documentation of the route(s) of exposure.
- Hepatitis B virus and HIV antibody status of the source patient(s) (if known), and how the exposure occurred.
- The medical confidentiality rights of the source patient shall be preserved at all times.
- If the source patient can be determined and permission is obtained, collection of and testing of the source patient's blood to determine the presence of HIV or HBV infection shall be conducted under the direction of the attending physician.
- Collection of blood from the exposed employee as soon as possible after the exposure incident for the determination of HIV and/or HBV status. Actual core antibody and surface antigen testing of the blood or serum sample may be done at that time or later if the employee so requests. If the test is deferred, arrangements shall be made through the attending physician to properly archive the specimen.
- Follow-up of the exposed employee including antibody and antigen testing, counseling, illness reporting, and safe and effective post-exposure prophylaxis, according to standard recommendations for medical practice as defined by the occupational medicine physician.

Where applicable laws require employee consent, documented consent shall be obtained prior to testing. If an employee refuses the blood test, documentation of the refusal will be made. Documentation of the test results shall be made available to the exposed employee(s). All test results shall be kept confidential.

12.6.4 Physician Information

The following information shall be provided to the evaluating physician:

- Copy of 29 CFR 1910.1030 and its appendices.
- Description of the affected employee's duties as they relate to the employee's occupational exposure.

12.6.5 Physician Opinion

For each potentially exposed employee evaluation, the employee shall receive a copy of the evaluating physician's written opinion within 15 working days of the completion of the evaluation. The written opinion shall be limited to the following information:

- The physician's recommended limitations upon the employee's ability to receive the hepatitis B vaccination.
- A statement that the employee has been informed of the results of the medical evaluation and that the employee has been told about any medical conditions resulting from exposure to blood or other potentially infectious materials, which require further evaluation or treatment.
- Specific findings or diagnoses, which are related to the employee's ability to receive the HBV vaccination. Any other findings and diagnoses shall remain confidential.

12.6.6 Hazard Communication

There are regulatory requirements for labels, signs, and training. The provisions and exceptions for these are contained in the subsections below.

12.6.7 Warning Labels

Containers used for disposal of blood-contaminated supplies and waste will be labeled in accordance with the word "biohazard." The following symbol shall be an integral part of the label:

12.6.8 Warning Signs

There will be no designated areas for medical treatment on project sites, because first aid is provided on an emergency basis only; therefore, warning signs are not applicable. In cases of potential exposure, observers and nonessential personnel should be verbally warned to keep a safe distance from injured personnel.

12.6.9 Employee Training Program

All employees who are first aid/CPR trained and may provide assistance shall be trained in the requirements for voluntary providers as described in Shaw Procedure No. HS512,

"Handling of Blood or other Infectious Material," this SSHP, and the general provisions of this procedure.

12.7 Recordkeeping

There are federal record-keeping requirements for training, medical, and incident reporting documentation. The provisions for keeping these records are contained in the subsections below.

12.7.1 Training Records

All employees covered under this exposure plan shall be trained as required. A record of the training shall be appropriately generated. The training record will contain the date of the training session(s), the contents or a summary of the training session(s), the names of persons conducting the training, and the names of all persons attending the training sessions. The training records will be maintained by the Shaw Training Department for at least 5 years from the training date.

12.7.2 Medical Records

Medical records necessary for Shaw employees will include documentation of HBV vaccination status, medical follow-up, post-exposure testing, and a medical professional's written evaluation. The employee medical records will be forwarded to and maintained by CORE Health Networks, 12091 Bricksome Avenue, Suite B, Baton Rouge, Louisiana 70816 for inclusion in the employee's medical file. Confidentiality of all medical records shall be maintained.

Shaw maintains employee medical records for the duration of the employee's employment plus 30 years thereafter. If, for whatever reason, Shaw no longer does business and no successor exists, Shaw will notify the director of NIOSH in writing 3 months prior to the disposal of records. If so directed, the records shall be transferred to the director of NIOSH.

12.7.3 Incident Recording

An incident that occurs because of rendering emergency medical care will be recorded on the OSHA 300 log as OSHA defines work-related injuries and illnesses. All injuries involving the release of blood or bodily fluids must be immediately reported to the HSM for proper reporting and follow-up.

12.8 Plan Review and Update

This Blood-borne Pathogen Exposure Control Plan shall be reviewed and updated on an annual basis.

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Draft • Revision 0 • November 2011 • WERC-09-13-002-3

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Draft • Revision 0 • November 2011 • WERC-09-13-002-3

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13.0 LOGS, REPORTS, AND RECORD KEEPING

Proper record keeping and data management are essential in the implementation of this SSHP. The forms associated with the record keeping and data management requirements shall be completed in an accurate, timely fashion and appropriately filed. The proper completion of forms is the responsibility of the Construction Manager or SSHO. Completed forms will be kept and maintained by Shaw for a 5-year period. Subcontractors will also be responsible for keeping a copy of the forms pertaining to their activities.

Copies of all pertinent site safety and health forms and logs are provided in Appendix D.

13.1 Employee Training and Medical Certification Records

Before personnel are allowed to work in regulated areas on site, the Construction Manager or SSHO shall verify that the following training documentation is current and available in the project Health and Safety file:

- Respiratory protection training certificate (all personnel required to wear respiratory protection).
- Portable fire extinguisher training (two workers per crew).
- First aid/CPR training (at least two workers on site).
- Site Safety Orientation documentation indicating that employees have received the following training:
  - Review of SSHP (Site Safety and Health Plan Acknowledgment Form [Appendix A]).
  - Site-specific Hazard Communication training (Hazard Communication and Right-To-Know Standards Employee Training Record [Appendix D]).
  - Other training as applicable, such as base procedures and rules.

The SSHO shall also verify that the following medical surveillance documentation is current and available in the project Health and Safety file:

- Annual audiogram evidence for workers who may be exposed to noise greater than 85 decibels.
- Positive physician's medical determination regarding the employee's ability to use respiratory protection for personnel required to wear respiratory protection.

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Draft • Revision 0 • November 2011 • WERC-09-13-002-3

All personnel (including visitors) using respiratory protection, shall have successfully passed a respirator fit test in accordance with Shaw Procedure No. HS601, "Respiratory Protection Program," within the last 12 months. A document providing proof of a fit test for the specific respirator used shall be available in the project Health and Safety file.

13.2 Daily Safety Log

The SSHO will maintain and complete a daily log for each day's work. The daily log will document each day's safety and health activities in sufficient detail for future reference as needed.

The following items will be developed as applicable and maintained on site by the SSHO as part of the daily safety log:

- Daily safety meeting logs.
- Noise survey data.
- Personnel training and medical certificates.
- Hot Work Permits.
- Air monitoring/sampling data forms.
- Project safety inspections (daily and monthly).
- Subcontractor safety inspections.
- Hazard Communication Program audits.
- Warnings given related to safety infractions.
- AHAs.
- JSAs.
- Accident investigation reports.
- First aid log.
- Confined space entry permits.

13.3 Safety Inspections/Audits

Shaw's accident prevention program is centered on the following key procedures:

- Investigating, reporting, and reviewing of all near misses, incidents, and accidents.
- Managing reviews of all incident/accident reports, corrective action, and project safety concerns.

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Draft • Revision 0 • November 2011 • WERC-09-13-002-3

- Reviewing of project, operations, and construction activities by safety and health professionals and supervisory personnel.

Safety reviews and inspections are conducted by all tiers of the management structure and are documented. A list of all corrective action items shall be maintained showing the corrective action, responsible person, and the date the action is to be completed. Follow-up inspections are conducted by safety and health personnel to verify that corrective actions or measures have been implemented.

The Construction Manager will inspect the site daily and identify areas of safety concerns or ideas for safety improvement. Crew leaders will also inspect site conditions and activities daily to identify changing conditions or potential hazards. Daily safety inspections shall be documented on the Daily Safety Inspection Report (Appendix D). Identified safety and occupational health deficiencies and suggested corrective measures will be brought to the attention of the Project Manager and HSM.

Safety and occupational health deficiencies shall be tracked on the Safety and Occupational Health Deficiency Tracking Log (Appendix D), which provides the following information:

- Date deficiency identified.
- Description of deficiency.
- Name of person responsible for correcting deficiency.
- Projected resolution date.
- Date actually resolved.

The Construction Manager will immediately notify the HSM of any OSHA or other regulatory agency inspections. (The inspection will not be delayed due to the Government Designated Authority being unavailable.) The Construction Manager shall provide the HSM a copy of any citations or reports issued by the inspector and any corrective action responses to the citation(s) or report(s).

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Draft • Revision 0 • November 2011 • WERC-09-13-002-3

13.4 Accident Investigation and Reporting

Project personnel are required to report all near misses, injuries, illnesses, and accidents to their immediate supervisor. The Construction Manager or SSHO shall immediately arrange appropriate medical care as required. Once immediate medical care for the injured personnel or other critical emergency procedures has been accomplished, the Construction Manager shall follow the Incident Notification, Reporting, and Management Procedure (Appendix H). The appropriate form(s) to be completed are in Appendix D and include the following:

- Supervisor's Employee Injury/Illness Report Form.
- Authorization for Release of Protected Medical Information.
- Authorization for Treatment for Occupational Injury/Illness.
- Vehicle Accident Report.
- Equipment, Property Damage and General Liability Loss Report.
- Underground Utility Hits Tip Sheet for Incident Investigations.
- Incident Investigation Report.
- Injured Employee Statement.
- Employee Witness Statement.
- Accident Review Board.

All incidents shall be immediately reported to the Project Manager and HSM.

The Construction Manager shall immediately investigate all near misses, injuries, illnesses, and accidents. Corrective actions will be determined and implemented to prevent the recurrence of the accident, and responsibility for implementation of corrective actions will be assigned. The final report and required forms will be submitted within 5 days of the incident to the HSM.

In the event that an accident results in an employee being sent to a doctor, the Return-to-Work Examination Form (Appendix D) shall be completed by the attending physician, on the date of treatment stating that either:

- Employee may return to full duty work.
- Employee may return to limited duty (with type of limitations).
- Employee is unable to return to work.

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Draft • Revision 0 • November 2011 • WERC-09-13-002-3

A copy of this release shall accompany the accident report. In addition to the requirement for maintaining a log of OSHA recordable injuries/illnesses, a separate log will be maintained for all first aid treatments not otherwise recordable/reportable.

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Draft • Revision 0 • November 2011 • WERC-09-13-002-3

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Draft • Revision 0 • November 2011 • WERC-09-13-002-3

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U.S. Environmental Protection Agency (EPA), 2005, *Uniform Federal Policy for Quality Assurance Plans (UFP-QAPP)*, OSWER Directive 9272.0-17, Office of Solid Waste and Emergency Response, U.S. Environmental Protection Agency, Washington, D.C.

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Draft • Revision 0 • November 2011 • WERC-09-13-002-3

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Draft • Revision 0 • November 2011 • WERC-09-13-002-3

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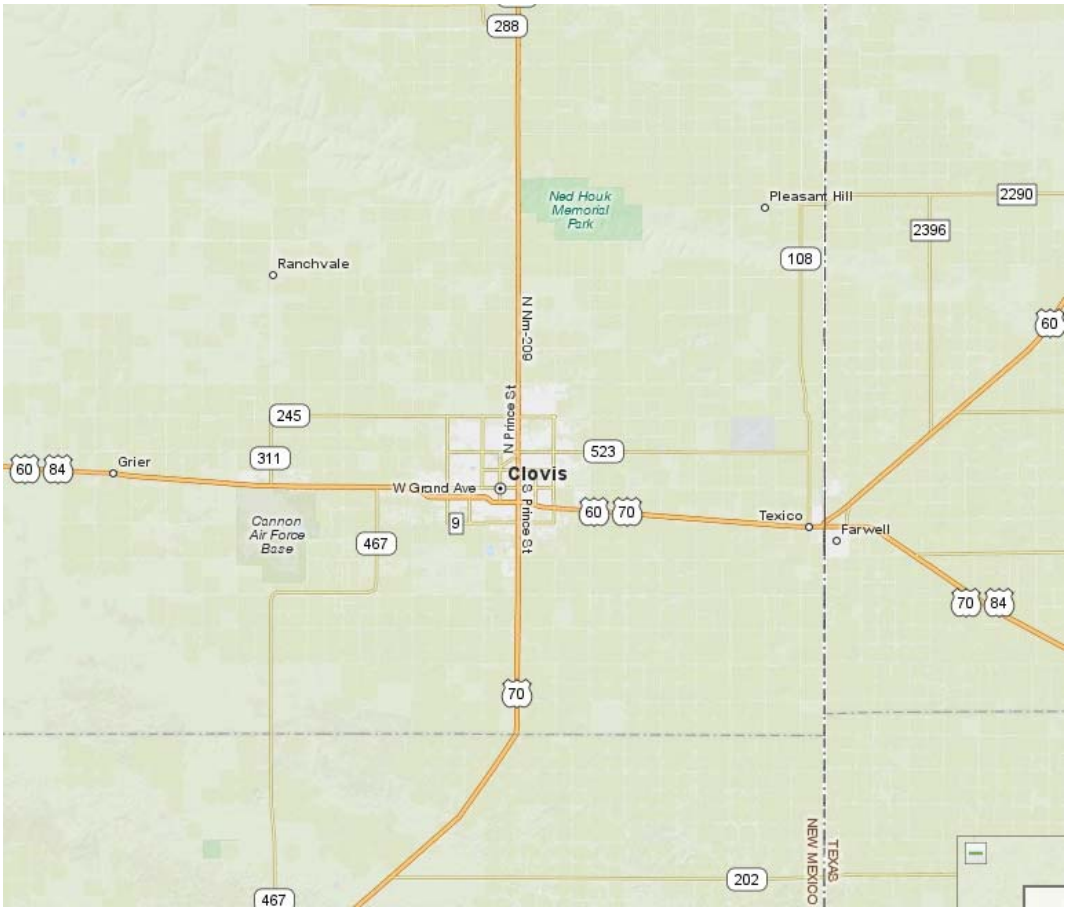
Contract No. FA8903-09-D-8580, Task Order No. 0013 • Draft • Revision 0 • November 2011 • WERC-09-13-002-3

Figures

Figure 1
Site Location Map



Contract No. FA8903-09-D-8580, Task Order No. 0013 • Draft • Revision 0 • November 2011 • WERC-09-13-002-3

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Draft • Revision 0 • November 2011 • WERC-09-13-002-3

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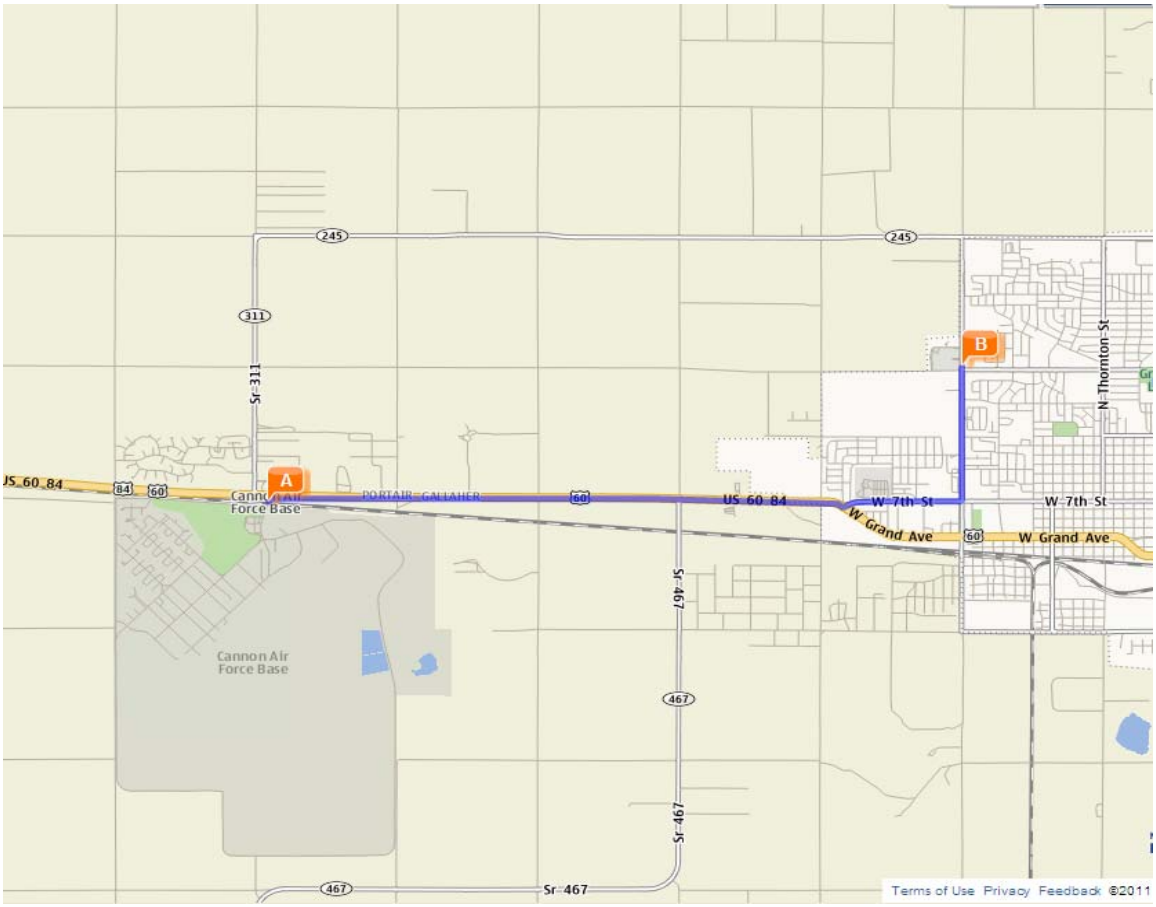
Figure 2
Hospital Route Map



Hospital Route Map from Cannon AFB (A) to
Plains Regional Medical Center (B)

2100 Martin Luther King Boulevard
Clovis, NM
(575) 769-7577

From Cannon AFB, go

1. 78 ft Start at unnamed road.
2. 4.1 mi Take ramp onto US-60 E, US-84 S.
3. 0.8 mi Turn left onto W 7th St.
4. 1.0 mi Turn left onto N Martin Luther King Jr. Blvd.

Your destination on 2100 N Martin Luther King Jr. Blvd is on the left The distance to the hospital is approximately 6 miles from the Cannon AFB, with a travel time of approximately 9 minutes. (Note: Map will be revised when site trailers are established.)

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Draft • Revision 0 • November 2011 • WERC-09-13-002-3

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Draft • Revision 0 • November 2011 • WERC-09-13-002-3

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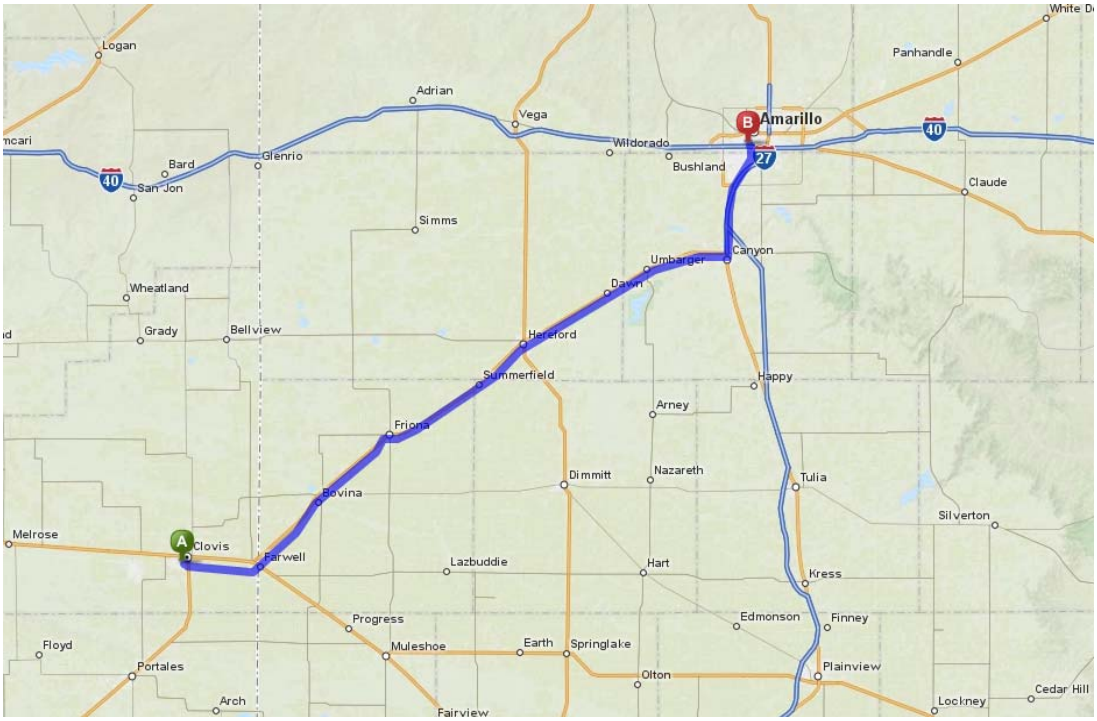
Figure 3
CORE Health Networks Medical Facility Route Map



CORE Health Networks Medical Facility Route Map from Cannon AFB (A) to Concentra Medical Center (B)

1619 South Kentucky, Suite F600
Amarillo, TX 79102
(806) 373-2200

From Cannon AFB, go:

1. Start at unnamed road.
2. 15.7 mi Take ramp onto US-60 E, US-84 S.
3. 0.1 mi Turn left onto US-60.
4. 77.8 mi Bear right to stay on US-60.
5. 3.0 mi Take the I-27/Amarillo/US-60 E/US-87 N exit to the left onto US-60 E, US-87 N.
6. 10.3 mi Continue on I-27 N.
7. 0.2 mi Take exit #121A/Georgia St onto Canyon Dr.
8. 1.8 mi Bear left onto S Georgia St.
9. 0.1 mi Turn left onto Interstate Dr W.
10. 0.1 mi Turn right onto S Kentucky St.
11. Your destination at on 1619 S Kentucky St is on the right.

The trip takes 109.2 mi and 1 hr 51 minutes. (Note: Map will be revised went site trailers are established.)

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Draft • Revision 0 • November 2011 • WERC-09-13-002-3

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Contract No. FA8903-09-D-8580, Task Order No. 0013 • Draft • Revision 0 • November 2011 • WERC-09-13-002-3

Tables

Table 1
Summary Table of Cannon Air Force Base Sites, Technical Approach, Performance Objectives, and Site Closure Dates

Site Identification	Site Name	Proposed Performance Objective	Proposed Date of Achieving Performance Objective	Description of Tech Approach	Projected Closeout Date
TU/US-C050	Inactive POL Storage Tank 4028B	Site Closure	October 2012	Prepare a Class III permit modification request to document New Mexico Environment Department (NMED) approval of CAC (CAC) without controls	4th Quarter 2012
RS-C103	North Playa Lake	Interim Stabilization Measures (ISM) and Draft Resource Conservation and Recovery Act (RCRA) Facility Investigation (RFI)	November 2012	Prepare Interim Stabilization Measures (ISM) and Resource Conservation and Recovery Act (RCRA) Facility Investigation (RFI) Work Plans; Perform ISM (up to 40 cubic yards [yd3] of sediment removed),sampling; Prepare a draft RFI for Air Force review and approval	Indefinite, depends on Air Force (AF) funding/future remedial actions
TU/US-C079	UST at Fire Training Area 1	Site Closure	October 2012	Prepare a Class III permit modification request to document NMED approval of CAC without controls	4th Quarter 2012
TU/US-C124	Inactive UST 1	Site Closure	October 2012	Prepare a Class III permit modification request to document NMED approval of CAC without controls	4th Quarter 2012
OW-C390	OWS 390	Site Closure	October 2012	Prepare a Class III permit modification request to document NMED approval of CAC without controls	4th Quarter 2012
TU/US-C002	Recovered Tank 108	Response Complete	December 2012	Prepare a Class III permit modification request to document NMED approval of CAC with controls	Indefinite, closed with controls
TU/US-C004	Recovered Tank 121	Response Complete	December 2012	Prepare a Class III permit modification request to document NMED approval of CAC with controls	Indefinite, closed with controls
TU/US-C006	Petroleum, Oil, or Lubricant Tank 129	Response Complete	December 2012	Prepare a Class III permit modification request to document NMED approval of CAC with controls	Indefinite, closed with controls
TU/US-C010	POL Tank 170	Site Closure	October 2012	Prepare a Class III permit modification request to document NMED approval of CAC without controls	4th Quarter 2012
TU/US-C125	Inactive UST 2	Site Closure	October 2012	Prepare a Class III permit modification request to document NMED approval of CAC without controls	4th Quarter 2012
WL-C098	Sanitary Sewer Line	Site Closure	October 2012	Prepare a Class III permit modification request to document NMED approval of CAC without controls	4th Quarter 2012
WL-C102	Wastewater Treatment Effluent Discharge	Response Complete	December 2012	Prepare a Class III permit modification request to document NMED approval of CAC with controls	Indefinite, closed with controls
SD-15	SWMU 34	Response Complete Permit Modification	December 2012 September 2013	Perform detailed records search, Prepare supplemental sampling work plan; Perform additional sampling; Prepare a summary report /CAC petition (CACP); Prepare a Class III permit modification request to document NMED approval of CAC with controls	Indefinite, closed with controls
FT-06	SWMU 78	Response Complete Permit Modification	December 2012 September 2013	Perform detailed records search; Prepare supplemental sampling work plan (if necessary); Perform additional sampling; Prepare a summary report/CACP; Prepare a Class III permit modification request to document NMED approval of CAC with controls	Indefinite, closed with controls
SD-12	SWMU 85	Response Complete Permit Modification	December 2012 September 2013	Perform detailed records search; Prepare supplemental sampling work plan; Perform additional sampling; Prepare a summary report/CACP; Prepare a Class III permit modification request to document NMED approval of CAC with controls	Indefinite, closed with controls
SD-20	SWMU 95	Response Complete Permit Modification	December 2012 September 2013	Perform detailed records search; Prepare supplemental sampling work plan; Perform additional sampling; Prepare a summary report/CACP; Prepare a Class III permit modification request to document NMED approval of CAC with controls	Indefinite, closed with controls
FT-08	SWMU 107	Site Closure	January 2014	Perform detailed records search; Prepare supplemental sampling work plan; Perform additional sampling; Prepare a summary report/CACP; Prepare a Class III permit modification request to document NMED approval of CAC with controls	3rd Quarter 2013
SS-19	AOC A	Site Closure	January 2014	Perform detailed records search; Prepare supplemental sampling work plan; Perform additional sampling; Prepare a summary report/CACP; Prepare a Class III permit modification request to document NMED approval of CAC with controls	3rd Quarter 2013
MY-C031	SWMU 31	Response Complete Permit Modification	December 2012 September 2013	Perform detailed records search; Prepare supplemental sampling work plan; Perform additional sampling; Prepare a summary report/CACP; Prepare a Class III permit modification request to document NMED approval of CAC with controls	Indefinite, closed with controls

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Draft • Revision 0 • November 2011 • WERC-09-13-002-3

Table 1 (continued)
Summary Table of Cannon Air Force Base Sites, Technical Approach, Performance Objectives, and Site Closure Dates

Site Identification	Site Name	Proposed Performance Objective	Proposed Date of Achieving Performance Objective	Description of Tech Approach	Projected Closeout Date
TU/US-C071	SWMU 71	Response Complete Permit Modification	January 2014	Perform detailed records search; Prepare supplemental sampling work plan; Perform additional sampling; Prepare a summary report/CACP; Prepare a Class III permit modification request to document NMED approval of CAC with controls	Indefinite, closed with controls
TA/AS-C091	SWMU 91	Site Closure	January 2014	Perform detailed records search; Prepare supplemental sampling work plan; Perform additional sampling; Prepare a summary report/CACP; Prepare a Class III permit modification request to document NMED approval of CAC with controls	3rd Quarter 2013
FT-C109	SWMU 109	Response Complete Permit Modification	December 2012 September 2013	Perform detailed records search; Prepare supplemental sampling work plan; Perform additional sampling; Prepare a summary report/CACP; Prepare a Class III permit modification request to document NMED approval of CAC with controls	Indeterminate, closed with controls
FT-C110	SWMU 1110	Response Complete Permit Modification	December 2012 September 2013	Perform detailed records search; Prepare supplemental sampling work plan; Perform additional sampling; Prepare a summary report/CACP; Prepare a Class III permit modification request to document NMED approval of CAC with controls	Indefinite, closed with controls
FT-C111	SWMU 111	Response Complete Permit Modification	December 2012 September 2013	Perform detailed records search; Prepare supplemental sampling work plan; Perform additional sampling; Prepare a summary report/CACP; Prepare a Class III permit modification request to document NMED approval of CAC with controls	Indefinite, closed with controls
FT-C112	SWMU 112	Response Complete Permit Modification	December 2012 September 2013	Perform detailed records search; Prepare supplemental sampling work plan; Perform additional sampling; Prepare a summary report/CACP; Prepare a Class III permit modification request to document NMED approval of CAC with controls	Indefinite, closed with controls
TU/US-C126	SWMU 126	Response Complete Permit Modification	December 2012 September 2013	Perform detailed records search; Prepare supplemental sampling work plan; Perform additional sampling; Prepare a summary report/CACP; Prepare a Class III permit modification request to document NMED approval of CAC with controls	Indefinite, closed with controls
OW-C127	SWMU 127	Response Complete Permit Modification	December 2012 September 2013	Perform detailed records search; Prepare supplemental sampling work plan; Perform additional sampling; Prepare a summary report/CACP; Prepare a Class III permit modification request to document NMED approval of CAC with controls	Indefinite, closed with controls
TA/AS-C129	SWMU 129	Response Complete Permit Modification	December 2012 September 2013	Perform detailed records search; Prepare supplemental sampling work plan; Perform additional sampling; Prepare a summary report/CACP; Prepare a Class III permit modification request to document NMED approval of CAC with controls	Indefinite, closed with controls
SD-13	Sanitary sewer lift station overflow pit	Site Closure	October 2012	Prepare a Class III permit modification request to document NMED approval of CAC without controls	4th Quarter 2012
DP-16	Solvent disposal site	Site Closure	October 2012	Prepare a Class III permit modification request to document NMED approval of CAC without controls	4th Quarter 2012
LF-02	Landfill No. 2	Response Complete	December 2012	Prepare a Class III permit modification request to document NMED approval of CAC with controls	Indefinite, closed with controls
SD-12	Stormwater collection point (South Playa)	Response Complete Permit Modification	December 2012 September 2013	Perform detailed records search; Prepare supplemental sampling work plan; Perform additional sampling; Prepare a summary report/CACP; Prepare a Class III permit modification request to document NMED approval of CAC with controls	Indefinite, closed with controls
SD-11	Engine test cell	Site Closure	October 2012	Prepare a Class III permit modification request to document NMED approval of CAC without controls	4th Quarter 2012
SD-11	Former overflow pit	Site Closure	October 2012	Prepare a Class III permit modification request to document NMED approval of CAC without controls	4th Quarter 2012
SD-11	Former leach field	Site Closure	October 2012	Prepare a Class III permit modification request to document NMED approval of CAC without controls	4th Quarter 2012
SD-11	Evaporation pond	Site Closure	October 2012	Prepare a Class III permit modification request to document NMED approval of CAC without controls	4th Quarter 2012
SD-11	Oil/water separator No. 5114	Site Closure	October 2012	Prepare a Class III permit modification request to document NMED approval of CAC without controls	4th Quarter 2012
SD-20	NE stormwater drainage area	Response Complete Permit Modification	December 2012 September 2013	Perform detailed records search; Prepare supplemental sampling work plan; Perform additional sampling; Prepare a summary report/CACP; Prepare a Class III permit modification request to document NMED approval of CAC with controls	Indefinite, closed with controls
SD-17	Old entomology rinse area	Response Complete	December 2012	Prepare a Class III permit modification request to document NMED approval of CAC with controls	Indeterminate, closed with controls
FT-07	Fire Training Area No. 2	Site Closure	October 2012	Prepare a Class III permit modification request to document NMED approval of CAC without controls	4th Quarter 2012

Table 1 (continued)
Summary Table of Cannon Air Force Base Sites, Technical Approach, Performance Objectives, and Site Closure Dates

Site Identification	Site Name	Proposed Performance Objective	Proposed Date of Achieving Performance Objective	Description of Tech Approach	Projected Closeout Date
OT-10	JP-4 fuel spill	Site Closure	October 2012	Prepare a Class III permit modification request to document NMED approval of CAC without controls	4th Quarter 2012
SS-18	Blown capacitors site	Site Closure	October 2012	Prepare a Class III permit modification request to document NMED approval of CAC without controls	4th Quarter 2012
FL-C070	Oil/water separator & leach field 326	Response Complete	October 2012	Prepare a Class III permit modification request to document NMED approval of CAC with controls	Indefinite, closed with controls

AF denotes Air Force.
AOC denotes Area of Concern.
CAC denotes Corrective Action Complete.
CACP denotes Corrective Action Complete Petition.
CY denotes cubic yards.
ISM denotes Interim Stabilization Measures.
NMAC denotes New Mexico Administrative Code.
NMED denotes New Mexico Environment Department.
PBR denotes Performance- Based Remediation.
RCRA denotes Resource Conservation and Recovery Act.
RFI denotes RCRA Facility Investigation.
RI denotes Remedial Investigation.
SWMU denotes Solid Waste Management Unit.
TCRA denotes Time-Critical Removal Action.
UST denotes Underground Storage Tank.
VCM denotes Voluntary Corrective Measures.

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Draft • Revision 0 • November 2011 • WERC-09-13-002-3

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Table 2
Minimum Clearance from Energized Overhead Electric Lines

Nominal System Voltage	Minimum Required Clearance
0 to 50 kilovolts	3 meters (10 feet)
51 to 200 kilovolts	4.5 meters (15 feet)
201 to 300 kilovolts	6 meters (20 feet)
301 to 500 kilovolts	7.5 meters (25 feet)
501 to 750 kilovolts	10.5 meters (35 feet)
751 to 1,000 kilovolts	13.5 meters (45 feet)

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Draft • Revision 0 • November 2011 • WERC-09-13-002-3

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Draft • Revision 0 • November 2011 • WERC-09-13-002-3

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Table 3
Task Protection Levels

Task	Initial PPE Level	Upgrade PPE Level	Skin Protection	Respiratory Protection	Other PPE
Mobilization and general site activities	Level D	Level D – Modified	Generally none: some activities may require Tyvek® coveralls to prevent insect bites / contact with poisonous plants	Initial - None	Hearing protection >85 dBA, leather work gloves.
Collect surface soil samples	Level D	Level D – Modified	Sample gloves; disposable boot covers if walking in areas with potential contamination; some activities may require Tyvek® coveralls to prevent insect bites / contact with poisonous plants	Initial - None	Hearing protection >85 dBA, leather work gloves.
Collect subsurface soil samples	Level D	Level D – Modified	Sample gloves; disposable boot covers if walking in areas with potential contamination; some activities may require Tyvek® coveralls to prevent insect bites / contact with poisonous plants	Initial - None	Hearing protection >85 dBA, leather work gloves.
Collect surface water and ground water samples	Level D	Level D – Modified	Sample gloves; disposable boot covers if walking in areas with potential contamination; some activities may require Tyvek® coveralls to prevent insect bites / contact with poisonous plants	Initial - None	Hearing protection >85 dBA, leather work gloves.
Well drilling and well installation	Level D – Modified	Level B	See Section 5.1.4 and Section 5.1.2	Initial - None Upgrade - Level B: if VOCs exceeds action level	Hearing protection >85 dBA, leather work gloves. 100% fall protection when working at height greater than 6 feet
Surface soil removal	Level D – Modified	Level B Level C	See Section 5.1.4, Section 5.1.2, and Section 5.1.3	Initial – None Upgrade - Level B: if VOCs exceeds action level Upgrade – Level C if dusts exceed action level	Hearing protection >85 dBA, leather work gloves.

Table 3 (continued)
Task Protection Levels

Task	Initial PPE Level	Upgrade PPE Level	Skin Protection	Respiratory Protection	Other PPE
Backfill excavations	Level D	NA	See Section 5.1.5	Initial - None	Hearing protection >85 dBA, leather work gloves.
Surveying	Level D	NA	See Section 5.1.5	Initial - None	Hearing protection >85 dBA, leather work gloves.
Site restoration	Level D	NA	See Section 5.1.5	Initial - None	Hearing protection >85 dBA, leather work gloves.
Soil borrow material import (loading, transportation, and dumping	Level D	NA	See Section 5.1.5	Initial - None	Hearing protection >85 dBA, leather work gloves.
Equipment decontamination	Level D – Modified	Level C	See Section 5.1.4 and Section 5.1.3	Initial – None Upgrade – Level C: Full-face air-purifying respirator.	Hearing protection >85 dBA, face-shield, shin/metatarsal protection.

dBA denotes decibels, A-scale.

NA denotes not applicable.

PPE denotes personal protective equipment.

VOC denotes volatile organic compound.

Table 4
Direct Reading Air Monitoring Requirements

Monitoring Device / Contaminant	Monitoring Location / Personnel	Monitoring Frequency	Action Level	Action
Combustible Gas Indicator/Oxygen Meter (Lower Explosive Limit [LEL]/ oxygen [O_2])	In the work area and near the breathing zone of personnel. In the work area and breathing zone of personnel during well drilling activities. In the work area prior to hot work activities. In the confined space prior to entry. In the work area during fuel spill cleanup activities.	A minimum of twice per hour (LEL) at each well installation location when free-phase LNAPL is expected or observed until activity at that location has been completed. A minimum of once per sampling event (LEL) at each sampling location when free-phase LNAPL is expected or observed (groundwater and subsurface soil/sediment). At any time in any work location where personnel observe odors. Prior to issuing a hot work permit or confined space entry permit. Continuous during fuel spill cleanup activities. At the discretion of the SSHO.	<10% LEL 20 - 22% O_2	Continue work with caution.
			>10% LEL <20% O_2 or >22% O_2	Stop work, evacuate area, and contact HSM.
Carbon Monoxide (CO)	In the work area near the breathing zone of personnel.	A minimum of once per hour when internal combustion engines are being operated in poorly ventilated areas. At the discretion of the SSHO.	<15 ppm CO	Continue work with caution.
			>15 ppm CO	Stop work, evacuate area, and contact HSM.
Hydrogen Sulfide (H_2S)	In the work area near the breathing zone of personnel.	Continuous at each well installation location within 500 feet of a landfill until activity at that location has been completed. At any time in any work locations where personnel observe rotten egg odors. At the discretion of the SSHO.	<1 ppm H_2S	Continue work with caution.
			>1 ppm H_2S	Stop work, evacuate area, and contact HSM.
Vinyl Chloride (VC) Colorimetric Detector Tube	In the work area near the breathing zone of personnel.	Collected at each well if PID Action Level is exceeded	<1 ppm VC	Continue Work With Caution
			>1 ppm VC	Stop Work Evacuate Area Contact HSM

Table 4 (continued)
Direct Reading Air Monitoring Requirements

Monitoring Device / Contaminant	Monitoring Location / Personnel	Monitoring Frequency	Action Level	Action
Benzene Colorimetric Detector Tube	In the work area near the breathing zone of personnel.	Collected at each well if PID Action Level is exceeded	<0.25 ppm	Continue Work With Caution
			>0.25 ppm	Stop Work Evacuate Area Contact HSM
Photoionization Detector (volatile organic compounds)	In the breathing zone of personnel during well drilling, well installation, well abandonment, and soil excavation activities. In the breathing zone of personnel during groundwater and subsurface soil/sediment sampling. In the breathing zone of personnel during fuel spill cleanup activities.	A minimum of twice per hour at each well drilling/installation location or soil excavation area where VOC are known or suspected until activity at that location has been completed (continuous when free-phase LNAPL or DNAPL is expected or observed). Hourly at each well abandonment location A minimum of once per sampling event at each sampling location (groundwater and subsurface soil/sediment)/continuous when free-phase LNAPL or DNAPL is expected or observed. A minimum of twice per hour at each soil removal location until activity at that location has been completed (continuous when free-phase LNAPL or DNAPL is expected or observed). Continuous during fuel spill cleanup activities. At any time in any work location where personnel observe odors. At the discretion of the SSHO.	> 2 ppm but < 10 ppm above background, sustained for 1 minute in the breathing zone	Stop work: evaluate hazard, increase monitoring frequency, provide engineering controls, and upgrade PPE.
			> 10 ppm but < 50 ppm above background, sustained for 5 seconds in the breathing zone	Stop work, evacuate area, and contact HSM.
			> 50 ppm above background, sustained for 1 second in the breathing zone	Stop work, evacuate area, and contact HSM.
Real-time Aerosol Monitor (dust)	In the work zone approximating worker breathing zone area during soil excavation, soil removal, soil loading, and other dust generating activities.	Continuous during soil excavation, soil removal, soil loading, and other dust generating activities. At the discretion of the SSHO.	> 1 mg/m^3 instantaneous	Continue work, apply more engineering controls.
			> 2.5 mg/m^3 time-weighted average	Evacuate area, apply engineering controls, upgrade level of PPE, and contact HSM.

DNAPL denotes dense nonaqueous phase liquid.

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Draft • Revision 0 • November 2011 • WERC-09-13-002-3

HSM denotes Health and Safety Manager. HSM may indicate more prescriptive Action Levels in the SSHP Addenda.
LNAPL denotes light nonaqueous phase liquid.
mg/m^3 denotes milligram(s) per cubic meter.
PPE denotes personal protective equipment.
ppm denotes part(s) per million.
SSHO denotes Site Safety and Health Officer.

Table 5
Emergency Telephone Numbers

Name/Organization	Telephone Numbers
Ambulance Emergency/EMS	575-784-9111
Cannon AFB Fire Department	Emergency –575-784-9111 Non Emergency –575-784-2578
Cannon AFB Security Force	NON emergency 575-784-4111
Clovis Police Department	Emergency 911 Non Emergency 575-763-9416
County Sheriff's Department	Emergency 911 Non Emergency(575) 769-2335
Cannon underground utility locator service	
Concentra Medical Center (Occupational Health Clinic)	(806) 373-2200
Plains Regional Medical Center (Hospital)	(575) 769-7577
CORE HEALTH	1-877-347-7429
Agency for Toxic Substances and Disease Registry	(404) 639-0615 (24-hour)
Chemtrec	(888) 344-7233
Poison Control Center	(800) 562-8236
National Response Center	(800) 424-8802
Daniel Cevallos, Jr. AFCEE Contracting Officer (KO)	(210)395-8722
Stephanie Ramon AFCEE/EXW COR	(210)395-8628
Kathleen Romalia (Shaw Project Manager)	(720) 554-8207
Spencer Patterson (Shaw Program Manager)	(720) 377-8806
Dave Mummert, CIH (Shaw CIH)	(419) 425-6129 (office) (419) 348-1544 (cell)
James Vigerust (SSHO Lead)	(505) 262-8736(office) (505) 410-4995 (cell)
Bill Foss (Installation Lead)	281-531-3180 (office)
Shaw Notification Hotline	(866) 299-3445

AFCEE denotes Air Force Center for Engineering and the Environment.
CIH denotes Certified Industrial Hygienist.
COR denotes Contracting Officer's Representative.
EMS denotes Emergency Medical Service.

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Draft • Revision 0 • November 2011 • WERC-09-13-002-3

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Draft • Revision 0 • November 2011 • WERC-09-13-002-3

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Contract No. FA8903-09-D-8580, Task Order No. 0013 • Draft • Revision 0 • November 2011 • WERC-09-13-002-3

Appendix A
Site Safety and Health Plan Acknowledgement

Holloman AFB Project
Site-Specific Health & Safety Acknowledgment Form

I understand, and agree to follow the Site-Specific Health & Safety Plan (SSHP) for the Holloman AFB Project. I understand that there may be additional safety and health requirements, which may be presented in task-specific Activity Hazard Analyses and Tailgate Safety Meetings. I agree to abide by the requirements of the SSHP and Activity Hazard Analyses for the work that I will perform.

Printed Name	Signature	Representing	Date

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Contract No. FA8903-09-D-8580, Task Order No. 0013 • Draft • Revision 0 • November 2011 • WERC-09-13-002-3

Appendix B
Site Safety and Health Plan Amendments and Addenda

Shaw® Shaw E & I

FS003.1_0

Ref. Document # _____

Page _____ of ____

Shaw E & I Chain of Custody Form

Project Number: _____

Project Name / Location: _____

Purchase Order #: _____

Shipment Date: _____

Waybill/Airbill Number: _____

Lab Destination: _____

Lab Contact Name / ph. #: _____

Project Contact: _____ (Name & phone #)

Send Report To: _____

Phone/Fax Number: _____

Address: _____

City: _____

Sampler's Name(s): _____

Sample ID Number	Sample Description	Collection Information			Matrix	# of containers	Container type	Preservative						Analyses Requested									Turn Around Time Requested
		Date	Time	G/C				HCL	NaOH	HNO_3	H_2SO_4	Ice											

Special Instructions:

QC/Data Package Level Required:

I II III IV/Project Specific: _____

Relinquished By:	Date:	Received By:	Date:
	Time:		Time:
Relinquished By:	Date:	Received By:	Date:
	Time:		Time:
Relinquished By:	Date:	Received By:	Date:
	Time:		Time:

G/C Codes

C = Composite G = Grab

Matrix Codes

DW = Drinking Water	SO =Soil
GW = Ground Water	SL = Sludge
WW = Waste Water	CP = Chip Samples
SW = Surface Water	WP = Wipe Samples
LIQ = Other Liquid	SOL = Other Solid
AS = Air Sample	SED = Sediment

Shaw® Shaw E & I

Shaw E & I COC Continuation Page

COC Ref. Document # _____ Page _____ of _____

Project Number: _____ Shipment Date: _____

Project Name / Location: _____

Sample ID Number	Sample Description	Collection Information			Matrix	# of containers	Container type	Preservative						Analyses Requested										Turn Around Time Requested
		Date	Time	G/C				HCL	NaOH	HNO_3	H_2SO_4	Ice												

Shaw Environmental, Inc.

FIELD ACTIVITY DAILY LOG

DAILY LOG	DATE			
	NO.			
	SHEET OF			

PROJECT NAME:	PROJECT NO.:
FIELD ACTIVITY SUBJECT:	
DESCRIPTION OF DAILY ACTIVITIES AND EVENTS:	

VISITORS ON SITE:	CHANGES FROM PLANS AND SPECIFICATIONS, AND OTHER SPECIAL ORDERS AND IMPORTANT DECISIONS:
WEATHER CONDITIONS:	IMPORTANT TELEPHONE CALLS:
SHAW PERSONNEL ON SITE:	
SIGNATURE:	DATE:

Attachment 1
ASTM Soil Classification & USCS Group Symbols

					Group Symbol				Group Name
>50% Sand & Gravel	GRAVEL % gravel > % sand	≤5% fines	Well-graded		GW	<15% sand			Well-graded GRAVEL
						≥15% sand			Well-graded GRAVEL with Sand
			Poorly-graded		GP	<15% sand			Poorly graded GRAVEL
						≥15% sand			Poorly graded GRAVEL with Sand
		10% fines	Well-graded	fines - ML or MH	GW-GM	<15% sand			Well-graded GRAVEL with Silt
						≥15% sand			Well-graded GRAVEL with Silt and Sand
				fines - CL or CH	GW-GC	<15% sand			Well-graded GRAVEL with Clay
						≥15% sand			Well-graded GRAVEL with Clay and Sand
			Poorly-graded	fines - ML or MH	GP-GM	<15% sand			Poorly graded GRAVEL with Silt
						≥15% sand			Poorly graded GRAVEL with Silt and Sand
				fines - CL or CH	GP-GC	<15% sand			Poorly graded GRAVEL with Clay
						≥15% sand			Poorly graded GRAVEL with Clay and Sand
		≥15% fines		fines - ML or MH	GM	<15% sand			Silty GRAVEL
						≥15% sand			Silty GRAVEL with Sand
				fines - CL or CH	GC	<15% sand			Clayey GRAVEL
						≥15% sand			Clayey GRAVEL with Sand
	SAND % sand > % gravel	≤5% fines	Well-graded		SW	<15% gravel			Well-graded SAND
						≥15% gravel			Well-graded SAND with Gravel
			Poorly-graded		SP	<15% gravel			Poorly graded SAND
						≥15% gravel			Poorly graded SAND with Gravel
		10% fines	Well-graded	fines - ML or MH	SW-SM	<15% gravel			Well-graded SAND with Silt
						≥15% gravel			Well-graded SAND with Silt and Gravel
				fines - CL or CH	SW-SC	<15% gravel			Well-graded SAND with Clay
						≥15% gravel			Well-graded SAND with Clay and Gravel
			Poorly-graded	fines - ML or MH	SP-SM	<15% gravel			Poorly graded SAND with Silt
						≥15% gravel			Poorly graded SAND with Silt and Gravel
				fines - CL or CH	SP-SC	<15% gravel			Poorly graded SAND with Clay
						≥15% gravel			Poorly graded SAND with Clay and Gravel
		≥15% fines		fines - ML or MH	SM	<15% gravel			Silty SAND
						≥15% gravel			Silty SAND with Gravel
				fines - CL or CH	SC	<15% gravel			Clayey SAND
						≥15% gravel			Clayey SAND with Gravel
50% or More Fines	Low-Plasticity Clay				CL	<30% sand & gravel	<15% Sand and Gravel		Lean CLAY
							15-25% sand & gravel	% sand ≥ % gravel	Lean CLAY with Sand
								% sand < % gravel	Lean CLAY with Gravel
						≥30% sand & gravel	% sand ≥ % of gravel	< 15% gravel	Sandy lean CLAY
								≥ 15% gravel	Sandy lean CLAY with Gravel
							% sand < % gravel	< 15% sand	Gravelly lean CLAY
								≥ 15% sand	Gravelly lean CLAY with Sand
	Low-Permeability Silt				ML	<30% sand & gravel	15% sand & gravel		SILT
							15-25% sand & gravel	% sand ≥ % gravel	SILT with Sand
								% sand < % gravel	SILT with Gravel
						≥30% sand & gravel	% sand ≥ % of gravel	< 15% gravel	Sandy SILT
								≥ 15% gravel	Sandy SILT with Gravel
							% sand < % gravel	< 15% sand	Gravelly Silt
								≥ 15% sand	Gravelly Silt with Sand
	Plastic Clay				CH	<30% sand & gravel	< 15% sand & gravel		Fat CLAY
							15-25% sand & gravel	% sand ≥ % gravel	Fat CLAY with Sand
								% sand < % gravel	Fat CLAY with Gravel
						≥30% sand & gravel	% sand ≥ % of gravel	< 15% gravel	Sandy fat CLAY
								≥ 15% gravel	Sandy fat CLAY with Gravel
							% sand < % gravel	< 15% sand	Gravelly fat CLAY
								≥ 15% sand	Gravelly fat CLAY with Sand
	Plastic Silt				MH	<30% sand & gravel	< 15% sand & gravel		Elastic SILT
							15-25% sand & gravel	% sand > % gravel	Elastic SILT with Sand
								% sand < % gravel	Elastic SILT with Gravel
						≥30% sand & gravel	% sand ≥ % of gravel	< 15% gravel	Sandy elastic SILT
								≥ 15% gravel	Sandy elastic SILT with Gravel
							% sand < % gravel	< 15% sand	Gravelly elastic SILT
								≥ 15% sand	Gravelly elastic SILT with Sand
	Organics (Peat or Bay Mud)				OL/OH	<30% sand & gravel	< 15% sand & gravel		Organic SOIL
							15-25% sand & gravel	% sand ≥ % gravel	Organic SOIL with Sand
								% sand < % gravel	Organic SOIL with Gravel
						≥30% sand & gravel	% sand ≥ % of gravel	< 15% gravel	Sandy Organic SOIL
								≥ 15% gravel	Sandy Organic SOIL with Gravel
							% sand < % gravel	< 15% sand	Gravelly Organic SOIL
								≥ 15% sand	Gravelly Organic SOIL with Sand

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Example
Visual Classification of Soils

PROJECT NUMBER:	PROJECT NAME:		
BORING NUMBER:	COORDINATES:		DATE:
ELEVATION:	GWL: Depth	Date/Time	DATE STARTED:
ENGINEER/GEOLOGIST:	Depth	Date/Time	DATE COMPLETED:
DRILLING METHODS:			PAGE: OF

DEPTH ( )	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER ( )	RECOVERY ( )	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	WELL CONSTRUCTION	REMARKS

NOTES:

Drilling Contractor: _____

Drilling Equipment: _____

Driller: _____

_____

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CONSISTENCY OF COHESIVE SOILS

CONSISTENCY	UNCONFINED COMPRESSIVE STRENGTH (TONS PER SQUARE FOOT)
VERY SOFT	LESS THAN 0.25
SOFT	0.25 to 0.50
FIRM	0.50 to 2.0
HARD	2.0 to 4.0
VERY HARD	MORE THAN 4.0

DENSITY OF GRANULAR SOILS

DENSITY	STANDARD PENETRATION RESISTANCE [1]
VERY LOOSE	0-4
LOOSE	5-10
MEDIUM DENSE	11-30
DENSE	31-50
VERY DENSE	OVER 50

[1] STANDARD PENETRATION RESISTANCE IS THE NUMBER OF BLOWS REQUIRED TO DRIVE A 2-INCH O.D. SPLIT BARREL SAMPLER 12 INCHES USING A 140-POUND HAMMER FALLING FREELY THROUGH 30 INCHES. THE SAMPLER IS DRIVEN 18 INCHES AND THE NUMBER OF BLOWS RECORDED FOR EACH 6-INCH INTERVAL. THE SUMMATION OF THE FINAL TWO INTERVALS IS THE STANDARD PENETRATION RESISTANCE.

GRAIN SIZE IN MM

COBBLES	GRAVEL		SAND			SILT AND CLAY
	COARSE	FINE	COARSE	MEDIUM	FINE	

USCS CLASSIFICATION FOR SOILS

COARSE-GRAINED SOILS

CLEAN GRAVELS (LITTLE OR NO FINES)	GW	WELL-GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES
	GP	POORLY GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES
GRAVELS WITH FINES (APPRECIABLE AMOUNT OF FINES)	GM	SILTY GRAVELS, GRAVEL-SAND-SILT MIXTURES
	GC	CLAYEY GRAVELS, GRAVEL-SAND-CLAY MIXTURES
CLEAN SANDS (LITTLE OR NO FINES)	SW	WELL-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
	SP	POORLY-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
SANDS WITH FINES (APPRECIABLE AMOUNT OF FINES)	SM	SILTY SANDS, SAND-SILT MIXTURES
	SC	CLAYEY SANDS, SAND-CLAY MIXTURES

FINE-GRAINED/HIGHLY ORGANIC SOILS

SILTS AND CLAYS LIQUID LIMIT (LESS THAN 50)	ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY
	CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS SILTY CLAYS, LEAN CLAYS
	OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
SILTS AND CLAYS LIQUID LIMIT (GREATER THAN 50)	MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SANDY OR SILTY SOILS
	CH	INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS
	OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
HIGHLY ORGANIC SOILS	PT	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS

Soil / Sediment Field Logsheet

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Site Name: Project #:

Sample ID:	Sample Location Sketch:
Sample Type*:	
*: SED=Sediment; SUR=Surface soil; SUB=Subsurface Soil; OTH=Other. grab=Grab, comp=Composite	
Date Sampled:	
Time Sampled:	
Depth (ft bgs):	
Physical description:	
Analyses requested:	Photograph Log #:
PID:	Calibration Date:
O2/LEL:	Calibration Date:
Weather:	
Temperature: ° F	
Sampling Equipment:	
Equipment Decontamination Technique:	
QC Samples:	
Analytical Laboratory:	
Comments:	
Field Technician: (Print)	Date:

Groundwater Logsheet

Shaw™ Shaw E & I

Site Name: Project #:

Sample ID:	Sample Location Sketch:
Sample Type*:	
*: grab = Grab, comp = Composite	
Date Sampled:	
Time Sampled:	
Depth (ft bgs):	
~~Physical description:~~	
~~Analyses requested:~~	
	Photograph Log #:
PID:	Calibration Date:
O2/LEL:	Calibration Date:
Weather:	
Temperature: ° F	
Sampling Equipment:	
Equipment Decontamination Technique:	
QC Samples:	
Analytical Laboratory:	
Comments:	
Field Technician: (Print)	Date:

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Jar Headspace Screening Results Log

Site: _____

Location: _____

Sample ID	Date	Headspace Reading	Comments

Page _____

Shaw™ Shaw Environmental, Inc.

TEST EQUIPMENT LIST AND CALIBRATION LOG

Project Name: _____ Project No. _____

Equipent Number and Use (Screening or Analytical)	Equipment Name (Manufacturer and Model ID)	Date and Time (of Califbration)	Calibration Standard Used (Mnaufacturer and Lot Number)	Equipment Reading (Include Units and Tolerances)	Comments (and/or Observations)	Initials (of Person)

Example Calibration Log

Shaw Environmental, Inc.

CALIBRATION FIELD LOG

Project Name: _____ Sample Location: _____
Project No.: _____ Date and Time: _____
Information Recorded by: _____

Sampling Team

Name Printed

_____
_____
_____
_____

EQUIPMENT

Equipment Type: **Portable PID**
Equipment/ID No.: _____

Analyte	Cal. Std.	Spike Amt. (ppm)	Measured Value (ppm)	Calibration Required? (Y/N)	Post-Calibration Value (ppm)
VOCs (solvents and TPH)	Reference Std.				

Equipment Type: **Water Quality Field Instrument**
Equipment/ID No.: _____

Analyte	Cal. Std.	Spike Amt.	Acceptance Criteria	Measured Value	Recalibration Required? (Y/N)	Post-Calibration Value
Conductivity	Reference Std. (mS/cm)		± 10%			
Turbidity	1.0 NTU	1.0	± 10%			
	10.0 NTU	10.0	± 10%			
ORP	Reference Std. (mV)	200-275	± 10%			
pH	7.0 pH units	7.0	6.95 - 7.05			
	10.0 pH units	10.0	9.95 - 10.05			
Dissolved Oxygen*	Reference Std. (100.0%)	100 %	± 10%	%		%
	Note the DO (mg/L) here after calibrating to 100.0% -->					mg/L

Barometric Pressure

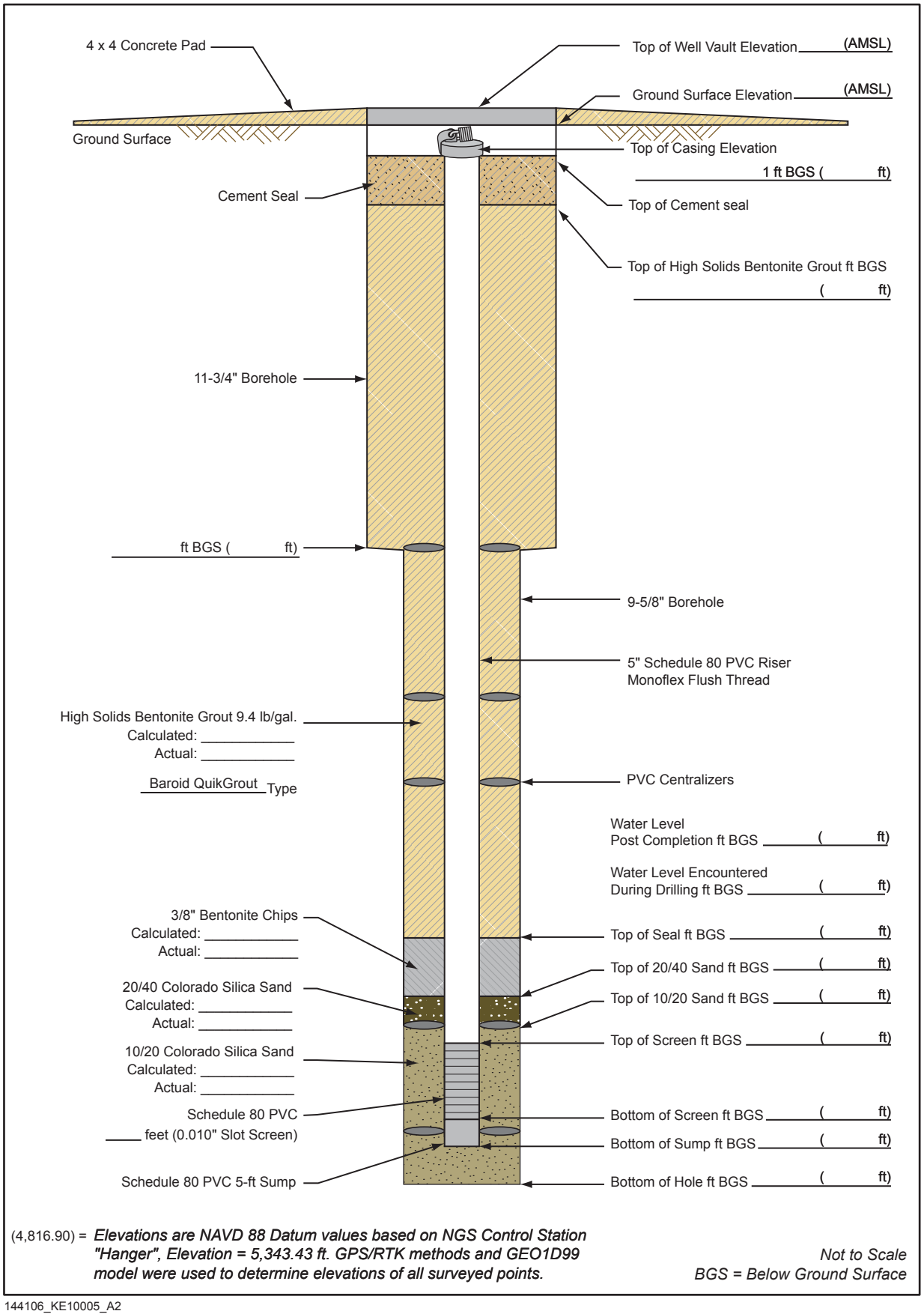
Local Barometric Pressure, if available (mm of Hg) _____ Adjust Instrument? Y N

Comments: _____
_____
_____
_____
_____
_____

*** Note**: When calibrating DO, calibrate to 100%. After DO has been calibrated, note the mg/L in the given field.

Monitoring Well Completion Diagram _____

Installation Start Date/Time: _____
Installation End Date/Time: _____



(4,816.90) = *Elevations are NAVD 88 Datum values based on NGS Control Station "Hanger", Elevation = 5,343.43 ft. GPS/RTK methods and GEO1D99 model were used to determine elevations of all surveyed points.*

Not to Scale
BGS = Below Ground Surface

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EXAMPLE
WELL PURGE RECORD

Project Name: _____

Location: _____ Well/Piez. No.: _____

Personnel: _____ Date Installed: _____

Date (Start/End): _____ Csg. Diameter (I.D.): _____

Method of Development: _____ Total Depth (ft. TOC): _____

❑ Surging ❑ Bailing ❑ Pumping ❑ Other (State Method) _____

❑ Original Development ❑ Redevelopment Development Date:_____

Depth to water before developing well:_____

		Volume (V)	Purge Factor	Volume To Purge
Height of Water Column:	_____ feet_____	=_____gal.*	_____	= _____

$V = (B * r_c^2 * L_c * 7.48)+(B*(r_w-r_c)^2*L_s*ø_s*7.48)$=_____gallons (See Notes below)

Depth purging from:_____ feet Time purging begins:_____

Weather:_____ Screened Interval (ft. BGL): _____

Equipment Nos.: pH Meter _____ EC Meter _____ Turbidity Meter_____

Equipment decontaminated prior to development Y _____ N _____

Describe _____

Date	Time	Water Level (ft. below TOC)	Volume Removed (gal.)	Temp (C or F)	pH	EC	Turbidity	D.O.	Comments

Notes:

- Water levels – Reported to the nearest 0.01 foot.
- pH – Reading rounded to 0.1 pH units
- Electrical conductivity (EC) – Reported to the nearest 10% mhos/cm or
- µmho/cm @25 C or in mS/cm of instrument set range
- Water temperature – Reported to the nearest 0.1 C or F feet
- Dissolved oxygen (D.O.) report in 0.1 mg/L
- Turbidity report in NTV nearest whole #

Where:

B=3.14

$ø_s$=porosity of the sand pack

r_c =radius of the well casing and screen in feet

L_c=length of water column inside the casing and screen in feet

r_w =radius of the well bore in feet

L_s =length of saturated portion of the sand pack in feet

7.48 gallons/cubic foot=conversion from cubic feet to gallons

Shaw The Shaw Group Inc.™

TAILGATE SAFETY MEETING

Division/Subsidiary **Shaw Environmental Inc.** Facility _____

Date _____ Time _____ Job Number _____

Customer _____ Address _____

Specific Location _____

Type of Work _____

Chemicals Used _____

OBTAIN MATERIAL SAFETY DATA SHEETS (MSDS) FOR CHEMICALS TO BE USED ONSITE

SAFETY TOPICS PRESENTED

Protective Clothing/Equipment _____

Chemical Hazards _____

Physical Hazards _____

.

Emergency Procedures _____

Hospital/Clinic _____ Phone _____ Paramedic Phone _____

Hospital Address _____

Special Equipment _____

Other _____

ATTENDEES

NAME PRINTED	SIGNATURE

Shaw The Shaw Group Inc.™

TAILGATE SAFETY MEETING

NAME PRINTED	SIGNATURE

Meeting conducted by:

NAME PRINTED	SIGNATURE

Supervisor _____

Project Manager _____

SAFETY MEETING LOG/JOB SAFETY ANALYSIS

Date/Time: _____ Job No.:_____

Location of Job (Unit/Location on Project):		**Job Task Analyzed**
Required PPE:	**Safety Access/ Location**	Supervisor of Work:
	Safe Haven:	JSA Prepared By:
	Wind Direction:	Are other crews in area?
Pre-Job Preparation 1. Fill out JSA 2. Review JSA (EVERYONE) 3. Sign JSA (EVERYONE)	Evacuation Route: Assembly Point::	New: / Revised:

Job Task (What you are doing)	**Audit the Job:** Audit Time:
Potential Hazards	**Supervisor's Comments:**
Recommended Action or Procedure	**Supervisor's Initials:**

Crew Name Signatures:		

PROJECT SAFETY INSPECTION REPORT

DATE _____

BUSINESS LINE: _____

PROJECT NAME/NUMBER: _____

PROGRAM MANAGER: _____ PROJECT MANAGER: _____

GENERAL PROJECT DESCRIPTION: _____

SITE ACTIVITIES AT TIME OF INSPECTION: _____

_____

_____

INTERVIEWED EMPLOYEE: _____

SAFETY ISSUE: _____

CORRECTIVE ACTION: _____

_____

ASSIGNED TO: _____ FOLLOW-UP DATE: _____

CORRECTION VERIFIED BY: _____ DATE: _____

INTERVIEWED EMPLOYEE: _____

SAFETY ISSUE: _____

CORRECTIVE ACTION: _____

_____

ASSIGNED TO: _____ FOLLOW-UP DATE: _____

CORRECTION VERIFIED BY: _____ DATE: _____

INSPECTION COMPLETED BY: _____ DATE: _____

HEALTH AND SAFETY REVIEW BY: _____ DATE: _____

PROJECT SAFETY INSPECTION REPORT

PROJECT _____ **DATE** _____

	YES	NO	N/A
FIRST AID			
1. Are first aid kit locations identified and accessible?			
2. Are emergency eye wash/safety showers available and inspected monthly?			
3. Are first aid kits inspected weekly?			
4. Is a qualified first aid/CPR provider on-site?			
PERSONAL PROTECTIVE EQUIPMENT			
1. Have levels of personnel protection been established?			
2. Are respirators decontaminated, inspected, and stored according to standard procedures?			
3. Have employees been fit-tested?			
4. Is defective personal protective equipment tagged and taken out of service?			
5. Does compressed breathing air meet CGA Grade "D" minimum?			
6. Are there sufficient sizes and quantities of protective equipment?			
7. At a minimum, are employees utilizing safety glasses, hard hats, and steel toe boots?			
FIRE PREVENTION			
1. Are employees smoking only in designated outdoor areas?			
2. Are fire lanes established and maintained?			
3. Are flammable liquid dispensing systems bonded?			
4. Are approved safety cans available for storage of flammable liquids?			
5. Has the local fire department been contacted?			
6. Are fire extinguishers available and inspected monthly?			
7. Are flammables and combustibles properly stored?			
8. Are flammable storage cabinets available and used when needed?			
AIR MONITORING			
1. Is required air monitoring being conducted?			
2. Are air monitoring instruments calibrated daily?			
3. Are air monitoring logs up to date?			
4. Are instrument user manuals available?			
5. Are instruments being maintained?			
6. Are employees notified of personal sampling results within 5 days of receipt?			
WELDING AND CUTTING			
1. Are fire extinguishers present at welding and cutting operations?			
2. Are confined spaces evaluated prior to and during cutting and welding operations?			
3. Have Hot Work Permits been completed?			
4. Are proper helmets, goggles, aprons, and gloves available for welding and cutting operations?			
5. Are welding machines properly grounded?			
6. Are oxygen and fuel gas cylinders stored a minimum of 20 feet apart?			
7. Are only trained personnel permitted to operate welding and cutting equipment?			
8. Are gas cylinders transported in a secured vertical position with caps in place?			
HAND AND POWER TOOLS			
1. Are defective hand and power tools tagged and taken out of service?			
2. Is eye protection available and used when operating power tools?			
3. Are guards and safety devices in place on power tools?			
4. Are power tools inspected before each use?			
5. Are nonsparking tools available when necessary?			

PROJECT SAFETY INSPECTION REPORT

PROJECT _____ **DATE** _____

	YES	NO	N/A
HAND AND POWER TOOLS (continued)			
6. Is the correct tool being used for the job?			
MOTOR VEHICLES			
1. Are vehicles regularly inspected?			
2. Are personnel licensed for the vehicles they operate?			
3. Are unsafe vehicles tagged and reported to supervision?			
4. Is vehicle's safety equipment operating properly?			
5. Are loads secure?			
6. Are vehicle occupants using safety belts?			
7. Are current insurance cards and blank accident report forms located in vehicles?			
EMERGENCY PLANS			
1. Are emergency telephone numbers posted?			
2. Have emergency escape routes been designated?			
3. Are employees familiar with the emergency signal?			
4. Has the emergency route to the hospital been established and posted?			
5. Is a vehicle on site that can transport injured employees to the hospital?			
MATERIALS HANDLING			
1. Are materials stacked and stored to prevent sliding or collapsing?			
2. Are tripping hazards identified?			
3. Are semi-trailers chocked?			
4. Are fixed jacks used under semi-trailers?			
5. Are riders prohibited on materials handling equipment?			
6. Are approved manlifts provided for the lifting of personnel?			
7. Are personnel in manlifts wearing approved fall protection devices?			
FIRE PROTECTION			
1. Has a fire alarm system been established?			
2. Do employees know the location and use of all fire extinguishers?			
3. Are fire extinguisher locations posted?			
4. Are combustible materials segregated from open flames?			
5. Have fire extinguishers been professionally inspected during the last year?			
6. Are fire extinguishers visually inspected monthly?			
ELECTRICAL			
1. Is electrical equipment and wiring properly guarded and maintained in good condition?			
2. Are extension cords kept out of wet areas?			
3. Is damaged electrical equipment tagged and taken out of service?			
4. Have underground electrical lines been identified by proper authorities?			
5. Has a lockout/tagout system been established?			
6. Are GFCIs being used on all temporary electrical systems and as needed?			
7. Are extension cords being inspected daily (i.e., group pin in place, no unapproved splices)?			
8. Are warning signs exhibited on high voltage equipment (250V or greater)?			
9. Is adequate distance maintained from overhead electrical lines?			
10. Are switches, circuit breakers, and switchboards installed in wet locations enclosed in weatherproof enclosures?			

PROJECT SAFETY INSPECTION REPORT

PROJECT _____ **DATE** _____

	YES	NO	N/A
CRANES AND RIGGING			
1. Are cranes inspected daily prior to use?			
2. Are crane swing areas barricaded or demarked?			
3. Is all rigging equipment tagged with an identification number and rated capacity?			
4. Is rigging equipment inspection documented?			
5. Are slings, chains, and rigging inspected before each use?			
6. Are damaged slings, chains, and rigging tagged and taken out of service?			
7. Are slings padded or protected from sharp corners?			
8. Do employees keep clear of suspended loads?			
9. Are rated load capacities and special hazard warnings posted on crane?			
10. Are the records of annual crane inspection available?			
11. Has accessible areas within the swing radius of the rear of the crane been barricaded?			
12. Do crane operators have required training/certification?			
COMPRESSED GAS CYLINDERS			
1. Are breathing air cylinders charged only to prescribed pressures?			
2. Are like cylinders segregated and stored in well-ventilated areas?			
3. Is smoking prohibited in cylinder storage areas?			
4. Are cylinders stored secure and upright?			
5. Are cylinders protected from snow, rain, etc.?			
6. Are cylinder caps in place before cylinders are moved?			
7. Are fuel gas and oxygen cylinders stored a minimum of 20 feet apart?			
8. Are propane cylinders stored and used only outside of buildings?			
SCAFFOLDING			
1. Is scaffolding placed on a flat, firm surface?			
2. Are scaffold planks free of mud, ice, grease, etc.?			
3. Is scaffolding inspected before each use?			
4. Are defective scaffold parts taken out of service?			
5. Have employees completed scaffold user training?			
6. On scaffolds where platforms are overlapped, is planking overlapped a minimum of 12 inches?			
7. Does scaffold planking extend over end supports between 6 to 18 inches (dependent upon platform length)?			
8. Are employees restricted from working on scaffolds during storms and high winds?			
9. Are all pins in place and wheels locked?			
10. Is required perimeter guarding (top rail, mid rail, and toe board) present?			
11. Has a competent person been designated to oversee scaffold construction?			
12. Are employees prohibited from moving mobile scaffold horizontally while employees are on them?			
13. Are all scaffold components manufactured by the same company?			
WALKING AND WORKING SURFACES			
1. Are ladders regularly inspected?			
2. Are accessways, stairways, ramps, and ladders clean of ice, mud, snow, or debris?			
3. Are ladders being used in a safe manner?			
4. Are ladders kept out of passageways, doors, or driveways?			
5. Are broken or damaged ladders tagged and taken out of service?			
6. Are metal ladders prohibited in electrical service?			

WALKING AND WORKING SURFACES (continued)			
7. Are stairways and floor openings guarded?			
8. Are safety feet installed on straight and extension ladders?			
9. Is general housekeeping being maintained?			
10. Are ladders tied off?			
11. Are handrails and side rails installed along the unprotected sides of stairways having 4 or more risers or rising more than 30 inches?			
SITE SAFETY PLAN			
1. Is a site safety plan available on site or accessible to all employees?			
2. Does the safety plan accurately reflect site conditions and tasks?			
3. Have potential hazards been described to employees on site?			
4. Is there a designated safety official on site?			
5. Have all employees signed the safety plan acknowledgment form?			
SITE POSTERS			
1. Are the following posters displayed in a prominent and accessible area?			
A. Minimum Wage			
B. OSHA Job Protection			
C. Equal Employment Opportunity			
2. Are all required state-specific posters displayed?			
SITE CONTROL			
1. Are work zones clearly marked?			
2. Are support trailers located to minimize exposure from a potential release?			
3. Are support trailers accessible for approach by emergency vehicles?			
4. Is the site properly secured during and after work hours?			
5. Is an exclusion zone sign-in/sign-out log maintained?			
6. Are only employees with current training and physicals permitted in exclusion zone?			
HEAVY EQUIPMENT			
1. Is heavy equipment inspected as prescribed by the manufacturer?			
2. Is defective heavy equipment tagged and taken out of service?			
3. Are project roads and structures inspected for load capacities and proper clearances?			
4. Is heavy equipment shut down for fueling and maintenance?			
5. Are backup alarms installed and working on mobile equipment?			
6. Have qualified equipment operators been designated?			
7. Are riders prohibited on heavy equipment?			
8. Are guards and safety appliances in place and used?			
9. Are operators using the "three point" system when mounting/dismounting equipment?			
EXCAVATION			
1. Has a "competent person" been designated to oversee excavation activities?			
2. Prior to opening excavations, are utilities located and marked?			
3. Has a professional engineer evaluated all excavations greater than 20 feet deep?			
4. Is there rescue equipment on site and accessible to the excavation area?			
5. Is excavated material placed a minimum of 24 inches from the excavation?			
6. Are the sides of excavations sloped or shored to prevent cave ins?			
EXCAVATION (continued)			
7. Have excavations greater than 4 feet deep been monitored for hazardous atmospheres (i.e., LEL/O_2 deficiency)?			
8. Are ladders or ramps used in excavations over 4 feet deep?			
9. Are means of egress available so as to require no more than 25 feet of lateral travel?			

PROJECT SAFETY INSPECTION REPORT

PROJECT _____ **DATE** _____

	YES	NO	N/A
10. Are barriers, i.e., guardrails or fences, placed around excavations near pedestrian or vehicle thoroughfares?			
11. Is excavation inspected daily by competent persons and documented?			
CONFINED SPACES			
1. Have employees been trained in the hazards of confined spaces?			
2. Are confined space permits posted at entrance to confined space?			
3. Is a copy of the confined space entry procedure available?			
4. Has a rescue plan been established?			
5. Is an entry supervisor present at each permit-required entry?			
6. Are required extraction/fall protection devices being used?			
DECONTAMINATION			
1. Are decontamination stations set up on site?			
2. Is decontamination water properly contained and disposed of?			
3. Are all pieces of equipment inspected for proper decontamination before leaving the site?			
4. Are shin/metatarsal guards being used during power washing activities?			
HAZARD COMMUNICATION			
1. Is there a copy of the HAZCOM procedure on site?			
2. Are their MSDSs for required materials/chemicals present on site?			
3. Are all containers properly labeled, as to content, hazard?			
4. Have employees been trained in accordance with the HAZCOM procedure?			
5. Do employees (including subcontractors) know and understand the effects of exposure from the chemicals on site?			
6. Have all personnel signed the HAZCOM acknowledgment form?			
7. Is there an updated list of chemicals maintained on site?			
TRAINING			
1. Are tailgate safety meetings being conducted daily?			
2. Are current training/medical records maintained on site?			
DOCUMENTATION			
1. Is an OSHA 300 Log maintained on site and posted during the months of February, March, and April?			
2. Are accident report forms available?			
3. Is a copy of health and safety policy and procedures available on site?			

PROJECT SAFETY INSPECTION REPORT

PROJECT _____ **DATE** _____

ALL NEGATIVE RESPONSES	CORRECTIVE ACTION	ASSIGNED TO	DATE ASSIGNED	DATE COMPLETED	VERIFIED BY

DESCRIBE POSITIVE SAFETY OBSERVATIONS

Shaw® Shaw E & I

FIELD CHANGE NOTICE LOG

FCN Number	Type	Preparer	Date of Initiation	Reviewer(s)	Engineering Document(s)	Rev.	Reason for Change	Appv'd / Disappv'd	Date	Date of Incorp.
	I, II,III	Name		Name(s)	Title, Dwg, #, Spec. #			A or D		

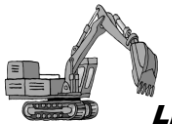
Change Request Log Form 0203

Equipment No: _____ **Date:** _____

Equipment Type: _____ **Location:** _____

Equipment Hrs: _____ **Supervisor:** _____

Shaw™
Shaw Environmental & Infrastructure, Inc.



DAILY EQUIPMENT INSPECTION

List Quantities And Kinds of Fluids Added In Space At Bottom Of Sheet

ITEM		OK	Add	N/A	Comments
1	Check Engine Oil Level And Engine Compartment For Trash, Debris, etc.	☐	☐	☐	☐
2	Check Hydraulic Oil Level, Cap And Vent.	☐	☐	☐	☐
3	Check Radiator Coolant Level And Radiator Fins For Dirt, Leaves, etc.	☐	☐	☐	☐
4	Check Transmission Oil Level (Dozers) or Swing Case (Excavators).	☐	☐	☐	☐
5	Check Oil Level in Frame Joint Bearing, Consult Manual. (Volvo A-40 only)	☐	☐	☐	☐
6	Check For Oil or Coolant Leaks.	☐	☐	☐	☐
7	Check Wheels / Tires / Tracks For Damage, Cuts And Proper Inflation PSI._____	☐	☐	☐	☐
8	Check Ground Engaging Implements, Cutting Edges, Teeth, Blade, etc.	☐	☐	☐	☐
9	Inspect Visible Hydraulic Hoses / Lines For Scuffs, Wear, Leaks, etc.	☐	☐	☐	☐
10	Inspect ROPS, FOPS, For Any Obvious Signs Of Loose Mounts, etc.	☐	☐	☐	☐
11	Check All Guages, Lights, Controls, Backup Alarms, Horn, etc.	☐	☐	☐	☐
12	Inspect Operators Compartment For Debris And Fire Extinguisher Charge. Check Floor For Build-up Of Dirt Around Pedals. Inspect Seat Belts, Lap Bar, Etc. Clean The Windows And Note Any Cracks.	☐	☐	☐	☐
13	Do a Walk Around Inspection Looking For Obvious Signs Of Future Problem Areas. Check Grab Handles and Step Treads, etc.	☐	☐	☐	☐
14	Check Operation Of All Systems, Boom, Bucket, Dump Bed, Grapple, Shears. Look for Leaks, Damage, Warning Signs, Excess Slack, Obvious Wear, etc.	☐	☐	☐	☐
15	Check Under The Machine For Any Loose Or Hanging Objects, Leaks, Or Anything Out Of The Ordinary.	☐	☐	☐	☐
16	Check Fuel Level And Cap Condition, Fill Tank Prior To Beginning Daily Operation.	☐	☐	☐	☐
17	**Lube All Moving Parts**, Such As Blade, Bucket, Stick, Connecting Links Equalizer bar, Cylinder Pins And Any Point That Is Subject To Grease Being Pushed Or Worn Out Due To Daily Use. Consult Manual For Grease Points.	☐	☐	☐	☐
18	Check Breathing Air Sustem (If Used). Make Sure Bottle Is Full And Mask / Hose Assembly Is Clean And In Good Working Condition Before Each Use.	☐	☐	☐	☐
19	**Verify The Presence Of The Operations / Maintenance Manual.**	☐	☐	☐	☐

Report All Damage To Supervisor Immediately

COMMENTS:

USE LINE NUMBER, BE SPECIFIC, NOTIFY REGIONAL MAINTENANCE COORDINATOR IF IMMEDIATE ATTENTION IS NEEDED.

EMPLOYEE NAME: **EMPLOYEE NUMBER:**

THESE SHEETS ARE TO BE RETAINED ON THE PROJECT FOR REVIEW BY ESG PERSONNEL.

Unit #		**Start Date**	
Mileage		**Project #**	
Vehicle Type		**License #**	
Inspected By		**Fuel Front**	
Employee #		**Fuel Rear**	

DAILY VEHICLE INSPECTION (Weekly Log)

For Authorized repairs on Donlen Vehicles, Call 1-800-323-1483

N/A = Not Applicable C = Comments O = Okay N = Needs Attention	**SAT**	**SUN**	**MON**	**TUE**	**WED**	**THU**	**FRI**
Exterior/Interior Clean							
Lights: Head-Tail-Turn-Stop-Emergency-Back Up							
Operating Controls/ Gauges							
Battery/ Starter/ Horn							
Air Conditioner/ Heater/ Defroster							
Back-up Alarm (Trucks)							
Windshield, Other Glass, Wipers/Washer							
Mirrors: Inside-Outside (Convex-Trucks)							
Insurance Card & Accident Report Kit							
Emergency Phone Number List							
Map to Urgent Care Facility & Hospital							
Current Registration, Plates							
Service Brakes, Emergency/Parking Brake							
Trailer Aux. Brake Controller/Electrical Connection							
Coupling Devices/Safety Chain Anchor Point							
Wheel Chocks (When Equipped with Trailer)							
Engine Oil, Oil Pressure							
Transmission Oil & Drive Line							
Radiator/Cooling System							
Exhaust/ Muffler							
Front Axle/Steering/Suspension System							
Donlen Coupon Book							
First Aid Kit							
Fire Extinguisher (mounted/accessible/charged)							
Emergency Flares or Reflective Markers							
Tires/Wheels/Rims							
Spare Tire, Jack, Lug Wrench							
Frame/Bumpers							
Seat Belts (One for Each Passenger)							
Visible Damage to Body							
Driver Safety Notification Sticker							
Other, Please Enter Comments Below							

Was Unit Serviced? Yes/ No Date Serviced Miles

Comments:

I have been authorized and I am licensed to operate this vehicle.

INSPECTORS SIGNATURE: **DATE:**

PLEASE REPORT ALL DEFICIENCIES TO YOUR SUPERVISOR

RETAIN THIS INSPECTION DOCUMENT IN PROJECT FILES

Shaw The Shaw Group Inc.™

Site Specific Health & Safety Plan Amendment Documentation

Project Name: Holloman AFB **Project No. 144106**

Amendment No. __ Date: _____

Amendment Address: _____

Reason For Amendment: _____

Amendment: _____

Scope of Work: _____

Chemical Hazards Specific To The Scope of Work:
_____

Specific AHA Identified: _____

PPE Required: _____

Monitoring Requirements: _____

_____
Completed by:

_____
Approved by:

_____
Approved by:

_____
Approved by:

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Contract No. FA8903-09-D-8580, Task Order No. 0013 • Draft • Revision 0 • November 2011 • WERC-09-13-002-3

Appendix C
Activity Hazard Analyses

Shaw Standard Operating Procedures

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CONTENTS

Section

CONTENTS (Concluded)

Acronyms and Abbreviations

%	percentage
<	less than
=	equal to
>	greater than
µm	micrograms
^{0}C	degrees Celsius
^{0}F	degrees Fahrenheit
ABS (plastic)	acrylonitrile-butadiene-styrene copolymers
AST	Above ground storage tank
ASTM	American Society for Testing and Materials
bgl	below ground level
bgs	below ground surface
BLM	Business Line Manager
COC	Chain of Custody
COLIWASA	Composite Liquid Waste Sampler
CPDO training	Competent Person – Drilling Oversight Training
DI water	deionized water
DNAPL	dense non-aqueous phase liquid
DO	dissolved oxygen
DOT	U.S. Department of Transportation
DTB	depth to bottom
DTW	depth to water
DUR	Data Usability Review
DWC	depth of the water column
ECP	Environmental Compliance Plan

Acronyms and Abbreviations (Continued)

EPA	U.S. Environmental Protection Agency
FAQ	Frequently Asked Question
FID	Flame Ionization Detector
Ft	feet/foot
FTL	Field Team Leader
g	grams
gal	gallon
GC	Gas Chromatograph
GPR	Ground Penetrating Radar
GRO	gasoline range organics
HASP	project specific Health and Safety Plan
HazCat	Hazard Categorization
HAZWOPER	Hazardous Waste Operations and Emergency Response
HDPE	high density polyethylene
HS	Health and Safety
HSO	Health and Safety Officer
IATA	International Air Transport Association
ID	Identification
IDW	Investigative Derived Waste
in	inch/inches
IP	Ionization Potential
IT	Information Technologies
JSA	Job Safety Analysis
kV	kilovolts
L/min	liters per minute

Acronyms and Abbreviations (Continued)

LCB	laboratory control blank
LCS	laboratory control spike
LEL	lower explosive limit
LNAPL	light non-aqueous phase liquid
MFG name	manufacturing name
mL	milliliters
mm	millimeters
MS	Matrix Spike
MSD	Matrix Spike Duplicate
MSDS	Material Safety Data Sheet
N/A	Not Available/ Not Applicable
NA #	North American hazardous chemicals number
NAPL	non-aqueous phase liquid
NCR	nonconformance reports
NFPA	National Fire Protection Association
NTUs	Nephelometric turbidity units
ORP	oxidation/reduction potential
OSHA	Occupational Safety and Health Administration
OVA	Organic Vapor Analyzer
oz	ounce
PCBs	polychlorinated biphenyls
pH	potential of Hydrogen
PID	Photo Ionization Detector
PM	Project Manager
PPE	Personal Protection Equipment

Acronyms and Abbreviations (Continued)

PPM	parts-per-million
PS/SCA	Procurement Specialists/Subcontract Administrators
PTFE	Teflon
PVC	polyvinyl chloride
QA	Quality Assurance
QA/QC	Quality Assurance/ Quality Control
QAPP	Quality Assurance Program Plan
QC	Quality Control
RCRA	Resource Conservation and Recovery Act
RPD	Relative Percent Difference
SAP	Sampling and Analysis Plan
SCBA	Self-Contained Breathing Apparatus
Shaw E & I	Shaw Group Environmental & Infrastructure
SOP	Standard Operating Procedure
SS	Stainless Steel
SSHO	Site Safety and Health Officer
SSO	Site Safety Officer
SVOCs	semi-volatile organic compounds
TCLP	Toxicity Characteristic Leaching Procedure
TD	Total Depth
TOC	top of casing
TSDS	Tank Sampling Data Sheet
UN #	United Nations hazardous chemicals number
USCS	Unified Soil Classification System
UST	Underground Storage Tank

Acronyms and Abbreviations (Concluded)

UV	ultraviolet
VOA vial	volatile organic analysis vial
VOCs	Volatile Organic Compounds
WC	workers compensation
ZHE	Zero Headspace Extraction

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1. PURPOSE

This procedure is intended to communicate the requirements for selection, use, and maintenance of all field logbooks. Field logbooks are often used to document observations, sampling information, and other pertinent information on project sites. They are considered legal documents and should be maintained and documented accordingly as part of the project file.

2. SCOPE

This procedure is applicable to all Shaw E & I site operations where field logbooks are utilized to document all site activities and pertinent information.

3. REFERENCES

- Nielsen Environmental Field School, 1997, *Field Notebook Guidelines*

4. DEFINITIONS

- **Significant detail**—Any piece and/or pieces of information or an observation that can be considered pertinent to the legal reconstruction of events, description of conditions, or documentation of samples and/or sampling procedures.
- **Significant event**—Any event or events that could influence or be considered pertinent to a specific task or function and therefore require documentation in the Field Logbook.
- **Field Logbook**—Logbooks used at field sites that contain detailed information regarding site activities that must include dates, times, personnel names, activities conducted, equipment used, weather conditions, etc. Field logbooks can be used by a variety of different field personnel and are part of the project file.

5. RESPONSIBILITIES

5.1 Procedure Responsibility

The Field Sampling Discipline Lead is responsible for maintenance, management, and revision of this procedure. Questions, comments, or suggestions regarding this technical SOP should be directed to the Field Sampling Discipline Lead.

5.2 Project Responsibility

Shaw employees performing this task, or any portion thereof, are responsible for meeting the requirements of this procedure. Shaw employees conducting technical review of task performance are also responsible for following appropriate portions of this SOP.

For those projects where the activities of this SOP are conducted, the Project Manager, or designee, is responsible for ensuring that those activities are conducted in accordance with this and other appropriate procedures. Project participants are responsible for documenting information in sufficient detail to provide objective documentation (i.e. checkprints, calculations, reports, etc.) that the requirements of this SOP have been met. Such documentation shall be retained as project records.

6. PROCEDURE

6.1 General

Each site or operation, as applicable, will have one current Logbook, which will serve as an index of all activities performed at the site or in the task performance. The Logbook is initiated at the start of the first applicable activity. Summary entries are made for every day that covered activities take place. Multiple field logbooks may be used depending upon the number of different types of field personnel conducting work and the various activities at the site. These field logbooks and the site logbooks shall be made part of the project files.

Information recorded in field logbooks includes observations (significant events and details), data, calculations, time, weather, and descriptions of the data collection activity, methods, instruments, and results. Additionally, the field logbook may contain descriptions of wastes, biota, geologic material, and site features including sketches, maps, or drawings as appropriate.

6.2 Equipment and Materials

- Logbook(s), bound with numbered pages, hard-covered, waterproof preferred. One per project or separate significant task (example-treatment residual composite collection).
- Indelible black or dark blue ink pen
- Other items needed to perform required tasks: compass, ruler, calculator, etc.

6.3 Preparation

Site personnel responsible for maintaining field logbooks must be familiar with the SOPs for all tasks to be performed.

Field logbooks are project files and should remain with project documentation when not in use. *Personnel should not keep Field logbooks in their possession when not in use. Field logbooks should only leave the project site for limited periods, and they should always be returned to the site files or the designated on-site location (Sampler's Trailer, etc.)*.

Field logbooks shall be bound with lined, consecutively numbered pages. All pages must be numbered prior to initial use of the field logbook.

The front cover shall include the following information:

- Project Number
- Project Name and Task(s) included in logbook
- Dates covered by logbook—the starting date must be entered on the first day of use
- Logbook number—if more than one logbook will be needed to cover project/task(s)

The inside front cover shall contain a listing and sign-off of each person authorized to make entries and/or review the logbook. All persons who make entries or review/approve such entries must signify their authority to enter into the logbook via their signature and the date of their signing on the inside front cover. If initials are used for entries instead of full names, the initials must be entered beside the full name on the inside cover.

6.4 Operation

The following requirements must be met when using a field logbook:

- Record significant details and/or events, work, observations, material quantities, calculations, drawings, and related information directly in the field logbook. If data-collection forms are in

use, the information on the form need not be duplicated in the field logbook. However, any forms used to record site information *must be referenced* in the field logbook.

- Information must be factual and unbiased.
- Do not start a new page until the previous one is full or has been marked with a single diagonal line so that additional entries cannot be made. Use both sides of each page.
- Write in black or dark blue indelible ink.
- Do not erase, scribble over, or blot out any entry. Do not use White-Out or like correction items. Before an entry has been signed and dated, changes may be made; however, care must be taken not to obliterate what was written originally. Indicate any deletion by a single line through the material to be deleted. Any change shall be initialed and dated. Error codes (Attachment 1) should be added to the end of the deleted entry. All error codes should be circled.
- Do not remove any pages from the book.
- Do not use loose paper and copy into the field logbook later.
- Record sufficient information to completely document field activities and all significant details/events applicable to the project/task(s) covered by the logbook.
- All entries should be neat and legible.

Specific requirements for field logbook entries include the following:

- Initial and date each page.
- Sign and date the final page of entries for each day.
- Initial, date, and if used, code all changes properly.
- Draw a diagonal line through the remainder of the final page at the end of the day.
- Record the following information on a daily basis:

  a) Date and time

  b) Name of individual making entry

  c) Detailed description of activity being conducted including well, boring, sampling, location number as appropriate

  d) Unusual site conditions

  e) Weather conditions (i.e., temperature, cloud cover, precipitation, wind direction and speed) and other pertinent data

  f) Sample pickup (chain-of-custody form numbers, carrier, time)

  g) Sampling activities/sample log sheet numbers

  h) Start and completion of borehole/trench/monitoring well installation or sampling activity

  i) Health and Safety issues, such as PPE upgrades, monitoring results, near-misses, and incidents associated with the logbook areas

  j) Instrumentation calibration details

Entries into the field logbook shall be preceded with the time of the observation. The time should be recorded frequently and at the point of events or measurements that are critical to the activity being logged. All measurements made and samples collected must be recorded unless they are documented by automatic methods (e.g., data logger) or on a separate form required by an operating procedure. In such cases, the field logbook must reference the automatic data record or form.

While sampling, make sure to record observations such as color and odor. Indicate the locations from which samples are being taken, sample identification numbers, the order of filling bottles, sample volumes, and parameters to be analyzed. If field duplicate samples are being collected, note the duplicate pair sample identification numbers. If samples are collected that will be used for matrix spike and/or matrix spike/matrix spike duplicate analysis, record that information in the field logbook.

A sketch of the station location may be warranted. All maps or sketches made in the field logbook should have descriptions of the features shown and a direction indicator. There must be at least one fixed point with measurements on any map drawn. Maps and sketches should be oriented so that north is towards the top of the page.

Other events and observations that should be recorded include (but are not limited to) the following:

- Changes in weather that impact field activities
- Visitors to the site associated with the covered task(s). Note their time of arrival and departure and provide a brief summary of their purpose on site.
- Subcontractor activities applicable to the covered task(s)
- Deviations from procedures outlined in any governing documents, including the reason for the deviation. Deviations from procedures must be accompanied with the proper authorization.
- Significant events that may influence data, such as vehicles in the vicinity of VOC sampling efforts
- Problems, downtime, or delays
- Upgrade or downgrade of personal protective equipment

6.5 Post-Operation

To guard against loss of data due to damage or disappearance of field logbooks, all original completed logbooks shall be securely stored by the project. All field logbooks will be copied at the end of each work shift and attached to the daily reports.

At the conclusion of each activity or phase of site work, the individual responsible for the field logbook will ensure that all entries have been appropriately signed and dated and that corrections were made properly (single lines drawn through incorrect information, initialed, coded, and dated). The completed field logbook shall be submitted to the project records file.

6.6 Restrictions/Limitations

Field logbooks constitute the official record of on-site technical work, investigations, and data collection activities. Their use, control, and ownership are restricted to activities pertaining to specific field operations carried out by Shaw personnel and their subcontractors. They are documents that may be used in court to indicate and defend dates, personnel, procedures, and techniques employed during site activities. Entries made in these notebooks should be factual,

clear, precise, and as non-subjective as possible. Field logbooks, and entries within, are not to be utilized for personal use.

7. ATTACHMENTS

- Attachment 1, Common Data Error Codes

8. FORMS

None

9. RECORDS

- Field Logbook

10. REVISION HISTORY AND APPROVAL

Revision Level Revision Date	Revision Description	Responsible Manager
00 6/5/2003	Initial Issue	N/A
01 9/8/2006	New template, new numbering of procedure, Section 1 Purpose- content added, Section 2 edited, Section 4-Definitions edited. Sections 6.2, 6.3, 6.4, 6.5 and 6.6 were all edited.	Guy Gallello
02 8/25/2011	Modified format only to align with Governance Management framework	Scott Logan

Attachment 1
Common Data Error Codes

COMMON DATA ERROR CODES

RE	Recording Error
CE	Calculation Error
TE	Transcription Error
SE	Spelling Error
CL	Changed for Clarity
DC	Original Sample Description Changed After Further Evaluation
WO	Write Over
NI	Not Initialed and Dated at Time of Entry
OB	Not Recorded at the Time of Initial Observation

All Error Codes should be circled.

1. PURPOSE

This procedure is intended to communicate the requirements for proper use and completion of Field Logsheets to document sample collection and data gathering activities. Field Logsheets are often utilized to document single location/event information. Examples include boring logs and drum/container logs. This procedure also provides several templates that *may* be utilized or modified to a particular need.

2. SCOPE

This procedure is applicable to all Shaw E & I projects where Field Logsheets are utilized to document data and/or sample collection information. This procedure does **not** mandate the use of Field Logsheets on all Shaw E & I data/sample collection efforts, and projects/programs are free to utilize other means (Field Logbooks, direct data entry, etc.) to document sample collection and other pertinent data gathering activities.

3. REFERENCES

- U.S. Environmental Protection Agency, 1998, *EPA Guidance for Quality Assurance Project Plans*, EPA/600/R-98/018, Washington, D.C.
- U.S. Army Corps of Engineers, 2001, *Requirements for the Preparation of Sampling and Analysis Plans*, EM200-1-3, Washington, D.C.

4. DEFINITIONS

None

5. RESPONSIBILITIES

5.1 Procedure Responsibility

The Field Sampling Discipline Lead is responsible for maintenance, management, and revision of this procedure. Questions, comments, or suggestions regarding this SOP should be directed to the Field Sampling Discipline Lead.

5.2 Project Responsibility

Shaw employees performing this task, or any portion thereof, are responsible for meeting the requirements of this procedure. Shaw employees conducting technical review of task performance are also responsible for following appropriate portions of this SOP.

For those projects where the activities of this SOP are conducted, the Project Manager, or designee, is responsible for ensuring that those activities are conducted in accordance with this and other appropriate procedures. Project participants are responsible for documenting information in sufficient detail to provide objective documentation (i.e. checkprints, calculations, reports, etc.) that the requirements of this SOP have been met. Such documentation shall be retained as project records.

6. PROCEDURE

Field Logsheets can be prepared to address the specific needs of each project and they can even be converted to laptop data entry forms. Field Logsheets are considered legally defensible, and all appropriate requirements must be observed.

6.1 Required Information

All Field Logsheets must contain entry lines for the following in addition to whatever sample/data gathering-specific information is desired:

- Site/Project Name
- Project Number
- Date (including time if required to properly document)
- Comments or Issues area to record any non-specified information pertinent to the sample/data collection effort
- Initial or signature line for person responsible for completion

6.2 Proper Completion/Use

Whenever Field Logsheets are utilized, the following requirements must be strictly followed and enforced:

- Field Logsheets are to be completed in **real-time.** They should not be filled out by transcription from another source.
- All corrections **must** be single-line cross-out with the initials of the person making the correction.
- All data/information areas **must** be completed. If an entry line/block is not applicable to a particular sample/data gathering effort, this must be indicated on the form by either a single line cross-out or the letters “NA” being written in the data line/block.

7. ATTACHMENTS

None

8. FORMS

- EID-FS-002.01, Waste Container Field Logsheet
- EID-FS-002.02, Soil/Sediment Field Logsheet
- EID-FS-002.03, Surface Water Field Logsheet
- EID-FS-002.04, Air Field Logsheet

9. RECORDS

- Field Logsheet

10. REVISION HISTORY AND APPROVAL

Revision Level Revision Date	Revision Description	Responsible Manager
00 6/5/2003	Initial issue	Guy Gallello
01 9/8/2006	Revised Section1 Purpose and Section 2 Scope. Revised section 6.1 Site Information. Changed Section 6.2 Sample Information, 6.3 Equipment Information, 6.4 Analytical to Section 6.2 being Proper Completion/Use.	Guy Gallello
02 1/23/2012	Modified format only to align with Governance Management framework.	Scott Logan

	Title: Field Logsheet	Form No: EID-FS-002.01_2

Uncontrolled when printed: Verify latest version on ShawNet/Governance

Waste Container Field Logsheet

Date: Time: Site:

Container Number: Project #:

Container Size: Weather:

Container Location: Photograph:

Container material of construction:		plastic	glass	metal	fiberboard
Container condition:	intact	bulging	leaking		
Lid type:	screw	bung	ring		
Lid material of construction:		plastic	glass	metal	fiberboard
Labels:	manufacturer:				
	address:				
	content name:				
	chemical name:				
	chemical formula:				
	other:				
Hazard	flammability:				
Label:	reactivity:				
	health:				
	other:				
PID:		Calibration Date:			
O2/LEL:		Calibration Date:			
Sampling Device:		Decontamination technique:			
Contents Description:					
	Amount:	1/4	1/2	3/4	full
	Color:				
	State:	solid	liquid	paste	other:
Sample Number:			Preservative:		
QC Samples:					
Analyses requested:					
Analytical Laboratory:					
Field Technician (Print):					
Comments:					

Soil / Sediment Field Logsheet

Site Name: Project #:

Sample ID:	Sample Location Sketch:
Sample Type*:	
*: SED=Sediment; SUR=Surface soil; SUB=Subsurface Soil; OTH=Other. grab=Grab, comp=Composite	
Date Sampled:	
Time Sampled:	
Depth (ft bgs):	
Physical description:	
Analyses requested:	Photograph Log #:
PID:	Calibration Date:
O2/LEL:	Calibration Date:
Weather:	
Temperature: ° F	
Sampling Equipment:	
Equipment Decontamination Technique:	
QC Samples:	
Analytical Laboratory:	
Comments:	
Field Technician: (Print)	Date:

	Title: Field Logsheet	Form No: EID-FS-002.03_2

Surface Water Field Logsheet

Site Name: Project #:

Sample ID:	Sample Location Sketch:
Date Sampled:	
Time Sampled:	
Depth (ft below surface):	

Analysis	Preservative

Field Reading	Calibration Date
Sp cond:	
pH:	
Temp:	
D.O.:	
Turbidity:	

Photograph Log #:	
Weather:	
Temperature:	° F
Sampling Equipment:	
Equipment Decon Technique:	

QC Samples:	
Analytical Laboratory:	
Comments:	
Field Technician: (Print)	Date:

	Title: Field Logsheet	Form No: EID-FS-002.04_2

Air Field Logsheet

Site Name: Project #:

Sample ID:	Sample Location Sketch:
Date Sampled:	
Time Sampled:	
Sampling Technique:	
Analyses:	
Field Reading / Calibration Date	
	Photograph Log #:
Weather:	
Temperature: ° F	
Sampling Equipment:	
Equipment Decon Technique:	
QC Samples:	
Analytical Laboratory:	
Comments:	
Field Technician: (Print)	Date:

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1. PURPOSE

The purpose of this procedure is to provide the requirements for completion of written Chain of Custody (COC) documentation and to provide a suggested Chain of Custody Form for project use.

2. SCOPE

This procedure is applicable to all Shaw E & I efforts where samples are transferred among parties, including to off-site testing facilities. Adherence to this procedure is not required whenever the same individual/team is performing the sampling and testing within the same workday, and transfer to the testing process is being documented by other means, e.g. sampling and then field-screening in a mobile laboratory.

3. REFERENCES

- U.S. Environmental Protection Agency, 1986, *Test Methods for Evaluating Solid Waste; Physical/Chemical Methods, SW-846*, Third Edition.
- U.S. Army Corps of Engineers, *Requirements for the Preparation of Sampling and Analysis Plans*, EM200-1-3.
- Shaw E & I, 2002, *Sampler's Training Course Handout*.

4. DEFINITIONS

- **Custody**—The legal term used to define the control and evidence traceability of an environmental sample. A sample is considered to be in an individual's custody when it is in actual physical possession of the person, is in view of the person, is locked in a container controlled by the person, or has been placed into a designated secure area by the person.
- **Chain of Custody Form**—A form used to document and track the custody and transfers of a sample from collection to analysis or placement in a designated secure area within the testing facility.
- **COC Continuation Page**—Additional page(s) that may be included with a Chain of Custody form. The continuation page(s) contain the information on additional samples contained within the *same* cooler/shipping container associated with the cooler/shipping container Chain of Custody form.

5. RESPONSIBILITIES

5.1 Procedure Responsibility

The Field Sampling Discipline Lead is responsible for maintenance, management, and revision of this procedure. Questions, comments, or suggestions regarding this technical SOP should be directed to the Field Sampling Discipline Lead.

5.2 Project Responsibility

Shaw E & I employees performing this task, or any portion thereof, are responsible for meeting the requirements of this procedure. Shaw employees conducting technical review of task performance are also responsible for following appropriate portions of this SOP.

For those projects where the activities of this SOP are conducted, the Project Manager, or designee, is responsible for ensuring that those activities are conducted in accordance with this and other appropriate procedures. Project participants are responsible for documenting information in sufficient detail to provide objective documentation (checkprints, calculations, reports, etc.) that the requirements of this SOP have been met. Such documentation shall be retained as project records.

6. PROCEDURE

6.1 Documentation

All Chain of Custody documentation must be completed in indelible ink. All corrections must be performed using standard single-line cross-out methods, and the initials of the individual making the change must be included beside the corrected entry.

6.2 Continuation Pages

Continuation pages may be utilized for shipping containers/coolers with sufficient samples/sample containers that all of the lines of the Chain of Custody form are used before the documentation of the cooler/shipping container is complete. The number of pages in total must be filled out. *All samples entered onto a Continuation Page must be included in the same cooler/shipping container as those on the Chain of Custody form itself.*

6.3 Header Information

- Each Chain of Custody form must be assigned a unique Reference Document Number–use the Project/proposal number followed by a unique numeric sequence or current date (if only one cooler sent per day). Continuation Pages should contain the same Document Reference Number as the Chain of Custody form that they are associated with. The project team should maintain a log of Chain of Custody Reference Document Numbers.
- The page identifier and total page count section must be completed. Total pages include the Chain of Custody form and any attached Continuation Pages.
- Project number, name, and location information must be completed for all forms.
- If available, the laboratory Purchase Order Number should be included on the appropriate line.
- The name and phone number of the *Project Contact* should be included; the Project Contact should be a responsible individual that the laboratory may access to address analytical issues. This person is usually the analytical lead for the project.
- The *Shipment Date* should be provided on the applicable lines.
- If shipping by carrier, the *Waybill/Airbill Number* must be included. Note: couriers will not sign custody documents. Therefore, inclusion of the waybill/airbill number on the Chain of Custody is the *only* means of documenting the transfer to the carrier.
- Laboratory Destination and Contact information should be provided.
- The Sampler(s) names should be provided on the appropriate line. This line should include all persons whose initials appear on any of the sample containers, to provide the laboratory a means of cross-referencing containers.
- The “Send Report To” information should be completed. If multiple reports/locations are needed, the information should be provided on a separate page included with the Chain of Custody documents.

6.4 Sample Information Section–Including on Continuation Page(s)

During actual sampling, each sample must be entered on the COC form at the time of collection in order to document possession. The sampler must not wait until sampling is completed before entering samples on the COC.

- Complete the *Sample ID Number* for each line. If there are multiple container types for a sample, use additional lines to indicate the needed information.
- Ensure that the *Sample Description* matches the description on the sample label–the laboratory will use this information for cross-referencing.
- Provide the *Collection Date* and *Time*. These must match those on the sample label and Field Logbook/Logsheets.
- Indicate whether the sample is a Grab or Composite sample.
- Indicate the *Matrix* of the sample. Use the Matrix Codes listed on the Chain of Custody form.
- Indicate the *Number of Containers* and the *Container Type*. If a sample has multiple container types, use multiple lines and cross-out the information spaces to the left of the container blocks. *Failure to do this may cause the laboratory to log-in each container type as a separate sample/lab-ID, resulting in a confused report and invoice.*
  - Alternatively, if each sample has the same number/type container types, use "various" in the *Container Type* block and provide detail in the *Special Instructions* section, e.g., "Each sample consists of one 16-oz jar, two pre-weighed VOC w/DI water, and one pre-weighed VOC w/Methanol."
- Check the appropriate *Preservative* box for each line/container type.
- Write in and check the *Analyses Requested* boxes for each line/container type. The appropriate method number (e.g., EPA Method 8260C) must be written as well as the method name.
- Indicate the *Turn-around Time Requested* for each sample.
- Use the *Special Instructions* section to provide important information to the laboratory, e.g., samples that may require dilution or samples that will need to be composited by the laboratory. This section may also be used to inform the laboratory of additional information contained in attachments to the Chain of Custody package.
- Circle the appropriate *QC/Data Package Level* requested.

6.5 Custody Transfer Section

- The first *Relinquished By* space must be completed by the individual who will either transfer the samples or seal the shipping container.
- If the samples will be transferred to a courier, write the courier/carrier company in the *Received By* box and enter the Date and Time that the shipping container was closed.
- All other transfers must be performed in person, and the Relinquisher must witness the signing by the Receiver.
- A copy of the Chain of Custody form and all associated Continuation Pages should be maintained in the project files.

7. ATTACHMENTS

None

8. FORMS

- EID-FS-003.01, Shaw E & I Chain of Custody Form
- EID-FS-003.02, Shaw E & I COC Continuation Page

9. RECORDS

- EID-FS-003.01, Chain of Custody Form
- EID-FS-003.02, Chain of Custody Continuation Page(s)

10. REVISION HISTORY AND APPROVAL

Revision Level Revision Date	Revision Description	Responsible Manager
00 07/22/2003	Initial Issue	N/A
01 09/08/2006	New template, new numbering of procedure, Section 6.3 was edited, content was added in Section 6.4	Guy Gallello
02 08/25/2011	Modified format only to align with Governance Management framework	Scott Logan

1. PURPOSE

The purpose of this procedure is to provide the requirements for completion and attachment of Custody Seals on environmental samples and shipping containers.

2. SCOPE

This procedure is applicable to all Shaw E & I efforts where sample legal defensibility and custody integrity is desired. Adherence to this procedure is not required whenever the same individual/team is performing the sampling and testing within the same workday, and transfer to the testing process is being documented by other means, i.e. sampling and then field-screening in a mobile laboratory.

3. REFERENCES

- U.S. Environmental Protection Agency, 1986, *Test Methods for Evaluating Solid Waste; Physical/Chemical Methods, SW-846*, Third Edition.
- U.S. Army Corps of Engineers, *Requirements for the Preparation of Sampling and Analysis Plans, EM200-1-3*
- Shaw E & I, 2002, Sampler's Training Course Handout.

4. DEFINITIONS

- **Custody**—The legal term used to define the control and evidence traceability of an environmental sample. A sample is considered to be in one's custody if it is in actual physical possession of the person, is in view of the person, has been locked in a container controlled by the person, or has been placed into a designated secure area by the person.
- **Custody Seal**—Commercially available thin strips of adhesive paper with write-in lines for the date/time and identification of the using party. Custody seals are placed over the caps of sample containers and along the cover seals of shipping containers as a means to detect tampering before arrival at the testing facility. All Shaw E & I strategic alliance laboratories provide Custody Seals in their sample container supply kits.

5. RESPONSIBILITIES

5.1 Procedure Responsibility

The Field Sampling Discipline Lead is responsible for maintenance, management, and revision of this procedure. Questions, comments, or suggestions regarding this technical SOP should be directed to the Field Sampling Discipline Lead.

5.2 Project Responsibility

Shaw E & I employees performing this task, or any portion thereof, are responsible for meeting the requirements of this procedure. Shaw E & I employees conducting technical review of task performance are also responsible for following appropriate portions of this SOP.

For those projects where the activities of this SOP are conducted, the Project Manager, or designee, is responsible for ensuring that those activities are conducted in accordance with this and other appropriate procedures. Project participants are responsible for documenting

information in sufficient detail to provide objective documentation (i.e. checkprints, calculations, reports, etc.) that the requirements of this SOP have been met. Such documentation shall be retained as project records.

6. PROCEDURE

6.1 Completing the Custody Seal Information

- All Custody Seals must be completed in indelible ink. All corrections must be made using standard single-line cross-out methods, and the initials of the individual making the change must be included beside the corrected entry.
- Each Custody Seal attached must be completed by writing the *Date*, at a minimum, and signing with *full signature* by the person responsible for the sealing of the sample.
- If a space is provided, the *Time* should also be added.

6.2 Attaching the Custody Seals

Whenever possible, custody seals should be attached over the sample container lids during actual sampling and not when the samples are packaged for shipment. This will provide confidence in legal custody and will demonstrate non-tampering during the sample collection process.

Do not attach custody seals to VOC sample containers, as contamination may occur. For these samples, the custody seal should be used to seal the folded plastic zip bag that holds the sample containers.

- For sample jars, the completed Custody Seal should be placed across the top of the lid with the edges below the lid/jar interface and attached to the jar material. This will require the visible breaking of the seal in order to open the container.
- Sample coolers and shipping containers should have Custody Seals attached in such a manner that the seal extends lengthwise from the top edge of the lid to the side of the cooler/container.

7. ATTACHMENTS

None

8. FORMS

None

9. RECORDS

None

10. REVISION HISTORY AND APPROVAL

Revision Level / Revision Date	Revision Description	Responsible Manager
00 08/14/2003	Initial Issue	N/A
01 09/08/2006	New template, new numbering of procedure, no content changes	Guy Gallello

Revision Level Revision Date	Revision Description	Responsible Manager
02 08/25/2011	Modified format only to align with Governance Management framework	Scott Logan

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1. PURPOSE

The purpose of this procedure is to provide the requirements for completion and attachment of sample labels on environmental sample containers.

2. SCOPE

This procedure is applicable to all Shaw E & I projects/proposals where samples will be collected.

3. REFERENCES

- U.S. Environmental Protection Agency, 1986, *Test Methods for Evaluating Solid Waste; Physical/Chemical Methods*, SW-846, Third Edition.
- U.S. Army Corps of Engineers, *Requirements for the Preparation of Sampling and Analysis Plans*, EM200-1-3
- Shaw E & I, 2002, Sampler's Training Course Handout.

4. DEFINITIONS

- **Sample Label**—Any writing surface with an adhesive backing that can be used to document sample identification information. The sample label is attached to the sample container as a means of identification and, in some commercially available or laboratory-supplied containers, may be pre-attached. All Shaw E & I strategic alliance laboratories provide sample labels or pre-labeled containers in their sample container supply kits.

5. RESPONSIBILITIES

5.1 Procedure Responsibility

The Field Sampling Discipline Lead is responsible for maintenance, management, and revision of this procedure. Questions, comments, or suggestions regarding this technical SOP should be directed to the Field Sampling Discipline Lead.

5.2 Project Responsibility

Shaw E & I employees performing this task, or any portion thereof, are responsible for meeting the requirements of this procedure. Shaw E & I employees conducting technical review of task performance are also responsible for following appropriate portions of this SOP.

For those projects where the activities of this SOP are conducted, the Project Manager, or designee, is responsible for ensuring that those activities are conducted in accordance with this and other appropriate procedures. Project participants are responsible for documenting information in sufficient detail to provide objective documentation (i.e. checkprints, calculations, reports, etc.) that the requirements of this SOP have been met. Such documentation shall be retained as project records.

6. PROCEDURE

- All sample labels must be completed in indelible ink. All corrections must be performed using standard single-line cross-out methods, and the initials of the individual making the change must be included beside the corrected entry.

- Sample labels should be completed and attached as samples are collected. Do not wait until final packaging to attach and/or complete the sample labels.
- Sample labels must be attached to the non-sealing portion of the container. Do not place labels on or across sample container caps.
- If the laboratory has provided pre-labeled containers, make sure to fill one for each parameter set needed. Laboratory pre-labeled containers are often bar-coded and it is important to provide a complete container set for each sample.
- The following information must be recorded on the Sample Label:
  - Sample Identification Number
  - Date and Time collected
  - Initials of person(s) responsible for collection
- If a space is provided, the *Analysis Requested* should also be added.
- If a *Description* is provided, remember it must match that on the Chain of Custody form for cross-referencing purposes.
- Cover the completed and attached label with clear plastic tape to prevent bleeding of the ink if it becomes wetted. *Do **not** perform this step for pre-weighed VOC vials, as the final weight values will be influenced by the mass of the tape. Protect these containers by enclosing the rack/holder in a plastic bag within the cooler.*

7. ATTACHMENTS

None

8. FORMS

None

9. RECORDS

None

10. REVISION HISTORY AND APPROVAL

Revision Level / Revision Date	Revision Description	Responsible Manager
00 09/08/2006	Initial issue	N/A
01 09/08/2006	Updated template, procedure numbering change, updated Section 2- Scope, Edited content in section 6.	Guy Gallello
02 08/28/2011	Modified format only to align with Governance Management framework	Scott Logan

1. PURPOSE

The purpose of this procedure is to establish the method for homogenizing samples prior to containerization. Proper homogenization is very important because it helps ensure that sample aliquots are representative of the whole collected sample and helps minimize sampling error so that other errors included in the measurement process, such as laboratory sample preparation and test measurement, can be better assessed.

2. SCOPE

This procedure applies to Shaw Environmental & Infrastructure (Shaw E & I) personnel responsible for the collection of environmental samples. The sample matrix must be amenable to mixing. This SOP applies to the collection of samples that are to be tested for all analytes except volatile analytes.

3. REFERENCES

- American Society for Testing and Materials (ASTM), 1998, Reducing Samples of Aggregate to Testing Size, C702.
- U.S. Army Corps of Engineers, Requirements for the Preparation of Sampling and Analysis Plans, EM 200-1-3, Section E-2, Homogenizing Techniques.

4. DEFINITIONS

- **Homogenize**—The use of physical mixing motions to make a uniform sample matrix.

5. RESPONSIBILITIES

5.1 Procedure Responsibility

The Field Sampling Discipline Lead is responsible for maintenance, management, and revision of this procedure. Questions, comments, or suggestions regarding this technical SOP should be sent to the Field Sampling Discipline Lead.

5.2 Project Responsibility

Shaw employees performing this task, or any portion thereof, are responsible for meeting the requirements of this procedure. Shaw employees conducting technical review of task performance are also responsible for following appropriate portions of this SOP.

For those projects where the activities of this SOP are conducted, the Project Manager, or designee, is responsible for ensuring that those activities are conducted in accordance with this and other appropriate procedures. Project participants are responsible for documenting information in sufficient detail to provide objective documentation (i.e. checkprints, calculations, reports, etc.) that the requirements of this SOP have been met. Such documentation shall be retained as project records.

6. PROCEDURE

Sampling equipment materials shall be selected so as to minimize contamination of samples. Sampling equipment shall be either new (never used previously), documented to have been decontaminated, or dedicated to each specific sampling point. Samples for organic

constituent/compound analysis should be collected and mixed using non-reactive material such as glass or stainless steel bowls, trowels, and/or spoons. Samples for metals analysis should be collected and mixed using equipment made of stainless steel, glass, or Teflon®.

Certain types of solid matrices may not be amenable to mixing using conventional techniques. For example, certain solids may require grinding and thorough mixing to ensure that the analytes of interest within the sample are homogeneously distributed. It is extremely important that soil and sediment samples be homogenized to ensure that the entire sample is as representative as possible of the media being sampled.

6.1 Solid Samples

The following two methods are examples for homogenizing solid samples. Other homogenization techniques may be employed using approved standard methods such as ASTM C702, Reducing Samples of Aggregate to Testing Size.

6.1.1 Quartering

- Place the sample on a hard, clean, level surface such as a pan. If such a surface is too small for the desired quantity, a clean sheet of plastic may be used.
- Mix the solid material by turning the entire quantity over three times with a trowel or shovel. For the third time, shovel the material into a cone-shaped pile.
- Carefully press down on the apex of the pile to create a soil layer of uniform thickness and diameter.
- Divide the material in the sample pan or on the plastic into quarters

  Option 1

  – Mix each quarter individually
  – Then mix two quarters to form halves
  – Mix each formed half and then fill the appropriate sample jars/containers

  Option 2

  – Remove two diagonally opposite quarters including any fine material
  – Mix the remaining material, build it into a cone, and press down to flatten as before
  – Divide the flattened material into quarters, discard two diagonally opposing sections, and repeat
  – Repeat the process until only enough sample remains to fill the required containers and proceed to fill the sample jars.

6.1.2 Mixing in a Bowl

- Place the sample in a bowl. Samples for organic constituent/compound analysis should be mixed using bowls and stirrers made of glass or stainless steel, while samples for metals analysis should be mixed using equipment made of glass, stainless steel, or hard plastic. Make sure the bowl is large enough to accommodate the sample, with extra volume to allow for mixing the sample.
- Mix the sample with the stirrer. If round bowls are used for sample mixing, adequate mixing is achieved by stirring the material in a circular fashion, reversing direction, and occasionally turning the material over. High moisture samples are more difficult to homogenize. Use an

adequate mixing motion for as long as needed to determine by visual observation that the sample media has taken on a uniform appearance.

6.2 Liquid Samples

Most aqueous samples do not require homogenization since water is well mixed due to diffusion and bulk convection. If the sample matrix is a viscous liquid, semi-solid, or an aqueous one with suspended solids, the sample will require mixing.

Do **not** shake the sample and do not agitate the sample in **any** way if collecting for volatile parameters. Volatile sample containers should be either filled directly from the sample source or if transferring from a large container, such as an automatic sampler reservoir, filled first and **without agitation**.

For non-volatile parameters, mix either using an appropriate stirrer or by gentle swirling and then immediately transfer the material into the appropriate containers. The sample should be mixed frequently during the container-filling step, in particular if there are a large number of containers, so that the condition of the bulk sampled fluid will be approximately the same when each parameter-specific sample container is filled.

7. ATTACHMENTS

None

8. FORMS

None

9. RECORDS

None

10. REVISION HISTORY AND APPROVAL

Revision Level Revision Date	Revision Description	Responsible Manager
00 06/05/2003	Initial Issue	N/A
01 09/08/2009	Updated template and changed numbering of procedure, edited Section 1-Purpose and Section 2-Scope, deleted Section 3.1, which was misc. matrix sampling SOPs to which sample mixing/homogenization may apply, Section 6.1 was broken down into subsections, Section 6.2 was converted from Aquous Samples to Liquid Samples and content was added.	Guy Gallello
02 08/25/2011	Modified format only to align with Governance Management Framework	Scott Logan

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1. PURPOSE

This procedure is intended to provide guidelines for the compositing of samples collected in the course of environmental program activities. Composites represent the average distribution of properties and can be used to reduce analytical costs or represent well-defined decision boundaries.

2. SCOPE

This procedure applies to the compositing of solid and liquid samples where no project-specific process is in place. Field composite methods are not appropriate for Volatile Organic Compounds (VOC) analysis of solids. Composites for these methods must be laboratory derived using either individual grab extracts or other laboratory methods.

3. REFERENCES

- U.S. Environmental Protection Agency, 1987, *Compendium of Superfund Field Operations Methods*, EPA 540/P-87/001a, OSWER 9355.0-14, Washington, DC.
- Shaw E & I Standard Operating Procedure EID-FS-010, *Sample Mixing/Homogenization*.

4. DEFINITIONS

- **Composite Sample**—A sample that is comprised of roughly equal amounts of discrete grabs from a set of sample locations or time/flow increments known as a *sample group.*
- **Sample Group**—A predetermined number or time/area span of discrete samples, which is composited into one sample for analytical purposes.

5. RESPONSIBILITIES

5.1 Procedure Responsibility

The Field Sampling Discipline Lead is responsible for maintenance, management, and revision of this procedure. Questions, comments, or suggestions regarding this technical SOP should be sent to the Field Sampling Discipline Lead.

5.2 Project Responsibility

Shaw E & I employees performing this task, or any portion thereof, are responsible for meeting the requirements of this procedure. Shaw E & I employees conducting technical review of task performance are also responsible for following appropriate portions of this SOP.

For those projects where the activities of this SOP are conducted, the Project Manager or designee is responsible for ensuring that those activities are conducted in accordance with this and other appropriate procedures. Project participants are responsible for documenting information in sufficient detail to provide objective documentation (i.e. checkprints, calculations, reports, etc.) that the requirements of this SOP have been met. Such documentation shall be retained as project records.

6. PROCEDURE

The discrete samples that are used to prepare a composite sample must be of equal volume and must each be collected in an identical manner. Field documentation must clearly indicate the composite elements on either a map or a composite logsheet. There are several types of composite samples.

Flow-proportioned composite—Flow-proportioned composite samples are collected proportional to the flow rate during the sampling period by either a time-varying/constant-volume or time-constant/varying-volume method. Flow-proportioned composite samples are typically collected using automatic samplers paced by a flow meter. This sampling method is commonly used for wastewaters.

Time composite—A time composite sample is composed of a discrete number of grab samples collected at equal time intervals during the sampling period. Time composite sampling is often used to sample wastewater discharges or streams.

Volume/mass composite—A volume/mass composite is composed of a discrete number of grab samples collected at defined volume or mass intervals. Volume/mass composite sampling is often used to sample the output of a process system such as a Thermal Destruction Unit or pug mill.

Area composite—Area composite samples are samples collected from individual grab samples located on a regularly spaced grid or along a pile at defined locations and depths. Each of the grab samples must be collected in an identical fashion and must be of equal volume.

Vertical or Depth composite—Vertical composites are composed of individual grab samples collected across a vertical cross section. Like area composites, the grab samples must be collected in an identical fashion and must be of equal volume. Soils and sediments can be used to create vertical composites.

6.1 Solid Composites

- To ensure the integrity of the composite, all discrete grab samples must be collected in an identical manner.
- Composite samples can be created by combining discrete grab samples into the same mixing/holding container as they are collected or by combining and mixing equal aliquots of containerized and homogenized discrete grab samples.
- Remove coarse fragments and organic material from the mixing bowl. Homogenize the sample as specified in SOP FS010, Sample Mixing/Homogenization.
- Remove sample aliquots and place into the appropriate sample containers for shipment to the laboratory.
- Label the sample and document the sampling event according to the project procedures.
- Package/ship the composite sample as required.

6.2 Liquid Composites

- Liquid composite samples should be created by combining equal aliquots of discrete samples.
- Assemble the containers that will comprise a given composite.
- Swirl or stir the individual containers to homogenize the contents just prior to removing the measured aliquots.

- Using clean glass pipets, deliver equal volumes from each grab container to the composite sample container that is to be shipped to the lab. For example, if there are five grab samples, and the composite sample requires 100 mL for the parameter of interest, pipet 20 mL from each of the grab samples into the composite sample container.
- Alternatively, measured volumes can be determined via a graduated cylinder/beaker and combined. The measuring container should be decontaminated between composites.
- Cap/seal the composite container and swirl to agitate. Stirring should be avoided as it increases the risk of introducing contamination to the sample.
- Label the sample(s), document the event, and package/ship the sample(s) as required.

7. ATTACHMENTS

None

8. FORMS

None

9. RECORDS

None

10. REVISION HISTORY AND APPROVAL

Revision Level / Revision Date	Revision Description	Responsible Manager
00 08/14/2003	Initial Issue	N/A
01 09/08/2006	Updated template and numbering of procedure changed, updated Section 2-Scope, added content to 6.1 and 6.2.	Guy Gallello
02 08/25/2011	Modified format only to align with Governance Management framework.	Scott Logan

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1. PURPOSE

The purpose of this procedure is to provide general instructions in the packaging and shipping of non-hazardous samples. The primary use of this procedure is for the transportation of samples collected on site to be sent off site for physical, chemical, and/or radiological analysis.

2. SCOPE

This procedure applies to the shipping and packaging of all non-hazardous samples. Non-hazardous samples are those that do not meet any hazard class definitions found in 49 CFR 107-178, including materials designated as Class 9 materials and materials that represent Reportable Quantities (hazardous substances) and/or materials that are not classified as *Dangerous Goods* under current IATA regulations.

In general most soil, air, and aqueous samples, including those that are acid or caustic preserved do **not** qualify as *hazardous materials* or *dangerous goods*. An exception is methanolic soil VOC vials: these containers are flammable in any quantity and **must** be packaged, shipped, and declared as *Dangerous Goods* whenever transported by air.

The Class 9 "Environmentally Hazardous" designation should only be applied to samples if they are known or suspected (via screening) to contain a sufficient concentration of contaminant to pose a health and/ or environmental risk if spilled in transport. Samples for which screening has shown a potential hazard (i.e. flammability) or those that are derived from a known hazard, including a site/facility with confirmed contamination by an *infectious substance* must also be shipped in accordance with the applicable DOT/IATA requirements. Refer to Shaw E & I SOP FS013.

Improper shipment of hazardous materials, especially willful misrepresentation and shipment as non-hazardous materials, is a violation of federal law and is punishable by fines and possible imprisonment of the guilty parties. It is also a violation of Shaw E & I policy and can result in disciplinary action up to and including termination of employment.

3. REFERENCES

- U.S. Army Corps of Engineers, 2001, *Requirements for the Preparation of Sampling and Analysis Plans*, EM200-1-3, Washington, D.C.
- U.S. Department of Transportation Regulations, 49 CFR Parts 108-178
- International Air Transport Association (IATA), *Dangerous Goods Regulations*, current edition.

4. DEFINITIONS

- **Cooler/Shipping Container**—Any hard-sided insulated container meeting DOT's or IATA's general packaging requirements.
- **Bubble Wrap**—Plastic sheeting with entrained air bubbles for protective packaging purposes.

5. RESPONSIBILITIES

5.1 Procedure Responsibility

The Field Sampling Discipline Lead is responsible for maintenance, management, and revision of this procedure. Questions, comments, or suggestions regarding this technical SOP should be sent to the Field Sampling Discipline Lead.

5.2 Project Responsibility

Shaw employees performing this task, or any portion thereof, are responsible for meeting the requirements of this procedure. Shaw employees conducting technical review of task performance are also responsible for following appropriate portions of this SOP.

For those projects where the activities of this SOP are conducted, the Project Manager, or designee, is responsible for ensuring that those activities are conducted in accordance with this and other appropriate procedures. Project participants are responsible for documenting information in sufficient detail to provide objective documentation (i.e. checkprints, calculations, reports, etc.) that the requirements of this SOP have been met. Such documentation shall be retained as project records.

6. PROCEDURE

6.1 Packaging

- Use tape and seal off the cooler drain on the inside and outside to prevent leakage.
- Place packing material on the bottom on the shipping container (cooler) to provide a soft impact surface.
- Place a large (30-55 gallon or equivalent) plastic bag into the cooler (to minimize possibility of leakage during transit).
- Starting with the largest glass containers, wrap each container with sufficient bubble wrap to ensure the best chance to prevent breakage of the container.
- Pack the largest glass containers in the bottom of the cooler, placing packing material between each of the containers to avoid breakage from bumping.
- Double-bag the ice (chips or cubes) in gallon- or quart-sized resealable plastic freezer bags and wedge the ice bags between the sample bottles.
- Add bagged ice across the top of the samples.
- When sufficiently full, seal the inner protective plastic bag, and place additional packing material on top of the bag to minimize shifting of containers during shipment.
- Tape a gallon-sized resealable plastic bag to the inside of the cooler lid, place the completed chain of custody document inside, and seal the bag shut.
- Tape the shipping container (cooler) shut using packing tape, duct tape, or other tear-resistant adhesive strips. Taping should be performed to ensure the lid cannot open during transport.
- Place a custody seal on two separate portions of the cooler, to provide evidence that the lid has not been opened prior to receipt by the intended recipient.

6.2 Labeling

- A “This Side Up” arrow should be adhered to all sides of the cooler, especially ones without obvious handles.
- The name and address of the receiver and the shipper must be on the top of the cooler.
- The airbill must be attached to the top of the cooler.

6.3 Shipping Documentation

- A Cooler Shipment Checklist (Attachment 1) should be completed and kept in the project file.

7. ATTACHMENTS

- Attachment 1, Shaw E & I Cooler Shipment Checklist

8. FORMS

None

9. RECORDS

- Chain of Custody Form
- Chain of Custody Continuation Page(s)
- Cooler Shipment Checklist

10. REVISION HISTORY AND APPROVAL

Revision Level / Revision Date	Revision Description	Responsible Manager
00 06/05/2003	Initial issue	N/A
01 09/08/2006	Updated template and numbering of procedure, content was added to Section 2-Scope	Guy Gallello
02 08/25/2011	Modified format only to align with Governance Management framework.	Scott Logan

Attachment 1
Sample Shipment Checklist

Project Name _____ Project Number _____

Address _____ Date_____ Time _____

City, State, Zip _____ Fax No._____

Site Contact No. _____

SAMPLE CHECKLIST	YES	NO	COMMENTS
SAMPLE LIDS ARE TIGHT AND CUSTODY SEALS IN PLACE?	❒	❒	
ARE ALL SAMPLE NUMBERS, DATES, TIMES AND OTHER LABEL INFORMATION LEGIBLE AND COMPLETE?	❒	❒	
HAVE ALL SAMPLE NUMBERS, DATES, TIMES AND OTHER SAMPLING DATA BEEN LOGGED INTO THE SAMPLE LOG BOOK?	❒	❒	
DO SAMPLE NUMBERS AND SAMPLE DESCRIPTIONS ON THE LABELS MATCH THOSE ON THE COC?	❒	❒	
HAVE THE SAMPLES BEEN PROPERLY PRESERVED?	❒	❒	
HAVE THE CHAIN OF CUSTODIES BEEN FILLED OUT COMPLETELY AND CORRECTLY?	❒	❒	
DOES THE ANALYTICAL SPECIFIED ON THE COC MATCH THE ANALYTICAL SPECIFIED IN THE SCOPE OF WORK?	❒	❒	
HAVE THE COC'S BEEN PROPERLY SIGNED IN THE TRANSFER SECTION?	❒	❒	

PACKAGING CHECKLIST	YES	NO	COMMENTS
HAS EACH SAMPLE BEEN PLACED INTO AN INDIVIDUAL PLASTIC BAG?	❒	❒	
HAS THE DRAIN PLUG OF THE COOLER BEEN TAPED CLOSED WITH WATER PROFF TAPE FROM THE INSIDE?	❒	❒	
HAVE ALL THE SAMPLES BEEN PLACED INTO THE COOLER IN AN UPRIGHT POSITION?	❒	❒	
IS THERE ADEQUATE SPACING OF SAMPLES SO THAT THEY WILL NOT TOUCH DURING SHIPMENT?	❒	❒	
HAVE AN ADEQUATE NUMBER OF BLUE ICE PACKS OR WATER ICE BEEN PLACED AROUND AND ON TOP OF THE SAMPLE?	❒	❒	
HAS FRESH BLUE ICE OR WATER ICE BEEN ADDED TO THE COOLER THE DAY OF THE SHIPMENT?	❒	❒	
HAS THE COOLER BEEN FILLED WITH ADDITIONAL CUSHIONING MATERIAL?	❒	❒	
HAS THE COC BEEN PLACE IN A ZIPLOCK BAG AND TAPED TO THE INSIDE OF THE LID OF THE COOLER?	❒	❒	
HAVE CUSTODY SEALS BEEN PLACED ONTO THE LID?	❒	❒	
HAS THE COOLER BEEN LABELED "THIS SIDE UP"?	❒	❒	
IF REQUIRED, HAS THE COOLER BEEN LABELED WITH THE DOT PROPER SHIPPING NAME, UN NUMBER AND LABEL?	❒	❒	
HAS THE LABORATORY PERFORMING THE ANALYSES BEEN NOTIFIED OF THE SHIPMENT OF SAMPLES?	❒	❒	

PROBLEMS/RESOLUTIONS: _____

_____

_____

PREPARED BY: _____ SIGNATURE _____

1. PURPOSE

This procedure is intended to provide minimal guidelines for the decontamination of contact sampling equipment. Contact sampling equipment is equipment that comes in direct contact with the sample or the portion of a sample that will undergo chemical analyses or physical testing.

2. SCOPE

This procedure applies to all instances where non-disposable direct contact sampling equipment is utilized for sample collection and no project-specific procedure is in place. This procedure is not intended to address decontamination of peristaltic or other sampling pumps and tubing. The steps outlined in this procedure must be executed between each distinct sample data point.

3. REFERENCES

- U.S. Environmental Protection Agency, Region 4, 2001, *Environmental Investigations Standard Operating Procedures and Quality Assurance Manual*, 980 College Station Road, Athens, Georgia. November.
- US Army Corp of Engineers, Washington, D.C., 2001, Requirements for the Preparation of Sampling and Analysis Plans (EM-200-1-3), February.

4. DEFINITIONS

- **Soap**—A standard brand of phosphate-free laboratory detergent, such as Liquinox®.
- **Organic Desorbing Agent**—A solvent used for removing organic compounds. The specific solvent would depend upon the type of organic compound to be removed. See Attachment 1 for recommendations.
- **Inorganic Desorbing Agent**—An acid solution for use in removing trace metal compounds. The specific acid solution would depend upon the type of inorganic compound to be removed. See Attachment 1 for recommendations.
- **Tap water**—Water obtained from any municipal water treatment system. An untreated potable water supply can be used as a substitute for tap water if the water does not contain the constituents of concern.
- **Distilled Water**—Water that has been purified via distillation. Distilled water can be purchased in most stores and is acceptable as a final rinse in non-trace analytical decontamination processes. Examples would include disposal profiling, HazCat, and other gross screening applications.
- **Analyte-free water**—Water that has been treated by passing through a standard deionizing resin column, and for organics either distillation or activated carbon units. At a minimum, the finished water should contain no detectable heavy metals or other inorganic compounds, and/or no detectable organic compounds (i.e., at or above analytical detection limits). Type I and Type II Reagent Grade Water meet this definition as does most laboratory-supplied blank water.

5. RESPONSIBILITIES

5.1 Procedure Responsibility

The Field Sampling Discipline Lead is responsible for maintenance, management, and revision of this procedure. Questions, comments, or suggestions regarding this technical SOP should be sent to the Field Sampling Discipline Lead.

5.2 Project Responsibility

Shaw employees performing this task, or any portion thereof, are responsible for meeting the requirements of this procedure. Shaw employees conducting technical review of task performance are also responsible for following appropriate portions of this SOP.

For those projects where the activities of this SOP are conducted, the Project Manager, or designee, is responsible for ensuring that those activities are conducted in accordance with this and other appropriate procedures. Project participants are responsible for documenting information in sufficient detail to provide objective documentation (checkprints, calculations, reports, etc.) that the requirements of this SOP have been met. Such documentation shall be retained as project records.

6. PROCEDURE

Wear appropriate eye protection including safety goggles when working with corrosive liquids, especially when diluting concentrated materials to create low-percentage solutions and follow all project Health and Safety requirements. Decontamination wastes are to be recovered and handled as impacted project waste materials and must be disposed of in accordance with regulatory requirements.

A decontamination area should be established. Implements can either be immersed in a 5-gallon bucket containing each solution/rinse or the solutions can be contained in hand-held units made of an inert and compatible material; such as a Teflon™ wash bottle. The analyte-free water needs to be placed in a container that will be free of any compounds of concern.

Consult Attachment 1 for the decontamination solutions/solvents appropriate to the task. The minimum steps for decontamination are as follows:

1. Remove particulate matter and other surface debris by brushing and/or dipping in the soap solution.
2. Rinse thoroughly with tap water.
3. If necessary, rinse with other applicable solutions/solvents. If hexane is used, be sure to follow it with isopropyl alcohol to allow for the final water rinses to properly mix and contact the surface.
4. Final rinse three times to make sure all residual solutions/solvents are removed.
5. Place decontaminated equipment on a clean surface appropriate for the compounds of concern and allow to air dry.

7. ATTACHMENTS

- Attachment 1, Recommended Decontamination Procedures.

8. FORMS

None

9. RECORDS

None

10. REVISION HISTORY AND APPROVAL

Revision Level Revision Date	Revision Description	Responsible Manager
00 06/05/2003	Initial issue	N/A
01 09/08/2006	Updated template and updated numbering of procedure, Sections 1 and 2 minor edits, added definition for Distilled Water, Section 6- extensive content changes	Guy Gallello
02 08/25/2011	Modified format only to align with Governance Management Framework	Scott Logan

Attachment 1
Recommended Decontamination Procedures

Compound	Detergent Wash	Tap Water	Inorganic Desorbing Agent	Tap Water	Organic Desorbing Agent1	Final Water Rinse4	Air Dry
Organic Constituents							
Volatile Organic Compounds	✓	✓			Methanol Purge & Trap grade	✓	✓
Base Neutrals/Acid Extractables/PCBs/Pesticides	✓	✓			Hexane followed by Isopropyl Alcohol	✓	✓
Organic Bases[2]	✓	✓	1% nitric acid	✓	Isopropyl Alcohol	✓	✓
Organic Acids[3]	✓	✓	1% nitric acid		Isopropyl Alcohol	✓	✓
Inorganic Constituents							
Trace Metals and Radio Isotopes	✓	✓	10% Nitric acid -Trace metals grade	✓		✓	✓
Cations/Anions	✓	✓				✓	✓
Acidic Compounds	✓	✓				✓	✓
Basic Compounds (caustic)	✓	✓	1% nitric acid	✓		✓	✓

1 – All organic solvents must be Pesticide Grade or better. The selection of appropriate solvent rinses should first consider if a *known or suspected* contaminant requires removal from sampling equipment. Secondly, identify whether the subsequent analytical protocol would be impacted by the proposed solvent or an impurity thereof (e.g., residual acetone present in isopropyl alcohol would be measured with certain volatile organics analysis).

2 - Organic bases include amines, hydrazines.

3 - Organic acids include phenols, thiols, nitro and sulfonic compounds.

4- Use a grade of water appropriate to the application. For trace level analysis this must be Analyte Free Water. For non-trace applications store-bought distilled water is sufficient

Adapted from: Appendix E, Requirements for the Preparation of Sampling and Analysis Plans (EM-200-1-3), February 2001. US Army Corp of Engineers, Washington, D.C.

1. PURPOSE

The purpose of this procedure is to establish the means by which all subcontracted environmental analytical data will be reviewed for completeness and usability based upon comparison to the project action/decision levels and Data Quality Objectives before use in the intended decision-making processes.

2. SCOPE

This procedure applies to all subcontracted analytical data including faxed or e-mailed preliminary reports.

By way of its requirements, this procedure prohibits verbal communication of analytical results and establishes minimum deliverable standards that must be provided for all subcontracted analytical data reports–including faxed or e-mailed preliminary reports. These minimum standards include the following:

- Sample Results
- Chain of Custody – unless already available to the reviewer
- Sample Receipt Documentation – unless already available to the reviewer
- QC Summary – Laboratory Control Blank, Laboratory Control Spike, Matrix Spike, Matrix Spike Duplicate, Post-digest Spike
- Surrogate Summary – (if applicable)
- Hold-time Compliance Summary – or signed certification that all requirements were met
- Initial and Continuing Calibration Information – or signed certification that it meets prescribed requirements
- GC/MS Tuning Information – (if applicable) or signed certification that it meets prescribed requirements

This procedure should be performed only by or under the oversight of properly qualified individuals. Oversight may be accomplished through provision of a project-specific and well-defined checklist, training in its use, regular QA checks, and real-time availability for issue resolution.

3. REFERENCES

- U.S. Environmental Protection Agency, *National Functional Guidelines for Inorganic Data Review*, EPA 540/R-94-013.
- U.S. Environmental Protection Agency, *National Functional Guidelines for Organic Data Review*, EPA 540/R-94-012.
- U.S. Department of Defense, 2002, Department of Defense Quality Systems Manual for Environmental Laboratories, Final, June.
- U.S. Army Corps of Engineers, Requirements for the Preparation of Sampling and Analysis Plans, EM-200-1-3.

4. DEFINITIONS

- **Data Usability Review (DUR)**—The cursory review of an analytical data package for completeness and compliance with the ordered analysis, specified quality, and method/project-specific protocols before the data is used as input to a particular project decision-making process. The DUR process identifies any potential data quality issues and informs the data users of the effect on the data usability.

- **Data Quality Objectives**—The empirical statements and quantitative measures necessary for a given set of measurements to be usable in the planned decision.

- **Data Quality Indicators**—Field and laboratory measures for which compliance with specified requirements or limits can be construed to support attainment of the Data Quality Objectives in a given data set.

- **Analytical Data Package**—The manner in which analytical results are provided from subcontractor laboratories. Analytical Data Packages can be received via fax, e-mail, or postal mail.

- **QC Summary**—A summary table of laboratory QC sample results.

- **Laboratory Control Blank (LCB)**—Reagent Water or Clean Solid Matrix analyzed in the same manner as a sample to determine the Target Analyte concentration contribution due to contamination in the entire analytical system.

- **Laboratory Control Spike (LCS)**—Reagent Water or Clean Solid Matrix spiked with a known concentration of target analytes and analyzed as a sample to determine the method accuracy of the analytical system.

- **Matrix Spike**—A sample spiked with a known concentration of target analyte and analyzed along with the rest of the analytical batch. The percent recovery of the target analytes is used to determine the effect on accuracy due to the sample matrix.

- **Matrix Spike Duplicate**—A duplicate of the Matrix Spike used to determine the analytical precision, expressed as Relative Percent Difference (RPD) of the analytical system.

- **Surrogate Compound**—In several organic methods, a compound similar in structure and chemical behavior to the target analytes, which is added to each Sample and QC Sample at a known concentration before the analysis begins. The surrogate recovery is used to approximate the recovery of the target compounds based upon the behavior of chemically similar analytes.

- **Post-digest Spike**—In metals analyses, used to determine the possibility of chemical interferences and digestion deficiencies. If the normal QC results are unacceptable, a known concentration of the target analyte is added to the sample digestate. The recovery is then used to determine if reanalysis or data qualification is warranted.

- **QC Acceptance Range**—The limits that define QC results demonstrating compliant accuracy and precision.

- **Qualified Person**—An individual capable through knowledge, education, formal training, and/or experience in the establishment and verification of analytical Data Quality Objectives. The Qualified Person is usually a chemist or environmental professional with several years of environmental analytical experience.

- **Trip Blank**—In VOC analysis, a container of Reagent Grade Water that is included in the sample cooler and analyzed by the laboratory to determine if cross-contamination may have occurred in shipping.
- **Ambient or Field Blank**—Reagent Grade Water containerized during sample collection activities and analyzed at the laboratory. The results are used to determine if sample results may be biased by site environmental factors.
- **Equipment Blank**—Final rinseate collected during sample equipment decontamination and analyzed by the laboratory. The results indicate the effectiveness of the decontamination procedure.
- **Field Duplicate**—An additional sample aliquot or, in some cases, a collocated sample that is collected and analyzed. The results are compared with the original samples as an indication of the overall precision of the entire sampling and analytical process.

5. RESPONSIBILITIES

5.1 Procedure Responsibility

The Field Sampling Discipline Lead is responsible for maintenance, management, and revision of this procedure. Questions, comments, or suggestions regarding this technical SOP should be directed to the Field Sampling Discipline Lead.

5.2 Project Responsibility

Shaw employees performing this task, or any portion thereof, are responsible for meeting the requirements of this procedure. Shaw employees conducting technical review of task performance are also responsible for following appropriate portions of this SOP.

For those projects where the activities of this SOP are conducted, the Project Manager, or designee, is responsible for ensuring that the activities are conducted in accordance with this and other appropriate procedures. Project participants are responsible for documenting information in sufficient detail to provide objective documentation (checkprints, calculations, reports, etc.) that the requirements of this SOP have been met. Such documentation shall be retained as project records.

6. PROCEDURE

6.1 First-Level Review of the Data Package

Verify that the package contains all of the required elements listed in Section 2. If any items are missing, contact the laboratory immediately and correct the situation.

Compare the reported results to the Chain of Custody request, and verify that all expected samples and analyses results were reported. If results are missing, contact the laboratory and correct the situation. If the “missing” data is not available yet, perform partial review of the data provided and hold the package for follow-up once the non-reported results are provided.

6.2 Second-Level Review

Consult the project Chemical Quality Plan (SAP, QAPP, etc.) for information concerning sample types and analysis requirements.

Compare the reported analytes, methods, and detection limits to those in the project plan for the specific analyses. Be sure to account for indicated and reasonable increased reporting limits due to dilutions or sample effects. Address any discrepancies with the laboratory directly.

Compare the results to project action-levels, and circle or otherwise mark all results above the limits.

6.3 QC Level Review

Consult the project Data Usability Review Checklists and/or the project Chemical Quality Plan and evaluate all provided QC results against project acceptance limits.

Mark or flag any results that are outside of the project limits and note on the applicable checklist (if using one).

Also evaluate any Field QC results such as Duplicates and Trip Blanks against requirements and note any issues.

6.4 Usability Review

If all QC results for all samples are within the acceptance ranges, complete the appropriate section of the checklist and then date and sign the completed checklist.

If all QC is acceptable and you are not using a checklist, you must indicate data usability directly on the data package itself or on a separate cover sheet. To do this, date and initial the QC Summary pages and write "QC acceptable data OK for use" on the cover sheet or QC Summary page.

If any QC is non-compliant, review its impact to use as project data by referencing the QC Results Impact Table attached to this SOP and consult with the Qualified Person to determine final acceptability. Note on the Data Report itself or checklist all discrepancies and the reasons for data acceptance, qualification, or rejection. If a Qualified Person has made the decision, this should also be noted.

If any of the data is determined to be unusable, immediately notify the Project Manager and project site personnel.

6.5 Reporting of Usability Review Results

Project personnel must be provided either a spreadsheet summary of the results with an attached, signed and dated Statement of Usability, or the complete Data Package with the project-specific Data Usability Review documentation. At **no time** are results to be communicated verbally.

7. ATTACHMENTS

- Attachment 1, Project QC Impact Table

8. FORMS

None

9. RECORDS

- Data Usability Results

10. REVISION HISTORY AND APPROVAL

Revision Level Revision Date	Revision Description	Responsible Manager
00	Initial issue.	N/A

Revision Level Revision Date	Revision Description	Responsible Manager
06/05/2003		
01 09/08/2006	Updated template and numbering of procedure	Guy Gallello
02 08/25/2011	Modified format only to align with Governance Management framework	Scott Logan

Attachment 1
Project QC Impact Table

QC Data Discrepancy	Result Non-detect	Result >10% Below Action-level	Result Within 10% of or Above Action-level	Result Greater than 10% Above Action-level
DISPOSAL				
Trip Blank Contaminated	No effect	No effect	No effect	No effect
LCB Contaminated	No effect on data	No effect on data	No effect unless contamination is >10% of action-level→reject	No effect unless contamination is =/> the difference between result and action-level
LCS Low Recovery	If MS/MSD are acceptable or Surrogates are acceptable and the RL is at most 20% of action-level→Data accepted	If MS/MSD are acceptable or Surrogates are acceptable→Data accepted Otherwise, flag and qualify that results may in fact be greater than action-level	If MS/MSD are acceptable or Surrogates are acceptable and LCS is within 10% of acceptance limit and result is above action-level→Data accepted Otherwise, flag and qualify result as suspected to be above action-level	No effect on data
LCS High Recovery	No effect on data	No effect on data	If MS/MSD are acceptable or Surrogates are acceptable evaluate potential bias in QC and accept data	No effect on data
Matrix Spike Low %R	If MSD and LCS acceptable and Surrogates or Post-spike within range Data is accepted with precision qualifier	If MSD and LCS acceptable and Surrogates or Post-spike within range Data is accepted with precision qualifier	No effect on data	No effect on data
Matrix Spike High %R	No effect on data	No effect on data	No effect on data	No effect on data
MS/MSD RPD High	No effect on data	No effect on data	No effect on data	No effect on data
Surrogate %R Low	If surrogate %R values are at least 70% of acceptance limit, Data is acceptable	If surrogate %R values are at least 70% of acceptance limit, Data is acceptable	No effect on data	No effect on data

QC Data Discrepancy	Result Non-detect	Result >10% Below Action-level	Result Within 10% of or Above Action-level	Result Greater than 10% Above Action-level
Surrogate %R High	No effect on data	No effect on data	If surrogate %R values are within 30% of acceptance limit→Data is acceptable	No effect on data
REMEDIATION or TREATMENT MONITORING				
Trip Blank Contaminated	No effect	No effect	If TB is greater than 10% of action-level or result→reject data	No effect
Duplicate Precision outside limits	No effect unless Duplicate is either above or within 50% of action-level - in this case qualify sample data and report with Duplicate result as "highest probable value"	No effect unless Duplicate is either above or within 30% of action-level - in this case qualify result as "assumed above action-level"	If Duplicate is either above or within 20% of action-level→qualify result as "assumed above action-level"	No effect-report result even if Duplicate is below action-level
LCB Contaminated	No effect on data	No effect on data	If LCB is greater than 10% of action-level or sample result→Data is unacceptable	No effect on data
LCS Low Recovery	If MS/MSD are acceptable or Surrogates are acceptable→Data accepted	If MS/MSD are acceptable or Surrogates are acceptable→Data accepted	If MS/MSD are acceptable or Surrogates are acceptable→Data accepted	No effect on data
LCS High Recovery	No effect on data	No effect on data	If MS/MSD are acceptable or Surrogates are acceptable evaluate for bias→Data accepted	No effect on data
Matrix Spike Low %R	If %R>50 and LCS acceptable-Data accepted	If %R>50 and LCS acceptable-Data accepted	If %R>50 LCS acceptable→Data accepted (evaluate potential low bias in results below action-level)	No effect
Matrix Spike High %R	No effect on data	No effect on data	If MSD and LCS acceptable and Surrogates or Post-spike within range→Data is accepted with precision qualifier	No effect on data

QC Data Discrepancy	Result Non-detect	Result >10% Below Action-level	Result Within 10% of or Above Action-level	Result Greater than 10% Above Action-level
MS/MSD RPD High	No effect on data unless perceived native concentration in MS or MSD result would be above action-level. In this case, reject data as highly suspect and advise review of sampling and lab sub-sampling procedures	No effect on data unless perceived MS or MSD native concentration would be above action-level. In this case, qualify results as potentially above action-level	If the perceived native result of either the MS or MSD is greater than 110% of action-level→qualify data as being above action-level	No effect on data
Surrogate %R Low	1) If confined to one Surrogate in a fraction, Data is acceptable 2) If surrogate %R values are at least 80% of acceptance limits, Data is acceptable	1) If confined to one Surrogate in a fraction, Data is acceptable 2) If surrogate %R values are at least 80% of acceptance limits, Data is acceptable	No effect on data	No effect on data
Surrogate %R High	No effect on data	No effect on data	If Surrogate %R is greater than 120% of acceptance limit, Data is unacceptable	No effect on data
VERIFICATION or CLOSURE ANALYSIS				
LCB Contaminated	No effect on data Comment LCB contamination	No effect on data Comment LCB contamination	If LCB is greater than 10% of action-level or sample result, Data is unacceptable	If LCB is greater than 10% of action-level or sample result, Data is unacceptable
LCS Low Recovery	If MS/MSD are acceptable or Surrogates are acceptable→Data accepted	If MS/MSD are acceptable or Surrogates are acceptable→Data accepted	If MS/MSD are acceptable or Surrogates are acceptable→Data accepted	If MS/MSD are acceptable or Surrogates are acceptable→Data accepted
LCS High Recovery	No effect on data	No effect on data	If MS/MSD are acceptable or Surrogates are acceptable→Data accepted (evaluate potential bias in reported result)	If MS/MSD are acceptable or Surrogates are acceptable→Data accepted
Matrix Spike Low %R	If MSD and LCS acceptable and Surrogates or Post-spike within range, Data is accepted with precision qualifier	If MSD and LCS acceptable and Surrogates or Post-spike within range, Data is accepted with precision qualifier	If MSD and LCS acceptable and Surrogates or Post-spike within range, Data is accepted with precision qualifier	If MSD and LCS acceptable and Surrogates or Post-spike within range, Data is accepted with precision qualifier

QC Data Discrepancy	Result Non-detect	Result >10% Below Action-level	Result Within 10% of or Above Action-level	Result Greater than 10% Above Action-level
Matrix Spike High %R	If MSD and LCS acceptable and Surrogates or Post-spike within range, Data is accepted with precision qualifier	If MSD and LCS acceptable and Surrogates or Post-spike within range, Data is accepted with precision qualifier	If MSD and LCS acceptable and Surrogates or Post-spike within range, Data is accepted with precision qualifier	If MSD and LCS acceptable and Surrogates or Post-spike within range, Data is accepted with precision qualifier
MS/MSD RPD High	No effect on data	If sample result is greater then 90% of action-level, Data is unacceptable	If RPD is greater than 110% of acceptance limit, Data is unacceptable	If RPD is greater than 110% of acceptance limit, Data is unacceptable
Surrogate %R Low	1) If confined to one Surrogate in a fraction, Data is acceptable 2) If surrogate %R values are at least 80% of acceptance limits, Data is acceptable	1) If confined to one Surrogate in a fraction, Data is acceptable 2) If surrogate %R values are at least 80% of acceptance limits, Data is acceptable	1) If confined to one Surrogate in a fraction, Data is acceptable 2) If surrogate %R values are at least 80% of acceptance limits, Data is acceptable	1) If confined to one Surrogate in a fraction, Data is acceptable 2) If surrogate %R values are at least 80% of acceptance limits, Data is acceptable
Surrogate %R High	1) If confined to one Surrogate in a fraction, Data is acceptable 2) If surrogate %R values are within 20% of acceptance limits, Data is acceptable	1) If confined to one Surrogate in a fraction, Data is acceptable 2) If surrogate %R values are within 20% of acceptance limits and other QC is within acceptance limits, Data is acceptable	If any Surrogate %R is greater than 110% of acceptance limit, Data is unacceptable	1) If confined to one Surrogate in a fraction, Data is acceptable 2) If surrogate %R values are within 20% of acceptance limits, Data is acceptable

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1. PURPOSE

The purpose of this document is to provide the methods and procedure for sampling of surface soils using trowels or spoons. Trowels or spoons can be used when matrices are composed of relatively soft and non-cemented formations and to depths of up to 12 inches into the ground surface, dependent on site conditions. Samples for Volatile Organic Compound (VOC) analysis should not be collected via trowel or spoon method. However, a trowel or spoon may be utilized to penetrate to and expose the undisturbed material at the desired depth for sampling by more applicable methods.

2. SCOPE

This procedure is applicable to all Shaw E & I projects where surface soil samples will be collected via trowel or spoon methods.

3. REFERENCES

- U.S. Army Corps of Engineers, 2001, *Requirements for the Preparation of Sampling and Analysis Plans*, Appendix C, SectionC.6, EM200-1-3, Washington, D.C.

4. DEFINITIONS

- **Trowel**—A sample collection device with a curved and pointed metal blade attached to a handle. All trace environmental samples should be collected using stainless steel blades.
- **Spoon**—A sample collection device with a round metal blade attached to a handle.
- **Surface Soil**—Soil that is removed from the surface no greater than 6 inches below grade after removing vegetation, rocks, twigs, etc.
- **Weathered Soil**—The top ⅛ to ¼ inch of soil impacted by heat from sun, rain, or foot traffic that could evaporate, dilute, or otherwise deposit contaminants from an adjacent location, thereby misrepresenting the actual soil characteristic.

5. RESPONSIBILITIES

5.1 Procedure Responsibility

The Field Sampling Discipline Lead is responsible for the maintenance, management, and revision of this procedure. Questions, comments, or suggestions regarding this technical SOP should be directed to the Field Sampling Discipline Lead.

5.2 Project Responsibility

Shaw employees performing this task, or any portion thereof, are responsible for meeting the requirements of this procedure. Shaw employees conducting technical review of task performance are also responsible for following appropriate portions of this SOP.

For those projects where the activities of this SOP are conducted, the Project Manager, or designee, is responsible for ensuring that those activities are conducted in accordance with this and other appropriate procedures. Project participants are responsible for documenting information in sufficient detail to provide objective documentation (checkprints, calculations,

reports, etc.) that the requirements of this SOP have been met. Such documentation shall be retained as project records.

6. PROCEDURE

6.1 Equipment

- Decontaminated trowel or spoon, stainless steel construction for trace environmental sampling. If samples will be collected at depth (0-6 inches), the trowel or spoon will require decontamination prior to collection of the targeted-depth sample. Alternatively, a different trowel or spoon can be used to remove the material to the targeted depth and the sample collected using a clean dedicated trowel or spoon.
- Engineers rule or stiff measuring tape
- Decontaminated stainless steel mixing bowl

6.2 Sampling

1. Don a pair of clean gloves.
2. If desired, place plastic sheeting around the targeted location to keep sampled material in place. Use a knife to cut an access hole for the sample location.
3. Remove any surficial debris (e.g. vegetation, rocks, twigs) from the sample location and surrounding area until the soil is exposed. Once exposed, the soil surface is designated as “at grade,” or 0 inches.
4. Use a trowel to scrape and remove the top 1/8 to 1/4 inch of weathered soil. (A spoon can be interchanged with trowel).
5. If collecting a sample that includes VOC analysis, collect the VOC sample aliquot first following more applicable methods.
6. With a new trowel, place the point of the blade on the ground. While holding the handle of the trowel, partially rotate the blade in a clockwise/counter-clockwise motion while pushing at a downward angle until the blade is inserted to the required depth or the blade is nearly covered. Be certain that the trowel is not inserted to a depth where the soil will touch the handle or other non-stainless steel portion of the trowel or the sampler’s hand.
7. With a prying motion lift up the trowel with soil on the blade and place soil into the stainless steel mixing bowl.
8. Repeat steps 6 and 7 until the required depth of soil is placed into the mixing bowl.
9. Measure the depth of the sample location with a rule or tape to verify the sampling depth and record in the field logbook.
10. Homogenize the non-VOC sample and transfer the sample directly into the sample container(s). Cap the sample container(s), label the containers, complete the documentation, and place the containers into the sample cooler.

7. ATTACHMENTS

None

8. FORMS

None

9. RECORDS

- Measurements recorded in Field Logbook or Field Logsheet

10. REVISION HISTORY AND APPROVAL

Revision Level Revision Date	Revision Description	Responsible Manager
00 8/28/2003	Initial issue	N/A
01 09/11/2006	Updated template and numbering of procedure, Section 1- Purpose had minor edits.	Guy Gallello
02 08/25/2011	Modified format only to align with Governance Management framework.	Scott Logan

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1. PURPOSE

The purpose of this document is to provide the methods and procedure for sampling of soils and other solids using soil probes and core-type devices. These samplers can be used when matrices are composed of relatively soft and non-cemented formations. They are utilized to collect near-surface core samples and can also be placed into boreholes at specified depths. Soil probe/corer samplers provide an intact depth-specific sample for geotechnical, chemical, radiological, or biological analysis.

2. SCOPE

This procedure is applicable to all Shaw E & I projects where soil samples will be collected via hand-operated soil probe/corer methods and no project-specific procedure exists. This procedure is not applicable to drilling or direct push methods.

3. REFERENCES

- U.S. Army Corps of Engineers, 2001, *Requirements for the Preparation of Sampling and Analysis Plans*, EM-200-1-3.
- American Society for Testing and Materials, *Standard Practice for Soil Investigation and Sampling by Auger Borings*, D1452-80 (re-approved 2000).
- U.S. Environmental Protection Agency, 1994, *Soil Sampling*, EPA/ERT SOP 2012, November.

4. DEFINITIONS

- **Soil Corer**—A sample collection device consisting of extension rods, a T-handle, and a sampling head. The sampling head is a thin-walled two-piece metal tube, split lengthwise, into which a metal or plastic sleeve is placed. The tube halves are held together with screw-locked ends, the bottom one having a point. The sleeve fills with material as the sampler is forced downward, allowing for an undisturbed core to be collected.
- **Soil Probe**—A core sample collection device consisting of a thin-walled metal tube with a cutting edge on the bottom. The tube is cut-away from its tip to approximately one-third of the way to its top to allow material to enter. The top of a soil probe is removable, and a plastic or metal sleeve is inserted through the top and is held in place by the reduced diameter of the tube at the top of the cutout. Soil probes can be attached to extension rods and T-handles or may be of one-length construction. Samples collected from a soil probe are almost always submitted to the laboratory intact.

5. RESPONSIBILITIES

5.1 Procedure Responsibility

The Field Sampling Discipline Lead is responsible for maintenance, management, and revision of this procedure. Questions, comments, or suggestions regarding this technical SOP should be directed to the Field Sampling Discipline Lead.

5.2 Project Responsibility

Shaw employees performing this task, or any portion thereof, are responsible for meeting the requirements of this procedure. Shaw employees conducting technical review of task performance are also responsible for following appropriate portions of this SOP.

For those projects where the activities of this SOP are conducted, the Project Manager, or designee, is responsible for ensuring that those activities are conducted in accordance with this and other appropriate procedures. Project participants are responsible for documenting information in sufficient detail to provide objective documentation (checkprints, calculations, reports, etc.) that the requirements of this SOP have been met. Such documentation shall be retained as project records.

6. PROCEDURE

The sampling procedure is as follows:

1. Assemble the sampler by inserting the appropriate sample tube and close the ends. If using extension rods, attach the sampler by its top to the bottom rod. Attach the T-handle either to the extension rod or directly to the sampler head.

2. If desired, place plastic sheeting around the targeted location to keep sampled material in place. Use a knife to cut an access hole for the sample location.

3. Don a pair of clean sample gloves.

4. Remove any surficial debris (e.g. vegetation, rocks, twigs) from the sample location and surrounding area.

5. If the sample will be collected from a depth beyond the surface, use a hand-auger to remove the overburden and expose the “target” sample depth. Measure the depth of the hole with a rule or stiff tape to confirm that the target depth has been reached.

6. If the sampling depth is below where the sampling device can be seen while sampling, measure the distance from the tip to top of the sampler and mark the extension rod at this distance plus the depth of the hole with tape as a reference.

7. Change sample gloves just prior to collecting the sample, especially if an auger was used to expose the target depth

8. To collect the sample using a Soil Corer, place the point of the assembled corer directly on the ground or in the auger hole and, while holding it vertical, push straight down into the soil. Do not twist. A slide hammer may be required for hard or stiff materials.

9. A Soil Probe should be placed into the location and pushed downward with a twisting motion to allow the cutting edge to work. Do not drive or hammer the sampler as this will damage the cutting tip.

10. Continue to force the sampler downward until either the top joint is touching the ground or the reference mark is even with the top of the auger hole. This will ensure that the entire sleeve is filled with material.

11. Extract the sampler by pulling upward with a slight rocking or twisting motion until the head is fully out of the hole.

12. Wipe the sampler head with a cloth or towel and remove it from the T-handle or extension rod.

13. Disassemble the sampler and remove the sleeve. Also perform any field screening desired (e.g., PID screen).

14. For a Soil Probe sample, the sleeve will most likely be submitted intact. Wipe the outside of the sleeve and use a knife to cut off any material sticking from the end so that the ends are even. Place Teflon™ tape over the ends and cap both ends. Be sure to label the top and bottom of the sample interval.

15. A Soil Corer sample may be submitted intact, especially for geotechnical parameters. If this is the case, wipe the outside of the sleeve and use a knife to cut off any material sticking from the end so that the ends are even. Place Teflon™ tape over the ends and cap, labeling the sleeve and marking the top and bottom of the sample interval.

16. If the Soil Corer sample will be aliquotted into other containers, use a knife to split the sleeve lengthwise and remove the top section to expose the sample.

17. If sampling for Volatile Organic Compounds (VOCs), collect sample aliquots from the intact core first using an EnCore™ or other syringe-type device.

18. Place the remaining material directly into sample jars or into a mixing bowl for homogenization and containerization. Cap the sample container(s), label it/them, complete the documentation, and place the sample container(s) into the sample cooler.

19. Decontaminate the sampler.

7. ATTACHMENTS

None

8. FORMS

None

9. RECORDS

None

10. REVISION HISTORY AND APPROVAL

Revision Level / Revision Date	Revision Description	Responsible Manager
00 12/05/2003	Initial issue.	N/A
01 09/11/2006	Updated template and numbering of procedure, minor edits in Section 6-Procedure	Guy Gallello
02 08/25/2011	Modified format only to align with Governance Management framework.	Scott Logan

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1. PURPOSE

The purpose of this procedure is to provide general information about the procedure for using the syringe soil VOC samplers and laboratory-prepared, pre-weighed vial. This sampling system is used to obtain and ship soil and clay samples for volatile organic compound (VOC) analysis, including gasoline range organics (GRO), in accordance with SW-846 Method 5035A and other related protocols.

2. SCOPE

This procedure applies to all instances where soils require sampling and shipment for high, medium, or low VOC analysis using laboratory-prepared vials which are either empty or contain the appropriate extraction solvent.

This procedure should be used where state guidelines or client programs mandate closed-system sampling with pre-weighed vials. Refer to state or program work plans for closed-system sampling.

This procedure and these types of samplers are applicable to non-elastic soils and non-compactable materials, such as loose sand, rocky soils, and gravel. However, the sampler must consider the matrix compatibility to the extraction solvent.

3. REFERENCES

- Method 5035A "Closed-System Purge and Trap for Volatile Organics in Soil and Waste" *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods*, SW-846, Third Edition, Revised December, 1996, Update IV

4. DEFINITIONS

- **Syringe Sampler**—A single-use volumetric sampling device designed to collect and deliver a reproducible amount of soil to a sample vial for VOC methods that require storage in an extraction solvent. A plastic syringe with its bottom cut off works well.
- **Pre-weighed vial**—An amber or clear glass vial with a TEFLON®-lined screw cap that may contain a measured volume of extraction solvent. The weight of the vial with the screw cap and if present, the extraction solvent is recorded at the laboratory prior to collecting the sample in the field. The solvent volume is typically 5 mL and the solvent can be water, sodium bisulfate solution, or methanol.

5. RESPONSIBILITIES

5.1 Procedure Responsibility

The Field Sampling Discipline Lead is responsible for maintenance, management, and revision of this procedure. Questions, comments, or suggestions regarding this technical SOP should be directed to the Field Sampling Discipline Lead.

5.2 Project Responsibility

Shaw employees performing this task, or any portion thereof, are responsible for meeting the requirements of this procedure. Shaw employees conducting technical review of task performance are also responsible for following appropriate portions of this SOP.

For those projects where the activities of this SOP are conducted, the Project Manager or designee is responsible for ensuring that the activities are conducted in accordance with this and other appropriate procedures. Project participants are responsible for documenting information in sufficient detail to provide objective documentation (checkprints, calculations, reports, etc.) that the requirements of this SOP have been met. Such documentation shall be retained as project records.

6. PROCEDURE

1. For each sample collected and for each applicable field or laboratory QC sample, a separate container must be collected to allow for laboratory determination of percent moisture.

2. Prepare the surface by removing grass, sticks, and other matter to allow the sampler to penetrate the intended location.

   – For hard pan soils and clays or excavations, scrape away the top few inches of the material to expose virgin and penetrable soil/clay for sampling.

   – When sampling subsurface cores, split the core cover lengthwise or push the core from the coring tube to expose the core and sample from points along the core.

3. If using a cut-off syringe, TerraCore™ or similar system, push the plunger down until it is a few millimeters above the edge of the cylinder bottom.

4. Insert the cartridge device into the material being sampled with a downward twisting motion until full.

5. Withdraw the sampling device from the medium and use a fresh tissue to wipe off excess material from the outside of the cartridge body, especially the O-rings. If soil is protruding from the tube, carefully slice it off even with the open end using a clean knife or spatula.

6. Carefully open the cap on a pre-weighed vial and place the sample into it by inserting the syringe tube into the vial and slowly pushing down on the plunger to eject the core. If there is solvent do this without touching the liquid. Make sure the entire core is ejected and **do not allow the liquid to splash out of the vial.**

7. For a pre-weighed vial which is empty (no solvent) complete the sample label and immediately place the sample into the laboratory supplied rack or box in a cooler with ice.

8. If the vial contains solvent, cap the vial and swirl it to break up the core and wet it with the liquid. **Do not shake the vial.**

9. Repeat steps 9 and 10 for any additional required sample vials; e.g., if the laboratory supplied both medium-level (methanol) and low-level (water/bisulfate) vials.

10. Place all vials back into the laboratory-supplied rack or box.

11. Fill the additional jar provided by the laboratory to perform moisture analysis.

12. Complete all required documentation.

13. Package and prepare for shipment. The least difficult method is to use empty pre-weighed vials, which are allowed in Method 5035A. The samples must be delivered to the laboratory under ice and then either placed into solvent, analyzed or frozen within 48-hours of collection.

14. If necessary, methanol extracts can be shipped as an “Exempted Quantity” as long as no container has more than 30ml and the total volume is no more than 500 mL. See section 2.7 of the Dangerous Goods Regulations under IATA for details on proper labeling. In most

instances, the laboratory-supplied cooler containing the methanol pre-weighed vials should have been properly labeled and declared.

7. ATTACHMENTS

None

8. FORMS

None

9. RECORDS

- Shipping Documentation
- Chain of Custody Form
- Chain of Custody Continuation Page(s)
- Cooler Shipment Checklist

10. REVISION HISTORY AND APPROVAL

Revision Level Revision Date	Revision Description	Responsible Manager
00 08/28/2003	Initial issue	Guy Gallello
01 01/23/2012	Added text/instructions for using an empty VOC vial and removed all reference/instructions/attachments for use of the EnCore™ system. Modified format to align with Governance Management framework.	Scott Logan

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1. PURPOSE

The purpose of this procedure is to provide general information about the sampling of roll-off containers and preparatory requirements for completing the task safely. Roll-off containers are often used to store excavated/treated soil, trash, and other solid materials on project sites.

2. SCOPE

This procedure applies to all instances where roll-off containers require sampling for characterization and there is no project and/or regulatory agency specified procedure in force.

The procedure presents two sampling protocols with differing statistical designs and objectives for characterization of roll-offs depending upon the end use of the material or known disposition.

- Procedure A is designed to provide limited characterization information for those instances where the properties of the material are not in question from site/process knowledge; such as trash/debris from a non-hazardous site or hazardous wastes where the disposition method is pre-determined.
- Procedure B provides a more representative sampling design and should be used in those instances where the material properties are in question or the material is to be reused. Examples include characterization of staged overburden, confirmation that treated materials meet criteria, comparison of material constituent concentrations to differing disposition deciding regulatory concentrations (such as in listed waste situations), and determination of non-hazardous nature of trash/debris from known or suspect hazardous sites.

3. REFERENCES

- U.S. Environmental Protection Agency, 2002, *RCRA Waste Sampling Draft Technical Guidance, Planning, Implementation, Assessment*, EPA/530-D-02-002, August.

4. DEFINITIONS

- **Roll-off**—A metal container used to store and transport bulk materials such as soil and debris. The container has wheels on the bottom and can be loaded/unloaded from its transport vehicle by way of a track mechanism on the truck. Roll-offs are typically open-top containers and range from 10 to 20 cubic yards in volume. For purposes of this procedure, a roll-off is any container used to store bulk wastes such as soil or debris.
- **Composite Sample**—A sample created by the mixing of several discrete samples into one sample representative of the average characteristics of the entity sampled.

5. RESPONSIBILITIES

5.1 Procedure Responsibility

The Field Sampling Discipline Lead is responsible for maintenance, management, and revision of this procedure. Questions, comments, or suggestions regarding this technical SOP should be directed to the Field Sampling Discipline Lead.

5.2 Project Responsibility

Shaw employees performing this task, or any portion thereof, are responsible for meeting the requirements of this procedure. Shaw employees conducting technical review of task performance are also responsible for following appropriate portions of this SOP.

For those projects where the activities of this SOP are conducted, the Project Manager, or designee, is responsible for ensuring that those activities are conducted in accordance with this and other appropriate procedures. Project participants are responsible for documenting information in sufficient detail to provide objective documentation (checkprints, calculations, reports, etc.) that the requirements of this SOP have been met. Such documentation shall be retained as project records.

6. PROCEDURE

Safety Note: *Roll-off containers may contain shifting and physically hazardous loads and are considered to be a confined space. No personnel shall enter a roll-off container without first obtaining a confined-space permit. Personnel should not enter a roll-off containing soil or treatment residuals unless the site ECP deems it safe to do so. At* ***no time*** *shall personnel enter a roll-off containing debris. If a roll-off container cannot be entered, all sampling must be performed either by accessing with a trier or similar implement or by using the assistance of heavy equipment.*

6.1 Procedure A—For Limited Characterization Applications

This procedure uses a five-point composite design to collect a limited representation of the material in the roll-off. If sampling for VOCs, one additional location is randomly selected and sampled for VOCs only. *This procedure should not be used in applications where VOC concentrations are central to the decision.*

- Obtain the five grab samples from as close to the corners and the center of the container as possible.
  - If using a trier or collecting from within the container, collect each grab from the full depth below the first foot of material into the containerized material load. Place the entire length of material into the composite-creation container (bowl or other implement).
  - If heavy equipment is assisting in the sampling effort, instruct the operator to scoop material at differing depths for each of the grab locations. Each “grab” sample should consist of the material from three spots in the loader/backhoe bucket.
  - If collecting debris samples, place a piece of each type of waste at the selected sample location into the mixing bowl. Debris pieces should also be cut or reduced to a manageable size (1 to 2 inches square) before being mixed. Some debris may be light, and larger volumes may need to be sampled and submitted in order to provide adequate sample mass. This is especially true of PPE and other low-weight waste materials
  - If collecting a sample for VOCs, select one randomly determined additional location and collect a VOC sample at a particular depth, below one foot from the surface material. If heavy equipment is assisting, direct the operator to scoop from one location at a depth beyond one foot and fill the appropriate VOC sample containers directly from the material in the bucket.
- Mix and homogenize the material collected from the five locations prior to filling sample containers. If the sample is debris, be sure to fill each container with similar material types. Label and document all containers and prepare for shipment.

6.2 Procedure B—For Applications Requiring More Intense Characterization

This procedure uses a more involved composite design based upon the collection of four "quadrant composites" and VOC grabs. The quadrant composites can be further combined to reduce analytical costs and provide a gross-average representation of the material properties, or, if more data points are desired, the composites can be analyzed separately to provide data on each quadrant of the material load.

- Divide the roll-off container into quadrants using string and/or stakes. The divisions should be across the middle on both the long and short axis to result in four sections of equal size.
- Sample each quadrant in five randomly selected locations. In addition, collect one VOC grab from one of the five selected locations at a randomly selected depth.
  - If using a trier or collecting from within the container, collect each grab from the full depth below the first foot of material into the containerized material load. Place the entire length of material into the quadrant composite-creation container (bowl or other implement).
  - If heavy equipment is assisting in the sampling effort, instruct the operator to scoop material at differing depths for each of the grab locations. Each "grab" sample should consist of the material from three spots in the loader/backhoe bucket.
  - If collecting debris samples, place a piece of each type of waste at the selected sample location into the mixing bowl. Debris pieces should also be cut or reduced to a manageable size (1 to 2 inches square) before being mixed. Some debris may be light, and larger volumes may need to be sampled and submitted in order to provide adequate sample mass. This is especially true of PPE and other low-weight waste materials
  - If collecting a sample for VOCs, select one of the locations in each quadrant and collect a VOC sample at a particular depth, below one foot from the surface material. If heavy equipment is assisting, direct the operator to scoop from the location at a depth beyond one foot, and fill the appropriate VOC sample containers directly from the material in the bucket.
  - Mix and homogenize the quadrant composite, and place the material into appropriate labeled sample containers. The VOC sample should always remain discrete.
- Repeat the process for each of the other quadrants.
- If multiple data points are desired, package and submit each of the quadrant composites for analysis along with the four quadrant VOC samples.
- If a container average is needed, form a composite by mixing and homogenizing half of each quadrant composite into a single sample and submitting the VOC samples separately. In some cases the laboratory may be instructed to create a VOC-lab composite by combining medium/high level extracts or even combining 5g core sampler aliquots into a TCLP/VOC-(ZHE) test.
- Place the labeled composite and VOC samples into a cooler with the project-required coolant (ice or dry ice), complete all required documentation, and ship the cooler to the laboratory per the project plans.

7. ATTACHMENTS

None

8. FORMS

None

9. RECORDS

None

10. REVISION HISTORY AND APPROVAL

Revision Level Revision Date	Revision Description	Responsible Manager
00 12/08/2003	Initial issue	N/A
01 09/11/2006	Updated template and numbering of procedure, minor edit to Section 2-Scope, reference added, definition of Composite Sample added, minor edits to content in Sections 6.1and 6.2.	Guy Gallello
02 08/25/2011	Modified format only to align with Governance Management framework	Scott Logan

1. PURPOSE

The purpose of this procedure is to provide the methods and procedures for measurement of groundwater well water levels and for conducting LNAPL measurements. Well water levels can either be determined as part of the well purging/sampling effort or be independently determined to provide information on site hydrology.

2. SCOPE

This procedure is applicable to all Shaw E & I projects where groundwater level and/or LNAPL measurements are taken.

3. REFERENCES

- American Society of Testing and Materials, D4750-87 (Reapproved 2001), *Standard Test Method for Determining Subsurface Liquid Levels in a Borehole or Monitoring Well (Observation Well)*, West Conshohocken, PA.
- U.S. Department of the Interior, 1977 (updated 1984), *National Handbook of Recommended Methods for Water-Data Acquisition*, Chapter 2, Reston, VA.

4. DEFINITIONS

- **Measuring Tape**—Steel or plastic tape with graduations to 0.01 feet. The tape shall not stretch more than 0.05 feet under normal use.
- **Electronic Measuring Device**—Commercial probe and cable designed to register a signal when the probe contacts water. The cable must have graduations to 0.01 feet.
- **Oil/water Interface Probe**- a specialized electronic measuring device that detects organic liquids. It is used to determine the interface and physical extent of any oil within the well.

5. RESPONSIBILITIES

5.1 Procedure Responsibility

The Field Sampling Discipline Lead is responsible for maintenance, management, and revision of this procedure. Questions, comments, or suggestions regarding this technical SOP should be sent to the Field Sampling Discipline Lead.

5.2 Project Responsibility

Shaw E & I employees performing this task, or any portion thereof, are responsible for meeting the requirements of this procedure. Shaw E & I employees conducting technical review of task performance are also responsible for following appropriate portions of this SOP.

For those projects where the activities of this SOP are conducted, the Project Manager, or designee, is responsible for ensuring that those activities are conducted in accordance with this and other appropriate procedures. Project participants are responsible for documenting information in sufficient detail to provide objective documentation (checkprints, calculations, reports, etc.) that the requirements of this SOP have been met. Such documentation shall be retained as project records.

6. PROCEDURE

Two techniques are discussed below: the measuring-tape method and the electronic method.

6.1 Equipment

The following equipment should be used when measuring groundwater levels:

- Decontaminated, weighted tape with graduations to 0.01 feet. The weight should be sufficient to ensure plumbness of the tape, but slender enough so as not to raise the water level significantly when submerged in the water.
- Decontaminated, commercial electronic water-level measuring device.
- Engineer's rule, graduated to 0.01 feet.
- Oil/water interface probe and meter.

6.2 Weighted Steel Tape

The following procedure should be used when measuring groundwater levels with a measuring tape:

1. Unlock the well cover and remove the cap.
2. Locate the reference point on the riser pipe.
3. Don a pair of clean gloves.
4. Slowly lower the weighted tape down the well until the bottom is reached, indicated by a bump and sudden slack in the line.
5. Straighten the tape out, removing the slack, and measure the distance at the reference point.
6. Record the reading at the reference point as Depth to Bottom (DTB).
7. Withdraw the tape from the well and record the reading at the wet/dry interface as Depth to Water (DTW).
8. The difference between the two measurements is the depth of the water column (DWC).
9. Dry and decontaminate the wetted portion of the tape.

6.3 Electronic Measurement

The following procedure should be used when measuring groundwater levels with an electronic water-level measuring device:

1. Check for proper instrument response by inserting the probe in water. Fix or replace the instrument as needed.
2. Unlock the well cover and remove the cap.
3. Locate the reference point on the riser pipe.
4. Don a pair of clean gloves.
5. Slowly lower the probe down the well until the signal indicates that the water has been contacted.

6. Record the reading at the reference point as DTW.
7. Withdraw the probe and repeat steps 5 & 6. Duplicate measurements should agree within 0.02 feet. If not, continue with measurements until 0.02 feet precision is achieved.
8. Lower the probe until the bottom of the well is reached, as indicated by slack in the line.
9. Pull slightly to remove the slack, measure at the reference point, and record as DTB.
10. Determine the water column length as (DTB-DTW) and record as DWC.
11. Remove the probe from the well and decontaminate it.

6.4 Light Non-Aqueous Phase Liquids

Oil or other light non-aqueous phase liquids (LNAPL) may be floating on the water in selected wells. If so, measure the LNAPL level and the water level using an oil/water interface probe as follows:

1. Check for proper instrument response by inserting the probe in water. Instruments typically indicate LNAPL with a steady indicator light and tone, while water is indicated by an intermittent light and tone.
2. Unlock the well cover and remove the cap.
3. Locate the reference point on the riser pipe.
4. Don a pair of clean gloves.
5. Slowly lower the oil/water interface probe down the well until the signal indicates that LNAPL has been contacted (typically a steady indicator light and tone).
6. Record the reading at the reference point as DTNAPL.
7. Continue lowering the probe until the signal indicates that water has been contacted (typically an intermittent light and tone).
8. Record the reading at the reference point as DTW.
9. Determine the depth of LNAPL as (DTW-DTNAPL) and record it.
10. Withdraw the probe and repeat steps 5 & 6. Duplicate measurements should agree within 0.02 feet. If not, continue with measurements until 0.02 feet precision is achieved.
11. Lower the probe until the bottom of the well is reached, as indicated by slack in the line.
12. Pull slightly to remove the slack, measure at the reference point, and record as DTB.
13. Determine the water column length as (DTB-DTW) and record as DWC.
14. Remove the probe from the well and decontaminate it.

7. ATTACHMENTS

None

8. FORMS

None

9. RECORDS

- Measurements recorded in Field Logbook or Field Logsheet

10. REVISION HISTORY AND APPROVAL

Revision Level Revision Date	Revision Description	Responsible Manager
00 08/18/2003	Initial Issue.	N/A
01 9/11/2006	Updated template and numbering of procedure, minor edit to Section 2-Scope, added definition of Oil/Water Interface Probe.	Guy Gallello
02 08/25/2011	Modified format only to align with Governance Management framework.	Scott Logan

1. PURPOSE

The purpose of this procedure is to provide the methods and techniques to be utilized when sampling aqueous liquids using bailer methods. This procedure does not apply to the use of depth-integrated modified bailer systems such as the Kemmerer Sampler. Bailers should not be utilized when sampling for trace levels of VOCs in wells containing high solids loads or wells that have been purged using micro techniques.

2. SCOPE

This procedure is applicable to all Shaw E & I projects where samples will be collected using a bailer. These may include groundwater wells, water treatment pools, frac tanks, and other containers.

It is not applicable to direct push groundwater sampling. See Procedure EID-GS-009 for suggested direct push groundwater sampling methods.

3. REFERENCES

- U.S. Army Corps of Engineers, 2001, *Requirements for the Preparation of Sampling and Analysis Plans*, Appendix C, Section C.2, EM200-1-3, Washington, D.C.
- American Society of Testing and Materials, D6634-01, *Standard Guide for Selection of Purging and Sampling Devices for Ground-Water Monitoring Wells*, West Conshohocken, PA.
- American Society of Testing and Materials, D4448-01, *Standard Guide for Sampling Ground-Water Monitoring Wells*, West Conshohocken, PA.

4. DEFINITIONS

- **Bailer**—A device used to collect aqueous liquid samples typically consisting of a long tube with a check valve system attached to a rope or cable. The bailer is lowered into the liquid, and once the desired depth is reached, the check valve is set by causing an upward motion. Bailers are constructed of stainless steel, polyethylene plastic, or Teflon™. Those made of polyethylene and Teflon™ can be considered disposable and utilized for one-time use.
- **Single check valve bailer**—The most commonly used type of bailer; a tubular bailer with a bottom check valve that allows water to enter the bailer while it is lowered. The weight of the water in the bailer closes the check valve upon retrieval.
- **Top-filling bailer**—A tubular bailer that is only open on the top. The bailer is lowered beneath the water surface and water enters the top of the bailer. This type of bailer should **not** be used for environmental sampling. However, it is a very effective well purging device.
- **VOC sampling device/attachment**—A detachable spigot usually constructed of polyethylene or Teflon™ that can be attached to the bottom of a bailer to regulate the flow while emptying the device, preventing agitation of the liquid as it exits.

5. RESPONSIBILITIES

5.1 Procedure Responsibility

The Field Sampling Discipline Lead is responsible for maintenance, management, and revision of this procedure. Questions, comments, or suggestions regarding this technical SOP should be directed to the Field Sampling Discipline Lead.

5.2 Project Responsibility

Shaw E & I employees performing this task, or any portion thereof, are responsible for meeting the requirements of this procedure and utilizing materials of a construction specified in the project plans or applicable to the contaminants of concern and other aspects of the sampling effort. These may include well diameter, well construction materials, depth to water, and the presence of DNAPL or LNAPL contaminants. Shaw E & I employees conducting technical review of task performance are also responsible for following appropriate portions of this SOP.

For those projects where the activities of this SOP are conducted, the Project Manager or designee is responsible for ensuring that those activities are conducted in accordance with this and other appropriate procedures. Project participants are responsible for documenting information in sufficient detail to provide objective documentation (checkprints, calculations, reports, etc.) that the requirements of this SOP have been met. Such documentation shall be retained as project records.

6. PROCEDURE

6.1 Equipment

The following equipment should be used for sampling aqueous liquids using bailer methods:

- Dedicated bailer; construction depending upon contaminants of concern and intended data use per the project plan. Disposable bailers should be utilized for one sample location only.
- Dedicated polyethylene/Teflon™-coated string or Teflon™-coated steel cable for lowering and raising the bailer.
- Tripod with mechanical winch for lowering and raising the bailer (typically only for deep or large-diameter wells).
- Plastic sheeting.

6.2 Sampling

The following procedure should be used when sampling aqueous liquids using bailer methods:

1. Don a pair of clean gloves.
2. Securely attach the required amount of string or cable to the bailer.
3. Spread a new piece of plastic sheeting around the well so as to keep the bailer rope from contacting the ground. This step is not necessary if sampling treatment pools or storage tanks.
4. If required, unlock the well cover and remove the cap.
5. If sampling a well, measure the static water level and total well depth as described in Procedure EID-FS-108.

6. Purge the well as detailed in Procedure EID-FS-110 using a separate bailer or other device. **Do not purge and sample with the same bailer.** The project planning documents should specify a well purging endpoint, which may include either of the following:
   - A selected number of well volumes
   - Water property stabilization as indicated by pH, conductivity, turbidity, or temperature measurements, etc.
7. Collect the sample immediately after purging, if applicable, by slowly lowering the bailer to the desired sampling depth and stopping briefly.
8. Set the check valve by pulling upward on the string/cable and then slowly raise the bailer to the surface.
9. Wipe the bailer body with a paper towel or tissue to prevent liquid on the outside from entering the sample containers.
10. If using one, attach the VOC device to the bottom of the bailer.
11. Transfer the groundwater sample immediately to the sample bottles.
    - Fill VOA vials first by opening the VOC device spigot and allowing the liquid to slowly fill the container without agitation and to a meniscus slightly above the top of the vial.
    - Cap and check all VOA vials for entrained air by slowly tipping and observing for bubbles. If any are present, discard the sample and collect again as above.
    - If not using a VOC attachment, the liquid can be collected by pushing up on the check valve or pouring from the top of the bailer.
12. Continue lowering and retrieving the bailer as needed to fill all required sample bottles.
13. Add preservatives to the samples as needed, and place the sample bottles on ice.
14. Note that most sample bottles come with preservatives already added. If such is the case, do not overfill the bottles.
15. Replace the well cap, if required, and lock the cover.
16. Record the sampling information.
17. Dispose of or decontaminate the bailer and string/rope as required in the project plan.

7. ATTACHMENTS

None

8. FORMS

None

9. RECORDS

- Measurements recorded in Field Logbook or Field Logsheet
- Sampling information recorded in Field Logbook or Field Logsheet

10. REVISION HISTORY AND APPROVAL

Revision Level Revision Date	Revision Description	Responsible Manager
00 08/17/2003	Initial issue.	N/A
01 09/11/2006	Updated template and numbering of procedure.	Guy Gallello
02 08/25/2011	Modified format only to align with Governance Management framework.	Scott Logan

1. PURPOSE

This procedure is intended to provide the methods to be used for preparing groundwater wells for sampling. Preparation includes accessing the well, screening for VOCs (if required), measuring depth and water column height, determining the well volume, and purging the stagnant groundwater from the monitoring well. This procedure presents methods for purging using both bailer and pump techniques. This procedure does not address low-flow or micro-purging, which is covered in Procedure No. EID-FS-111.

2. SCOPE

This procedure is applicable to all Shaw E & I projects where groundwater samples will be collected from a monitoring well and where no project/program-specific procedure is in place. Unless specifically directed in project/program plans, well purging will be considered complete when 3 to 5 well volumes have been removed from the well and/or the well water quality parameters (pH, specific conductivity, temperature, dissolved oxygen) collected during purging have stabilized for three consecutive readings.

3. REFERENCES

- U.S. Army Corps of Engineers, 2001, *Requirements for the Preparation of Sampling and Analysis Plans*, Appendix C, Section C.2, EM200-1-3, Washington, D.C.
- American Society for Testing and Materials, D6634-01, *Standard Guide for Selection of Purging and Sampling Devices for Ground-Water Monitoring Wells*, West Conshohocken, PA.
- American Society for Testing and Materials, D4448-01, *Standard Guide for Sampling Ground-Water Monitoring Wells*, West Conshohocken, PA.

4. DEFINITIONS

- **Bailer**—A device used to collect water typically consisting of a long tube with a check valve system attached to a rope or cable. The bailer is lowered into the water, and once the desired depth is reached, the check valve is set by causing an upward motion on the bailer. Bailers are constructed of stainless steel, polyethylene plastic, or Teflon™. Bailers made of polyethylene and Teflon™ may be considered disposable.
- **Pump**—An electric, compressed air, or inert gas driven device that raises liquids by means of pressure or suction. The types of pumps used for well purging should be chosen based on the well size and depth, the type of contaminants, and the specific factors affecting the overall performance of the sampling effort. Pump types that may be used include centrifugal, peristaltic, centrifugal submersible, gas displacement, and bladder pumps.
- **Well Purging**—The action of removing stagnant groundwater using mechanical means from a monitoring well. Well purging is performed prior to collecting groundwater samples from a well for purposes of attaining representative samples from the groundwater zone where the monitoring well is screened.

5. RESPONSIBILITIES

5.1 Procedure Responsibility

The Field Sampling Discipline Lead is responsible for maintenance, management, and revision of this procedure. Questions, comments, or suggestions regarding this technical SOP should be directed to the Field Sampling Discipline Lead.

5.2 Project Responsibility

Shaw employees performing this task, or any portion thereof, are responsible for meeting the requirements of this procedure and utilizing materials of a construction specified in the project plans or applicable to the contaminants of concern and other aspects of the sampling effort. These aspects may include well diameter, well construction materials, depth to water, and the presence of DNAPL or LNAPL contaminants. Shaw employees conducting technical review of task performance are also responsible for following appropriate portions of this SOP.

For those projects where the activities of this SOP are conducted, the Project Manager, or designee, is responsible for ensuring that those activities are conducted in accordance with this and other appropriate procedures. Project participants are responsible for documenting information in sufficient detail to provide objective documentation (checkprints, calculations, reports, etc.) that the requirements of this SOP have been met. Such documentation shall be retained as project records.

6. PROCEDURE

6.1 Considerations

When planning for the well sampling task, the following variables should be reviewed to determine which well purging method to use:

- **Recharge capacity of each well:** The recharge capacity of a well will determine how fast the well should be purged. The purge rate should be the same as the recharge rate of the groundwater zone to prevent drawing the water table down and creating a cascading effect of groundwater entering the well along the well screen. If recharge rates are greater than 0.5 gallons per minute, bailers or pumps may be used to remove water from the well. Wells with slow recharge rates (<0.5 gpm) may need to be sampled using other methods such as low-flow or micro-purge techniques that do not agitate the well and therefore do not require full purging.

- **Well construction details, including well depth, diameter, screened interval, screen size, material of construction, and depth to water table:** The diameter and well depth will determine the size of the pump or bailer that will be required to remove water. The screen opening size will limit the rate at which water can be removed from the well due to high flow rates through the screen creating turbulent flow.

- **Groundwater quality, including type and concentration of chemical compounds present:** Choose a device that is constructed of materials compatible with the chemicals in the groundwater. Chemical contaminants can also dictate the rate at which the water can be removed from the well. Whenever possible, wells that contain VOCs should be purged using low-flow purging methods to prevent volatilization.

- **Presence of LNAPL or DNAPL:** If LNAPL or DNAPL are present, it is not recommended that the well be purged, due to the potential for creating a contaminated smear zone.

6.2 Equipment

The following equipment is recommended for use in conducting well purging:

- Bailers and line
- Pump and discharge hose/line
- Water level indicator
- Swabbing materials
- pH meter–if desired
- Specific conductance meter–if desired
- Temperature meter or gauge–if desired
- Nephelometer-turbidity–if desired
- Dissolved Oxygen meter–if desired
- Photoionization detector (PID)
- Drums or tanks to contain the purge water
- Field log book or sheets
- Calculator
- Plastic sheeting to spread around sampling area

6.3 Pre-Purging

To prevent cross contamination of other wells on site, upgradient and background wells should be sampled first. The procedure for pre-purging is as follows:

- Prepare the area surrounding the well by placing plastic sheeting on the ground surface to prevent potential cross-contamination of the purging and sampling implements.
- Place and secure the drum, tank, or suitable purge-water container in close proximity to the well for the collection and storage of purge water. *Purge water must be containerized and disposed of in the manner specified in the project/program plan or as the client directs.* ***Never*** *return purge water to the well.* If in doubt or where requirements are not specified, handle all purge water as waste and dispose of it accordingly.
- If screening for organics, measure and record the background organic vapors in the ambient air using a PID in accordance with manufacturer recommendations.
- Open the well casing, remove the well cap, and immediately measure and record the organic vapor levels from the head space within the well casing using a PID, if required, in accordance with manufacturer recommendations.
- Measure the depth to the static water level and the depth to the bottom of the well using the water level indicator in accordance with Procedure EI-FS108, *Water Level Measurements.*
- Calculate the volume of water within the well casing and screen as follows:

  $V = [\pi(di/2)^2 (TD-H)] (7.48)$

  Where:

  V = volume of groundwater in the casing, gallons

  di = inside diameter of casing, feet

TD = total well depth, feet

H = depth to the static water level, feet

Alternatively, for typical well casing diameters, the Volume can be determined as follows:

$V = CF \times (TD-H)$

Where:

V = volume of groundwater in casing, gallons

CF = Casing Factor, gallons per linear foot-from table below

Well Diameter (inches)	Casing Factor (CF) (gallons/foot)
2	0.16
4	0.65
6	1.47
8	2.61
10	4.08
12	5.88

6.4 Well Purging by Bailing

The well must not be bailed dry; water should be purged from the well at the same rate as it recharges to prevent loss of contaminants through degassing and to prevent agitation, which may release false levels of fine-grained particles or sediments to the groundwater zone. Water level measurements may be performed to verify that water levels remain constant during bailing.

The procedure for well purging by bailing is as follows:

- Attach new bailer line to a clean bailer or new disposable bailer. Attach the other end of the bailer line to the protective casing or your wrist allowing sufficient length to reach the well screen depth.
- Slowly lower the bailer down the well to avoid agitating the water and begin bailing groundwater by allowing water to pass through the bailer check valve into the bailer. Remove the filled bailer and empty the water into the purge-water container.
- If water quality parameters are not being used to determine stabilization, remove 5 well volumes from the well and then sample using a freshly decontaminated reusable or unused disposable bailer. **Do not sample with the same bailer used to purge.**
- If water quality parameters are being used to determine stabilization, two well volumes should be removed and the water quality parameters measured and recorded as the last bailer amount is removed from the well. This should be done by filling measurement containers with water directly from the bailer and taking readings.
- Continue purging until 3 to 5 well volumes have been removed from the well and three consecutive water quality parameter reading sets yield results within 10 percent of each other. For pH use +/- 0.3 units as the standard.

- Once stabilization has been achieved, collect the sample using a freshly decontaminated reusable or unused disposable bailer. **Do not sample with the same bailer used to purge.**

6.5 Well Purging Using a Pump

The well must not be pumped dry; water should be purged from the well at the same rate as it recharges to prevent loss of contaminants through degassing and to prevent agitation, which may release false levels of fine-grained particles or sediments to the groundwater zone. Water level measurements may be performed to verify that water levels remain constant during pumping.

The procedure for well purging using a pump is as follows:

- Review and understand the proper operating and maintenance instruction for each type of pump that is used prior to placing the pump in the well. Each pump type has specific procedures for operation.
- Assemble the pump and discharge line in accordance with manufacturer instructions. Ensure the pump discharge line is long enough so that the pump intake can be located within the well screen area and the discharge end can reach the purge water container.
- Lower the pump into the well until it is submerged and at the desired pumping depth.
- Start the pump and begin monitoring discharge rates and volume collected.
- If water quality parameters are not being used to determine stabilization, remove 5 well volumes from the well and then sample using the appropriate method.
- If water quality parameters are being used to determine stabilization, remove 2 well volumes and measure and record the water quality parameters at regular intervals as the purging continues. This can be accomplished either by using in-line direct-reading instruments or by collecting the pump discharge into appropriate measurement containers.
- Continue purging until 3 to 5 well volumes have been removed from the well and three consecutive water quality parameter reading sets yield results within 10 percent of each other. For pH use +/- 0.3 units as the standard.
- Once the stabilization has been achieved, collect the sample using a method applicable to the well and contaminants of concern.

7. ATTACHMENTS

None

8. FORMS

None

9. RECORDS

- Measurements recorded in Field Logbook or Field Logsheet
- Calculations recorded in Field Logbook or Field Logsheets

10. REVISION HISTORY AND APPROVAL

Revision Level / Revision Date	Revision Description	Responsible Manager
00	Initial issue.	N/A

Revision Level Revision Date	Revision Description	Responsible Manager
12/10/2003		
01 09/21/2006	Updated template and numbering of procedure, content was added to Section 1- Purpose	Guy Gallello
02 08/25/2011	Modified format only to align with Governance Management framework	Scott Logan

1. PURPOSE

This procedure is intended to provide methods for low-flow sampling of groundwater from monitoring wells. Low-flow or micro-purge sampling is a method of collecting samples from a well that does not require the removal of large volumes of water from the well and therefore does not overly agitate the water and suspended particles or potentially aspirate VOCs. The method entails the removal of water directly from the screened interval without disturbing any stagnant water above the screen by pumping the well at low enough flow rates to maintain minimal drawdown of the water column followed by in-line sample collection. Typical flow rates for low-flow sampling range from 0.1 L/min to 0.5 L/min depending on site characteristics.

2. SCOPE

This procedure is applicable to all Shaw E & I projects where groundwater samples will be collected from a monitoring well using low-flow or micro-purge methods and where no project/program specific procedure is in use.

3. REFERENCES

- U.S. Army Corps of Engineers, 2001, *Requirements for the Preparation of Sampling and Analysis Plans*, Appendix C, Section C.2, EM200-1-3, Washington, D.C.
- American Society for Testing and Materials, D6771-02, *Standard practice for Low-Flow Purging and Sampling for Wells and Devices Used for Ground-Water Quality Investigations*, West Conshohocken, PA.
- American Society for Testing and Materials, D4448-01, *Standard Guide for Sampling Ground-Water Monitoring Wells*, West Conshohocken, PA .
- U.S. Environmental Protection Agency Region 1, 1996, *Low Stress (Low Flow) Purging and Sampling Procedure for the Collection of Ground Water Samples from Monitoring Wells*, SOP GW0001, Revision 2, July 30.

4. DEFINITIONS

- **Low Flow**—Refers to the velocity that is imparted during pumping to the formation adjacent to the well screen, not necessarily the flow rate of the water discharged by the pump at the surface.
- **Micro-purge**—Another term for low-flow sampling referred to as such due to the fact that pre-sampling groundwater removal (purging) is performed at flow rates 2 to 3 orders of magnitude less than typical bailer or pump methods.
- **Pump**—An electric, compressed air, or inert gas driven device that raises liquids by means of pressure or suction. The types of pumps used for well purging should be chosen based on the well size and depth, the type of contaminants, and the specific factors affecting the overall performance of the sampling effort. Low flow/micro-purge sampling is performed using specially constructed pumps, usually of centrifugal, peristaltic, or centrifugal submersible design, with low draw rates (<1.0L/min).
- **Well Purging**—The action of removing groundwater using mechanical means from a monitoring well prior to collecting groundwater samples. Purging removes the stagnant

groundwater from the column allowing the groundwater surrounding the well screen to enter the collection zone.

5. RESPONSIBILITIES

5.1 Procedure Responsibility

The Field Sampling Discipline Lead is responsible for maintenance, management, and revision of this procedure. Questions, comments, or suggestions regarding this technical SOP should be directed to the Field Sampling Discipline Lead.

5.2 Project Responsibility

Shaw employees performing this task, or any portion thereof, are responsible for meeting the requirements of this procedure and utilizing materials of a construction specified in the project plans or applicable to the contaminants of concern and other aspects of the sampling effort. These aspects may include well diameter, well construction materials, depth to water, and the presence of DNAPL or LNAPL contaminants. Shaw employees conducting technical review of task performance are also responsible for following appropriate portions of this SOP.

For those projects where the activities of this SOP are conducted, the Project Manager, or designee, is responsible for ensuring that those activities are conducted in accordance with this and other appropriate procedures. Project participants are responsible for documenting information in sufficient detail to provide objective documentation (checkprints, calculations, reports, etc.) that the requirements of this SOP have been met. Such documentation shall be retained as project records.

6. PROCEDURE

Low-flow/micro-purge sampling involves removing water directly from the screened interval without disturbing any stagnant water above the screen or without lowering the water table. Since it is not based upon the removal of well volumes, it requires in-line monitoring of water quality parameters which may include pH, specific conductivity, temperature, dissolved oxygen, and redox potential to determine when the groundwater sample zone has stabilized. The sample is then collected using the same pump directly from the discharge tubing.

6.1 Considerations

The following variables should be reviewed in planning for low-flow purging and sampling:

- **Recharge capacity of each well:** The recharge capacity of a well will determine how fast the well should be purged. The purge rate should be no greater than the recharge rate of the groundwater zone to prevent water table drawdown.
- **Well construction details, including well depth, diameter, screened interval, screen size, material of construction, and depth to water table:** The diameter and well depth will determine the size of the pump and the location from which the pump will operate. Peristaltic and suction draw pumps are only viable at depths of less than 25 feet. The pump intake should be placed within the well screen.
- **Pump:** Low-flow purging and sampling can be used in any well that can be pumped at a constant rate of not more than 1.0 L/min. Continuous discharge and cycle discharge pumps with adjustable flow rate controls should be used to avoid causing continuous drawdown. Whenever possible, dedicated pumps should be installed to avoid disturbing the water column.
- **Groundwater quality, including type and concentration of chemical compounds present:** Low-flow methods can be used for all types of aqueous-phase contamination,

including VOCs, SVOCs, metals, pesticides, PCBs, radionuclides, and microbiological constituents. Pump parts and tubing should be made of materials that are compatible with the analytes of interest.

6.2 Equipment

The following equipment is recommended for use in conducting well purging:

- Pump capable of <1.0L/min draw rates
- Discharge line constructed of material compatible with the contaminants of interest. Enough for a fresh line to be used at each well
- Water level indicator
- Flow-through Water Quality Meter (pH, specific conductance, temperature, optional Dissolved Oxygen, Redox potential)–calibrated
- Nephelometer–for turbidity measurement-calibrated (if required)
- Photoionization Detector (PID)–calibrated (if screening for VOCs is required)
- Drums or tanks to contain the purge water
- Field log book
- Calculator
- Plastic sheeting
- Sample containers and preservatives
- Ice and Ziploc-type bags

6.3 Pre-Sampling

To prevent cross-contamination of other wells on-site, upgradient and background wells should be addressed first. It is also a good idea to use fresh discharge line for each well as the low-flows make it difficult to flush contaminants between samples. The procedure for pre-sampling is as follows:

- Prepare the area surrounding the well by placing plastic sheeting on the ground surface to prevent potential cross-contamination of the pump and discharge hose or sample equipment and materials.
- Place and secure the drum, tank, or suitable purge water container in close proximity to the well for the collection and storage of purge water. *Purge water must be containerized and disposed of in the manner specified in the project/program plan or as the client directs.* ***Never*** *return purge water to the well.* If in doubt or where requirements are not specified, handle all purge water as waste and dispose of it accordingly.
- If performing VOC screening, measure and record the background organic vapors in the ambient air using a PID, in accordance with manufacturer recommendations.
- Open the well casing, remove the well cap, and immediately measure and record the organic vapor levels from the head space within the well casing using a PID, in accordance with manufacturer recommendations.
- Measure the depth to the static water level using the water level indicator in accordance with Procedure EI-FS108, *Water Level Measurements*.

6.4 Well Purging

The procedure for well purging is as follows:

- Review and understand the proper operating and maintenance instruction for each type of pump that is used prior to placing the pump in the well. Each pump type has specific operating procedures.
- Some wells may include a dedicated pump that is already placed in the well along the well screen. If this is the case, review well construction data to verify the proper placement of the pump intake. Inspect the location where the discharge line and pump support cable exit the well to determine that they are in the proper position (markings should be present at the well head to show this).
- Assemble the pump and clean discharge line in accordance with manufacturer instructions. Ensure the pump discharge line is long enough so that the pump intake can be located within the well screen area and the discharge end can reach the purge water container.
- Slowly lower the pump into the well until it is submerged and at the desired pumping depth.
- Connect the pump discharge to the flow-through water quality meter system in accordance with the manufacturer's procedure.
- Start the pump and begin monitoring discharge rates and volume collected. Adjust flows if necessary to remain in a range of 0.1 to 0.5L/min without exceeding the well discharge rate.
- Monitor and record the pH, conductivity, temperature, dissolved oxygen, redox potential, and turbidity at set intervals (2 to 10 minutes).
- Collect the sample following the procedure below when all monitored water quality parameters are stable, as indicated by three consecutive readings differing by less than 10 percent. For pH use +/-0.3 units as the standard.

6.5 Sample Collection

The procedure for sample collection is as follows:

- Prepare the sample bottles and preservatives required for the sampling.
- Don a pair of clean gloves.
- Collect the sample immediately after purging through the pump discharge line.
  - Fill VOA vials first (reduce the flow rate of the pump discharge) allowing the liquid to slowly fill the container without agitation and obtain a meniscus slightly above the top of the vial.
  - Cap and check all VOA vials for entrained air by slowly tipping and observing for bubbles. If any are present, discard the sample and collect again as above.
- Continue filling all required sample bottles.
- Add preservatives to the samples as needed, and place the sample bottles on ice. Note that most sample bottles come with preservatives already added. If such is the case, do not overfill the bottles.
- Replace the well cap, if required, and lock the cover.
- Record the sampling information.

- For a dedicated down-hole pumping system, do not decontaminate the pump but rinse the water quality meter's flow-cell and probes with distilled water.
- If using a non-dedicated pump and meter system, decontaminate the pump and meter.
  - Retrieve the pump and remove and dispose of the discharge line, including the line leading to and from the water quality meter system.
  - Rinse the water quality meter system with distilled water.
  - Attach a few feet of clean line to the pump and water quality meter system with a discharge end into the purge waste container.
  - Place the pump into a container of distilled water, adjust the flow to its maximum, and allow the entire system to flush with distilled water for at least 5 minutes or longer if the waste does not appear to be clean.
- Secure the area by removing equipment and materials, properly dispose of plastic sheeting and other disposable sampling materials, and close the purge water container(s).
- Proceed to the next well and repeat the process using clean discharge tubing for each well sampled.

7. ATTACHMENTS

None

8. FORMS

None

9. RECORDS

- Measurements recorded in Field Logbook or Field Logsheet
- Sampling information recorded in Field Logbook or Field Logsheet

10. REVISION HISTORY AND APPROVAL

Revision Level / Revision Date	Revision Description	Responsible Manager
00 09/21/2006	Initial issue.	N/A
01 09/21/2006	Updated template and numbering of procedure, minor edits to Sections 6.0 Procedure, 6.2 Equipment, and 6.5 Sample Collection	Guy Gallello
02 08/25/2011	Modified format only to align with Governance Management framework.	Scott Logan

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1. PURPOSE

This procedure is intended to provide general guidance for sampling of tanks and storage vessels for all analyses including waste characterization or compatibility (HazCat) analysis. The procedure also presents safety requirements and reiterates Shaw policies with regards to safe container access and opening.

2. SCOPE

This procedure is applicable to all Shaw E & I activities where any type of tank or vessel with a capacity greater than 120 gallons requires sampling for either specific analysis or characterization purposes.

3. REFERENCES

- Cassis, Jo, et al., 1985, *Guidance Document for Cleanup of Surface Tank and Drum Sites*, prepared for Office of Emergency and Remedial Response, USEPA, Washington, D.C. under Contract No. 68-01-6930.
- U.S. Environmental Protection Agency, 2002, *RCRA Waste Sampling Draft Technical Guidance, Planning, Implementation, Assessment*, EPA/530-D-02-002, August.
- U.S. Environmental Protection Agency, 1994, *Tank Sampling*, EPA/ERT SOP 2010.
- U.S. Environmental Protection Agency, 1986, *Drum Handling Practices at Hazardous Waste Sites*, EPA/600/2-86/013.

4. DEFINITIONS

- **Tank**—A container designed to hold greater than 120 gallons of material constructed primarily of non-earthen materials that provide structural support. A tank may be open or closed at the top. For the purposes of this procedure, a tank also includes tank trucks, tanker cars, and other movable containers with volumes exceeding 120 gallons.
- **Nomex**—A flame-retardant fabric used to manufacture coveralls and other outer gear for use in potentially flammable environments. Most plants that handle, store, or manufacture flammable materials require Nomex outer garments during all work processes.

5. RESPONSIBILITIES

5.1 Procedure Responsibility

The Field Sampling Discipline Lead is responsible for maintenance, management, and revision of this procedure. Questions, comments, or suggestions regarding this technical SOP should be directed to the Field Sampling Discipline Lead.

5.2 Project Responsibility

Shaw employees performing this task, or any portion thereof, are responsible for meeting the requirements of this procedure. Shaw employees conducting technical review of task performance are also responsible for following appropriate portions of this SOP.

For projects where the activities of this SOP are conducted, the Project Manager, or designee, is responsible for ensuring that those activities are conducted in accordance with this and other appropriate procedures. Project participants are responsible for documenting information in sufficient detail to provide objective documentation (i.e. checkprints, calculations, reports, etc.) that the requirements of this SOP have been met. Such documentation shall be retained as project records.

6. PROCEDURES

Safety note: Tanks and other containers can pose a potential threat to employee health and the environment. It is extremely important that all safety precautions outlined in an approved project health and safety plan are understood and followed. All monitoring devices shall be intrinsically safe, and all tools shall be non-sparking. To protect against possible toxic gas/vapor exposure, all tank/vessels should be accessed and sampled in Level B PPE unless the site responsible person (SSHO or chemist) deems otherwise based upon clear and unquestionable information. All unknown containers where there is not assurance of the absence of toxic gas or vapors from cyanide, sulfide, or strongly corrosive acids must be remotely opened and sampled using Level B PPE.

6.1 Equipment

- **Dosimeter**—A portable, transistorized survey meter that can be used for radiation monitoring purposes and/or contamination measurements. *All tanks in landfills, in dump sites, or from sites where there is a potential that radioactive materials may have been used must be screened with a dosimeter.*
- **LEL (lower explosive limit) Meter**—An air-monitoring device that can test the surrounding air for sufficient oxygen content for life support and/or the presence of combustible gases or vapors, which may pose a potential flammability hazard. The lower explosive limit is defined as the minimum concentration of a particular combustible gas in the air which can be ignited. The upper explosive limit is defined as the maximum concentration that can be ignited.
- **Toxic gas meter**—A portable warning device used for detecting specific toxic gases found in the surrounding air (H_2S, HCl, Cl_2, HCN, and $COCl_2$).
- **Photo Ionization Detector (PID)**—A portable air-monitoring instrument used to detect organic vapors. The PID does not distinguish between different types of vapors or tell if more than one vapor is present.
- **Sample Equipment**—Specific sample equipment will be identified by the type of material in the tank/vessel. The equipment may include a bacon bomb sampler, a sludge judge, glass thieves, bailers, a COLIWASA, or subsurface grab samplers. The use of these is described in Section 6.5 of this SOP.
- **Weighted tape line, measuring stick, or equivalent**—This will be used to measure the depth of product in the tank.
- **High Volume Blower**—Used to exchange/purge the tank atmosphere for health & safety purposes, if necessary.

6.2 Special Types of Containers

- **Exotic Metal Tanks**—Very expensive tanks made of aluminum, nickel, stainless steel, or other unusual metals; these usually contain extremely dangerous materials.
- **Polyethylene or PVC-lined Tanks**—These often contain strong acids or bases. If the lining is punctured, the substance usually corrodes the steel, resulting in a significant leak or spill and possible explosive gas (hydrogen) generation.

- **Single-Walled Drums Used as a Pressure Vessel**—These tanks have fittings for both product filling and placement of an inert gas, such as nitrogen. Such tanks may contain reactive, flammable, or explosive substances.

6.3 General Cautions

Prior to performing any sampling of tanks, facility personnel shall be notified of planned activities if the facility is still active. Facilities will have specific minimum requirements regarding access to tanks, including a sign-in sheet, PPE selection, grounding, de-energizing and isolating tank systems, radio communications, and/or escort requirements.

Many projects require the sampling of some type of tanks and/or vessels at one time or another. These tanks/vessels can range from an underground storage tank to a vat inside a building. The following section describes specific details and associated hazards of tank sampling. NO SHAW EMPLOYEE OR SUBCONTRACTOR SHALL ENTER A TANK OR BREAK THE PLANE OF THE SAMPLE ACCESS POINT WITH THEIR HEAD TO COLLECT A SAMPLE. If a sample cannot be obtained without doing so, the situation must be re-evaluated with the SSO and site management.

- **Difficulties and Dangers**—Sampling of tanks, vats, process vessels, tank cars, and other types of containers presents unique problems. Generally, containers of this type are enclosed. Some tanks/vessels have small access ports, manways, hatches (on larger vessels), or taps and bungs (on smaller vessels). The physical size, shape, materials of construction, and locations of access will limit the types of equipment and methods of collection that can be used.

- **Toxic or Flammable Gas Hazards**—When liquids are contained in sealed vessels, gas vapor pressures build up, sludge settles out, and density layering develops. When containers are opened, the potential for explosive reactions or the release of noxious gases requires considerable safeguards. The vessels should be opened with extreme caution; preliminary sampling of any headspace gases is always warranted, and Level B protection is standard until the dangers are well understood.

- **Tank Physical Hazards**—Another source of danger is climbing on old rusty tanks, some of which may be over 70 feet tall, such as fuel oil storage tanks. Workers must not attempt to climb onto a rusty ladder, catwalk, or stairs. Instead, workers shall use OSHA-approved ladders or man-lifts to reach the top of the tank.

- **PPE-Associated Hazards**—Nomex is fire-retardant fabric; however, when soaked in flammable substances, the Nomex no longer retains the fire-retardant characteristics. Workers must be sure to don clean Nomex. Climbing on ladders while wearing PPE could create slippery and unstable conditions. PPE will limit mobility from carrying a SCBA unit; man-lifts should be used when the selected PPE severely limits mobility up and down ladders and/or stairs.

- **Weather Hazards**—Accessing tanks or vessel outdoors in below-freezing temperatures creates slippery conditions. High winds may be prevalent atop the tank that are not apparent from the ground level. Workers must wear lanyards and/or harnesses if sample access points are near edges of the tank.

6.4 Preliminary Inspection

The following process shall be used for the preliminary inspection:

- Verify that all screening instruments are operational and have been calibrated before proceeding.

- If the sampling is being performed for purposes of compatibility or HazCat analysis, obtain a blank Tank Sampling Data Sheet (TSDS) or, if using a touch-pad-based container logging system, advance to a blank entry. If the tank/vessel is to be sampled to determine characterization for investigation or disposal, use the standard project sample numbering convention. If a number is not already identified on the tank itself, assign a number to the tank/vessel *before* beginning the visual evaluation.

- If using a dosimeter, perform the radiation survey on the tank first. If the activity is above the limits of the health and safety plan, do not continue unless your PPE is sufficient to proceed.

- Proper tank inspection is necessary for safety and efficiency in sampling or working on the tank, and because the information generated may be input to a proposal. It is important that accurate tank dimensions and tank orientation be recorded on a TSDS. The location, size, type, and condition of valves are important. Tank condition should be detailed. The height and size of the dike surrounding the tank should be noted. Manways, vents, vacuum breakers, and pressure-relief valves should be noted.

- Tracing pipes connected to a tank will indicate whether it is connected to another reservoir of liquid. Bear in mind that any valve in the line may be open or broken. It is important to note whether tank jacketing or pipe insulation is asbestos. Tank liners, especially if constructed of glass, should also be noted.

6.5 Opening Tank/Vessel

- If the tank/vessel is not in direct contact with the ground surface, make sure it is grounded before proceeding. Static electricity could potentially ignite any flammable contents.

- Headspace gases are the accumulated gaseous components found above solid or liquid layers in closed vessels. These gases may be the result of volatilization, degradation, or chemical reaction. Poorly ventilated or partially sealed areas can also act to concentrate gas vapors.

- Component concentrations normally exceed those found in ambient measurements. Therefore, techniques used to monitor low-level hazardous gases must be modified for handling these higher concentrations and for the remote sensing of tank contents. The anticipated higher concentrations can be dealt with by altering the instrument detector range, reducing the sample gas flow rate into the instrument, or utilizing a sample dilution system. These techniques are necessary for preventing saturation, poisoning, and/or gross deterioration of the detector element. When using lengthy extensions, you must also take into account increased time-lags for instrument response.

- Most ambient measurement devices have sample intakes that are highly directional and localized. The use of an extension will allow the operator to maintain a safe position while obtaining samples from varying depths and distances within containers.

- Poorly ventilated vessels can usually be sampled for headspace gases through small hatches or openings. Fully sealed vessels must be approached more cautiously since breaching may result in the uncontrolled release of pressurized gases or the potential for violent reactions with the ambient atmosphere. Any decision to open a sealed vessel should be based on sound need. For on-site work, both the supervisor and the health and safety officer (HSO) need to be informed of this type of situation. Depending on specific circumstances, special permission to open sealed vessels may be required. The investigator must be cognizant of the inherent dangers and must take appropriate safety precautions. IF NO KNOWLEDGE OF THE TANK CONTENTS EXISTS AND THE TANK IS COMPLETELY SEALED, DO NOT OPEN BY HAND. Re-evaluate the situation with proper authorities.

- The parameters that must be checked are oxygen content, explosiveness, and toxicity. Oxygen content and explosiveness must be checked first, since the PID, which is used to

measure organic vapors, is not intrinsically safe. Toxicity may be assessed from PID or OVA readings and/or Drager tube readings. Because vapors with various densities will stratify, readings should be taken at the top, middle, and bottom of the tank. These readings should be recorded on the tank inspection sheet and in the field log note book.

- Flame ionization detectors, such as OVA and LEL, that utilize the sample gas stream as their combustion air may have insufficient oxygen for combustion and will likely require use of a dilution probe. The introduction of entrained droplets from the container contents should also be avoided. Careful handling of the extension tube to avoid close contact with the materials surface (and in some instances, the use of a glass wool filter plug) will prevent material build-up in the probe and detector.

Note: When a pressurized vessel is encountered, notify the site supervisor and/or the HSO. This vessel will require special handling and MUST NOT BE OPENED WHILE UNDER PRESSURE.

- If the tank is empty, note it on the TSDS. The determination of "empty" needs to be made prior to collection of tank samples. This determination can vary from project to project depending on what the project objectives are. For example, suppose a tank is empty except for rust scale on the insides of the tank. It may be necessary to scrape the rust scale for a sample if one of the concerns is to pressure-wash the tank. The information gathered from the rust scale sample may determine what waste stream the rust scale goes into when the tank is scraped out and what waste stream the rinsate (from pressure washing) goes into. Depending on the size/volume of the tank, an inch of product could mean a significant quantity. Consult the site supervisor and/or the project manager prior to sample collection.

- Determination and measurement of layering in tanks is essential to quantify each type of material in the tanks. A variety of methods can be used to accomplish this, such as:

  – Tank gauging tape/ORS interface probe—These probes are able to distinguish between liquids that conduct electricity and those that do not. This allows you to distinguish an aqueous layer from a light or heavy immiscible organic layer. The probe is lowered on a measuring tape. Consult the ORS manual for operating instructions. The standard probe must not be used with chlorinated organics. However, the units can be ordered with probes that are compatible with all solvents. Be certain the gauging tape and probe are properly grounded.

  – Sludge Judge™—The Sludge Judge™ is an acrylic tube, in 5-foot sections, which is marked off in feet and has a check valve at the bottom. While it is too difficult to decontaminate to make it useful for sampling, it can be used to observe layering. However, it is degraded quickly by exposure to most organic solvents.

  – A stick with waterfinder paste—If one is certain that there is only a light organic layer, an aqueous layer, and sludge in the tank, then the tank may be “stuck.” A stick is coated on one side with waterfinder paste. Then it is lowered slowly into the tank. When the liquid surface is reached, the stick is marked at hatch level. When resistance is felt, indicating the top of the dense sludge, the stick is again marked. When the bottom of the tank is reached, the stick is marked again. One must be careful because a dense immiscible solvent layer can cause a false bottom of sludge to be formed between it and the aqueous layer. This results from solids whose density is between that of water and of the dense solvent.

  – Depth Composite—A sample that reflects layering with depth. An accurate depth composite can give a good indication of layering. Measurements of layers in the sample can be scaled up to give rough measurements of the layers in the tank.

  – Frost Line—The band, visible on the tank exterior, that separates the organic liquids from the water. Organic liquids generally have lower heat capacities than water. As a result, on cool mornings or whenever the temperature drops below 32°F, one can sometimes

see frost on a tank with a band that is frost-free corresponding to the location of an aqueous layer.

- Unless available from plant information, obtain measurements of the diameter, D, and height, H (vertical), or length, L (horizontal), of the tank. Use the following equations to calculate the tank capacity in gallons:

Vertical Tanks

$$V = \Pi \times (D/2)^2 \times H \times 7.48$$

Where

V is the total volume in gallons

Π = 3.14 or approximately 22/7

D is the tank diameter in feet

H is the tank height in feet

7.48 is the constant conversion factor from cubic feet to gallons

Horizontal Tanks

$$V = \Pi \times (D/2)^2 \times L \times 7.48$$

Where

V is the total volume in gallons

Π = 3.14 or approximately 22/7

D is the tank diameter in feet

L is the tank length in feet

7.48 is the constant conversion factor from cubic feet to gallons

- Alternatively, consult the scales for Vertical and Horizontal cylindrical tanks on the Shaw TSDS. These can be used both to determine the tank capacity and to estimate product/layer volumes.

6.6 Sampling Tank/Vessel

- Review the sampling plan to determine the project sampling objectives prior to collecting the sample. The project data objectives and data use establish the appropriate sampling protocol. Waste characterization samples do not require stringent sampling efforts since the end result of the tank product is disposal. Particular attention is required to collect all phases of the tank for hazardous categorization. A periodic product test sample requires further requirements for collecting representative samples at various depths.
  - Waste/Disposal characterization—If the entire contents of a tank will be characterized and disposed of as one waste stream, simple sampling methods such as using a pond sampler or even a disposable plastic pitcher attached to a pole may suffice.
  - Hazard Categorization (HazCat)—If the intent is to determine the hazards of an unknown tank's contents, it is extremely important to collect all phases and layers of the tank contents. This can be accomplished using implements such as a drum thief, bailer, Sludge Judge™, or PVC Pipe sampler. Layer samples can also be collected using a

bacon bomb or similar depth-specific sampler and collecting a "sample" from within each defined layer.

– Quality Control/Process Sampling—If the intent is to determine whether the tank contents meet a specification or to ascertain whether a layer of unacceptable material (such as water) exists, a depth-specific sampling method such as bacon bomb should be used.

- Several sampling devices exist for sampling liquids in tanks: bacon bomb, pond sampler, PVC pipe sampler, sludge judge, and dip tube. All of these sampling devices will provide a depth-based composite of the liquid, with the exception of the pond sampling device. This device is utilized when there is minimal liquid at the bottom of a tank and a sample needs to be collected (note that 1 inch of material in the bottom of a tank can be a substantial amount, depending on the size of the tank). Refer to respective Shaw SOPs for procedures on using sampling equipment.

- Several types of sludge/solids sampling devices also exist for use in tanks: PVC pipe sampler, Sludge Judge™, pond sampler, floor scraper, and a shovel. The PVC pipe sampler and the Sludge Judge™ can provide a depth-based composite. A pond sampler or shovel is useful when minimal solid material is at the bottom of a tank. The floor scraper is useful when it is necessary to scrape scale from an otherwise empty tank, in order to collect a sample. Refer to Shaw SOPs for procedures on using specific sampling equipment.

- In some instances, a solid may form on top of a liquid. When the solid is broken up, this may reveal the liquid layer. The solid and liquid should be collected.

- Unless the intended sample is to target a specific depth/layer of contents, every effort must be made to collect all phases of the tank contents*. If a layer is not accessible or cannot be sampled, it* ***must*** *be noted on the TSDS*. Tanks may contain air- or water-reactive solids that are covered with inert materials such as phosphorous under water or metallic sodium under light hydrocarbon fuels. *Misclassification of such containers can and has resulted in serious repercussions during future handling efforts*.

- After sampling is complete, the tank should be resealed to prevent the escape of vapors and possible reactions from rainwater, air, etc. The resealing method that should be used will depend on the opening methods used and may include replacing the manway cover or other access point.

- Sample collection should be documented, and samples should be packaged and shipped in accordance with the project plans and Shaw SOPs. *Samples with known hazards evident from the field data must be shipped in accordance with Shaw Procedure No. EID-FS-013.* Remember to keep the total weight of samples, cooler, and ice below 60 pounds.

6.7 Tank Sampling Data Sheet Completion

For projects where samples are being collected for purposes of characterizing the container contents for segregation and/or disposal, the field data gathered during the sampling activities is imperative to the process and must be recorded on a TSDS (EID-FS-115.01).

The following is a list of the information needed for the TSDS form.

- Tank Number—Use either straight numeric or a site standard convention. Do **not** identify/number tanks by items such as date or locations. This information should be cross-reference to tank numbers elsewhere.

- Project Number--Assigned by Shaw E & I to each project.

- Project Location--Generally the client company's name and/or street address of the facility/site.

- Project Contact--The Shaw E & I employee responsible for overseeing the sampling operation. This person should be the individual to whom questions are to be directed or verbal results given for review (i.e., project chemist or site supervisor).
- Phone--Site phone or number of the supporting Shaw E & I office.
- Logger--Name of individual responsible for filling in the sampling portion of the TSDS.
- Sampler--Name of individual(s) responsible for obtaining the sample.
- Weather--Weather conditions during sampling (e.g., temperature and/or precipitation).
- Date--Date when sample is collected.
- Time--Time when sample is collected.
- Orientation--Place an "x" in the box identifying the tank as horizontally or vertically aligned.
- Location—Place an "x" in the box that describes the tank location relative to the ground surface (aboveground [AST] or underground [UST]).
- Condition--Place an "x" in the box indicating the integrity of the tank.
- Construction--Place an "x" in the box indicating the tank material (metal or fiberglass), and if it is lined.
- Shape--Place an "x" in the box indicating the shape of the tank.
- Type Cover—Place an "x" in the box indicating if the secondary containment is concrete or asphalt.
- Control Dike—Place an "x" in the box indicating the integrity of the secondary containment.
- Specialties—Indicate if the tank is/was heated, pressurized, or insulated.
- Layers—Designate the layer as top, middle, or bottom for a multi-layered sample. If only one layer exists, complete only the line associated with the top layer, "T."
- Physical State—Place an "x" in the box indicating the actual physical state of each layer.
- Color—Write in the standard color description for each layer of the sample. **The only acceptable color descriptions are as follows:**

blue (blu)	white (wht)	black (blk)
red (red)	cream (crm)	orange (org)
pink (pnk)	yellow (yel)	gray (gry)
colorless (cls)	purple (pup)	tan (tan)
green (grn)	brown (brn)	green-blue (g-bl)

- Clarity—Place an "x" in the box indicating the clarity of each layer of the sample.
- Layer Thickness—Record the thickness of each layer in inches.
- Estimated Volume—Using the Volume per Foot Calculation Table on the TSDS, enter the estimated volume of material in the tank (for each layer, if appropriate).

- Capacity—Enter the total capacity of the tank as calculated for the height, length, diameter and/or width, as appropriate, for the geometry of the tank.
- pH—Record pH measurement in standard units (SU): 0 to 14; or designate "N/A" if no measurement was obtained. Measurements should be made by pH test strips.
- PID—Record the results for vapor analysis by photoionization detector (PID), or designate “N/A” if no measurements were obtained. The PID scale reads in ppm (0 to 2,000).
- Dosimeter—Record the results of the field radiation survey in this space, or designate "N/A" if no measurement was obtained. The dosimeter’s scale units are in millirems per hour (mr/hr or mrem/hr).
- DOT Haz—Indicate the hazard category from placards or stencils on the tank. Example: Corrosive Liquid.
- UN/NA—Record any UN or NA numbers which are stenciled or written on the tank. These numbers are always prefixed by either UN or NA.
- NFPA—Enter NFPA information from the tank, if available.
- Chemical Name—Enter any chemical compound, key ingredient, trade name, and/or chemical name of the contents on the label or stenciled on the tank. Indicate whether the information was printed on a label or stenciled or handwritten. If the space provided is inadequate, indicate that the information continues on the back of the log, and use the space on the back as needed.
- Solvent and Lot Number used in Sampling—Enter this information for samples collected, if applicable.
- Diagram of Tank—Sketch the tank, including raw measurements, and the general layout of the tank area.
- Recommendations—Identify the preferred sampling device, if possible, along with other suggestions to increase safety and maximize representativeness of sample(s) collected.
- Access—Identify how the tank can be accessed for sampling.
- Comments—Provide additional information or comments for which no specific space is designated. This space can be used to document unusual comments or problems such as contents that are too hard to sample, tank color, or colored crystals that have formed on the tank. If the space provided is inadequate, indicate that the information continues on the back of the log, and use the space on the back as needed.
- The TSDS acts as its own Chain of Custody for projects where an on-site laboratory is being utilized. On these projects, the samples should be transferred along with the log, and the log should be signed and transferred to the on-site laboratory staff. This transfer is not necessary whenever the sampling personnel are also the on-site laboratory staff, which occurs on small projects.
- For projects where the samples will be shipped to an off-site laboratory for HazCat, copies of the TSDSs must be included with the Chain of Custody documentation. The samples should be transferred via Shaw’s standard Chain of Custody process.

7. ATTACHMENTS

None

8. FORMS

EID-FS-115.01_2 Tank Sampling Data Sheet

9. RECORDS

- Tank Sampling Data Sheet
- Field Logbook or Field Logsheet

10. REVISION HISTORY AND APPROVAL

Revision Level Revision Date	Revision Description	Responsible Manager
00 03/15/2004	Initial issue.	N/A
01 09/21/2006	Updated template and numbering of procedure, Section 3 References- Internal SOP references were removed, minor edits to Sections 6.5, 6.6 and 6.7.	Guy Gallello
02 08/25/2011	Modified format only to align with Governance Management framework.	Scott Logan

Tank Sampling Data Sheet

TANK SAMPLING DATA SHEET

PROJECT NUMBER: _____
PROJECT NAME: _____
TANK NUMBER: _____

PROJECT LOCATION	LOGGER	DATE
PROJECT CONTACT	SAMPLER	TIME
PHONE	WEATHER	

ORIENTATION ☐ VERTICAL ☐ HORIZONTAL
LOCATION ☐ AST ☐ UST
CONDITION ☐ EXCELLENT ☐ POOR ☐ GOOD ☐ LEAKING ☐ FAIR
CONSTRUCTION ☐ METAL ☐ FIBERGLASS ☐ LINED

SHAPE: ☐ SPHERICAL ☐ CYLINDRICAL ☐ RECTANGULAR
TYPE COVER: ☐ CONCRETE ☐ ASPHALT
CONTROL DYKE: ☐ EXCELLENT ☐ POOR ☐ GOOD ☐ LEAKING ☐ FAIR ☐ NONE
SPECIALTIES: ☐ HEATED ☐ PRESSURIZED ☐ INSULATED JACKET

LAYERS	PHYSICAL STATE				COLOR (USE STD COLORS)	CLARITY			LAYER THK. (IN)	ESTIMATED VOLUME (GALLONS)
	LIQUID	SOLID	GEL	SLUDGE		CLEAR	CLOUDY	OPAQUE		
TOP										
MIDDLE										
BOTTOM										

DOT HAZ:
UN/NA:
NFPA:
CHEMICAL NAME:
SOLVENT & LOT # USED IN SAMPLING

CAPACITY_____
HEIGHT_____
LENGTH_____
DIAMETER_____
WIDTH_____
pH_____
PID_____
DOSIMETER_____
_____MREM/HR

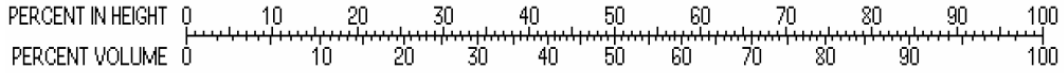
VOLUME PER FOOT, V, CALCULATIONS FOR VERTICAL CYLINDRICAL TANKS WITH DIAMETER, D

D, ft	V, gal/ft	D, ft	V, gal/ft	D, ft	V, gal/ft
2	23.5	11	711	20	2350
3	54	12	846	21	2591
4	94	13	993	22	2843
5	147	14	1151	23	3108
6	211	15	1322	24	3384
7	288	16	1504	25	3672
8	376	17	1698	30	5287
9	476	18	1903	35	7197
10	587	19	2121	40	9400

DIAGRAM OF TANK (INCLUDE RAW MEASUREMENTS)

RECOMMENDATIONS:_____
ACCESS:_____
COMMENTS:_____

PERCENT VOLUME CALCULATION OF A HORIZONTAL CYLINDRICAL TANK



CAPACITY OF A CYLINDRICAL TANK IN GALLONS

$$V_{gal} = L_{feet}\left(\tfrac{1}{2} \times D_{feet}\right)^2 \times \pi \times 7.48 \, {}^{gal}/_{ft^3}$$

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1. PURPOSE

This procedure is intended to provide general guidance for sampling of drums and other small containers for all analyses including characterization or compatibility (HazCat) analysis. The procedure also presents container handling and safety requirements and reiterates Shaw policies with regards to safe container handling.

2. SCOPE

This procedure is applicable to all Shaw E & I instances where drums or other containers of less than 120-gallon capacity require sampling for either specific analysis or characterization purposes. This procedure also presents important safety information and Shaw policies concerning the opening of drums/containers.

3. REFERENCES

- Cassis, Jo, et al., 1985, *Guidance Document for Cleanup of Surface Tank and Drum Sites*, Prepared for Office of Emergency and Remedial Response, USEPA, Washington, D.C. under Contract No. 68-01-6930.
- U.S. Environmental Protection Agency, 2002, *RCRA Waste Sampling Draft Technical Guidance, Planning, Implementation, Assessment*, EPA/530-D-02-002, August.
- U.S. Environmental Protection Agency, 1994, *Drum Sampling*; EPA/ERT SOP 2009.
- U.S. Environmental Protection Agency, 1986, *Drum Handling Practices at Hazardous Waste Sites*, EPA/600/2-86/013.

4. DEFINITIONS

- **Drum**—A container constructed of metal, plastic, glass, or fiber designed to hold material. The size of the container can be as small as an ampoule found on laboratories shelves to as large as 120-gallon capacity.
- **Drum Type A**—A drum or other container in which the contents are reasonably known and for which a qualified chemist or other hazardous material-experienced individual has determined that no hazard from shock sensitivity, air reactivity, or hazardous reactions is probable. These drums may be opened by hand unless damaged or visibly bulging. Determination may be made based upon visual inspection of drum/container condition, legible labeling, site information/records, or process/use knowledge that is supported by other information. Examples include staged IDW, waste oils, and other unused/waste products that do not degrade into shock-sensitive compounds. Type A Drums must also be constructed of typical materials and not of nickel, stainless steel, aluminum, center bung, or other special designs usually used to hold highly reactive materials. *All drums removed from legacy landfills or dump sites must be treated as Drum Type B containers and accessed remotely*.
- **Drum Type B**—A drum that poses a potential risk of injury to the sampler from shock sensitivity, air reactivity, flammability, toxicity, or rapid polymerization. Included in this category are drum/containers with visible crystals along the sides or tops, those constructed of non-typical materials or design (nickel, stainless steel, aluminum, or center bung), non-IDW drums that are bulging, containers with too much damage to allow for safe hand-opening, and **all** unknowns from sites where there is not assurance of non-hazardous

content. *In addition, it is Shaw policy that all drums removed from landfills or dump sites must be treated as Drum Type B containers and accessed remotely and in Level B PPE unless a clear determination can be made to handle them otherwise*.

Equipment

- **Dosimeter**—A portable, transistorized survey meter that can be used for radiation monitoring purposes and/or contamination measurements. *All drums in landfills, in dump sites, or from sites where a potential exists that radioactive materials may have been used must be screened with a dosimeter.*
- **Drum Thief**—A thin-walled borosilicate glass tube used to collect liquid samples from drums and containers.
- **LEL (Lower Explosive Limit) Meter**—An air monitoring device that can test the surrounding air for sufficient oxygen content for life support and/or the presence of combustible gases or vapors which may pose a potential flammability hazard. The lower explosive limit is defined as the minimum concentration of a particular combustible gas in the air that can be ignited. The upper explosive limit is defined as the maximum concentration that can be ignited.
- **Toxic Gas Meter**—A portable warning device used for detecting specific toxic gases found in the surrounding air (i.e., H_2S, HCl, Cl_2, HCN, and $COCl_2$).
- **PID (Photoionization Detector)**—A portable air-monitoring instrument used to detect organic vapors. The PID does not distinguish between different types of vapors or tell if more than one vapor is present.

Special Types of Containers

- **Laboratory Packs**—Such drums are commonly used for disposal of expired chemicals and process samples from laboratories, hospitals, and similar institutions. Bottles in the lab pack may contain incompatible materials and may not be packed in absorbent material. They may contain radioisotopes; shock-sensitive material; or highly volatile, highly corrosive, or very toxic exotic chemicals. Lab packs have been the primary ignition sources for fires at some hazardous waste sites.
- **Exotic Metal Drums**—Very expensive drums (aluminum, nickel, stainless steel, or other unusual metals) that usually contain an extremely dangerous material.
- **Polyethylene or PVC-lined Drums**—These drums often contain strong acids or bases. If the lining is punctured, the substance usually corrodes the steel, resulting in a significant leak or spill and possible explosive gas (hydrogen) generation.
- **Single-Walled Drums Used as a Pressure Vessel**—These drums have fittings for both product filling and placement of an inert gas, such as nitrogen. Such drums may contain reactive, flammable, or explosive substances.

5. RESPONSIBILITIES

5.1 Procedure Responsibility

The Field Sampling Discipline Lead is responsible for maintenance, management, and revision of this procedure. Questions, comments, or suggestions regarding this technical SOP should be directed to the Field Sampling Discipline Lead.

5.2 Project Responsibility

Shaw employees performing this task, or any portion thereof, are responsible for meeting the requirements of this procedure. Shaw employees conducting technical review of task performance are also responsible for following appropriate portions of this SOP.

For projects where the activities of this SOP are conducted, the Project Manager, or designee, is responsible for ensuring that those activities are conducted in accordance with this and other appropriate procedures. Project participants are responsible for documenting information in sufficient detail to provide objective documentation (i.e., checkprints, calculations, reports, etc.) that the requirements of this SOP have been met. Such documentation shall be retained as project records.

6. PROCEDURE

Safety note: Drums and other containers can pose a potential threat to the employee's health and the environment. It is extremely important that all safety precautions outlined in an approved project health and safety plan are understood and followed. **At no time shall Shaw E & I employees open an unknown and potentially hazardous or Type B drum/container by hand.** All monitoring devices shall be intrinsically safe and all tools shall be non-sparking. To protect against possible toxic gas/vapor exposure, all drums/containers should be accessed and sampled in Level B PPE unless the site responsible person (SSHO or chemist) deems otherwise based upon clear and unquestionable information. All unknowns where there is not assurance of the absence of toxic gas or vapors from cyanide, sulfide, or strongly corrosive acids **must** be opened and sampled using Level B PPE.

6.1 Evaluate and Log Drum/Container

- Verify that all screening instruments are operational and have been calibrated before proceeding.
- If the sampling is being performed for purposes of compatibility or HazCat analysis, obtain a blank Drum/Container log or, if using a touch pad-based drum logging system, advance to a blank entry.
- If the drum/container is being sampled for other purposes, use the standard project sampling logging convention.
- Assign a number to the drum/container *before* beginning the visual evaluation. This will ensure that all drums/containers are accounted for.
- Complete the header and visual observation sections of the Drum/Container log. Be sure to note any markings, the manufacturer trade names, the drum condition, and NFPA information on the drum/container. Do not complete the Volume section until after the drum has been opened. Also, if on a staging area, notate the location of the drum/container on the log; draw a map if necessary.
- If using a dosimeter, perform the radiation survey on the drum first. If the activity is above the limits of the health and safety plan, do not continue unless your PPE is sufficient to proceed.

6.2 Open and/or Sample Drum/Container

- Type B drums that have been remotely opened via a backhoe-attached brass punch will most likely be staged for sampling. Drums/containers may sometimes be logged, opened remotely, and sampled as they are unearthed from landfills and dump sites and then placed into over-packs with or without their lids in place. Type A drums/containers can be opened using a bung wrench, non-sparking crow-bar-type implement, or even a brass punch and hammer combination. Type B containers not opened via backhoe are usually opened using

drum/container-attachable remote punch apparatus or, in the case of small containers, drill-based cap removal or drilling systems.

- If the drum/container is not in direct contact with the ground surface, make sure it is grounded before proceeding. Static electricity could potentially ignite any flammable contents.
- If the drum/container was previously opened, remove the lid of the over-pack container or other covering from the top of the drum.
- If opening the drum manually or with a single-container remote-opening system, proceed to open the drum/container.
- Use a PID (if weather permits), LEL meter, and/or toxic gas meter to collect air monitoring readings from the drum/container. Record the results on the Drum/Container Log.
- If the drum is empty (<2 inches of content for a 55-gallon drum), note it on the Drum/Container Log and proceed to the next drum/container.
- Insert the drum thief almost to the bottom of the drum or until a solid layer is encountered. About 1 foot of tubing should extend above the drum. Allow the waste in the drum to reach its natural level in the tube. Cap the top of the sampling tube using a thumb or forefinger. Carefully remove the capped tube from the drum and insert the uncapped end in the sample container. Release thumb or forefinger from tube and allow the glass thief to drain completely into the sample container. Repeat as necessary until the required sample volume has been collected.
- Close the sample container cover tightly, wipe off with a paper towel, and place a label on the sample container. Replace the overpack lid or place a plastic cover over the drum/container.
- Place the used sampling tube, along with paper towels or waste rags (used to wipe up any spills), into an empty metal barrel marked “sampling waste” for subsequent disposal. Alternatively, break the drum thief in half inside the drum/container and leave it in the drum. *Make sure the top of the thief does not extend above the drum cover or serious eye/hand injury may occur to others.*
- Solids in drums are sampled by use of tongue depressors or disposable scoops. All reasonable efforts shall be made to obtain the sample to a depth of 12 inches or refusal. It is sometimes necessary to sample the material with the use of a trier. Nonexpendable sampling tools must be decontaminated between drums. Sometimes, the material must first be broken up with a non-sparking hammer or hammer and chisel, or, for rubber-like solids, a piece may need to be cut off with a knife.
- In some instances, a solid may form on top of a liquid. When the solid is broken up this may reveal the liquid layer. The solid and liquid should be collected.
- Every effort must be made to collect all phases of the drum contents. *If a layer is not accessible or cannot be sampled it **must** be noted on the Drum/Container Log*. Drums may contain air- or water-reactive solids that are covered with inert materials such as phosphorous under water or metallic sodium under light hydrocarbon fuels. *Misclassification of such drums can and has resulted in serious repercussions during subsequent handling efforts*.
- After sampling is complete, the container should be resealed to prevent the escape of vapors and possible reactions from rainwater, air, etc. The resealing method depends on the opening methods used and may include replacing the lid and retaining ring, placing the drum in an over-pack when it cannot be resealed by any other method, and/or placing polyethylene sheeting over the drum in a manner that prevents rainwater from entering the drum.

- Samples should be documented, packaged, and shipped in accordance with the project plans and Shaw SOPs. *Samples with known hazards evident from the field data must be shipped in accordance with Shaw Procedure No. EID-FS-013.* Remember to keep the total weight of samples, cooler, and ice below 60 pounds.

6.3 Drum/Container Log Completion–HazCat/Compatibility Projects

For projects where samples are being collected to characterize the container contents for segregation and/or disposal (HazCat or compatibility analysis), the field data gathered during the sampling activities is imperative to the process and must be recorded on a Drum/Container Sampling Log. The following information is needed for the form:

- Drum Number—Use either straight numeric or a site standard convention. Do **not** identify/number drums by items such as date or locations. This information should be cross-reference to drum numbers elsewhere.
- Project Number—Assigned by Shaw E & I to each project.
- Page x of y—If the drum log is accompanied by Material Safety Data Sheets (MSDSs) or other information, then the total number of pages is required. Commonly, will be page 1 of 1.
- Project Location—Generally the client company's name and/or street address of the facility or site.
- Project Contact—The Shaw E & I employee responsible for overseeing the sampling operation. This person should be the individual to whom questions are to be directed or verbal results given for review (i.e., project chemist or site supervisor).
- Phone—Site phone or number of the supporting Shaw E & I office.
- Logger—Name of the individual responsible for filling in the sampling portion of the Drum Inventory Log.
- Sampler—Name of individual(s) responsible for obtaining the sample.
- Weather—Weather conditions during sampling (e.g., temperature and/or precipitation).
- Date—Date when sample is collected.
- Time—Time when sample is collected.
- Drum Type—Place an "x" in the box or boxes that best describe the drum type and materials of construction.
- Lid Type—Place an "x" in the box that describes the type of closure on the container.
- Drum Condition—Place an "x" in the box indicating the integrity of the drum. "Meets DOT specifications" means the drum can be shipped according to U.S. Department of Transportation (DOT) regulations.
- Drum Size—Place an "x" in the box indicating the volume of the drum when full. If the drum is over-packed, the inner drum volume should be indicated, not the size of the over-pack.
- Drum Contents—Place an "x" in the box indicating the volume of waste contained in the drum.
- Overpacked—Place an "x" in the "yes" box if the container was overpacked, along with an "x" in the box that states the type of overpack utilized.

- Layers—Designate the layer as top, middle, or bottom for a multi-layered sample. If only one layer exists, complete only the line associated with the top layer, "T."
- Physical State—Place an "x" in the box indicating the actual physical state of each layer.
- Color—Write in the standard color description for each layer of the sample. **The only acceptable color descriptions are as follows:**

blue (blu)	white (wht)	black (blk)
red (red)	cream (crm)	orange (org)
pink (pnk)	yellow (yel)	gray (gry)
colorless (cls)	purple (pup)	tan (tan)
green (grn)	brown (brn)	green-blue (g-bl)

- Clarity—Add an "x" in the box indicating the clarity of each layer of the sample.
- Layer Thickness—Record the estimated thickness of each layer in inches.
- pH—Record the pH measurement in standard units (SU), 0 to 14, or designate "N/A" if no measurement was obtained. Measurements should be made by pH test strips.
- PID—Record the results for vapor analysis by photoionization detector (PID) or designate "N/A" if no measurement was obtained. The PID scale reads in ppm (0 to 2,000).
- Dosimeter—Record the results of the field radiation survey in this space or designate "N/A" if no measurement was obtained. The dosimeter's scale units are in millirems per hour (mr/hr or mrem/hr).
- Other—Use this space to record additional analysis that may take place or designate "N/A" if no other measurements were taken. The information should include the equipment used, the parameter being measured, and its concentration. Example: Drager tube - HCN - 5 ppm.
- DOT Haz—Hazard category from placards or stencils on drum. Example: Corrosive Liquid.
- UN/NA—Space for any UN or NA numbers that are stenciled or written on the drum. These numbers are always prefixed by either UN or NA.
- MFG Name—Record the name, address, and telephone number of the company producing or distributing the chemical/product. If the space provided is inadequate, indicate that the information continues on the back of the log, and use the back side as needed.
- Chemical Name—Record the chemical compound, key ingredient, trade name, and/or chemical name of the contents on the label or stenciled on the drum. Indicate whether the information was printed on a label or stenciled or handwritten on the drum. If the space provided is inadequate, indicate that the information continues on the back of the log, and use the back side as needed.
- Additional Information—This space is for additional information or comments for which no specific space is designated. Use it to provide unusual comments or indicate problems such as contents too hard to sample, drum color, or colored crystals formed on the drum. If the space provided is inadequate, indicate that the information continues on the back of the log.

The Drum/Container Log acts as its own Chain of Custody for projects where an on-site laboratory is being utilized. On these projects, the samples should be transferred along with the log, and the log should be signed and transferred to the on-site laboratory staff. This transfer is

not necessary whenever the sampling personnel are also the on-site laboratory staff, as occurs on small projects.

For projects where the samples will be shipped to an off-site laboratory for HazCat, copies of the Drum/Container Logs must be included with the Chain of Custody documentation. The samples should be transferred via Shaw's standard Chain of Custody form.

7. ATTACHMENTS

None

8. FORMS

Form EID-FS-116.01 Drum Container Sampling Log

9. RECORDS

- Drum/Container Log
- Field Logbook or Field Logsheet
- Chain of Custody Form
- Chain of Custody Continuation Page(s)

10. REVISION HISTORY AND APPROVAL

Revision Level Revision Date	Revision Description	Responsible Manager
00 01/05/2004	Initial issue.	N/A
01 09/21/2006	Updated template and numbering of procedure.	Guy Gallello
02 08/25/2011	Modified format only to align with Governance Management framework.	Scott Logan

Drum Container Sampling Log

(FS116.1_0)

	DRUM/CONTAINER SAMPLING LOG	DRUM NO. _____ PROJECT NO. _____ PAGE _____ OF _____

Project Location _____ Logger _____ Date _____
Project Contact _____ Sampler _____ Time _____
Phone _____ Weather _____

Drum Type: Fiber ☐ Poly Lined ☐ Steel ☐ Poly ☐ Stainless Steel ☐ Nickel ☐
Lid Type: Ringtop ☐ Closed Top ☐
Drum Condition: Meet DOT Spec. ☐ Good ☐ Fair ☐ Poor ☐
Drum Size: 110 ☐ 85 ☐ 55 ☐ 42 ☐ 30 ☐ 16 ☐ 10 ☐ 5 ☐ Other _____
Drum Contents: Volume Full ☐ 3/4 ☐ 1/2 ☐ 1/4 ☐ < 1/4 ☐ MT ☐
Overpacked: No ☐ Yes ☐ Overpack Type: Fiber ☐ Steel ☐ Poly ☐

	Phys. State				Color	Clarity			Layer Thickness	**Field Analysis**
	LAYERS	LIQUID	SOLID	GEL	SLUDGE	Use STD Colors	CLEAR	COLOUDY	OPAQUE	Inches	
T											pH _____ Su PID _____ ppm
M											Dosimeter _____
B											Other _____

Drum Labels / Markings

DOT Haz _____ UN / NA _____

MFG Name _____
Chemical Name _____
Additional Information _____

LABORATORY COMPATABILITY DATA

☐ Mark if physical state and color matches the above information. If not, stop analysis and notify Project Contact. Further work will not be paid for.

Drum Cat: _____
Analyst: _____
Date Performed: _____

Radiation Pos ☐ Neg ☐ _____ mRem / Hr

	Phys. State				Color	Clarity			Layer Thickness	Water Solubility	React	pH	Hex Sol	Per	Oxid	CN	Sul	Beil-stein	Flash Point	PCBs (25ppm)	Layer Class
	LAYERS	LIQUID	SOLID	GEL	SLUDGE	Use STD Colors	CLEAR	COLOUDY	OPAQUE	Inches	Solubility S, PS, I Density H or L	A= Air W= Water	Std. Units	S or I	+ or -	+ or -	+ or -	+ or -	+ or -	< 60 C 140 F + or -	+ or -	
T																					
M																					
B																					

Comments: _____

PCB Conc. _____ ppm Flash Point _____ C/F Compatability Composite Bulk No. _____
Data Reviewer: _____ Data Review Date: _____

Field Reviewer: _____ Field Review Date: _____

Transfer Number	Transfers Relinquished By	Transfers Accepted By	Date	Time
1				
2				
3				

1. PURPOSE

The purpose of this procedure is to provide the basic methods and guidance for volatile organic compound (VOC) screening of environmental samples using jar headspace techniques. Jar headspace analytical screening can be used to provide field data regarding the presence or absence of VOC vapors in environmental samples.

Field screening for VOC compounds can be useful for such environmental characterization purposes as discovery of site VOC contamination; selection of field samples to submit to a laboratory for analyses; selection of surface soil sampling locations; selection of boring locations; placement of groundwater monitoring wells; soil cutting (from drilling operations) screening for disposal characterization purposes; and purge water (from well purging/sampling tasks) screening for disposal characterization purposes.

2. SCOPE

This SOP is applicable to all Shaw E & I projects where VOC screening by the jar headspace method is employed. This procedure serves as general guidance on the proper methods for conducting jar headspace analytical screening. Users should always consult state-specific, program-specific, or project-specific requirements to ensure compliance with requirements when performing the activities of this SOP.

3. REFERENCES

- Massachusetts Department of Environmental Protection, *Interim Remediation Waste Management Policy for Petroleum Contaminated Soils*, #WCS-94-400.

4. DEFINITIONS

- **Flame Ionization Detector (FID)**—An organic compound detector based upon the ionization in a flame of compounds containing carbon-hydrogen bonds. The FID is a gross screening tool that detects the total organic content of the introduced sample. Its response is lower to halogenated compounds, and it will not respond to compounds lacking a carbon-hydrogen bond.

- **Ionization Potential (IP)**—The amount of energy required to remove an electron from the outer shell of a molecule or atom. The resultant molecule or atom will be a positively charged cation.

- **Photo Ionization Detector (PID)**—An organic compound detection system based upon the ionization of compounds via UV-radiation. A PID will respond only to those compounds with IP values less than or equal to the output of the UV-lamp. As such it is an indicator of aromatic and conjugated organic compounds. PID response is lower for halogenated compounds. PID systems are available with either a 10.2 or 11.7ev lamp.

5. RESPONSIBILITIES

5.1 Procedure Responsibility

The Field Sampling Discipline Lead is responsible for maintenance, management, and revision of this procedure. Questions, comments, or suggestions regarding this technical SOP should be directed to the Field Sampling Discipline Lead.

5.2 Project Responsibility

Shaw E & I employees performing this task, or any portion thereof, are responsible for meeting the requirements of this procedure. Shaw E & I employees conducting technical review of task performance are also responsible for following appropriate portions of this SOP.

For those projects where the activities of this SOP are conducted, the Project Manager, or designee, is responsible for ensuring that those activities are conducted in accordance with this and other appropriate procedures. Project participants are responsible for recording information in sufficient detail to provide objective documentation (i.e., checkprints, calculations, reports, etc.) that the requirements of this SOP have been met. Such documentation shall be retained as project records.

6. PROCEDURE

6.1 Equipment

The equipment to be used for jar headspace screening includes the following:

- Field logbook(s)
- Volatile organic compound vapor meter (PID or FID)
- Field Data Forms - See Section 8
- Indelible markers
- Wide-mouth glass jars (16-oz preferred, 8 oz minimum size)
- Stainless steel laboratory spoons
- Aluminum foil

6.2 Field Gas Chromatography

If field GC is being employed, the following additional equipment will be required:

- Gas Chromatograph system
- Calibration standards and materials
- Gas-tight syringes

6.3 Procedure Steps

- Calibrate field screening equipment in accordance with the manufacturer's instructions and/or project-specific requirements.
- Obtain a soil sample from the sampling device (split spoon, spatula, shovel, etc.) immediately after removal from the ground. Groundwater samples can be collected from the inside of auger flights using a disposable bailer. In order to reduce loss of the volatiles, take care to minimize handling of the sample and exposure to the air during transfer to the jar.
- Half-fill a clean glass jar with the sample to be analyzed. Quickly cover each open top with one or two sheets of clean aluminum foil and subsequently apply screw caps to tightly seal the jars. Sixteen-ounce (approximately 500 mL) soil or "mason" type jars are preferred. Do not use jars with less than 8 oz. (approximately 250 mL) total capacity.
- Allow sealed jar to sit for at least 10 minutes. Vigorously shake jars for 15 seconds at the beginning of the headspace development period. Where ambient temperatures are below

32°F (0°C), sample bottles should be placed within a heated vehicle or building for the prescribed period to allow the volatilization process to occur.

- Remove screw/lid and expose foil seal. Puncture foil seal with instrument sampling probe into the jar. Keep probe tip sufficiently above the media surface to avoid uptake of water droplets or soil particulates into the sample probe.
- As an alternative collection method or when using a field GC, use a gas-tight syringe to withdraw a measured volume of the headspace and inject into the probe inlet or calibrated GC.
- Following probe insertion through the foil seal and/or sample injection into the probe, the maximum (non-GC) instrument response should occur between 2 and 5 seconds. Record the highest meter response as the jar headspace concentration in the field log book or sheet. For GC analysis, determine and record the response/concentration of the target compound(s)
- Perform Duplicate QC and evaluate in accordance with the project plans
- Dispose of all wastes, including screened samples, in accordance with the project plans

7. ATTACHMENTS

- Attachment 1, Ionization Potentials for Common Volatile Contaminants

8. FORMS

- Form EID-FS-203.01, Jar Headspace Screening Results Log

9. RECORDS

- Field Logbook
- Field Data Forms
- Form EID-FS-203.01, Jar Headspace Screening Results Log

10. REVISION HISTORY AND APPROVAL

Revision Level Revision Date	Revision Description	Responsible Manager
00 09/18/2003	Initial Issue.	N/A
01 8/25/2011	Modified format only to align with Governance Management framework.	Scott Logan

Attachment 1
Ionization Potentials for Common Volatile Contaminants

Analyte	IP (eV)	Analyte type
Acetone	9.69	AAK
Acrolein	10.10	AAK
Allyl alcohol	9.67	SDO
Benzene	9.245	AC
Bromochloromethane (I.S.)	10.77	AH
Bromoform	10.51	AH
Bromomethane	10.53	AH
n-Butanol	10.04	AAETS
2-Butanone (MEK)	9.53	AAK
Carbon disulfide	10.08	AAETS
Carbon tetrachloride	11.47	AH
Chlorobenzene	9.07	AC
Chlorodibromomethane	10.59	AH
Chloroethane	10.98	AH
Chloroform	11.42	AH
Chloromethane	11.28	AH
1,2-Dibromoethane	10.19	AH
Dibromomethane	10.49	AH
1,2-Dichlorobenzene	9.07	AH
1,3-Dichlorobenzene	9.12	AH
1,4-Dichlorobenzene	8.94	AH
Dichlorodifluoromethane	12.31	AH
1,2-Dichloroethane	11.12	AH
trans-1,2-Dichloroethene	9.66	AH
1,2-Dichloropropane	10.87	AH
Diethyl ether	9.53	AAETS
Ethanol	10.48	AAETS
Ethyl acetate	10.11	AAE
Ethyl benzene	8.76	AC
Ethylene oxide	10.565	MM
2-Hexanone	9.34	AAK
Iodomethane	9.54	AH
Isopropylbenzene	8.69	AH
Methane	12.98	PC
Methanol	10.85	AAETS
Methylene chloride (DCM)	11.35	AH
4-Methyl-2-pentanone (MIBK)	9.30	AAK
Naphthalene	8.12	AC
Nitrobenzene	9.92	AC

Analyte	IP (eV)	Analyte type
Pyridine	9.32	HM
Styrene	8.47	AC
Tetrachloroethene	9.32	SDO
Toluene	8.82	AC
Trichloroethene	9.45	SDO
Trichlorofluoromethane	11.77	AH
Vinyl acetate	9.19	SDO
Vinyl chloride	9.995	SDO
o-Xylene	8.56	AC
m-Xylene	8.56	AC
p-Xylene	8.445	AC

PC = Paraffins and Cycloparaffins

AH = Alkyl Halides

AAETS = Aliphatic Alcohol, Ether, Thiol, and Sulfides

AAK = Aliphatic Aldehydes and Ketones

AAE = Aliphatic Acids and Esters

SDO = Some Derivatives of Olefins

HM = Heterocyclic Molecules

AC = Aromatic Compounds

MM = Miscellaneous Molecules

Jar Headspace Screening Results Log

Site: _____

Location: _____

Sample ID	Date	Headspace Reading	Comments

STANDARD OPERATING PROCEDURE

Subject: Standards for Conducting Subsurface Soil Sampling While Drilling

1. PURPOSE

This procedure provides the standard practice for subsurface soil sampling while drilling. The procedure includes the minimum recommended steps and quality checks that employees and subcontractors are to follow when performing the subject task.

This procedure may also contain guidance for other recommended or suggested practice that is based upon collective professional experience. Recommended practice goes beyond the minimum requirements of the procedure, and should be implemented when appropriate.

2. SCOPE

Geosciences Standard Operating Procedure (SOP) EI-GS001 describes standards for collecting subsurface soil samples while drilling, and defines how such sampling will be conducted and documented for projects executed by Shaw Environmental & Infrastructure Inc. (Shaw E & I). This standard is specific to sampling activities that are intended for the collection of soil samples for chemical analysis. Proper collection procedures are necessary to ensure the quality and integrity of all subsurface soil samples.

This SOP addresses technical requirements and required documentation. Responsibilities of individuals performing the work are also detailed. Additional project-specific requirements for subsurface soil sampling while drilling may be developed, as necessary, to supplement this procedure and to address project-specific conditions and/or objectives. This standard does not address subsurface soil sampling using direct-push techniques. Such sampling is covered under another SOP.

3. REFERENCES

Soil sampling should follow accepted industry practices while drilling. These are as defined by the latest version of the following ASTM Standards:

ASTM D 1586 Standard Method for Penetration Test and Split- Barrel Sampling of Soils.

ASTM D 1587 Standard Practice for Thin-Walled Tube Sampling of Soils.

ASTM D 3550 Standard Practice for Thick Wall Ring-Lined Split Barrel Sampling of Soils.

ASTM D 6169 Selection of Soil and Rock Sampling Devices Used with Drill Rigs for Environmental Investigations.

4. DEFINITIONS

The following definitions are applicable to the collection of subsurface soil samples while drilling, and are used in this SOP.

- **Borehole**—Any hole drilled into the subsurface for the purpose of identifying lithology, collecting soil samples, and/or installing monitoring wells.

- **Split-Spoon Sampler**—A steel tube, split in half lengthwise, with the halves held together by threaded collars at either end of the tube. This device can be driven into resistant (semiconsolidated) materials using a drive weight or drilling jars mounted to the drilling rig. A standard split-spoon sampler (used for performing standard penetration tests, ASTM D-1586) is 2 inches in outside diameter and 1⅜ inches in inside diameter. This standard spoon typically is available in two common lengths, providing either 20-inch or 26-inch internal longitudinal clearance for obtaining 18-inch or 24-inch long samples, respectively. Six-inch long sleeves (tubes) of brass, stainless steel, or plastic are commonly placed inside the sampler to collect and retain soil samples. A 5-foot long split-spoon sampler is available. A modified split-spoon sampler is also commonly used. The modified design is similar to the standard split-spoon, except the outside diameter varies from 2 to 3½ inches, and the inside diameter varies from 1½ to 3 inches (ASTM D 3550). The 2½-inch outside diameter sampler is referred to as the California Sampler.

- **Shelby Tube Sampler**—A thin-walled metal tube used to recover relatively undisturbed samples. These tubes are available in various sizes, ranging from 2 to 6 inches in outside diameter and from 18 to 54 inches in length (ASTM D 1587). A stationary piston device is included in the sampler to reduce sampling disturbance and to increase sample recovery. It has been found to be advantageous to collect Shelby tube samples from soft soil with the use of a hydraulically operated sampler (ASTM D 6519), often referred to as the Osterberg sampler. It has also been found to be advantageous to collect Shelby tube samples from hard soil with the use of a core barrel sampler, such as the Pitcher and Dennison samplers.

- **Drilling Jars**—A set pair of linked, heat-treated steel bars. The jars may be attached to a wireline sampling string incorporating a split spoon or other impact sampler. The jars are used to drive the sampler into the soil ahead of the bottom of the borehole, such as in cable tool drilling.

5. RESPONSIBILITIES

5.1 Procedure Responsibility

The Geosciences Discipline Lead is responsible for the development, maintenance, and revision of this procedure. Any questions, comments, or suggestions regarding this technical SOP should be directed to the Geosciences Discipline Lead. The Geosciences Discipline Lead's location and associated contact information can be found on the Shaw Group intranet site, ShawNet.

5.2 Project Responsibility

Employees conducting subsurface soil sampling while drilling, or any portion thereof, are responsible for meeting the requirements of this procedure. Employees conducting technical review or oversight of such efforts are also responsible for following appropriate portions of this SOP. Project participants are responsible for documenting information in sufficient detail to provide objective documentation (forms, calculations, reports, etc.) that the requirements of this SOP have been met. Such documentation shall be retained as project records.

6. PROCEDURES (TECHNICAL REQUIREMENTS AND STANDARDS)

This section addresses the process and procedures involved with subsurface soil sampling while drilling. Proper subsurface soil sampling procedures are necessary to ensure the quality and integrity of the samples.

The details within this SOP should be used in conjunction with project-specific work plans. The project work plans will generally provide the following information:

- Sample collection objectives

- Anticipated locations of soil borings and target horizons or depths of soil samples to be collected
- Numbers and volumes of samples to be collected
- Types of chemical analyses to be conducted for the samples
- Specific quality control (QC) procedures and sampling required
- Any additional subsurface soil boring sampling requirements or procedures beyond those covered in this SOP, as necessary

Many different methods may be used for subsurface soil sample collection during drilling. Refer to ASTM D 6169-98 for guidance for the selection of soil sampling devices used with drill rigs. This SOP focuses on the two most common methods of soil sample collection: split-spoon sampling and Shelby tube sampling. At a minimum, the basic procedures outlined below for these two subsurface soil sampling methods will be followed.

6.1 General Sampling Considerations

The two subsurface soil sampling methods covered in this SOP, split-spoon and Shelby tube, are commonly used in conjunction with hollow stem auger, air rotary, and dual tube percussion drilling methods. Split-spoon or Shelby tube sampling may also be conducted when drilling with mud rotary methods; however, when using this drilling method the samples are not generally used for chemical analyses. This is because the samples may become invaded or chemically altered when they are tripped through the drilling mud during sample retrieval. In addition, loose unconsolidated soils may also literally wash out of the samplers when they are tripped through the mud column.

The procedures described in this SOP should be used in conjunction with the SOP for the specific drilling method used at the site. The drilling method SOPs are listed on the Insider. Included in these drilling method SOPs are specific drilling requirements related to subsurface soil sampling. These also include, but are not limited to, site clearance, site preparation, and health and safety requirements. Consequently, this SOP, the SOP for the specific drilling method to be used at the site, and the project work plans should be reviewed together before the initiation of drilling and sampling.

6.2 Split-Spoon Sampling

Split-spoon samples for chemical analysis are usually obtained in brass, plastic, or stainless steel sleeves. The types, dimensions, and number of sleeves to be used, along with the length and type of sampler, should be stated in the project work plans. The split-spoon sampler, lined with the appropriate sleeves, is connected to the drill rod string or a wireline sampling string and is driven by a drive hammer (140 or 340 pound, depending on the size of the sampler) or drilling jars into the undisturbed soil ahead of the bottom of the borehole. The project-specific procedure for collecting and preserving samples from the split-spoon sampler should be outlined in the project work plans. The basic standard procedure for split-spoon sampling is as follows:

1. Calibrate all field analytical and health and safety monitoring equipment according to the instrument manufacturer's specifications. Calibration results must be recorded on the appropriate form(s) as specified by the project work plan or health and safety plan. Instruments that cannot be calibrated according to the manufacturer's specifications must be removed from service and tagged.

2. Wear the appropriate personal protective equipment as specified in the project work plan or health and safety plan. Personal protection will typically include the following, at a minimum: hard hat, safety glasses, gloves, steel-toed boots, hearing protection, and coveralls.

3. Between each sampling location and prior to each sampling run, decontaminate the sampler, sleeves, and other sampling equipment according to applicable Shaw- and/or project-specific procedures.

4. Drill or advance the borehole to the desired depth or target horizon where the sampling run is to begin. During drilling, monitor vapors in the breathing zone according to the project work plan and health and safety plan.

5. When the desired sampling depth or target horizon is reached, remove the drill bit or plug from inside the drive casing or augers. Check the bottom depth with a tape to measure for the presence of "flowing sands" or slough inside the auger, casing, or borehole.

6. Insert the sleeves into the split-spoon sampler, connect the halves, and screw together the rear threaded collar and front drive shoe. Attach the split-spoon sampler to the bottom end of the drill rod string or wireline sampling string. Set up and attach the specified-weight hammer, if used.

7. Drive the sampler into the soil at the bottom of the borehole. Record the type of sampler assembly and hammer weight on the appropriate form(s) (an example Visual Classification of Soil Form [i.e., field log] is included as an attachment to this SOP), as specified in the project work plans. To minimize off-gassing of the volatiles, the sampler should not be driven until the sampling team is ready to process the sample.

8. When conducting penetration testing, observe and record on the appropriate form the number of hammer blows as described in appropriate Shaw- and/or project-specific procedures.

9. Pull the drill rod or wireline sampling string up from the bottom of the borehole and remove the sampler.

10. Remove the drive shoe and rear collar from the sampler and open the split barrel.

11. Remove the sleeves one at a time, starting with the sleeve adjoining the drive shoe. Observe and record the amount of sample recovery on the appropriate form per applicable Shaw procedures. Any observed field problems associated with the sampling attempt (e.g., refusal) or lack of recovery should be noted on the appropriate form. Log the sample in accordance with applicable Shaw and/or project-specific requirements.

12. Select the sleeve(s) to be submitted for laboratory analysis. Sample sleeve selection should be based on five factors: (1) judgment that the sample represents relatively undisturbed intact material, not slough; (2) proximity to the drive shoe; (3) minimal exposure to air; (4) lithology; and (5) obvious evidence of contamination. The project work plans should specify which sample sleeves will be submitted for specific analyses and confirm the selection factor(s).

13. Place Teflon™ film over each end of sleeves to be submitted for chemical analysis, and seal each end with plastic end caps. Do not use any type of tape to seal the cap, because tape causes a toluene interference. All samples should be individually stored in resealable plastic bags. Note: Additional project-specific sample preparation steps or modifications may be required as stated in the project work plans.

14. Appropriately label and number each sleeve to be submitted for analysis. The label will be filled out using waterproof ink and may contain the following information:

    – Project number
    – Boring number
    – Sample number
    – Bottom depth of sleeve
    – Date and time of sample collection

- Parameters of analysis
- Sampler's initials

15. Document the sampling event on the appropriate form(s), as specified in the project work plans. The information listed on the form should, at a minimum, include the following:
    - Project name and number
    - Date and time of the sampling event
    - Drilling and sampling methods used – specify sample type
    - Sample number
    - Sample location
    - Boring number
    - Sample depth interval
    - Sample description (type of matrix)
    - Weather conditions
    - Unusual events
    - Signature or initials of the sampler
16. Appropriately preserve, package, handle, and ship the sample in accordance with applicable Shaw and/or project-specific procedures. The samples shall also be maintained under custody. Samples stored on site will be subject to the provisions of applicable Shaw procedures and/or project work plans. However, all reasonable attempts should be made to ship samples on the date they are collected.
17. One of the sample sleeves may also be utilized for lithologic logging. This sleeve may not then be retained for chemical analysis, as soil must be removed from the sleeve to effectively describe the soils/lithology and compile the lithologic log.
18. Where headspace organic vapor screening is required by the project work plans, remove the soil from one of the remaining sleeves and place in a seam-sealing, polyethylene bag. Place the bag in the sunlight (warm) for at least five minutes, then using an organic vapor probe (portable photoionization detector, flame ionization detector, or other appropriate instrument), monitor the soil headspace for organic vapors. Record the reading on the appropriate form(s) specified in the project work plans.
19. Repeat this sampling procedure at the intervals specified in the project work plans, and/or at suspected significant lithology changes until the bottom of the borehole is reached and/or the last sample is collected.

6.3 Thin-Walled or Shelby Tube Sampling

A thin-walled tube, or Shelby tube sampler may be used to collect relatively undisturbed soil samples. The project-specific procedure for collecting soil samples using a Shelby tube sampler should be outlined in the project work plans. The basic or standard procedure for Shelby tube sampling is described in the following text.

1. Calibrate all field analytical and health and safety monitoring equipment as discussed in Section 6.2, step 1.
2. Wear the appropriate personal protective equipment as described in Section 6.2, step 2.

3. Between each sampling location and prior to each sampling run, decontaminate the sampler and other sampling equipment according to applicable Shaw- and/or project-specific procedures.

4. Drill or advance the borehole to the desired depth or target horizon where the sampling run is to begin. While drilling, monitor the breathing zone according to the project work plans and health and safety plan.

5. Once the desired sampling depth or target horizon is reached, check the bottom depth with a tape to measure for the presence of "flowing sands" or slough inside the auger, casing, or borehole. Then connect the sampling tube to the drill rod string and advance the tube to the bottom of the boring. Then push the tube about 2 to 2.5 feet into the soil with a continuous, rapid motion without impact or twisting. If Osterberg, Pitcher, or Dennison samplers are used, follow the manufacturers' instructions for advancement of the sampler.

6. Pull the drill rod string up from the bottom of the borehole and remove the sampling tube from the string. Observe and record the amount of sample recovery and any associated problems as discussed in Section 6.2, step 11.

7. Place Teflon™ film over each end of the tube if it is to be submitted for chemical analysis and seal the ends with plastic end caps. With a waterproof marker, write a "T" for top on the leading end and a "B" for bottom on the trailing end of the tube. Note: Additional project-specific sample preparation steps or modifications may be required, as stated in the project work plans.

8. Appropriately label and number the tube as described in Section 6.2, step 14.

9. Document the sampling event on the appropriate form(s), as discussed in Section 6.2, step 15.

10. Appropriately preserve, package, handle, and ship the sample in accordance with applicable Shaw- and/or project-specific procedures. The samples shall also be maintained under custody. Samples stored on site will be subject to the provisions of applicable Shaw procedures and/or project work plans. However, all reasonable attempts should be made to ship samples on the date they are collected.

11. Repeat this sampling procedure at the intervals specified in the project work plans until the bottom of the borehole is reached and/or the last sample is collected.

Records generated as a result of this SOP will be controlled and maintained in the project record files.

7. ATTACHMENTS

None.

8. FORMS

Example Visual Classification of Soils Form (Field Log)

Shaw® Shaw E & I

Example
Visual Classification of Soils (Field Log)

PROJECT NUMBER:	PROJECT NAME:	
BORING NUMBER:	COORDINATES:	DATE:
ELEVATION:	GWL: Depth Date/Time	DATE STARTED:
ENGINEER/GEOLOGIST:	Depth Date/Time	DATE COMPLETED:
DRILLING METHODS:		PAGE: OF

DEPTH ( )	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER ( )	RECOVERY ( )	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	WELL CONSTRUCTION	REMARKS

NOTES:

Drilling Contractor: _____

Drilling Equipment: _____

Driller: _____

_____

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STANDARD OPERATING PROCEDURE

Subject: Standards for Direct Push Groundwater Sampling

1. PURPOSE

This procedure provides the standard practice for direct push groundwater sampling. The procedure provides the minimum required steps and quality checks that employees and subcontractors are to follow when performing the subject task.

This procedure may also contain guidance for recommended or suggested practice that is based upon collective professional experience. Recommended or suggested practice goes beyond the minimum requirements of the procedure and should be implemented when appropriate.

2. SCOPE AND RELATED STANDARDS

Geosciences Standard Operating Procedure (SOP) EI-GS009 describes standards for direct push groundwater sampling and discusses how such sampling will be conducted and documented for projects executed by Shaw Environmental & Infrastructure Inc. (Shaw E & I). Responsibilities of individuals performing the work are also detailed. Additional project-specific requirements for direct push groundwater sampling may be developed, as necessary, to supplement this procedure and to address project-specific conditions and/or objectives.

This SOP covers requirements for basic collection of groundwater samples from direct push temporary installations (such as the Hydropunch® system). It describes equipment, procedures, and aspects of quality control. The following are some manners of collecting groundwater samples that are not covered specifically in this SOP:

- The use of driven-point well systems that do not protect (enclose) the well screen during installation.
- The use of specialized closed-chamber devices such as the BAT® system (www.bat-gms.com) or SimulProbe® (www.besstinc.com).
- The use of driven devices that contain built-in pumping or testing systems.

Individuals needing assistance planning or conducting direct push groundwater sampling or these other types of sampling may consult internal Shaw E & I technical listings for experts or may contact the Geosciences Discipline Lead (see Section 5.1).

3. REFERENCES (STANDARD INDUSTRY PRACTICES)

The most current versions of the following references are useful for planning and implementing direct push groundwater sampling activities:

ASTM D 6001	Standard Guide for Direct-Push Water Sampling for Geoenvironmental Investigations
ASTM D 5730	Guide to Site Characterization for Environmental Purposes with Emphasis on Soil, Rock, the Vadose Zone, and Ground Water
ASTM D 4448	Guide for Sampling Groundwater Monitoring Wells

ASTM D 4750 Test Method for Determining Subsurface Liquid Levels in a Borehole or Monitoring Well (Observation Well)

QED Environmental Systems, Inc. http://www.qedenv.com/sales/hydropunch.html

Geoprobe Systems, Inc. http://www.geoprobe.com

USEPA Clu-in. http://fate.clu-in.org/direct_push/dpgroundwater.asp

4. DEFINITIONS

The following definitions are applicable to direct push groundwater sampling and this SOP:

- **Direct Push**—The creation of a boring by the displacement of soil without cutting or grinding, and without the production of mechanically altered soil (cuttings) at the ground surface. In direct push methods, soil is displaced, primarily laterally, as a pipe or rod is forced vertically downward, creating a cylindrical space (i.e., a boring). Energy to create the boring is generated by a "direct push rig" and may use constant pressure (e.g., hydraulically-powered), vibration, or other means.
- **Geoprobe**—Geoprobe® is a registered trademark of Geoprobe Systems, Inc. (www.geoprobe.com). The term *geoprobe* is informally used to refer to any small-diameter push-coring tool that is operated from a small vehicle and is used for site characterization (typically soils). Geoprobe Screen Point 15 and Screen Point 16 Systems are similar to the Hydropunch® II system (see below) and are considered suitable for use by this SOP.
- **Hydropunch**—Hydropunch® I and II are registered products of QED Environmental Systems, Inc. (www.qedenv.com). The term *hydropunch* is informally used to refer to any short to medium-length small-diameter, protected well screen system that is driven (pushed) to depth and then exposed to soil material and pore fluids by retraction of a protective sleeve, without regard to manufacturer, trademark, or registered name. The Hydropunch® I and Hydropunch® II systems are considered suitable for use by this SOP.
- **Well Screen**—A filtering device that is designed to retain soil, earthen material, or artificial sand pack on one side (outside) and permit the flow of water or other subsurface fluid into a void space on the other side (inside). A well screen is nearly always rigid and cylindrical.
- **Protected Screen**—A well screen that is encased within another material or system as it is emplaced and becomes exposed to soil materials and pore fluids only when a target depth has been reached and the protective device has been retracted or removed. The Hydropunch® and Geoprobe® Screen Point systems utilize protective covers, which are left in place until the target depth has been reached, and are then lifted upward, exposing the well screen to adjacent soil material and pore fluids.
- **Unprotected Screen**—A well screen that is in contact at all times during use with soil materials and pore fluids. The most common unprotected screen is a driven well point.

5. RESPONSIBILITIES

5.1 Procedure Responsibility

The Geosciences Discipline Lead is responsible for the development, maintenance, and revision of this procedure. Any questions, comments, or suggestions regarding this technical SOP should be directed to the Geosciences Discipline Lead. The Geosciences Discipline Lead's location and associated contact information can be found on the Shaw Group intranet site, ShawNet.

5.2 Project Responsibility

Employees planning or conducting direct push groundwater sampling are responsible for meeting the requirements of this procedure. Employees conducting technical review or oversight of direct push groundwater sampling are also responsible for appropriate portions of this SOP. Project participants are responsible for recording information in sufficient detail to provide objective documentation (i.e., field notes, forms, reports, etc.) that the requirements of this SOP have been met. Such documentation shall be retained as project records.

6. PROCEDURES (TECHNICAL REQUIREMENTS)

This section presents information on design issues, planning and preparation, basic procedures, documentation requirements, and technical review requirements for direct push groundwater sampling. Contract vendors generally conduct the pushing or driving of the sampling equipment to the desired sampling depth and associated collection of groundwater samples on Shaw E & I projects. A rig geologist is also present at each sampling event to oversee sampling activities and to ensure that samples are collected from the proper depths and placed in the correct containers following appropriate protocols. Contract vendors will require a detailed scope of work and adequate oversight.

6.1 Design Issues Likely to Affect Sample Quality or Collection

Sample quality is easily compromised by poorly selected or applied sampling techniques. Common and avoidable problems include the following:

- Use of Unprotected Screens. Use of an unprotected screen creates a likelihood that pore fluid and possibly soil particles that are not from the target depth (final depth) of the screen will pass through the well screen and into the well chamber and be included in the sample. This creates uncertainty as to how representative the sample is of the target horizon. This SOP recommends against the use of unprotected screens.

- Excessive Sediment or Particulate Matter within Well Screen. The presence of sediment within samples may bias analytical result, hamper laboratory quality control, or have other deleterious effects. The presence of sediment from an aquifer that is contaminated with an organic contaminant may positively bias (i.e., increase) the concentration results from analysis of organic chemicals, as organic chemicals are typically sorbed onto sediment. The presence of sediment or other particulate matter may also positively bias the concentration results from analysis of metals. This SOP recommends that entrainment of sediment into water within the well screen and the sample be avoided as much as reasonably possible.

- Collection of samples at a Uniform Depth Interval (e.g., every five feet or every ten feet of depth) Instead of Collection at Targeted Hydrostratigraphic Horizons. Many programs have been designed for sample collection at uniform pre-set depth intervals. Though this methodology may provide useful data, a more efficient and technically sound methodology involves targeting specific hydrostratigraphic units and boundaries (interfaces) between the units that may significantly affect the transport and distribution of contaminants. Such methodology involves constructing suitable cross-sections and interpreting the distribution of hydrostratigraphic units from boring logs, cone penetrometer test curves, and/or borehole geophysical logs, and then selecting sampling locations and depths appropriately.

Direct push groundwater sampling is commonly used in unconsolidated fine-grained and sandy soils. Problems are encountered when trying to push/drive the sampler through consolidated soils, cemented soils, coble or boulder beds, rubble fill, etc. In addition, some fine-grained beds may not yield water in sufficient volumes to allow sample collection in a timely manner. Evaluation of subsurface data (e.g., boring logs, cross-sections, reports, cone penetrometer tests, borehole geophysical logs, etc.) from the site or adjacent areas may provide information relative to potential problems with direct push sampling, including if the method is viable at the site. This should be done as part of the planning phase.

6.2 Planning and Preparation

Planning for direct push groundwater sampling activities involves the following:

- Reviewing and following Shaw Procedure HS316 "Drill Rig Operations."
- Identifying sample collection objectives and exact methodologies and equipment to be used for sample collection.
- Identifying specific locations, targeted depths, and specific identification numbers for groundwater samples to be collected.
- Identifying numbers and volumes of samples to be collected.
- Specifying types of chemical analyses to be conducted for the samples.
- Listing specific quality control (QC) procedures and sampling required.
- Describing any detailed project-specific sampling requirements or procedures beyond those covered in this SOP, as necessary.
- Listing expected soil types, hydrostratigraphy, and/or formations to be encountered.
- Identifying and listing all pertinent health and safety issues and requirements, including those contained in the project-specific health and safety plan(s), relative to work activities, including site utility clearance.
- Compiling main subcontractor requirements for direct push groundwater sampling and generating the statement of work to procure subcontractor services.

The specific sampling methods to be used and detailed procedures for collecting the groundwater samples should be developed to minimize disturbance or alteration of the samples. For example, the procedures for collecting groundwater samples for VOC analysis should prescribe a methodology that minimizes the contact of the sample with air. The methods and procedures should also allow appropriate or successful sample collection with respect to the expected depth to water, total depth, and inside diameter of the temporary screen system. For example, specified pumps should have sufficient power to lift water, and any downhole equipment should be narrow enough to operate without fouling or sticking in the direct push sample tubes.

All of the above information and items should be compiled as part of a sampling plan contained within the project-specific work plans. The work plans should include detailed, project-specific direct push groundwater sampling procedures beyond the basic procedures and requirements in this SOP.

Preparation for direct push groundwater sampling activities includes the following:

- Securing all necessary site access, permitting, and plan approvals.
- Procuring the appropriate direct push sampling subcontractor.
- Completing all necessary underground utility clearance activities at each of the sampling locations; each location should be cleared according to requirements of Shaw Procedure HS308 "Underground/Overhead Utility Contact Prevention" and the project work plans.
- Briefing the rig geologist and other site personnel on specific information necessary for effective implementation of the sampling effort (e.g., sampling objectives, locations, and depths; project-specific sampling requirements and procedures; pertinent health and safety requirements; etc.).
- Verifying that project personnel have proper health and safety training.

The project manager or designee is responsible for appropriately briefing field personnel, as described above.

6.3 Basic Procedure

The basic procedure for direct push groundwater sample collection is described below. More detailed project-specific procedures, based on sampling and quality control requirements and other aspects of the actual project, should be compiled to supplement this procedure and should be presented in the project work plans.

1. Decontaminate the direct push sampling rig and associated sampling equipment, in accordance with applicable Shaw E & I SOPs and/or project-specific requirements/procedures, before mobilizing to the first sample location.

2. The driller and rig geologist should inspect the direct push rig to verify that the equipment is properly maintained, adequately decontaminated, and capable of achieving the objectives for sampling equipment advancement, groundwater sample collection, and abandonment of the boring.

3. Calibrate all field analytical and health and safety monitoring equipment according to the instrument manufacturer's specifications and/or project work plans. Calibration results must be recorded on the appropriate form(s) as specified by the project work plans or health and safety plan.

4. Wear the appropriate personal protective equipment as specified in the project work plans or health and safety plan. Personal protection will typically include the following, at a minimum: hard hat, safety glasses, gloves, steel-toed boots, hearing protection, and coveralls.

5. Make sure the location is free of underground utilities in accordance with Shaw Procedure HS308 and the project work plans.

6. Between each sampling location and prior to each sampling run, decontaminate the sampling equipment according to applicable Shaw E & I SOPs and/or project-specific procedures.

7. Push or advance the sampling device until it is at the target depth or horizon where the sample is to be collected.

8. Retract the protective sleeve upward until the length of well screen is exposed, allowing water to flow into the sampler.

9. During advancement of the sampling device and collecting of the sample, conduct appropriate health and safety measurements/monitoring as required and specified in the project work plans or health and safety plan.

10. Evaluate for the presence and sufficiency of water within the well screen. This is usually done with a small-diameter electric water-level indicator.

11. If sufficient water is present, perform any purging that is part of the required sampling protocol.

12. Collect the water sample from inside the well screen and transfer into appropriate containers in accordance with appropriate Shaw E & I SOPs and project-specific requirements. Label and number each sample container according to applicable Shaw E & I SOPs and/or the project work plans.

13. Document the sampling event on the appropriate form(s), as specified in the project work plans. The information listed on the form(s) should, at a minimum, include the following:

    - Project name and number
    - Date and time of the sampling event
    - Sampling methods used – specify sample type
    - Sample number
    - Sample location
    - Sample depth interval
    - Sample description (type of matrix)
    - Weather conditions
    - Unusual events, including lack of water or insufficient water volume in sampler
    - Signature or initials of sampler

14. Appropriately preserve, package, handle, and ship the sample in accordance with applicable Shaw E & I technical SOPs and/or project-specific procedures. The samples shall also be maintained under custody. Samples stored on site will be subject to the provisions of applicable Shaw E & I procedures and/or project requirements. All reasonable attempts should be made to ship samples on the date they are collected.

15. Perform any other downhole operations that are required prior to abandoning the hole, including removing the direct push sampling equipment from the boring.

16. Fill the boring with grout in accordance with applicable Shaw E & I SOPs and/or project-specific requirements/procedures.

6.4 Documentation

Accurate documentation of the sampling event (e.g., emplacement of the temporary screen system, development of the temporary installation, sample collection, etc.) and the sample condition are important for interpreting the quality of the analyte concentrations found within the sample, and for ensuring that various project and quality control requirements are met. Such documentation should be compiled on the appropriate forms as specified in the project work plans. In addition, some regulatory agencies may require that any boring that penetrates the water table be reported in the same manner as a monitoring well. This may necessitate generation of a well construction diagram and/or boring log. Such documentation requirements should be specified in the project work plans.

6.5 Technical Review

Direct push groundwater sampling specifications, procedures, and results (e.g., reports, logs, etc.) should undergo technical review. It is recommended that the technical reviewer also provide review/oversight of the actual field implementation of the sampling activities. This may include aiding in troubleshooting sampling problems. The technical reviewer should be an experienced senior geologist or hydrogeologist. At a minimum, the technical reviewer should be a person capable of planning and supervising direct push groundwater sampling programs. Individuals needing assistance in finding qualified technical reviewers may consult internal Shaw technical listings for experts in direct push sampling.

Any issues raised during the technical review shall be resolved between the reviewer and staff planning, conducting, or preparing results of direct push groundwater sampling activities as follows:

- Comments/issues raised relative to planning and developing detailed procedures for sampling should be resolved before mobilization and sampling commences.
- Comments/issues raised relative to results of sampling activities should be resolved before external use or submission (i.e., outside of Shaw E & I) of the results.

The technical review comments and issues, and corresponding resolution, shall be documented and filed with the project records. The records should be maintained until project closeout.

7. ATTACHMENTS

None.

8. FORMS

None.

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STANDARD OPERATING PROCEDURE

Subject: Standards for Conducting Direct Push Drilling and Soil Sampling

1. PURPOSE

This procedure provides the standard practice for direct push drilling and soil sampling. The procedure provides the minimum required steps and quality checks that employees and subcontractors are to follow when performing the subject task.

This procedure may also contain guidance for recommended or suggested practice that is based upon collective professional experience. Recommended or suggested practice goes beyond the minimum requirements of the procedure and should be implemented when appropriate.

2. SCOPE AND RELATED STANDARDS

Geosciences Standard Operating Procedure (SOP) EI-GS021 describes standards for direct push drilling and soil sampling, and discusses how such drilling and sampling will be conducted and documented for projects executed by Shaw Environmental & Infrastrucure Inc. (Shaw E & I). Responsibilities of individuals performing the work are also detailed. Additional project-specific requirements for direct push drilling and soil sampling may be developed, as necessary, to supplement this procedure and to address project-specific conditions and/or objectives.

This SOP covers requirements for collection of soil and unconsolidated materials by direct push methods primarily for laboratory or other testing and for lithologic description or analysis (logging). It describes basic equipment and procedures and addresses aspects of the process where quality must be maintained. It does not address procedures for specific brands of equipment, or for uncommon purposes of boring or sampling. Other types of soil and rock sampling while drilling are addressed in other Shaw E & I technical SOPs.

3. REFERENCES (STANDARD INDUSTRY PRACTICES)

The methodology for direct push drilling and soil sampling should follow industry standard practices. The latest revision of the following references are relevant and useful for planning and conducting direct push drilling and soil sampling:

ASTM D 6282	Direct Push Soil Sampling for Environmental Site Characterizations
ASTM D 6286	Standard Guide for Selection of Drilling Methods for Environmental Site Characterization

4. DEFINITIONS

The following definitions are applicable to direct push drilling and soil sampling and this SOP.

- **Direct push drilling**—The creation of a boring by the displacement of soil without cutting or grinding and without the production of mechanically-altered soil (cuttings) at the ground surface. In direct push drilling, soil is displaced, primarily laterally, as a pipe or rod is forced vertically downward, creating a cylindrical space (i.e. a boring). Energy to create the boring may be generated from constant pressure (e.g., hydraulically-powered), vibration, or other means.

- **Slough**—Slough is soil or other earth material that has been dislodged from its original location within the boring and displaced elsewhere within the boring (usually to the bottom). The creation

and sampling of slough should be avoided, because slough has disturbed properties and is typically of uncertain origin with respect to depth. The presence of slough also impedes proper abandonment of borings.

- **Conductor Casing**—Conductor casing is drill pipe that is extended down into the ground as a boring is advanced, to prevent sidewall material from falling into the borehole and covering the in-place soil material that constitutes the bottom of the boring. Conductor casing is usually removed when a borehole is being abandoned.

- **Sample**—A mass of soil or earthen material that has been removed from the boring from a known depth, has had little internal disturbance, and may be considered representative of the in-situ earthen material from a known depth and representative with respect to the intended tests or properties of interest.

5. RESPONSIBILITIES

5.1 Procedure Responsibility

The Geosciences Discipline Lead is responsible for the development, maintenance, and revision of this procedure. Any questions, comments, or suggestions regarding this technical SOP should be directed to the Geosciences Discipline Lead. The Geosciences Discipline Lead's location and associated contact information can be found on the Shaw Group intranet site, ShawNet.

5.2 Project Responsibility

Employees planning or conducting direct push drilling and soil sampling, or any portion thereof, are responsible for meeting the requirements of this procedure. Employees conducting technical review or oversight of direct push drilling and soil sampling are also responsible for following appropriate portions of this SOP. Project participants are responsible for recording information in sufficient detail to provide objective documentation (field notes, logs, forms, reports, etc.) that the requirements of this SOP have been met. Such documentation shall be retained as project records.

6. PROCEDURES (TECHNICAL REQUIREMENTS)

This section addresses basic requirements and procedures involved with direct push drilling and soil sampling. This section includes information on selection of methods and equipment, planning and preparation requirements, health and safety requirements, drilling and sampling procedures, and key practices for ensuring quality.

Proper drilling and subsurface soil sampling procedures are necessary to ensure the quality and integrity of the samples. The details within this SOP should be used in conjunction with project-specific work plans. The project work plans should generally provide the following information:

- Specific direct push drilling and soil sampling methodologies and equipment to be employed
- Sample collection objectives
- Anticipated locations and total depths of soil borings and target horizons or depths of soil samples to be collected
- Numbers and volumes of samples to be collected
- Types of chemical analyses to be conducted for the samples
- Specific quality control (QC) procedures and sampling requirements

- Detailed direct push drilling and subsurface soil sampling requirements or procedures based upon site-specific conditions and project-specific objectives/requirements

6.1 Selection of Methods and Equipment

The practice of direct push drilling and soil sampling involves numerous variations in methodology and types of equipment. There are few industry-wide standards for direct push drilling and soil boring. Key aspects of the variations in direct push drilling and sampling are as follows:

- **The use of single-wall or dual-wall sampling systems**. Single-wall systems generally provide lower-quality sampling and higher rates of production than dual-wall systems. Single-wall systems can typically be advanced with lower energy sources (i.e., to greater depth) than dual-wall systems because they have smaller area and hence encounter less sidewall friction and tip resistance during advance.

- **Open-hole or cased boring**. *This SOP recommends that borings always be advanced through or with a conductor casing*.

- **Open-barrel or closed (sealed)-barrel sampler**. Open-barrel samplers are open at the bottom at all times, and may fill with slough, lose sample material as they are retrieved, or contribute to or be subject to cross-contamination. Closed-barrel samplers are closed at the bottom until being mechanically opened at a target depth. Closed-barrel samplers reduce the potential for sampling of slough or cross-contamination of the sample.

- **Liner or inner-barrel material**. Inner barrel/sampler tubes should be selected based on the need to see or access samples for lithologic evaluation and the need to perform chemical or other analytical testing. Use of lexan or other see-through materials can be beneficial in identifying soil type or visual indications of contamination (such as petroleum saturation). Some liners, such as lexan, can be quickly cut to select certain sample intervals for testing, and the sample may be retained, shipped, and stored directly in the liner. Liners or sample barrel material should generally not be made of materials that include any of the chemical species that are sought during analysis.

- **Energy source for making the boring**. Energy sources may be static or dynamic, and may include vibratory or sonic systems, hydraulic systems, percussion (hammer) systems, or even rotational systems.

- **Energy source for removing the sampler**. Energy sources may be static or dynamic, and are generally one of the following: hydraulically-lifted rod systems, winch and wire rope systems, or percussive systems (backpounding). This SOP recommends against backpounding as a means of removing samplers, as it tends to disturb samples.

- **Use of checkball or open-top tubes for collection of soil**. Checkball systems prevent fluids that are within the sampling barrel, above the sample, from flowing down into the barrel as the sampler is retrieved. Checkball systems are mostly used when sampling granular soils beneath the water table, to minimize the potential for water to dislodge or alter sample material as the barrel is retrieved.

- **Use of catchers or retainers**. Catchers are used to help retain loose soils within the sampling barrel as it is retrieved. Catchers are most commonly used when sampling granular soils beneath the water table, with variable success.

6.2 Planning and Preparation

Planning for direct push drilling and soil sampling activities involves the following:

- Identifying drilling and sample collection objectives and exact methodologies and equipment to be used for sample collection
- Identifying specific drilling and sampling locations, targeted depths, and specific identification numbers of soil samples to be collected
- Identifying numbers and volumes of samples to be collected
- Specifying types of chemical analyses to be conducted for the samples
- Listing specific quality control (QC) procedures and sampling requirements
- Describing any detailed project-specific sampling requirements or procedures beyond those covered in this SOP, as necessary
- Listing expected soil types, hydrostratigraphy, and/or formations to be encountered (if known)
- Identifying and listing all pertinent health and safety issues and requirements, including those contained in the project-specific health and safety plan(s), relative to work activities (including site utility clearance)
- Compiling main subcontractor requirements for direct push drilling and soil sampling and generating the statement of work to procure subcontractor services

All of the above information and items should be compiled as part of a sampling plan contained within the project work plans. This plan includes detailed, project-specific direct push drilling and soil sampling procedures beyond the basic procedures and requirements in this SOP.

Preparation for direct push drilling and soil sampling activities includes the following:

- Securing all necessary site access, permitting, and plan approvals
- Procuring the appropriate direct push drilling and sampling subcontractor
- Completing all necessary underground utility clearance activities at each of the sampling locations; each location should be cleared according to requirements in appropriate Shaw E & I technical SOPs and the project work plans.
- Briefing the rig geologist, subcontractor personnel, and other site personnel on specific information necessary for effective implementation of the sampling effort (e.g., sampling objectives, locations and depths, project-specific sampling requirements and procedures, pertinent health and safety requirements, etc.)
- Verifying that job personnel have proper health and safety training

The Project Manager, or designee, is responsible for appropriately briefing field personnel, as described above.

6.3 Health and Safety Requirements

Prior to initiating drilling and sampling activities, applicable Shaw E & I and project-specific safety requirements must be reviewed by Shaw E & I site personnel and subcontractors. This review is conducted to familiarize these individuals with specific hazards associated with the site and drilling activities, as well as with health and safety procedures associated with the operation and maintenance of drilling equipment. Such information may be found in the project health and safety

plan and other applicable Shaw E & I policies and procedures, such as HS316, *Drilling Operations*, and HS-308, *Underground/Overhead Utility Contact Prevention*. Additional health and safety requirements include the following:

- Tailgate Safety Meetings should be held in the manner and frequency stated in the project health and safety plan. All Shaw E & I and subcontractor personnel at the site should have appropriate training and qualifications as specified by the project health and safety plan. Documentation should be kept readily available in the project files on site.
- During drilling, all personnel within the exclusion zone should pay close attention to all rig operations. Pushed or driven drill tools can catch or snag loose clothing, causing serious injury.
- Clear communication signals must be established with the drilling crew, since verbal communication may not be heard during the drilling process.
- The entire crew should be made aware to inform the rig geologist when any unforeseen hazard arises or when anyone is approaching the exclusion zone.

6.4 Drilling and Sampling Requirements/Procedures

This SOP cannot present a single, detailed and specific procedure that is applicable to all methods and equipment that are available (Section 6.1) or to the specific sampling objectives of a specific project. An example procedure for direct push drilling and soil sample collection is shown in Attachment 1. The example procedure may be supplemented or customized to provide project-specific requirements and procedures.

Sample quality is easily compromised by poorly selected samples or haphazard drilling and sampling technique. Common problems and suggested solutions include the following:

- Generation of excess slough. Excess sloughing occurs when conductor casing is not used, when soil materials fall out of the sample barrel as it is retrieved, and when soil at or near the ground surface falls into the boring. Slough is excess when the amount that is present hinders the collection of sufficient representative sample volume or mass for the required testing or lithologic analysis.
- Collection of slough for testing or logging. This occurs when a large volume of slough is present in the boring bottom at the time the sampler is emplaced and driven into soil. Because slough is disturbed and from unknown depth, it is unsuitable for logging or testing.
- Disturbance (negatively-biasing) of samples for analysis of Volatile Organic Compounds (VOCs). The act of driving a sampling tube into soil causes compression and some heating of the soil, and can create macroscopic void space, i.e., a microannulus between the soil and sampling tube. Heating, compression of soil, and creation of void space contribute to the migration of gaseous fluids as well as the partitioning of VOCs, such as gasoline or solvent vapors. Although some heating, compression, and formation of microannular space are unavoidable, care should be taken to minimize these phenomena to the extent that is reasonably possible. Some sampling devices and methods are more suitable for analysis of samples for VOCs than others.
- Improper abandonment of borings. Excess slough or caving (the dislodgement and falling of a significant volume of sidewall material) hinders the proper abandonment of a boring. Where this occurs, the borehole should be cleaned out prior to grouting. A tremmie pipe should be used to conduct grout to the bottom of the borehole if a conductor casing is not in place prior to and during grouting.

Additional key practices that will ensure the quality of the samples collected and proper/efficient abandonment of the borings, include the following:

- Drill with a Conductor Casing. Various equipment, systems, and methods exist for direct push drilling and soil sampling. Some systems are open-hole (i.e., do not use conductor casing), hence borings made with these systems are at high risk for slough-related difficulties in logging, sampling, and abandonment. Most systems have provisions for driving down a conductor casing, to keep the boring open and relatively free of slough when the sampler or a plug or drive-point is not present at the bottom of the casing system. **This SOP recommends the use of a method of direct push drilling that integrally includes the advancement of conductor casing as the boring is made**, and further recommends that the conductor casing remain in place during sampling and into the abandonment process.

- Measure the Boring Depth. A weighted tape should be used to verify the depth of the boring within the conductor casing. Measurement should be made with reference to the ground surface. It is important to measure depth at the start of sampling intervals and at total depth (TD) of the boring.

- Clean-Out Excessive Slough. If slough is present, it should be removed by forcing a sampler into it and retrieving and emptying the sampler of slough.

- Identify Slough and Avoid Sampling it or Logging it as In Situ Material. Slough is generally easy to identify based on jumbled internal textures, lighter density, macroscopic and unmineralized void spaces, greater softness and malleability, and decreased cohesion, as compared to in situ material that has not been dislodged prior to the sampling process.

- Grout Through a Conductor Casing. Grouting through a conductor casing prevents any significant accumulation of slough in the boring and ensures that grout will be the predominant material in the borehole, thereby minimizing any potential for vertical migration of fluids in the filled borespace. This minimizes potential liability.

6.5 Documentation

Accurate documentation of the boring, sampling, and abandonment activities is important for interpreting sample results, interpreting boring conditions and lithologic information, and conceptually reconstructing events. Appropriate forms (including boring logs) should be completed in accordance with appropriate Shaw E & I technical SOPs and project-specific requirements/procedures.

6.6 Technical Review

All direct push drilling and soil sampling specifications, procedures, and results (e.g., reports, forms, etc.) should undergo technical review. It is recommended that the technical reviewer also provide review/oversight of the actual field implementation of direct push drilling and soil sampling activities. This should include aiding in troubleshooting for drilling and sampling problems. The technical reviewer should be an experienced senior geologist or hydrogeologist. At a minimum, the technical reviewer should be a person capable of planning and supervising direct push drilling and associated sampling and well installation programs. Individuals needing assistance in finding qualified technical reviewers may consult internal Shaw technical listings for experts in drilling or direct push drilling and sampling.

Any issues raised during the technical review shall be resolved between the reviewer and the staff planning, conducting, or preparing results of direct push drilling and soil sampling activities, as follows:

- Comments/issues that arise relative to planning and developing detailed procedures for direct push drilling and soil sampling should be resolved before mobilization and drilling commences.

- Comments/issues that arise relative to the results of drilling and sampling activities should be resolved before external (i.e., outside of Shaw E & I) use or submission of the results.

The technical review comments and issues, and corresponding resolution, shall be documented and filed with the project records. Such records should be maintained until project closeout.

7. ATTACHMENTS

- Attachment 1, Example Direct Push Drilling and Soil Sampling Procedure

8. FORMS

None.

Attachment 1
Example Direct Push Drilling and Soil Sampling Procedure

The following procedure is provided as an example. It should be customized based on project/site-specific equipment, methodology, and sampling and quality control requirements. This procedure is written for a direct push drilling rig that uses a small-diameter conductor casing with a 3-foot long inner wireline sample barrel (with a 3-foot long acrylic liner) connected to the bottom of the casing. The casing and associated sample barrel are driven, pushed, or vibrated into the ground in 3-foot increments. Soil samples are collected into the acrylic sample tubes as the conductor casing and sample barrel are advanced into the formation. The samples inside the liner and sample barrel are then retrieved with a wireline, leaving the conductor casing in place. Soil samples are thus continuously collected until the total depth of the boring is reached. The example procedure consists of the following:

1. Decontaminate the direct push sampling rig and associated sampling equipment before mobilizing to the first sample location, in accordance with applicable Shaw E & I technical SOPs and/or project-specific requirements/procedures.

2. Inspect the direct push rig to make sure the equipment is properly maintained, adequately decontaminated, and determined capable of achieving the objectives for drilling (equipment advancement), sample collection, and abandonment of the boring (to be done by the driller and rig geologist).

3. Calibrate all field analytical and health and safety monitoring equipment according to the instrument manufacturer's specifications and/or project work plans. Calibration results must be recorded on the appropriate form(s) as specified by the project work plans or health and safety plan.

4. Wear the appropriate personal protective equipment, as specified in the project work plans or health and safety plan. Personal protection will typically include, at a minimum, a hard hat, safety glasses, gloves, steel-toed boots, hearing protection, and coveralls.

5. Remove the surface cover (e.g., concrete, asphalt, etc.) at the drilling/sampling location according to the project work plans.

6. Once the direct push rig is sited at the sampling location, make sure the location is free of underground utilities, as per the project work plans and Shaw Policy and Procedure HS308, *Underground/Overhead Utility Contact Prevention*. Manually probe or excavate near-surface soils (as required) as an additional step to avoid underground utilities or structures.

7. Learn the drilling equipment heights and dimensions necessary to independently determine the boring or sampler depth while observing the work (to be done by the rig geologist). Such information includes lengths of rods, casing, barrels, and other in-ground equipment; the length of strokes or advances; and the height from ground surface to "full down" stroke of the direct push rig.

8. Between each sampling location and prior to each sampling run, decontaminate the sampling equipment according to applicable Shaw E & I technical SOPs and/or project-specific procedures.

9. Inform the driller of the expected total depth, the first and expected additional sampling depths, the likelihood of encountering groundwater or NAPL, and any contingency or opportunistic decisions that are anticipated (such as contingency-sampling or increased total depth).

10. Record the type of sampler assembly on the appropriate form(s) as specified in appropriate Shaw E & I technical SOPs or the project work plans. To minimize off-gassing of volatiles, the sampler should not be advanced/pushed until the sampling team is ready to process the sample.

11. Commence drilling and sample collection by advancing the conductor casing and associated sample barrel (with liner) for the first 3-foot increment.

12. Pull the wireline sampling string up from the bottom of the borehole and remove the sample barrel. Make sure that each sample barrel is retrieved as quickly and smoothly as possible. Record the depth interval for each sample drive as the sample barrel is being retrieved.

13. Remove the acrylic liner containing the soil sample from the sample barrel.

14. Observe and record the amount of sample recovery on the appropriate form(s), according to applicable Shaw E & I procedures and/or the project work plans. Any observed field problems associated with the sampling attempt (e.g., refusal) or lack of recovery should be noted on the appropriate form.

15. Select the appropriate portion of the liner containing the sample to be cut and be submitted for laboratory analysis. Such selection should be based on the following factors: (1) judgment that the sample represents relatively undisturbed intact material, not slough; (2) volume/length of sample required for analysis; (3) minimal exposure to air; (4) lithology; and (5) obvious evidence of contamination. The project work plans should specify the volume/length of sample to be submitted for specific analyses and confirm the selection factor(s).

16. Place Teflon™ film over each end of the liner containing the samples to be submitted for chemical analysis and seal each end with plastic end caps. Do not use any type of tape to seal the cap, because tape causes a toluene interference. All samples should be individually stored in resealable plastic bags. Note: Additional project-specific sample preparation steps or modifications may be required as stated in the project work plans.

17. Appropriately label and number each sample to be submitted for analysis according to applicable Shaw E & I technical SOPs and the project work plans. The label will be filled out using waterproof ink and may contain, at a minimum, the following information:

    – Project number
    – Boring number
    – Sample number
    – Bottom depth of sleeve
    – Date and time of sample collection
    – Parameters of analysis
    – Sampler's initials

18. Document the sampling event on the appropriate form(s), as specified in the project work plans. The information listed on the form(s) should, at a minimum, include the following:

    – Project name and number
    – Date and time of the sampling event
    – Sampling methods used – specify sample type
    – Sample number
    – Sample location
    – Sample depth interval
    – Sample description (type of matrix)
    – Weather conditions
    – Unusual events, including lack of water or insufficient water volume in sampler
    – Signature or initials of sampler

19. Appropriately preserve, package, handle, and ship the sample in accordance with applicable Shaw E & I technical SOPs and/or project-specific procedures. The samples shall also be maintained under custody. Samples stored on site will be subject to the provisions of applicable Shaw E & I procedures and/or project requirements. All reasonable attempts should be made to ship samples on the date they are collected.

20. Cut/split the remaining acrylic liner to expose the remaining soils for logging. The descriptions of the soil and preparation of a boring log should follow applicable Shaw E & I technical SOPs and project-specific requirements/procedures. The soil boring log should include the following information:

    – Borehole location
    – Name of the drilling company and driller
    – Dates and times when drilling began and when it was completed
    – Lithologic data and descriptions from soil samples
    – Sampling depths and recovery of soil samples

21. Continue to advance the borehole in 3-foot increments and collect soil samples to the total depth. As the borehole is advanced, the rig geologist will generally do the following:

    – Observe and monitor rig operations
    – Conduct all health and safety monitoring and sampling and supervise health and safety compliance
    – Prepare a boring log from cuttings or soil samples according to applicable Shaw E & I technical SOPs and project-specific requirements
    – Document drilling progress and other appropriate observations on appropriate forms
    – Supervise the collection and preparation of any soil, soil vapor, or groundwater samples

    The rig geologist should not leave the drill site while drilling operations are being conducted and the borehole is being advanced.

22. As drilling progresses, the rig geologist should observe and be in frequent communication with the driller regarding drilling operations. Conditions noted should include relative rates of penetration, flowing sands, drilling refusal, changes in equipment, etc. These conditions should be recorded on the appropriate logs and forms in accordance with applicable Shaw E & I technical SOPs and/or the project work plans. Drilling should not be allowed to progress faster than the rig geologist can adequately observe conditions, compile logs, and supervise safety and sampling activities.

23. The rig geologist should also observe the make-up and tightening of connections as additional conductor casing joints are added to the drill string. Any observed drilling problems and causes, including significant down time, should be recorded on the appropriate forms.

24. Cuttings (i.e., left over soil samples) and fluid containment during drilling should be observed and supervised by the rig geologist as per the project work plans.

25. Periodically measure the boring depth with a weighted tape to verify its depth. If it cannot be directly measured, then count rods or pipe lengths that have been inserted into the ground or take other action to verify depth (in a manner that is independent of asking the driller the boring depth).

26. If the borehole is to be abandoned once drilling and sampling is completed, follow procedures outlined in applicable Shaw E & I technical SOPs and the project work plans. The abandonment will be supervised by the rig geologist. If the borehole contains slough, the slough should be removed prior to abandonment.

27. If a monitoring well is to be installed in the borehole, follow appropriate Shaw E & I technical SOPs and project-specific requirements/procedures. The well installation will be supervised by the rig geologist.

28. After drilling, sampling, and well installation or borehole abandonment is completed, lay the conductor casing down and move the rig off of the location. The rig geologist or appropriate designee will supervise demobilization/site restoration. Additional demobilization requirements/ procedures are as follows:

    – All debris generated by the drilling operation should be removed and disposed of appropriately.

    – The site should be cleaned, the ground washed as necessary, and the site conditions restored according to the project work plans.

    – All abandoned borings should be topped off and completed as specified by the project work plans. All wells should also have their surface completions finished as specified by the project work plans.

    – Any hazards remaining as a result of drilling activities should be identified and appropriate barriers and markers put in place, as specified by the project health and safety plan.

    – All soil cuttings and fluids should be properly contained, clearly labeled, and maintained in compliance with the project work plans and/or other applicable requirements.

29. Complete all appropriate forms and documentation as required in the project work plans.

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STANDARD OPERATING PROCEDURE

Subject: Standards for Soils Logging

1. PURPOSE

This procedure provides the standard practice for soils logging (the description of soils). The procedure includes the minimum required steps and quality checks that employees and subcontractors are to follow when performing the subject task.

This procedure may also contain guidance for other recommended or suggested practice that is based upon collective professional experience. Recommended practice goes beyond the minimum requirements of the procedure, and should be implemented when appropriate.

2. SCOPE

Geosciences Standard Operating Procedure (SOP) EI-GS025 describes standards for the description and field classification of engineering soils by visual-manual methods for projects executed by Shaw Environmental & Infrastructure, Inc. (Shaw E & I). It applies to soils logging for generation of boring logs, trench logs, and any other type of descriptive soil log generated by visual observation and manual tests performed in the field. This procedure does not cover all of the requirements or standards for generation and completion of boring logs. (Standards for boring log generation can be found in Shaw Procedure No. EI-GS027.) This SOP does not include nor cover the use of laboratory or field geotechnical tests to identify/classify and describe soils, although descriptions may be augmented by data from such tests, when available.

The SOP addresses technical requirements and required documentation. Responsibilities of individuals performing the work are also detailed. Additional project-specific requirements for soils logging may be developed, as necessary, to supplement this procedure and address project-specific conditions and/or objectives.

3. REFERENCES

The description and classification of soil should follow accepted industry practices. These are presented in the latest version of the following American Society for Testing and Materials (ASTM) Standards:

ASTM D 653	Standard Terminology Relating to Soil, Rock, and Contained Fluids
ASTM D 2487	Standard Test Method for Classification of Soils for Engineering Purposes
ASTM D 2488	Standard Practice for Description and Identification of Soils (Visual-Manual Procedure)

Additional reference materials that are useful for planning and conducting soils logging include the following:

- United States Army, 1997, *Field Manual (FM) 5-410, Military Soils Engineering,* Revised, June 1997. Available on line at: http://www.adtdl.army.mil/cgi-bin/atdl.dll/fm/5-410/toc.htm
- United States Bureau of Reclamation (USBR), 1998, *Engineering Geology Field Manual, Second Edition*. Available on line at: http://www.usbr.gov/pmts/geology/fieldman.htm

- United Stated Department of Agriculture (USDA), 1993, *Soil Survey Manual, Soil Conservation Service*. Available on line at: http://soils.usda.gov/procedures/ssm/main.htm
- American Geological Institute, AGI Data Sheets
- US Army Corps of Engineers, 1953, *The Unified Soil Classification System; US Army Technical Memorandum, No.3-357*.
- Compton, Robert R., 1962, *Manual of Field Geology*, John Wiley and Sons Inc.
- US Department of the Interior, 1974, *Earth Manual*, a Water Resources Technical Publication.

4. DEFINITIONS

The following definitions are applicable to the logging of soils and this SOP.

- **Clay**—Soil passing a No. 200 (75µm) sieve that can be made to exhibit plasticity (putty-like properties) within a range of water contents, and that exhibits considerable strength when air-dry. For classification, a clay is a fine-grained soil, or fine-grained portion of a soil, with a plasticity index equal to or greater than 4.
- **Coarse Grained Soils**—Soils composed of greater than 50% sand and gravel or larger sized particles.
- **Fine Grained Soils**—Soils composed of 50% or more silt and clay-sized particles.
- **Gravel**—Particles of rock that will pass through a 3-inch (75mm) sieve and be retained on a No. 4 (4.75mm) sieve.
- **Sand**—Particles of rock that will pass a No. 4 (4.75mm) sieve and be retained on a No. 200 (75µm) sieve.
- **Silt**—Soil passing a No. 200 (75µm) sieve that is nonplastic or very slightly plastic and that exhibits little or no strength when air dry. For classification, a silt is a fine-grained soil, or the fine-grained portion of a soil, with a plasticity index less than 4.
- **Soil**—All unconsolidated materials above bedrock.
- **Standard Penetration Test**—ASTM D 1586 method for the collection of soil samples.
- **USCS**—Unified Soil Classification System.

5. RESPONSIBILITIES

5.1 Procedure Responsibility

The Geosciences Discipline Lead is responsible for the development, maintenance, and revision of this procedure. Any questions, comments, or suggestions regarding this technical SOP should be directed to the Geosciences Discipline Lead. The Geosciences Discipline Lead's location and associated contact information can be found on the Shaw Group intranet site, ShawNet.

5.2 Project Responsibility

Employees planning or conducting soils logging are responsible for meeting the requirements of this procedure. Employees conducting technical review or oversight of such efforts are also responsible for following appropriate portions of this SOP. Project participants are responsible for recording information in sufficient detail to provide objective documentation (logs, forms, reports, etc.) that the requirements of this SOP have been met. Such documentation shall be retained as project records.

6. PROCEDURES (TECHNICAL REQUIREMENTS)

This section addresses the process and procedures necessary for the preparation of soil descriptions based on the field classification of soils by visual-manual methods. Objective, quantitative and accurate observations are necessary to ensure the quality and scientific integrity of soil descriptions. The guidance contained within this SOP should be used in conjunction with project-specific work plans to prepare soil descriptions.

All personnel required to log soil for Shaw Technical Services should follow the guidelines presented in this SOP unless project, contract, or client requirements specify otherwise. The guidance provided in this SOP is based primarily on the procedures contained in the most recent version of American Society for Testing and Materials (ASTM) D 2488, *Standard Practice for Description and Identification of Soils (Visual-Manual Procedure)*. The logging/description of rock is discussed in Shaw Procedure No. EI-GS026, *Standards for Rock Logging*. Preparation of boring logs should follow Shaw Procedure EI-GS027, *Standards for Generation of Boring Logs* and/or the project work plans. Personnel involved in describing soil and preparing soil boring logs should be familiar with these documents.

Field soil descriptions prepared for soils collected from boreholes may be recorded on the Visual Classification of Soils Form (Section 8) unless project, contract, or client requirements specify otherwise. Descriptions will focus on making and recording objective, concise, quantitative, and accurate observations. The field geologist conducting the logging should refrain from providing subjective, interpretative, diagnostic, or genetic comments and observations until the soil is completely and accurately described following the guidance contained in this SOP.

6.1 Soils Description

The standard method for classification of soil is the Unified Soil Classification System (USCS). This system and classification method is presented in ASTM D 2488-00, *Standard Practice for Description and Identification of Soils (Visual Manual Procedure)*. When classifying soils using this method, a representative soil sample is obtained. The soil sample is then attributed to one of two broad groups: 1) fine-grained soils, or 2) coarse-grained soils. Fine-grained soils are composed of 50% or more silt and clay sized particles. Coarse-grained soils are composed of greater than 50% sands and gravels. Flow charts for determining the USCS symbol and associated name are provided on Figures 1a, 1b, and 2 in ASTM D 2488-00. A summary chart of the groups and USCS symbols is provided in Attachment 1. The soil description for each group should be prepared to contain the information and follow the sequence provided below.

6.1.1 *Fine Grained Soils* (Silts and Clays) Description Format

The standard description format for a fine-grained soil is as follows:

SOIL GROUP NAME; color; moisture state; consistency; plasticity; percentage of fines; percentage and size-range of coarse fraction; maximum particle size; evidence of contamination (visual evidence/odors); other terms (see below).

6.1.2 *Coarse Grained Soils* (Sands and Gravels) Description Format

The standard description format for a coarse-grained soil is as follows:

Grading term, **SOIL GROUP NAME;** color; moisture state; density; percentage and size-range of coarse fraction; maximum particle size; angularity; shape; percentage and plasticity of fines; evidence of contamination (visual evidence/odors); other terms (see below).

6.1.3 Other Terms to Include in Description

Additional information useful for describing the characteristics of a soil include the following:

- Hardness of coarse sand and larger particles
- Surface coating on coarse-grained particles
- Bedding and other soil structures
- Organic soil or presence of organic material
- Cement, caliche
- HCl reaction
- Mineralogy/petrology of grains/clasts
- Debris; metal, concrete, plastic, etc.
- Evidence of fill
- Evidence of disturbance

6.2 Descriptive Terms (Explanation and Use)

Brief explanations and use of the above descriptive terms are provided in the following text. Specific criteria and field methods used to assign the proper term in a soil sample description are provided in ASTM D 2488-00 and other references listed above. These terms should be included in the descriptions of the soil units.

- **Soil Group Name:** The primary criterion used to assign the soil group name is the percentage of each soil particle size fraction. The soil group name will be assigned based on the percentage and size-range distribution of soil particles using Figures 1a, 1b, and 2 in ASTM D 2488-00 and/or the classification chart in Attachment 1. Following determination of the soil group name, the USCS group symbol should be assigned to the soil unit. The group name and USCS group symbol for fine-grained soils will also need to be determined following the procedure in Section 14 of ASTM D 2488-00.

- **Grading term:** (Coarse-grained soils) Gradation is the proportion by mass of a soil distributed in a specified particle-size range. Coarse-grained soils are described as poorly graded or well graded. Note that grading is the opposite of sorting; a well-graded soil is poorly sorted and vice versa. Grading is described in Sections 15.3.1 and 15.3.2 of ASTM D 2488-00.

- **Color:** Color is an especially important property in identifying organic soils and is often important in identifying other types of soils. Within a given locality, color may also be useful in identifying materials of similar geologic units. Color should be described for moist samples. Note in the description if the color represents a dry condition. If the sample contains layers or patches of varying colors (i.e., mottled), this should be noted, and representative colors should be described.

  The Munsell Soil Color System should be used for consistent color descriptions and identification. This is because a given color will often be given different names by different people conducting the logging. A given color may also appear differently to people when next to other colors.

- **Moisture state:** Describe as dry, moist, or wet according to the following:
  - Dry Absence of moisture, dusty, dry to touch
  - Moist Damp but no visible water
  - Wet Visible free water, usually soil is below the water table
- **Density (coarse-grained soils):** Describe density (degree of firmness) for coarse-grained soils as very loose, loose, medium dense, dense, or very dense, as indicated by the criteria below. This observation is inappropriate for fine-grained soils. Terminology is as follows:

Density	Standard Penetration Resistance (SPT)
Very loose	0 – 4
Loose	5 – 10
Medium dense	11 – 30
Dense	31 – 50
Very dense	> 50

- **Consistency (fine-grained soils):** Describe consistency (degree of firmness) for intact fine-grained soils as very soft, soft, firm, hard, or very hard, as indicated by the criteria below. This characteristic should not be used for soils with significant amounts of gravel. Classification is as follows:

Consistency	Thumb/Thumbnail Test	Standard Penetration Resistance (SPT)
Very soft	Thumb penetration > 1in. (25 mm)	< 2
Soft	Thumb penetration ≈ 1 in. (25 mm)	2 – 4
Firm	Thumb penetration ≈ ¼ in. (5 mm)	5 – 15
Hard	Thumb will not indent, but thumbnail will	16 – 30
Very hard	Thumbnail will not indent.	> 30

- **Plasticity (fine-grained soils):** Describe as nonplastic, low, medium, or high. To determine plasticity, shape into an elongated thread about 1/8-inch in diameter. Describe plasticity based on the following:
  - **Nonplastic:** A 1/8-inch thread cannot be rolled at any water content.
  - **Low:** The thread can barely be rolled, and a lump cannot be formed when drier than the plastic limit.

  - **Medium:** The thread is easy to roll and little time is needed to reach the plastic limit. The thread cannot be re-rolled when the plastic limit is reached and the lump crumbles when drier than the plastic limit.
  - **High:** It takes a considerable amount of time to reach the plastic limit when rolling the sample. The thread can be re-rolled several times once the plastic limit is reached and the lump can be formed without crumbing when drier than the plastic limit.

- **Percentage of fines:** Estimate (to the nearest 5%) the percentage of silt and clay-sized particles combined, or the percentage of silt and clay individually to the nearest 10%.
- **Percentage of coarse fraction:** Estimate (to the nearest 5%) the percentage of sand and gravel-sized particles.
- **Size-range of coarse fraction:** Describe the size-range as fine sand, medium sand, coarse sand, fine gravel, coarse gravel, cobble-sized, or boulder-sized.
- **Maximum particle size or dimension:** Describe the maximum particle size of the course fraction.
- **Angularity:** Angularity is a description for coarse-grained materials only. The angularity of coarse sand, gravel, cobbles, and boulders is described as angular, subangular, subrounded, or rounded as indicated by the criteria below. A range of angularity may be stated, as such: sub-rounded to rounded. The criteria are as follows:
  - **Angular**—Particles have sharp edges and relatively planar sides with unpolished surfaces.
  - **Subangular**—Particles are similar to angular description but have rounded edges.
  - **Subrounded**—Particles have nearly planar sides but well-rounded corners and edges.
  - **Rounded**—Particles have smoothly curved sides and no edges.
- **Shape:** Describe the shape of the gravel, cobbles, and boulders as “flat”, “elongated,” or “flat and elongated” if they meet the criteria below. Indicate the fraction of the particles that have the shape, such as “one-third of gravel particles are flat”; note any unusually shaped particles.

  The particle shape is classified/described as follows, where length, width, and thickness refer to the greatest, intermediate, and least dimensions of a particle, respectively:

  - **Flat**—Particles with width/thickness ratio >3
  - **Elongated**—Particles with length/width ratio >3
  - **Flat and elongated**—Particles that meet criteria for both flat and elongated
- **Evidence of contamination (visual/olfactory):** Describe any visual signs (i.e., staining) or odors that may indicate that contamination is present.
- **Other Terms:** (see below).

6.3 Other Terms

Other geologic observations should be included to describe soils. These other observations and terms are just as important as the descriptive terms in Section 6.2. These other terms need to be carefully considered, observed, and included in the soil descriptions, as applicable. Such terms include the following:

- **Hardness:** Indicate the hardness of coarse sand or larger particles as hard, or state what happens when the particles are hit by a hammer; (e.g., “gravel-size particle fractures with considerable hammer blow,” “some gravel-size particles crumble with hammer blow”). Hard

particles are those that do not fracture or crumble when struck with a hammer. Remember that the larger the particle, the harder the blow required to fracture it. A good practice is to describe the particle size and the method that was used to determine the hardness.

- **Surface coating:** On coarse-grained particles.
- **Bedding**: Describe thickness, orientation, and/or grading.
- **Soil Structure:** Describe as stratified, laminated, fissured, slickensided, blocky, lenses, or homogeneous. The descriptors presented are for soils only; they are not synonymous with descriptions for rock.
  - **Stratified**—Alternating layers of varying material or color; note thickness.
  - **Laminated**[1]—Alternating layers of varying material or color with layers less than 6 mm thick; note thickness.
  - **Fissured**[1]—Breaks along definite planes with little resistance to fracturing.
  - **Slickensided**[1]—Fracture planes appear polished or glossy, sometimes striated.
  - **Blocky**[1]—Cohesive soil that can be broken down into small angular lumps which resist further breakdown.
  - **Lenses**—Inclusion of small pockets of different soils, such as small lenses of sand scattered through a mass of clay; note thicknesses.
  - **Homogeneous**—Same color and textural or structural appearance throughout.

  [1]Do not use for coarse-grained soils with the exception of fine sands, which can be laminated.
- **Organic soil:** Note the presence and type of organic particles; change in color upon exposure to air or odor.
- **Cementation:** Describe the cementation of intact soils as weak, moderate, or strong, as indicated by the criteria below:
  - **Weak**—Crumbles or breaks with handling or little finger pressure
  - **Moderate**—Crumbles or breaks with considerable finger pressure
  - **Strong**—Will not crumble or break with finger pressure.
- **HCl reaction:** Calcium carbonate is a common cementing agent in soils. The reaction with dilute hydrochloric acid is useful in determining the presence and abundance of calcium carbonate. Describe the reaction with HCl as none, weak, or strong, as indicated by the criteria below:
  - **None** – No visible reaction
  - **Weak**—Some reaction, with bubbles forming slowly
  - **Strong**—Violent reaction, with bubbles forming immediately
- **Mineralogy/petrology of grains/clasts:** Describe the specific minerals (e.g., mica, gypsum, etc.) and/or lithologies of clasts and relative percentages.
- **Evidence of fill:** Describe debris such as metal, concrete, plastic, etc.
- **Evidence of disturbance:** Describe visual evidence and degree of disturbance. Classify as natural (biological, tectonic, etc.) or manmade (e.g., construction).
- **Sedimentary structures:** Describe sedimentary structures or lack of structures in soil samples (includes root tubes).

6.4 Boring Log Preparation

Soil descriptions prepared following the guidance in this SOP should be recorded on a boring log according to the provisions and requirements of Shaw Procedure No. EI-GS027, *Standards for Generation of Boring Logs*. The soil descriptions should be recorded on the log in waterproof and smear-proof blue or black ink. Additional information may also be included on the log to supplement the soil descriptions as described in Procedure No. EI-GS027. An example Visual Classification of Soils field log form is included in this SOP (Section 8).

6.5 Technical Review

All soil descriptions (logging results) should undergo technical review and approval before internal or external distribution (i.e., outside of Shaw E & I). The technical reviewer should be an experienced senior geologist or hydrogeologist and capable of logging and describing soils following the requirements of this procedure. For logging/soil descriptions prepared for a site in a state that requires review and approval of such work products by a registered or licensed geologist, the individual conducting the technical review should hold appropriate registration or licensing in that state.

The technical reviewer should be given appropriate information on the geology of the site, the scope of associated site activities, any and all assumptions used in the logging and any other important information regarding site conditions or issues affecting soil descriptions. The technical reviewer must also be given sufficient time to conduct a sound and thorough review.

Certain states require the logging of soils and generation of boring logs under the supervision of a registered or licensed geologist. For sites and projects in such states, an appropriately registered or licensed geologist should be identified during the planning/preparation phase of the project. The registered/licensed geologist will meet with the field geologist(s) that will be conducting the soils logging. The registered/licensed geologist will brief the field geologist(s) regarding applicable requirements for soils logging and boring log generation, including the requirements in this SOP and Shaw Procedure No. EI-GS027, *Standards for Generation of Boring Logs.* The registered/licensed geologist may also observe/review the logging conducted by the field geologist(s) at the site during drilling and logging operations.

Any issues raised during the technical review should be resolved between the reviewer and employees generating the soil descriptions before internal distribution or external submission of the boring logs containing the descriptions. The technical review comments and issues and corresponding resolution should be documented and filed with the project records. Such records should be maintained until project closeout.

7. ATTACHMENTS

- Attachment 1, ASTM Soil Classification & USCS Group Symbols

8. FORMS

- Example Visual Classification of Soils Form

Attachment 1
ASTM Soil Classification & USCS Group Symbols

					Group Symbol				Group Name
>50% Sand & Gravel	GRAVEL % gravel > % sand	≤5% fines	Well-graded		GW	<15% sand			Well-graded GRAVEL
						≥15% sand			Well-graded GRAVEL with Sand
			Poorly-graded		GP	<15% sand			Poorly graded GRAVEL
						≥15% sand			Poorly graded GRAVEL with Sand
		10% fines	Well-graded	fines - ML or MH	GW-GM	<15% sand			Well-graded GRAVEL with Silt
						≥15% sand			Well-graded GRAVEL with Silt and Sand
				fines - CL or CH	GW-GC	<15% sand			Well-graded GRAVEL with Clay
						≥15% sand			Well-graded GRAVEL with Clay and Sand
			Poorly-graded	fines - ML or MH	GP-GM	<15% sand			Poorly graded GRAVEL with Silt
						≥15% sand			Poorly graded GRAVEL with Silt and Sand
				fines - CL or CH	GP-GC	<15% sand			Poorly graded GRAVEL with Clay
						≥15% sand			Poorly graded GRAVEL with Clay and Sand
		≥15% fines		fines - ML or MH	GM	<15% sand			Silty GRAVEL
						≥15% sand			Silty GRAVEL with Sand
				fines - CL or CH	GC	<15% sand			Clayey GRAVEL
						≥15% sand			Clayey GRAVEL with Sand
	SAND % sand > % gravel	≤5% fines	Well-graded		SW	<15% gravel			Well-graded SAND
						≥15% gravel			Well-graded SAND with Gravel
			Poorly-graded		SP	<15% gravel			Poorly graded SAND
						≥15% gravel			Poorly graded SAND with Gravel
		10% fines	Well-graded	fines - ML or MH	SW-SM	<15% gravel			Well-graded SAND with Silt
						≥15% gravel			Well-graded SAND with Silt and Gravel
				fines - CL or CH	SW-SC	<15% gravel			Well-graded SAND with Clay
						≥15% gravel			Well-graded SAND with Clay and Gravel
			Poorly-graded	fines - ML or MH	SP-SM	<15% gravel			Poorly graded SAND with Silt
						≥15% gravel			Poorly graded SAND with Silt and Gravel
				fines - CL or CH	SP-SC	<15% gravel			Poorly graded SAND with Clay
						≥15% gravel			Poorly graded SAND with Clay and Gravel
		≥15% fines		fines - ML or MH	SM	<15% gravel			Silty SAND
						≥15% gravel			Silty SAND with Gravel
				fines - CL or CH	SC	<15% gravel			Clayey SAND
						≥15% gravel			Clayey SAND with Gravel
50% or More Fines	Low-Plasticity Clay				CL	<30% sand & gravel	<15% Sand and Gravel		Lean CLAY
							15-25% sand & gravel	% sand ≥ % gravel	Lean CLAY with Sand
								% sand < % gravel	Lean CLAY with Gravel
						≥30% sand & gravel	% sand ≥ % of gravel	< 15% gravel	Sandy lean CLAY
								≥ 15% gravel	Sandy lean CLAY with Gravel
							% sand < % gravel	< 15% sand	Gravelly lean CLAY
								≥ 15% sand	Gravelly lean CLAY with Sand
	Low-Permeability Silt				ML	<30% sand & gravel	15% sand & gravel		SILT
							15-25% sand & gravel	% sand ≥ % gravel	SILT with Sand
								% sand < % gravel	SILT with Gravel
						≥30% sand & gravel	% sand ≥ % of gravel	< 15% gravel	Sandy SILT
								≥ 15% gravel	Sandy SILT with Gravel
							% sand < % gravel	< 15% sand	Gravelly Silt
								≥ 15% sand	Gravelly Silt with Sand
	Plastic Clay				CH	<30% sand & gravel	< 15% sand & gravel		Fat CLAY
							15-25% sand & gravel	% sand ≥ % gravel	Fat CLAY with Sand
								% sand < % gravel	Fat CLAY with Gravel
						≥30% sand & gravel	% sand ≥ % of gravel	< 15% gravel	Sandy fat CLAY
								≥ 15% gravel	Sandy fat CLAY with Gravel
							% sand < % gravel	< 15% sand	Gravelly fat CLAY
								≥ 15% sand	Gravelly fat CLAY with Sand
	Plastic Silt				MH	<30% sand & gravel	< 15% sand & gravel		Elastic SILT
							15-25% sand & gravel	% sand > % gravel	Elastic SILT with Sand
								% sand < % gravel	Elastic SILT with Gravel
						≥30% sand & gravel	% sand ≥ % of gravel	< 15% gravel	Sandy elastic SILT
								≥ 15% gravel	Sandy elastic SILT with Gravel
							% sand < % gravel	< 15% sand	Gravelly elastic SILT
								≥ 15% sand	Gravelly elastic SILT with Sand
	Organics (Peat or Bay Mud)				OL/OH	<30% sand & gravel	< 15% sand & gravel		Organic SOIL
							15-25% sand & gravel	% sand ≥ % gravel	Organic SOIL with Sand
								% sand < % gravel	Organic SOIL with Gravel
						≥30% sand & gravel	% sand ≥ % of gravel	< 15% gravel	Sandy Organic SOIL
								≥ 15% gravel	Sandy Organic SOIL with Gravel
							% sand < % gravel	< 15% sand	Gravelly Organic SOIL
								≥ 15% sand	Gravelly Organic SOIL with Sand

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Example
Visual Classification of Soils

PROJECT NUMBER:	PROJECT NAME:		
BORING NUMBER:	COORDINATES:		DATE:
ELEVATION:	GWL: Depth	Date/Time	DATE STARTED:
ENGINEER/GEOLOGIST:	Depth	Date/Time	DATE COMPLETED:
DRILLING METHODS:			PAGE: OF

DEPTH ( )	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER ( )	RECOVERY ( )	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	WELL CONSTRUCTION	REMARKS

NOTES:

Drilling Contractor: _____

Drilling Equipment: _____

Driller: _____

_____

1651-9-02

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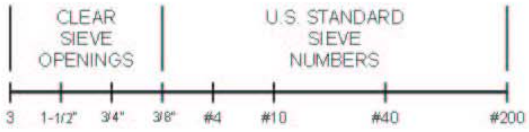
CONSISTENCY OF COHESIVE SOILS

CONSISTENCY	UNCONFINED COMPRESSIVE STRENGTH (TONS PER SQUARE FOOT)
VERY SOFT	LESS THAN 0.25
SOFT	0.25 to 0.50
FIRM	0.50 to 2.0
HARD	2.0 to 4.0
VERY HARD	MORE THAN 4.0

DENSITY OF GRANULAR SOILS

DENSITY	STANDARD PENETRATION RESISTANCE [1]
VERY LOOSE	0-4
LOOSE	5-10
MEDIUM DENSE	11-30
DENSE	31-50
VERY DENSE	OVER 50

[1] STANDARD PENETRATION RESISTANCE IS THE NUMBER OF BLOWS REQUIRED TO DRIVE A 2-INCH O.D. SPLIT BARREL SAMPLER 12 INCHES USING A 140-POUND HAMMER FALLING FREELY THROUGH 30 INCHES. THE SAMPLER IS DRIVEN 18 INCHES AND THE NUMBER OF BLOWS RECORDED FOR EACH 6-INCH INTERVAL. THE SUMMATION OF THE FINAL TWO INTERVALS IS THE STANDARD PENETRATION RESISTANCE.



GRAIN SIZE IN MM

COBBLES	GRAVEL		SAND			SILT AND CLAY
	COARSE	FINE	COARSE	MEDIUM	FINE	

USCS CLASSIFICATION FOR SOILS

COARSE-GRAINED SOILS

CLEAN GRAVELS (LITTLE OR NO FINES)	GW	WELL-GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES
	GP	POORLY GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES
GRAVELS WITH FINES (APPRECIABLE AMOUNT OF FINES)	GM	SILTY GRAVELS, GRAVEL-SAND-SILT MIXTURES
	GC	CLAYEY GRAVELS, GRAVEL-SAND-CLAY MIXTURES
CLEAN SANDS (LITTLE OR NO FINES)	SW	WELL-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
	SP	POORLY-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
SANDS WITH FINES (APPRECIABLE AMOUNT OF FINES)	SM	SILTY SANDS, SAND-SILT MIXTURES
	SC	CLAYEY SANDS, SAND-CLAY MIXTURES

FINE-GRAINED/HIGHLY ORGANIC SOILS

SILTS AND CLAYS LIQUID LIMIT (LESS THAN 50)	ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY
	CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS SILTY CLAYS, LEAN CLAYS
	OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
SILTS AND CLAYS LIQUID LIMIT (GREATER THAN 50)	MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SANDY OR SILTY SOILS
	CH	INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS
	OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
HIGHLY ORGANIC SOILS	PT	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS

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STANDARD OPERATING PROCEDURE

Subject: Standards for Trench Logging

1. PURPOSE

This procedure provides the standard practice for generation of trench logs. The procedure includes the minimum required steps and quality checks that employees and subcontractors are to follow when performing the subject task.

This procedure may also contain guidance for recommended or suggested practice that is based upon collective professional experience. Recommended practice goes beyond the minimum requirements of the procedure, and should be implemented when appropriate.

2. SCOPE

Geosciences Standard Operating Procedure No. EI-GS028 describes standards for generation of trench logs, and describes how such logs will be prepared for projects executed by Shaw Environmental & Infrastructure, Inc. (Shaw E & I). For the purpose of this SOP the term "trench logging" also refers to trench mapping, the logging of the walls of large excavations and logging of small exploratory excavations (sometimes called potholes). The SOP addresses technical requirements and required documentation. Responsibilities of individuals performing the work are also detailed. Additional project-specific requirements for trench logging may be developed, as necessary, to supplement this procedure and address project-specific conditions and/or objectives.

3. REFERENCES (STANDARD INDUSTRY PRACTICES)

Trench logging shall follow accepted industry practices. These industry practices are as presented in the latest version of the following ASTM standards:

ASTM D 4879	Standard Guide for Geotechnical Mapping of Large Underground Openings in Rock
ASTM D 5434	Standard Guide for Field Logging of Subsurface Explorations of Soil and Rock

The following reference materials are also useful for planning and conducting trench logging activities:

- Compton, R. R., 1985, *Geology in the Field*, John Wiley and Sons, Inc., New York, NY, 398 pp.
- Hathaway, A. W., and Leighton, F. B., 1979, Trenching as an exploratory tool: *in*, Hathaway, A. W., and McClure, C. R. Jr., editors, Geology in the siting of nuclear power plants: Geologic Society of America, Reviews in Engineering Geology, vol. IV, P. 169-195
- United States Bureau of Reclamation (USBR), 1998, *Engineering Geology Field Manual, Second Edition*. Available on line at: http://www.usbr.gov/pmts/geology/fieldman.htm
- United States Geological Survey, 1999, *Open-File Report 99-430, Digital Cartographic Standard for Geologic Map Symbolization*. Available on line at: http://geopubs.wr.usgs.gov/open-file/of99-430
- American Geological Institute, AGI Data Sheets

4. DEFINITIONS

The following definitions are applicable to trench logging and this SOP.

- **Backhoe Trench**—A trench excavated into the subsurface to expose rock or unconsolidated materials for the purpose of identifying lithology, characterizing subsurface conditions, and/or collecting samples. In most cases, trenches are 2 to 3 feet wide and 5 to 15 feet deep with at least one end sloped for easy access.
- **Contact**—The boundary between two geologic units (different soil or rock types); a surface in three dimensions, portrayed as a line on a map, cross-section or trench log.
- **Dozer Trench**—A cut to expose rock or unconsolidated materials. Normally excavated vertically, free of narrow benches and loose debris.
- **Formation**—A named stratigraphic unit or primary unit of formal mapping or description possessing certain distinctive lithic features.
- **Soil**—All unconsolidated materials above bedrock.
- **USCS**—Unified Soil Classification System

5. RESPONSIBILITIES

5.1 Procedure Responsibility

The Geosciences Discipline Lead is responsible for the development, maintenance, and revision of this procedure. Any questions, comments, or suggestions regarding this technical SOP should be directed to the Geosciences Discipline Lead. The Geosciences Discipline Lead's location and associated contact information can be found on the Shaw Group intranet site, ShawNet.

5.2 Project Responsibility

Employees supervising trench-logging activities are responsible for meeting the requirements of this procedure. Employees conducting technical review of trench logging activities are also responsible for following appropriate portions of this SOP. Project participants are responsible for recording information in sufficient detail to provide objective documentation (field notes, reports, etc.) that the requirements of this SOP have been met. Such documentation shall be retained as project records.

6. PROCEDURES (TECHNICAL REQUIREMENTS AND STANDARDS)

Exploratory trenches are cut to expose earth materials below the surface. Trench walls normally should be excavated vertically and be free of loose debris. Trench floors should be clean so that geologic structures such as contacts and shear zones are traceable from the wall into the floor for optimum determination of their nature and attitude. If trenches are to be left unattended, fencing or covering of the trench may be required.

6.1 Equipment Requirements and Considerations

The following equipment is useful and should be present for trench logging activities:

- Scraper, putty knife, square-nosed shovel, or rock pick to expose critical features
- Whisk broom or paint brush for cleaning trench exposures
- Flagging, nails, and wooden stakes to establish reference points used to measure critical features

- Surveyor's tape and Brunton compass to measure trench features (length depth, bearing, etc.)
- Grid paper and engineers scale for preparing base sheets
- Camera

6.2 Health and Safety Requirements

Prior to initiating trench logging activities, applicable Shaw E & I and project-specific safety requirements must be reviewed by Shaw E & I site personnel and subcontractors. This review is conducted to familiarize these individuals with specific hazards associated with the site and trench logging activities. Such information may be found in the project health and safety plan and other applicable Shaw E & I policies and procedures, including HS307, *Excavation and Trenching*.

Trench logging may be subject to OSHA excavation and confined space rules, and a "competent person" may be required to provide appropriate oversight during the project fieldwork. The competent person (most commonly a geologist or engineer) is responsible for evaluating the trench conditions, filing appropriate paperwork, and approving entrance. Trenches greater than 4 feet deep will not be entered without being shored to the satisfaction of the competent person. The competent person is responsible to ensure the dozer or backhoe operator produces a safe finished trench that meets OSHA safety standards.

Prior to working in a trench, the geologist conducting the logging and the competent person should inspect the ground surface near the trench and trench walls for fracturing, failure planes (obvious or incipient), and loose materials. If trenches are to be left unattended, fencing or covering of the trench may be required.

6.3 General Requirements for Trench Logs

The recorded information in a trench log will depend on the specific purpose of the site investigation. For example, a trench located to document the margins of a waste fill will not require the fine detail normally associated with a trench log documenting the evidence for a fault trace. However, trench logs should contain or include the following items:

- **Title** – including name of individual trench, project name, and site name
- **Trench bearing** – preferably located above sidewall sketch or north arrow on sketch of trench floor
- **Graphic or bar scale** – necessary for both horizontal and vertical scales
- **Sample locations** – if samples are collected
- **Soil or rock structure** – bedding (sedimentary), foliation (metamorphic), zonation (igneous), horizon (soil)
- **Legend or reference to legend location** – explaining **all** symbols, abbreviations, contacts, patterns, etc., depicted on the log
- **Unit labels** – Depending on the objectives of the trench logging, it may be appropriate to label the geologic/lithologic units with a USCS name, formation name, hydrogeologic unit name, or informal unit name. The units may be shown on the log as symbols or abbreviations that are explained in the legend.
- **Descriptions of lithologic units** – Depending on the objective of the trench logging, descriptions of the lithologic units may be provided. The descriptions may be presented in the legend next to the symbol for the lithologic unit. Procedure Nos. EI-GS025, *Standards for Soils Logging*, and

EI-GS026, *Standards for Rock Logging,* provide information on describing soils and rock, respectively.

- **Date prepared and name of individual who prepared the log** – should include first initial and last name of person who prepared the log and date of preparation for subsequent review and approval.
- **Dates of all observations** – if trench observation/logging is carried out over more than one day
- **Reference to base/location map used** – cited directly on the log
- **Appropriate sign-offs as "checked by" and "approved by"** – needs to be reviewed and signed as per text below and applicable Shaw standards and requirements. The professional signing the map as "approved by" should preferably be the individual who conducts the technical review of the map.

The specific objectives and requirements for the trench logs should be specified in the project-specific work plans.

6.4 Basic Construction of Trench Log

Basic construction of a trench log includes the following:

- Prepare base sheets to an appropriate scale. Typical dozer or backhoe trench log scales are between 1 inch (in) = 5 feet (ft) and 1 inch (in) = 10 feet (ft). However, scales could be smaller (1 inch (in) = 1 foot (ft)) if fine detail is required or larger (1 inch (in) = 50 feet (ft)) if required by structural and stratigraphic relationships. Base sheets should have a scaled grid (10 squares to the inch blue line paper is recommended).
- Mark stationing or surveyed control points on the trench walls at appropriate intervals immediately prior to logging. 10-foot mapping intervals are commonly used because this is a convenient distance for a single view with minimal visual distortion. In a backhoe trench, both walls should be spot cleaned and examined prior to major cleaning to determine which wall exposes the best geologic data.
- Sketch the walls and floors of the trench across the base sheet, locating the stationing at the proper scale.
- Determine the vertical heights of the trench walls at each station and between stations. It is often useful to place nails and string in a grid on the trench wall for ready reference of features during logging. At a minimum a horizontal baseline should be established by running a string between nails driven into the cleaned trench wall. A small string level (available in most hardware stores) is used to level the string.
- Enter names, symbols, and descriptions of lithologic units in the explanation on each base sheet prior to logging. Refer to Shaw Procedure Nos. EI-GS026, *Standards for Rock Logging,* and EI-GS025, *Standards for Soil Logging*, for logging terminology and descriptive information. It is recommended that written descriptions of soil and rock units and structural zones be restricted to the area below the sketch/log of the trench (see examples in Attachment 1).
- Use nails and flagging strips to mark obscure contacts or other features for ready reference.
- Accurately plot structural elements such as the position and attitude of contacts, bedding, foliation or cleavage, faults, shear zones, and joints using standard symbols. (Examples of standard symbols may be found in Compton [1985] and U.S. Geological Survey Open-File Report 99-430.)
- Accurately plot other features of concern such as degree of weathering, moisture content, soil formation, as needed.

- Photograph critical features and note the photo locations on the log.
- After the logging is completed, color the geologic units (optional) to complete the log and perform a field check.

6.5 Potential Errors to Avoid in Constructing Trench Logs

The following errors in technique have been observed on trench logs and should be avoided:

- Not mapping all excavated surfaces consistently. Avoid oversimplification. Inconsistencies or oversimplification can damage the credibility of the log. Review previous logging for consistency over the course of the project, if multiple trenches are logged.
- Not using an appropriate scale. Overly detailed logs use resources better used elsewhere. If simple plots document the critical features, do not spend time or resources acquiring additional detail. However, the purpose of the log must be considered. If small scale features will be needed (e.g., piercing points, slickensides, small scale folds for fault characterization), make sure the log scale will allow for collection and presentation of these details.

6.6 Technical Review

All trench logs should undergo technical review. The technical reviewer should be an experienced senior geologist or earth scientist. At a minimum, the technical reviewer should be a person capable of planning, constructing, and interpreting the specific types of trench logs prepared for the project. For trench logs prepared for a site in a state that requires preparation of such work products under the supervision, review, or approval of a registered or licensed geologist (or earth scientist), the individual conducting the technical review and sign-off as “approved by” should hold appropriate registration or licensing in that state.

The technical reviewer should consider the following items in conducting the review of trench logs:

- All bulleted required items in Section 6.3 should be effectively included and depicted, as appropriate.
- All items regarding basic log construction in Section 6.4 should be appropriately addressed and incorporated on the log(s).
- Potential errors listed in Section 6.5 should not be evident on the log(s).
- The logs should be complete and easy to read with all information legibly shown.

Any issues raised during the technical review should be resolved between the reviewer and staff preparing the logs before external submission of the logs (i.e., outside of Shaw E & I). The technical review comments and issues, and corresponding resolution, should be documented and filed with the project records. Such records should be maintained until project closeout.

7. ATTACHMENTS

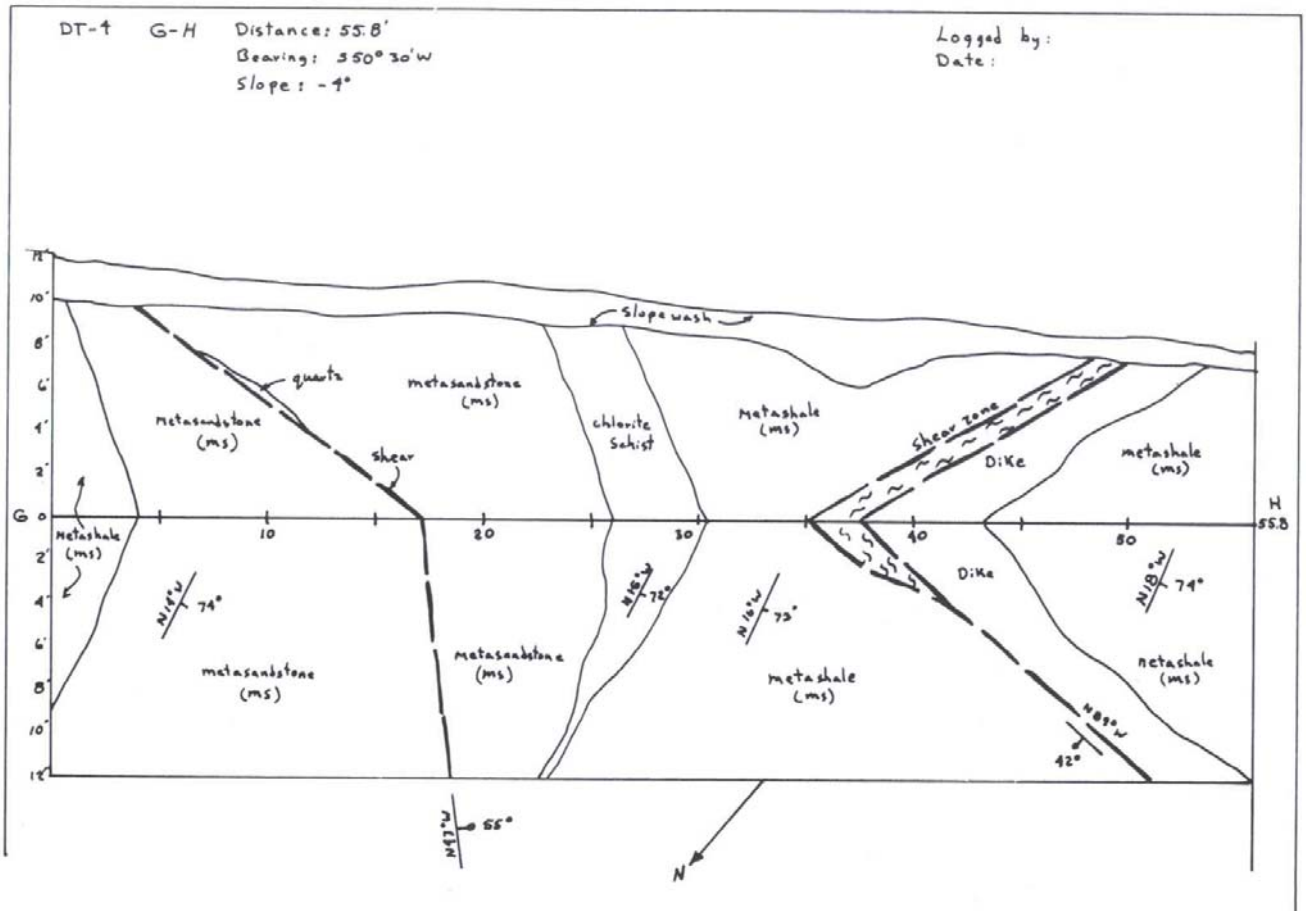
- Attachment 1, Trench Log Examples

8. FORMS

None.

Attachment 1
Trench Log Examples

(Examples are from the United States Bureau of Reclamation, Engineering Geology Field Manual, Second Edition, 1998)



7 1336 A (1-86) Bureau of Reclamation

LOG OF TEST PIT

HOLE NO. TP-4-TTDL

FEATURE
AREA DESIGNATION Sta. 203+27 on Centerline
COORDINATES N 439,409 E 767,405
APPROXIMATE DIMENSIONS 17'x4'x10'
DEPTH WATER ENCOUNTERED 1/ Not Encountered DATE

PROJECT
GROUND ELEVATION 2722.6
METHOD OF EXPLORATION MF-80 Backhoe
LOGGED BY
DATE(S) LOGGED 8/7/87

CLASSIFICATION GROUP SYMBOL (describe sample taken)	CLASSIFICATION AND DESCRIPTION OF MATERIAL SEE USBR 5000, 5005	% PLUS 3 in (BY VOLUME) 3 - 5 in	5 - 12 in	PLUS 12 in
SP-SM two 60-lb sacks 2.0 feet	o.0 to 2.0 ft. POORLY GRADED SAND WITH SILT, GRAVEL AND COBBLES: About 55% coarse to fine, angular to subangular sand; about 35% coarse to fine, angular to subangular, brittle to hard gravel with moderate surface coating; about 10% fines with low plasticity, rapid dilatancy, low toughness, low dry strength; strong reaction with HCl. TOTAL SAMPLE (BY VOLUME): About 5% 75 to 125 mm, brittle to hard, angular to subangular cobbles; trace of plus 125 mm brittle to hard, angular to subangular cobbles; remainder minus 75 mm; max. dimension, 250 mm. LAB TEST DATA: Sack samples taken from spoil pile. 46% gravel, 44% sand, 10% fines; LL=30, PI=10, Cu=88.5, Cc=1.8. Maximum and Minimum Relative Density: 127.3 lbf/ft^3, 99.2 lbf/ft^3; Lab max. density, opt.: 117.4 lbf/ft^3, 13.0%. Laboratory Classification is Well Graded Gravel With Clay and Sand (GW-GC)s. (Nondispersive). IN-PLACE CONDITION: Loose, homogeneous, root holes, moderate cementation, dry, brown. GEOLOGIC INTERPRETATION: Quaternary Slopewash (Qsw)	5	T	0
(SM)gc Andesite (Tsa) two 45-lb sacks	2.0 to 10.0 ft. SILTY SAND WITH GRAVEL WITH TRACE OF COBBLES: About 60% coarse to fine, angular to subangular sand; about 25% coarse to fine, angular to subangular, brittle to hard gravel with moderate surface coating; about 15% fines with low plasticity, rapid dilatancy, low toughness, low dry strength; max. dimension, 250 mm; strong reaction with HCl. LAB TEST DATA: Two sack samples taken from backhoe bucket at 7.0 to 7.5 depth. 54% sand, 29% gravel, 17% fines; LL=34, PI=8. Lab max. density, opt.: 112.2 lbf/ft^3, 15.1%. (Nondispersive).	T	T	0

REMARKS Moderate ground cover of mesquite and paloverde trees, greasewood bushed and maximum size cobble taken from excavation was 400x250x250 mm. Stopped test pit at 10.0 feet, unable to excavate further with backhoe.

1/ Report to nearest 0.1 foot

GPO 849-2[illegible]

7-1336-A (1-86) Bureau of Reclamation

LOG OF TEST PIT

HOLE NO. _____

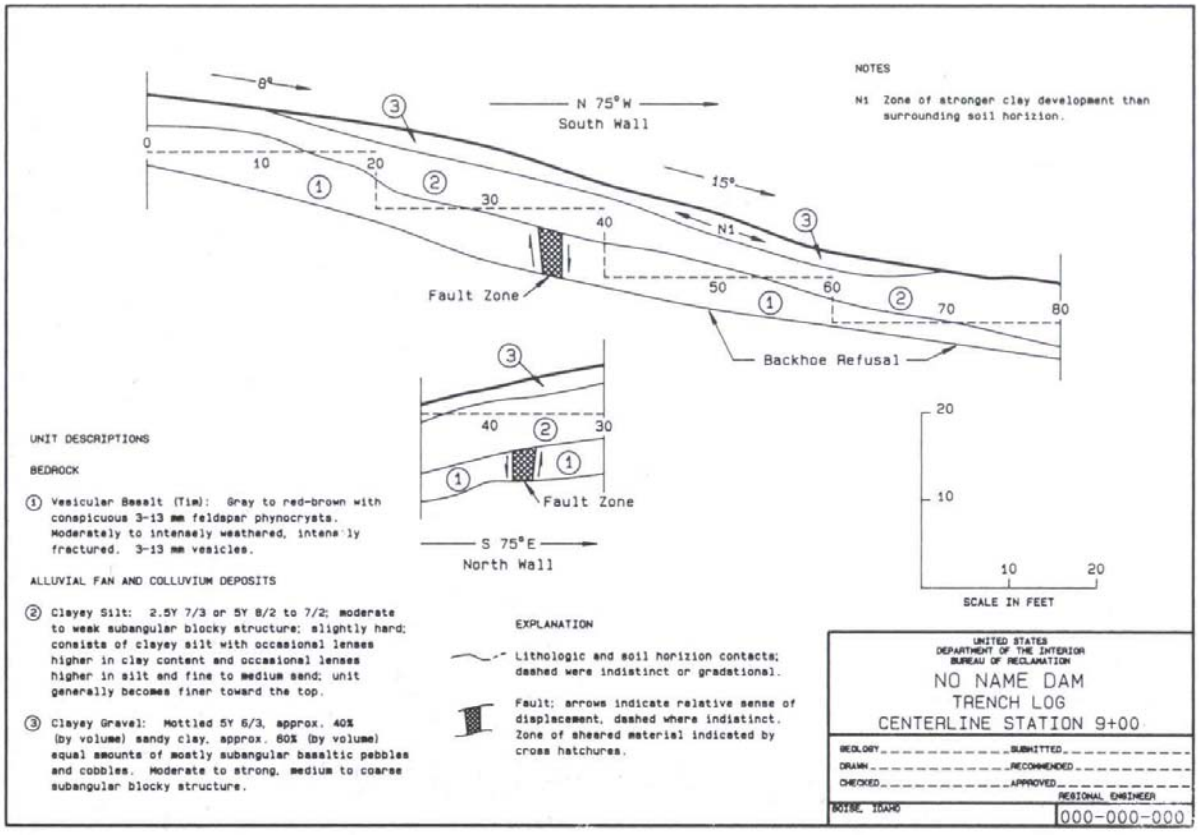
FEATURE _____ PROJECT _____
AREA DESIGNATION _____ GROUND ELEVATION _____
COORDINATES N _____ E _____ METHOD OF EXPLORATION _____
APPROXIMATE DIMENSIONS _____ LOGGED BY _____
DEPTH WATER ENCOUNTERED 1/ _____ DATE _____ DATE(S) LOGGED _____

CLASSIFICATION GROUP SYMBOL (describe sample taken)	CLASSIFICATION AND DESCRIPTION OF MATERIAL SEE USBR 5000, 5005	% PLUS 3 in (BY VOLUME) 3 - 6 in	6 - 12 in	PLUS 12 in
CL three sack samples 4.2 ft	0.0 to 4.2 ft LEAN CLAY: About 90% fines with medium plasticity, high dry strength, medium toughness; about 10% predominantly fine sand; maximum size, medium sand; strong reaction with HCl. IN-PLACE CONDITION: Soft, homogeneous, wet, brown. Three 50-lbm sack samples taken from 12-inch-wide sampling trench for entire interval on north side of test pit. Samples mixed and quartered.			
(SC)g block sample 9.8 ft	4.2 to 9.8 ft CLAYEY SAND WITH GRAVEL: About 50% coarse to fine, hard, subangular to subrounded sand; about 25% fine, hard, subangular to subrounded gravel; about 25% fines with medium plasticity, high dry strength, medium toughness; maximum size, 20 mm; weak reaction with HCl. IN-PLACE CONDITION: Firm, homogeneous except for occasional lenses of clean fine sand 1/4 inch to 1 inch thick, moist, reddish-brown. 12- by 12-inch block sample taken at 6.0 to 7.0 ft depth, at center of south side of test pit.			

REMARKS

1/ Report to nearest 0.1 foot

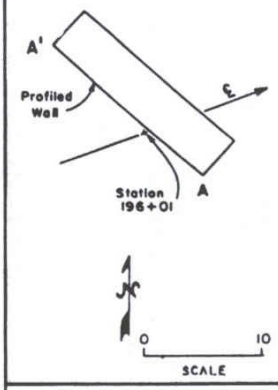
GPO 849-344


NOTES
N1 Zone of stronger clay development than surrounding soil horizion.
8°
N 75°W
South Wall
15°
N1
Fault Zone
Backhoe Refusal
0
10
20
30
40
50
60
70
80
S 75°E
North Wall
Fault Zone
UNIT DESCRIPTIONS
BEDROCK
① Vesicular Basalt (Tim): Gray to red-brown with conspicuous 3-13 mm feldspar phynocrysts. Moderately to intensely weathered, intensely fractured. 3-13 mm vesicles.
ALLUVIAL FAN AND COLLUVIUM DEPOSITS
② Clayey Silt: 2.5Y 7/3 or 5Y 8/2 to 7/2; moderate to weak subangular blocky structure; slightly hard; consists of clayey silt with occasional lenses higher in clay content and occasional lenses higher in silt and fine to medium sand; unit generally becomes finer toward the top.
③ Clayey Gravel: Mottled 5Y 6/3, approx. 40% (by volume) sandy clay, approx. 60% (by volume) equal amounts of mostly subangular basaltic pebbles and cobbles. Moderate to strong, medium to coarse subangular blocky structure.
EXPLANATION
Lithologic and soil horizion contacts; dashed were indistinct or gradational.
Fault; arrows indicate relative sense of displacement, dashed where indistinct. Zone of sheared material indicated by cross hatchures.
20
10
10
20
SCALE IN FEET
UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION
NO NAME DAM
TRENCH LOG
CENTERLINE STATION 9+00
GEOLOGY
DRAWN
CHECKED
SUBMITTED
RECOMMENDED
APPROVED
REGIONAL ENGINEER
BOISE, IDAHO
000-000-000

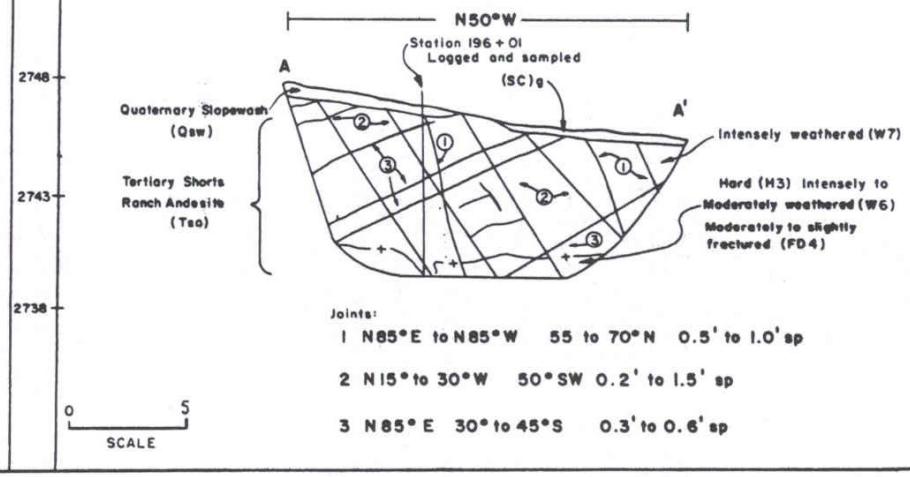
GEOLOGIC PROFILE OF TEST PIT NO. TP-2-TTDL

FEATURE OUTLET PIPELINE LOCATION STATION 196+01 ℄ PROJECT _____ STATE _____
COORDINATES N 439,095 E 766,624 GROUND ELEVATION 2746.8 BOTTOM ELEVATION 2739.3
METHOD OF EXCAVATION MF-80 Backhoe TOTAL DEPTH 7.5' SIZE 17' x 4' DEPTH TO WATER TABLE Not encountered
BEGUN 8/6/87 FINISHED 8/6/87 OPERATOR R. Gilmando GEOLOGIST Joe Geologist

PLAN



PROFILE OF EXCAVATION



Joints:

1 N85°E to N85°W 55 to 70°N 0.5' to 1.0' sp

2 N15° to 30°W 50°SW 0.2' to 1.5' sp

3 N85°E 30° to 45°S 0.3' to 0.6' sp

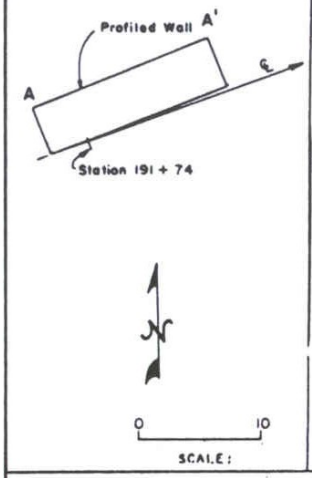
NOTES

TEST PIT NO. TP-2-TTDL

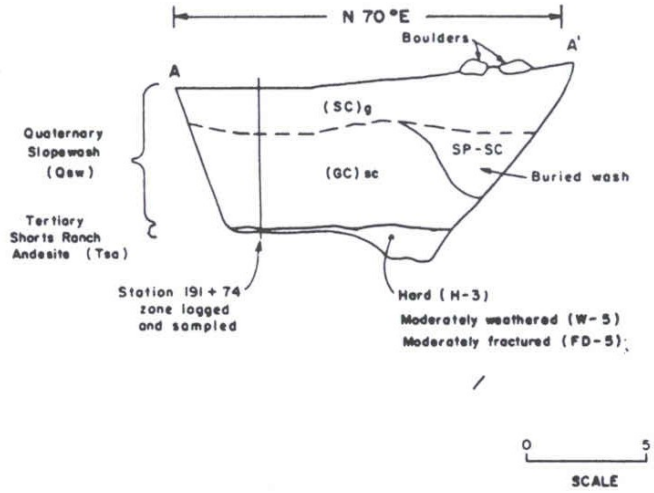
GEOLOGIC PROFILE OF TEST PIT NO. TP-1-TTDL

FEATURE OUTLET PIPELINE LOCATION STATION 191 + 74 ℄ PROJECT STATE
COORDINATES N 436,961 E 766,219 GROUND ELEVATION 2770.7 BOTTOM ELEVATION 2764.7
METHOD OF EXCAVATION MF-80 Backhoe TOTAL DEPTH 6' SIZE 16" x 4' DEPTH TO WATER TABLE Not encountered
BEGUN 8/6/87 FINISHED 8/6/87 OPERATOR R. Gilmondo GEOLOGIST Joe Geologist

PLAN



PROFILE OF EXCAVATION



NOTES

TEST PIT NO. TP-1-TTDL

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STANDARD OPERATING PROCEDURE

Subject: Standards for Design and Installation of Groundwater Monitoring Wells

1. PURPOSE

This procedure provides the standard practice for groundwater monitoring well design and installation. The procedure provides the minimum required steps and quality checks that employees and subcontractors are to follow when performing the subject task.

This procedure may also contain guidance for recommended or suggested practice that is based upon collective professional experience. Recommended or suggested practice goes beyond the minimum requirements of the procedure and should be implemented when appropriate.

2. SCOPE

Geosciences Standard Operating Procedure (SOP) EI-GS031 describes standards for the design and installation of groundwater monitoring wells, and how such design and installation will be conducted and documented for projects executed by Shaw Environmental & Infrastrucure Inc. (Shaw E & I). Responsibilities of individuals performing the work are also detailed. Additional project-specific requirements for monitoring well design and installation may be developed, as necessary, to supplement this procedure and address project-specific conditions and/or objectives.

This SOP covers requirements for basic monitoring well design and installation. The following types of well design and installations are not covered specifically in this SOP:

- Any well that is not primarily intended for groundwater monitoring.
- Wells with multiple screen interval completions.
- Multiple wells or casings within a single boring.
- Instrumented wells (e.g. wells with inclinometers).
- Driven wells.

Individuals needing assistance in the design and installation of monitoring wells and/or these other types of wells/completions may consult internal Shaw E & I technical listings for experts or may contact the Geoscience Discipline Lead (see Section 5.1).

3. REFERENCES (STANDARD INDUSTRY PRACTICES)

The design and installation of groundwater monitoring wells should follow industry standard practices. These are discussed in the latest version of the following ASTM Standards:

ASTM D 5092	Design and Installation of Groundwater Monitoring Wells in Aquifers
ASTM D 5787	Practice for Monitoring Well Protection

The following references are also useful for the planning, design, and installation of groundwater monitoring wells:

ASTM D 6286	Selection of Drilling Methods for Environmental Site Characterization
ASTM F 480	Standard Specification for Thermoplastic Well Casing Pipe and Couplings Made in Standard Dimension Ratios (SDRs), SCH 40 and SCH 80.

Smith, S. A., 1995, *Monitoring and Remediation Wells: Problem Prevention, Maintenance and Rehabilitation*, CRC Press.

U. S. Army Corps of Engineers, 1998, *Monitoring Well Design, Installation and Documentation at Hazardous, Toxic and Radioactive Waste Sites, Engineer Manual EM 1110-1-4000*, November 1. http://www.usace.army.mil/inet/usace-docs/eng-manuals/em1110-1-4000/.

4. DEFINITIONS

The following definitions are applicable to monitoring well design and installation and this SOP.

- **Monitoring Well**—An engineered structure made for the purposes of accurately recording the depth to free water within the ground and for the repeated collection of liquid samples that are representative of the conditions of the groundwater within the vicinity of the screened portion of the well.
- **Installation**—The construction of a groundwater monitoring well within the ground.
- **Water Table**—The surface or level in the saturated zone at which the hydraulic pressure is equal to atmospheric pressure.
- **Well Casing String (System)**—Monitoring well components consisting of blank casing (riser), well screen, well sump (optional), and top and bottom caps that are connected together and placed in the well boring for construction of the well.

5. RESPONSIBILITIES

5.1 Procedure Responsibility

The Geosciences Discipline Lead is responsible for the development, maintenance, and revision of this procedure. Any questions, comments, or suggestions regarding this technical SOP should be directed to the Geosciences Discipline Lead. The Geosciences Discipline Lead's location and associated contact information can be found on the Shaw Group intranet site, ShawNet.

5.2 Project Responsibility

Employees designing or installing groundwater monitoring wells, or any portion thereof, are responsible for meeting the requirements of this procedure. Employees conducting technical review or oversight of monitoring well design or installation are also responsible for following appropriate portions of this SOP. Project participants are responsible for recording information in sufficient detail to provide objective documentation (e.g., field notes, completion diagrams, reports, etc.) that the requirements of this SOP have been met. Such documentation shall be retained as project records.

6. PROCEDURES

Groundwater monitoring wells are constructed to facilitate reliable, repeatable, representative, and cost-effective sampling of groundwater with minimal disturbance of the aquifer. The degree of

representativeness of samples depends upon both the well installation and the sampling procedures. Poor well design or construction may result in samples that are unrepresentative of the groundwater quality for the strata or formation in which the wells are screened. Well sampling procedures are addressed in other Shaw E & I technical SOPs.

This SOP presents procedures for monitoring well design and installation that will facilitate collection of representative samples and be protective of the environment, in manners consistent with accepted practice and with most regulatory requirements.

6.1 Planning

The planning phase for monitoring well design and installation is an important function and includes the following:

- Identifying and addressing conceptual design issues/parameters (see Section 6.1.1)
- Selecting the drilling and well construction methods to be used (see Section 6.1.2)
- Identifying key approvals necessary for site access and installation of monitoring wells (see Section 6.1.3)
- Listing key Health and Safety requirements (see Section 6.1.4)
- Identifying and listing key requirements of subcontractor(s) used for well installation (see Section 6.1.6)

All planning, design, and installation of monitoring wells shall meet applicable federal, state, or local agency regulations/requirements. Additional program/project-specific requirements may also need to be addressed. Design elements and specifications, drilling methods, health and safety requirements, and detailed site- or project-specific installation procedures should be described in the project-specific work plans.

6.1.1 Conceptual Design

The expected stratigraphic interval for completion, the approximate total depth of the well, and the expected drilling conditions need to be known/developed. This information is necessary in order to complete the design for the well(s) (see Section 6.2), select methods for the drilling and construction of a well, and determine appropriate site-specific installation procedures.

The following are critical issues that must be identified and addressed during conceptual design:

- Monitoring and sampling objectives for the well(s) (e.g., collect groundwater samples, monitor position of the water table, measure thickness of non-aqueous phase liquid (NAPL), collect NAPL samples, etc.)
- Specific hydrostratographic interval or zone targeted for monitoring (e.g., base of unconfined unit A, top of confined aquifer B, first water-bearing fractured interval in unit X, water table in unconfined unit C, etc.)
- Any expectations for other future uses of the well(s) (e.g., groundwater extraction, NAPL [product] recovery, fluid injection for remediation, etc.).
- Expected top and bottom depths of the targeted zone (screen interval) of monitoring and total depth of the well(s).
- The type(s) of sampling that are to be performed in the well.
- Contaminant and groundwater chemistry and relation to composition of well materials.

- Current and expected use of the drill site area during the lifetime of the well.
- Expected long-term range or fluctuation in the position of the water table, or water level in the well(s).
- Expected grain size gradations of the zone that is to be filter-packed.
- Expectations for the presence of light or dense NAPL.
- Rough diameter of well casing and screen to be installed.
- "Drillability" of the geologic formations and/or type of drilling method(s) appropriate for penetrating formations to be encountered and installing the well(s) (see Section 6.1.2).
- Need for telescoped casing, including shallow permanent casing.
- Requirements for collecting formation fluid, cuttings, or intact formation samples as the well boring is advanced (drilled).
- Requirements for geophysical logging of the wellbore or completed well.

Additional project-specific critical issues may also need to be identified and addressed, and should be described in the project work plans.

6.1.2 Selection of Drilling and Well Construction Methods

The drilling method(s) to be used for constructing the monitoring well will need to be identified. Primary criteria for selecting a drilling method are a follows:

- Ability to drill and maintain a stable wellbore of the desired diameter and depth in the geologic formations at the site and effectively construct the well, as anticipated.
- Ability to avoid more complex constructions such as telescoped casings (deep wells) and shallow permanent casings to prevent communication between water-bearing zones.
- Minimizing formation damage or introduction of drilling fluids into the formation.
- Cost and time factors (budget) for the drilling method and site conditions.
- Flexibility of a drilling method to adapt to unexpected but possible different subsurface conditions or lithology, such as a perched aquifer or bedrock where only alluvium was anticipated.
- Surface access requirements, impacts, and limitations for drilling and sampling equipment (e.g., wildlife areas, archaeology site, buildings, etc.).
- Minimizing and controlling the generation of cutting or fluid wastes produced during the drilling.
- Ability to efficiently and reliably collect samples and data during the drilling process.

The selected drilling method(s) should be specified in the project work plans.

6.1.3 Approvals

Specific approvals for well installation need to be identified and can include notifications, permits, legal access and right-of-entry, and contacting and cooperating with inspection authorities.

Typical or basic pre-work approvals include some or all of the following:

- Permit for Drilling and/or Well Construction. A permit for drilling and/or installation of the well(s) may be required from a government agency (and sometimes also from a client agency) that has appropriate jurisdiction. Fees or accounts for payments of fees for oversite are often required by

many jurisdictions. Local, State, and Federal agencies may have specific well construction requirements that need to be identified and followed.

- Project work plans. Review and approval of various work plans (containing design specifications and procedures for installing monitoring wells) by a regulatory agency and the client are often required.
- Request/notification for underground utilities. Additionally, Shaw Procedure HS308, *Underground/ Overhead Utility Contact Prevention,* shall be followed. Additionally, in nearly every state it is a legal requirement to notify a third-party consortium for the identification and marking of known underground utility structures and features. There may also be client-specific requirements for underground utility identification and clearance.
- Legal Authority to Enter/Construct. Rights of entry and rights to construct must be in hand for any property that is not owned by the Client and under contract.
- Requirements for inspections before, during, or after well installation may exist. Regulatory agencies in urbanized areas and on more sophisticated or larger projects commonly retain and exercise the right to inspect work.

The approvals need to be appropriately planned for and executed in order to effect timely and efficient installation of the monitoring wells.

6.1.4 Health & Safety

All applicable Shaw E & I and project-specific health and safety requirements for drilling and well installation shall be identified and adhered to at a minimum. The Client, regulatory agencies, property owner, or site operator may have additional requirements that must be identified and addressed. All requirements must be listed and described in the project health and safety plan.

6.1.5 Subcontractors & Personnel

Requirements for the subcontractor that is drilling and installing the monitoring well(s) must be identified. The requirements are compiled into a statement of work to procure subcontractor services once the design of the monitoring well(s) is completed.

The drilling subcontractor typically must possess one or more licenses pertaining to its qualifications to perform the type of work, and authority to work in the city or state. This can include a contractor's license, issued by the state, and other specialized licenses, such as for drilling and installation of water wells, to demonstrate expertise and responsibility. Such license requirement should be listed in the project work plans.

6.2 Design Process and Considerations

Monitoring wells may be designed after the approximate completion interval and total depth, drilling conditions, method of drilling, sampling requirements, and relevant understanding of contaminant and groundwater chemistry are known. Additional site- or project-specific conditions may also need to be known. Certain special design or installation conditions require additional evaluation and consideration. Some conditions potentially requiring special design or installation considerations are listed in Attachment 1. The following text discusses the components that need to be evaluated and specified for the monitoring well design. The specific design components and parameters for the well(s) should be described in the project work plans.

6.2.1 Borehole and Casing Diameters

The borehole diameter must be sufficiently wide to construct the well, and the well casing string must be sufficiently wide for use after completion. The borehole diameter should be at least 4 inches greater than the nominal casing diameter. For deep borings it may be prudent for the boring diameter

to be 6 inches greater than the nominal casing diameter. For drilling methods that involve constructing the well within temporary casing (i.e., hollow-stem auger or temporarily driven drill casing), it is common for the boring diameter to be 6 to 7 inches greater than the nominal well casing diameter (i.e., 10 to 12–inch diameter boreholes). The borehole diameter needs to be sufficiently wide such that all the well construction materials may be placed without obstruction.

The well casing should have an interior diameter sufficient to allow passage of all equipment that might plausibly be used within the casing during the lifetime of the well. Monitoring wells are commonly 2- or 4-inch nominal diameter for depths to about 200 feet, and often 6-inch diameter for greater depths.

It is common to select an inside casing diameter that is 1 inch greater than the diameter of any equipment expected to be used within the well casing for shallower wells, and 2 inches greater for deeper wells.

Many monitoring wells are installed in boreholes made by direct push drilling methods. For these wells the casing strings are relatively small diameter, generally <2 inches. The borehole diameters using direct push methods are also relatively small, generally <3 inches. Viable monitoring wells can be constructed using these methods; however, due to the relatively narrow annular space, a pre-pack may be used for the filter pack (see Section 6.2.8).

6.2.2 Length and Position of Well Screen

Only factory-manufactured well screen should be used. Screens are commonly available in lengths of 5, 10, and 20 feet, and sometimes 2.5 feet. Pieces may be joined for greater lengths.

Most monitoring well screens are designed to be 5 or 10 feet long, and many regulatory agencies specify these lengths in their guidance or regulations. The reason for short screen lengths is that well screens and associated filter packs are analogous to elevator shafts within buildings: contaminants and other materials may migrate up and down within them with ease. In addition, there may be stratification of dissolved phase contaminants in the formation that may be diluted during purging and sampling across a long screen interval.

There are a few site-specific situations where well screens of 20 feet or more may be suitable or necessary. Such situations could include wells where the expected range in water levels is 20 feet or more, and the well needs to screen across the water table; or where the target formation is more than 20 feet thick, the contaminant plume is believed to be of great thickness, there is little or no vertical groundwater gradient within the target formation and no potential for a NAPL. In general, the length of screen (and associated length of filter pack) selected for the well should be based upon site-specific objectives, requirements, and conditions, should be designed to meet monitoring/sampling objectives, and should not contribute to enhanced vertical transport of contaminants.

The position or depth of the well screen relative to the water table, or specific target horizon or fracture/stratigraphic interval must be clearly known. Such information should be specified in the project work plans.

6.2.3 Length of Filter Pack

The filter pack should not extend more than 2 to 3 feet above the top of the well screen and no more than 1 to 2 feet below the bottom cap or sump. This is because filter packs typically have much higher vertical permeability than the adjoining native formation, and hence will facilitate the preferential vertical flow of groundwater or contaminants. Excess length of filter packs facilitates the vertical spread of contamination as well as the collection of samples that “average” (i.e., dilute) across a greater thickness of aquifer than anticipated.

A transition (or secondary) pack may be placed over the primary filter pack. The transition pack is a finer gradation material than the primary pack, and is designed to retard the infiltration of the overlying

bentonite and/or cement seal into the primary filter pack. It is appropriately used where the primary filter pack is a coarse gradation with a high potential for the infiltration of the overlying seal material.

6.2.4 Lengths of Seals

A bentonite seal should be placed directly over the uppermost filter pack. It should be 2 to 3 feet thick. A cement annular seal should extend from the top of the bentonite seal to the surface. In deeper wells, the seal may be over 100 feet thick.

The lengths and positions of the bentonite and cement seals may have to be adjusted if the water table is shallow (i.e., <6 feet deep). At times, a thicker bentonite seal may also be prudent when there are uncertainties in the borehole condition. Information on the composition of the seals is provided in Sections 6.2.10 and 6.2.11.

6.2.5 Shallow Permanent Casing

A permanent (larger diameter) shallow casing may be necessary to isolate the wellbore and well casing string (Section 6.2.6) and prevent communication between water-bearing zones. Such casings are commonly steel pipe of large diameter. The inside diameter of such casing should be at least 4 inches more than the exterior well casing diameter, to provide an adequate width for filling with a cement seal. This may require a very large initial boring for the shallow casing, and may necessitate a different drilling method. The use of a shallow casing in well construction will typically double the total cost of well construction.

Permanent shallow casings may be appropriate under the following conditions:

- The shallow or overlying aquifer or zone is highly contaminated and the deeper aquifer or zone of completion may have much lower or no contamination.
- The monitoring well will be screened/filter packed in a zone that has contaminant or natural chemistry distinct from that of an overlying zone of saturation.
- The monitoring well will be screened/filter packed in a zone that has different total head from an overlying zone of saturation, indicating that advection would occur between the two zones via the wellbore.
- Either the screened/filter pack zone or an overlying zone of saturation is an important resource for drinking water supply.
- A NAPL is suspected to exist above the zone that is to be screened/filter packed.

At times, a temporary drive casing may be used in drilling and constructing a well in place of a permanent shallow casing. The use of a permanent shallow casing or temporary drive casing in the installation of the well should be based upon site-specific objectives and conditions or regulatory requirements, and specified in the project work plans.

6.2.6 Well Casing String

This section discusses each component of the well casing string. The components include blank casing (riser), well screen, sump (optional), and top and bottom caps.

Blank Casing or Riser

Blank well casing (or riser) is attached to the top of the well screen and extends from the screen up to, or just above, the ground surface. Blank casing is made from the following materials:

- PVC. Any PVC well pipe/screen should be manufactured to ASTM F-480 standards. Schedule (SCH) 40 or SCH 80 are typically used; SCH 80 is typically used for total depths greater than

roughly 100 feet. Use of SCH 40 PVC at depths roughly greater than 100 to 150 feet; or in environments rich in ketones, esters, or certain aromatic hydrocarbons, may be problematic.

- Stainless Steel. Stainless steel (SS) is commonly used for wells with high concentrations of solvents or other organic compounds. Type 304 is the most commonly used grade and 316 is less commonly used, but more resistant to corrosion/chemical reaction. Use in saline or reducing waters may cause corrosion or leaching of metals.

- PTFE (Teflon). PTFE is very expensive. Its surface is slippery, and it may slip during installation, and it may be difficult for seal material to bond to it. It has higher chemical resistance and lower leachability than PVC or SS.

- Reinforced Fiberglass. The outside surface of reinforced fiberglass casing is slippery, brittle, and easy to crack if not handled with care. It is usually used for monitoring specific remediation applications/techniques.

ABS plastic, high density polyethylene (HDPE), and low carbon steel pipe are other materials that are sometimes used for blank well casing.

Well casing material should be selected based upon the following factors:

- The expected total well depth and expected depth of water during construction. For wells deeper than roughly 100 feet, the selection of casing material must consider the potential for the casing to collapse or tear apart as it is being hung in the well bore.

- The natural and contaminant groundwater chemistry. Saline waters and pH<7 are conditions which will likely degrade stainless steel or other metal well casings. Certain chemical products, or high dissolved concentrations, of non-polarizing organic compounds may cause swelling or even dissolution of PVC, or dissolution of some plasticizers.

- The cost of the well casing material. Well casing materials vary in cost as follows: least expensive – PVC; moderately expensive – stainless steel; most expensive – PTFE (Teflon).

Casing connections should be flush treaded. O-rings of known chemistry and compatible with the water chemistry and sampling objectives may be used to ensure a tight seal. Glued or solvent welded connections are not acceptable as the glues or solvents can alter the chemistry of the groundwater samples. Connections held together with slip couplings and sheet metal screws are also not acceptable. The screws can easily fail and can also damage sampling equipment.

Well Screen

Well screens are composed of the same materials as the blank casing and should be factory-manufactured. For monitoring wells, the dominant criterion for selection of the screen should be sizing to exclude approximately 90% of the filter or sand pack particles. Sizing and selection of well screen and filter pack is covered in Shaw E & I technical SOP EI-GS033, *Standards for Filter Pack and Well Screen Selection*.

Common screen types are slotted (milled) or wire-wrap. Slotted (milled) screen has the least open area (typically 2-6%) and is the least expensive. The most common widths of the cut slots used are 0.010 and 0.020-inch. Wire-wrap screen typically has 5-15% open area and comes in various grades of spacing between the wraps. Teflon and fiberglass screens are usually only available as slotted screen.

Well screens do not have to be of the same material as the blank casing. For example, a well could be constructed of SCH 80 PVC blank casing and 304 stainless well screen. If different materials are used, care should be taken to ensure that the screen and blank casing can be securely connected, and that the use of dissimilar metals does not create problems with corrosion/cathodic reaction at the connection. Individuals needing help in designing well casing string configurations should find a senior geologist/hydrogeologist with monitoring well design and installation experience.

Well Sump (Foot)

A well sump consists of a short piece (i.e., 1 to 3 feet) of blank well casing with a bottom cap that is attached to the bottom of the screen section. A sump is used when dense non-aqueous phase liquid (DNAPL) is expected to enter the well (and is to be sampled and/or removed from the well), or a significant amount of sediment may enter the well over time.

The use of a foot or sump results in the expenditure of more resources during installation, development, and well purging. It is a practice that carried over from the installation of water supply wells, and is generally of little benefit for monitoring wells. The use of a sump may not be practical where the bottom of the well screen is to be set at the top of a lower confining unit. Consequently, the current trend is to avoid the use of sumps in monitoring wells.

Top and Bottom Caps

The well screen or sump should have a firmly attached bottom cap to prevent formation material from entering the well during installation and after completion. The top cap is usually either a slip cap that is placed over the top of the blank casing, or a rubber (expansion) gasket cap that is used to seal the top of the casing. The purpose of the top cap is to prevent entry of surface water into the well casing.

6.2.7 Centralizers

Centralizers are concentric devices that are designed to keep the well casing centered within the borehole, and to build a well that has an adequate annular space around the sides of the well casing. Centralizers are generally not used for wells less than 20 feet total depth and are typically not used when constructing a well through hollow stem augers or when using direct push drilling methods. The augers maintain space between the well casing string and borehole wall as the well is constructed.

Drillers generally have to use extra care in installing wells with centralizers. This is because the centralizers may become dislodged during installation of the casing string, hinder emplacement of filter pack or seal material with a tremie pipe, or hinder measuring the depths of filter pack or seal material. Any installation of centralizers should be closely supervised.

Centralizers, if used, are typically placed at intervals of every 20 feet for SCH 40 PVC casings. They may be placed at intervals of every 40 feet for steel or other more rigid casings. Centralizers are also placed just above the top of the well screen and, for certain wells, at the bottom of the screen or sump. The exact spacing to be used should be based on well- and site-specific conditions and specified in the project work plans. Metal centralizers will interface with electrical geophysical logs run inside PVC well casing.

6.2.8 Filter Pack

Filter packs may either be artificial (emplaced engineered material, including pre-packs) or natural (in-place geologic formation). Artificial packs are used most commonly and should be considered the default approach. Natural sand packs are not recommended and should generally only be used when installation of an artificial pack is not feasible (due to subsurface conditions).

Engineered (Artificial) Filter Pack. Engineered filter packs should consist of chemically inert rounded particles of a defined size distribution. Clean-washed and bagged graded silica sands are usually used for this purpose. Selection of filter pack size should follow appropriate Shaw E & I technical SOPs and/or project-specific requirements. Filter packs are best placed (especially with deeper borings) with a small diameter pipe (tremie) extended to the bottom of the borehole. The tremie is slowly withdrawn as the sand is pumped into the boring.

Pre-Pack. Pre-pack and channel-pack are integral systems of interior casing, filter pack, centralizers, and exterior casing. They are commonly used for small diameter (i.e., 1-inch casing diameter) wells and may be preferable for larger diameters wells where heaving or caving formation is prevalent.

Filter pack gradations and screen opening sizes can be designed or selected from several off-the-shelf products.

Natural Sand Pack. Use of a natural pack may be appropriate if the following criteria are met: an engineered filter pack cannot be installed and the natural formation in the vicinity of the proposed well screen is well characterized, homogeneous, composed predominantly of grains that will not enter the well screen, sufficiently permeable, and loose enough that it will collapse around the well screen. The use of a natural sand pack will usually require prior regulatory agency and client approval. Such approval should be documented, as required for the project, and the documentation maintained as project records.

6.2.9 Transition (Secondary) Filter Pack

A transition (or secondary) sand pack may be placed above the primary filter pack. This transition pack may be used where the filter pack is sufficiently coarse-grained and graded such that there is potential for the bentonite seal to migrate significantly into it. Such migration may result in bentonite entering the well screen. An optional upper transition filter pack may also be placed between the bentonite seal and the cement seal. Transition sand packs are typically 2 to 3 feet thick and composed of a graded, engineered silica sand with smaller grain size than the primary filter pack.

6.2.10 Bentonite Seal

The bentonite seal serves to separate the sanitary seal from the filter pack and provides extra protection against any migration of fluid up or down the wellbore from the screen/filter pack interval. It is typically 2 to 3 feet thick and may be composed of bentonite chips or pellets that are emplaced and then hydrated in-place, or it may be composed of a mechanically-mixed bentonite powder-water slurry that is tremied into place.

6.2.11 Cement Annular Seal

The cement seal constitutes the bulk of the annular fill in a deep well. Its primary purpose is to prevent fluids from migrating up or down the wellbore above the filter pack. To do this it must have low permeability, fill the entire annular space, and not shrink.

The seal is composed of a grout mixture of Portland cement and water, with or without a bentonite additive. An admixture of about 5% bentonite powder, added to a cement-water slurry, is used to minimize shrinkage of the seal after it has been emplaced and is setting. Some regulatory agencies have guidance, requirements, or specifications for using or not using bentonite in the grout. Such guidance and/or requirements need to be known and incorporated into the well design.

The use of quick-setting or other additives is not recommended as they can affect the chemistry of the groundwater samples. At times such additives may be necessary in highly permeable formation, but should only be used after appropriate regulatory approval. Such approval should be documented in the project files. Proper mixing and installation are important. The seal material should be mechanically mixed. It should be emplaced into the borehole in a way that prevents contact with the boring sidewall until it is in place, so that it does not pull sidewall material with it as it falls. The use of a tremie pipe, as with the sand pack placement, will facilitate completing the annular seal, especially in deeper borings. This helps to prevent voids or bridging of the cement. Additional information on the composition and mixing of the cement seal is presented in ASTM D 5787.

Cement generates heat as it sets. It is possible for deformation or failure of thermoplastic (i.e., PVC or ABS) well casing to occur from the heat generated during setting of the cement seal. This problem is exacerbated by more-rapidly-setting cements and thicker annular spaces. At times, the thickness of the annular space is greater than designed, for example if the formation washes out during drilling or cleaning of the wellbore. In such cases the potential for softening and sagging of the well casing is great as the cement sets. If this occurs, the well must be abandoned and replaced. Changing the design of the well may also be necessary.

6.2.12 Above-Grade or Flush-Mount Surface Completion

Selection of an above-grade or flush-mount surface completion is largely determined by the likelihood of vehicle traffic at the site surface, or other client/property owner requirements (e.g., visual aesthetics, etc.). Flush-mount completions are default practice where there is vehicle traffic, the ground surface is stable, and flooding is not anticipated. Above-grade completions are commonly used in areas of little or no vehicle traffic, where the ground surface is unstable (loose or muddy), where high grasses are present, or where a likelihood of standing water exists. There may be strict regulatory requirements for the design and construction of surface completions. Such requirements must be identified and incorporated into the well design.

The following are the primary design criteria for every surface completion:

- Preventing hazard to/from vehicles.
- Preventing damage to the well.
- Preventing inflow of surface waters.
- Preventing unauthorized access and/or tampering. (requires some form of locking or securing the wellhead)
- Ease of use.
- Client/property owner requirements.

The exact type and components of the surface completion to be used should be described in the project work plans.

Above-Grade Completions

The primary components of an above-grade completion are the surface pad, protective casing, locking lid, drain hole, and bollards. Information on each of these components is provided in the following text.

Surface Pad. The surface pad is a concrete pad that stabilizes the protective casing, provides a firm surface for workers, and directs surface waters away from the well casing. The protective pad should be at least 2 feet by 2 feet and at least 4 inches thick; however, it is recommended that it be somewhat larger and at least 6 inches thick. The surface pad should have a slight slope away from the protective casing to drain water away from the well.

Protective Casing. The protective casing should be weather- and tamper-resistant, capable of keeping rainfall from reaching the well casing, and resistant to opening without use of significant force. It is set around and over the well casing, extending from at least 6 inches above the well casing to at least 2 feet below grade (~30 inches below top of surface pad). There should be cement all the way around the protective casing, to its full depth.

Lid. The protective casing should have a locking, hinged lid that will protect the wellhead from rain, tampering, animals, and ultraviolet damage.

Drain hole. A small hole should be drilled through the protective casing, a short distance above the top of the surface pad (higher if flooding is anticipated).

Bollards. Bollards (a.k.a. bumpers, traffic guards) are emplaced around the protective casing to hinder the destruction of the well from vehicles. Bollards are often made of six-foot long, 4- to 6-inch diameter iron (black) pipe, filled with concrete. Bollards should be painted in a weather-resistant and highly-visible color paint.

Bollards should be set to a depth of at least 30 inches. They should be placed in an oversized, slough-free borehole or excavation that is filled with concrete. The borehole or excavation for the bollard should be at least 6 inches greater diameter than the bollard. Bollards are typically placed 3 to 6 feet from a well, usually 4 per well. At times, the bollards are embedded in the surface pad.

Bollards are easily knocked over when the momentum (speed and/or weight) of an impacting vehicle is great. For wells that are deeper or otherwise significantly expensive to replace, more robust bollards may be made as follows:

- Use a wider-diameter, thicker walled pipe for the bollard.
- Use a longer pipe. Bury it more deeply yet maintain enough height that any portion of a vehicle will strike the bollard before striking the protective well casing.
- Bury the pipe in a wider excavation. A wider and heavier concrete base is more difficult to dislodge than a narrow, shallow and light base.
- Space the bollards further out from the well. This may require use of 6 or more bollards.

Bollards should not be placed as to completely prevent a development, workover, or sampling rig from accessing the well.

Flush-Mount Completions

Flush-mount completions are constructed for monitoring wells that need to be secured from damage when driven over by vehicles, constructed in locations that have very low likelihood of flooding, and need to be resistant to entry of rainfall or sheetflow. A locking protective street box or vault is the main component of the flush-mount completion. The box needs to have the following characteristics:

- Sufficient strength to not break, crack, significantly sag, or permanently deform when the greatest expectable vehicle wheel weight is upon it
- A lid that is snuggly fitting and securely bolted to the frame
- Minimal potential for rainfall or sheetflow to enter it

The box should be set slightly above surface grade and placed in concrete. The concrete should completely surround the box and be sloped from the top edge of the box to surface grade. The top of the blank well casing should be positioned inside the box to provide sufficient clearance to install a top cap on the casing.

6.3 Monitoring Well Installation

The basic process for monitoring well installation consists of drilling and preparing the well boring or borehole (includes setting permanent shallow protective casing [if required] and drilling borehole to total depth [TD]); decontaminating the well material (as necessary); connecting the components of the well casing string; carefully placing the well casing string in the borehole; placing/setting the annular materials (filter pack, transition pack [optional], bentonite seal, and cement seal); and constructing the surface completion. The procedures for installation (construction) of a monitoring well depend upon a variety of site-specific conditions and factors discussed in Sections 6.1 and 6.2.

Detailed site-specific procedures for monitoring well installation should be developed and described in the project work plans and be based on the site-specific conditions and factors. Drilling of the borehole for the well should also follow applicable Shaw E & I technical SOPs and project-specific requirements/procedures. An example of a basic monitoring well installation procedure is included as Attachment 2. It is not possible for this SOP to present a detailed, specific procedure that would be applicable to the wide range of well designs, drilling methods, and installation methods available or applicable to specific conditions for a particular project. The example procedure may be customized

and supplemented to address site- or project-specific conditions and requirements. Monitoring well installation should be supervised by the rig geologist.

6.4 Documentation

Accurate documentation is important to demonstrate that the monitoring well was installed appropriately and to help ensure the usability of monitoring and sampling results from the well. Appropriate forms should be completed as per applicable Shaw E & I technical SOPs and project-specific requirements/procedures. Such forms can consist of a well construction form and a boring log. An example well construction form is included with this SOP (see Section 8). Basic requirements for generation of boring logs are presented in Shaw E & I technical SOP EI-GS027, *Standards for Generation of Boring Logs*.

Additional aspects of work may be addressed on separate appropriate forms. Such items to be entered on the appropriate forms include the following:

- Observations or measurements pertaining to health and safety
- Times of starting and completion of tasks and any significant down time
- Any problems or issues related to installing a particular well
- Exact counts (footages, weights, bags, piece numbers, etc.) of materials, as required for payment purposes.

In addition, the regulatory agencies may have specific documentation requirements for monitoring well installations. These requirements should be known and planned for in advance to ensure timely and effective compliance.

6.5 Acceptance

Shaw E & I or client QC programs may have specific requirements for the acceptance of a monitoring well. These requirements may include submittals of documentation (see above discussion) and/or field tests. The following are examples of field QC tests.

Straightness of Well Casing

A well casing must be sufficiently straight that any instrument/equipment used within the casing can freely pass through it. As many instruments/equipment have lengths of 3 feet, 10 feet, or even more, a casing that is not straight can cause an instrument or equipment to become stuck or prevent it from passing the area of constriction. Methods to help ensure a straight casing are to drill a straight boring (if possible) and, once the boring is complete, to hang or suspend the casing (using slips, etc.) while constructing the well.

Sediment Content or Turbidity

A client or oversight agency may have a maximum measured turbidity allowed for water samples produced from a monitoring well. They may refuse to accept a well that does not adequately clean up of sediment and turbidity during development. Careful design and construction of the well help ensure that the initial sedimentation rate and turbidity within the well can be reduced to acceptable limits during subsequent development of the well.

At times, monitoring wells are required to be designed and installed in fine-grained non-aquifer units. In such cases, the required maximum turbidity standards may not be achieved even with careful design and well installation practices.

6.6 Technical Review

All monitoring well design and installation specifications, procedures, and results (e.g., reports, forms, etc.) should undergo technical review. It is recommended that the technical reviewer also provide review/oversight of the actual field implementation of monitoring well installation activities. This should include aid in troubleshooting drilling and installation problems. The technical reviewer should be an experienced senior geologist or hydrogeologist. At a minimum, the technical reviewer should be a person capable of planning and supervising monitoring well installation programs. Individuals needing assistance in finding qualified technical reviewers may consult internal Shaw E & I technical listings for experts in well design and installation.

Any issues raised during the technical review shall be resolved between the reviewer and staff planning, conducting, or preparing results of monitoring well installation activities as follows:

- Comments/issues raised relative to planning, designing, and developing detailed procedures for monitoring installation should be resolved before mobilization and drilling/well installation commences.
- Comments/issues raised relative to results of well installation activities should be resolved before external (i.e., outside of Shaw E & I) use or submission of the results.

The technical review comments and issues, and corresponding resolution should be documented and filed with the project records. Such records should be maintained until project closeout.

7. ATTACHMENTS

- Attachment 1, Conditions Potentially Requiring Special Design or Installation Considerations
- Attachment 2, Example Monitoring Well Installation Procedure

8. FORMS

- Example Monitoring Well Construction Form

Attachment 1
Conditions Potentially Requiring Special Design or Installation

Installation over 100 feet total depth – potential for casing failure during installation of well. Careful selection of casing materials and drilling techniques; careful handling of well materials during installation recommended.

Installation in waters with polar organic chemicals at concentrations > approximately 25% of solubility limit – potential for damage to PVC casing, screen, and components. Literature research and possibly using material other than PVC is recommended.

Installation in reducing waters or low pH waters with hydrogen sulfide – potential for corrosion of steel casing components and leaching of metals such as Ni and Cr into well waters. Use of non-metal casing may be recommended.

Drilling through a confining zone between two saturated zones – high potential for advective flow of contaminated water through borehole. Use of a conductor casing or temporary drive casing may be required.

Extremely unstable formation/flowing sands – necessitates careful consideration and implementation of drilling and installation techniques, including use of mud rotary drilling methods and/or temporary drive casing. Use of water to flood hollow stem augers to construct wells in flowing sands is another technique. However, issues may arise with possible chemicals in the water supply used. May also require prior regulatory acceptance/concurrence; some agencies may not allow use of this technique.

Installation at the water table – careful review of range in depth to water is recommended. Recommend for well screen that is high enough and low enough to capture all expected depths of water.

Installation through uncased borehole – a high potential exists for dislodging of loose sidewall materials during installation, and of bridging of sand or seal materials, or entrainment of sloughed sidewall materials. Use of a tremie pipe is recommended for installing filter pack and seals.

Expected use includes active recovery of liquids – the well screen and filter pack should be more carefully designed to ensure adequate flow of liquids into the well casing.

Monitoring for radionuclides – certain well construction materials (such as bentonite) contain naturally-occurring radioactive components. Discussion of construction materials with geoscience leads at Shaw's U.S. Dept. of Energy Project Offices is recommended.

Attachment 2
Example Monitoring Well Installation Procedure

The following monitoring well installation procedure is provided as an example or basic procedure. It should be customized based on project/site-specific conditions, equipment, methodologies, and quality control requirements. This procedure is written for a generic shallow 2- or 4- inch diameter monitoring well installed inside a mud rotary boring or inside hollow stem augers or temporary drive casing. The rig geologist should supervise drilling of the well boring and installation of the monitoring well. The example procedure consists of the following:

1. The well boring should be drilled to the desired total depth using the methods and procedures specified in applicable Shaw E & I technical SOPs and the project work plans. This includes generation of a boring log by the rig geologist during the advancement of the boring.

2. After the borehole has been successfully drilled to the target total depth, remove all drill cuttings prior to constructing the well. Additional conditioning of the borehole may be required depending upon observed conditions. Review logs and notes with the driller for any zones or depths exhibiting drilling problems that may affect the well installation. Make sure the proposed screen depths will be placed in the proper stratigraphic interval. Identify and plan any other necessary actions mutually agreed upon by the rig geologist, project geologist, and the driller to ensure or aid in effective installation of the well.

3. Remove the drill pipe and bit if using rotary techniques, or remove the center stem, bit, and plug if using the hollow-stem auger technique. The well construction materials will then be installed inside the open borehole or through the center of the drive casing or augers.

4. Measure the total depth of the completed boring using a weighted sounding line. Check the borehole depth to ensure that formation material has not heaved to fill the borehole. If heaving has taken place, options for cleaning, redrilling, or installation in the open section of the boring should be discussed with the project geologist and driller.

5. In the event that the hole was drilled beyond the desired depth, sealant (usually bentonite or as specified in the project work plans) may be added to the bottom of the boring to raise the bottom of the hole to the desired depth. The bentonite should be added gradually to prevent bridging. Bentonite addition should stop when its level has reached approximately 6 inches to 1 foot below the desired base of the well casing string. The bentonite plug should be allowed to hydrate for at least 1 hour before installation of a filter pack or other well materials.

6. Calculate volumes of filter pack, bentonite pellets/slurry, and cement grout required, based on borehole and well casing dimensions.

7. Place a layer of filter pack (6 inches to 1 foot, or as specified in the project work plans) at the bottom of the borehole. The filter pack will be installed through the center of the drive casing/augers. Filter pack will be added slowly while withdrawing the drive casing/augers. Measure and record the depth to the top of the layer.

8. Thoroughly decontaminate the blank casing, well screen, sump (optional), and top and bottom caps to be installed in the well according to applicable Shaw E & I technical SOPs and/or the project work plans.

9. Inspect the blank casing, well screen, sump, top and bottom caps, and any other well construction materials prior to installation to ensure that no damage has occurred during shipment and decontamination activities.

10. Connect the well casing string together. Make sure the top cap is securely positioned on the blank casing to prevent unwanted material from entering the well during construction activities. Carefully lower the well string through the open borehole, drive casing, or inside of the augers until the well string is at the desired depth. The well string should be suspended by the installation rig and should not rest on the bottom of the boring. The casing string should be vertical and centrally positioned in the borehole. Stainless steel centralizers should be used if necessary and feasible. In the event that the well string was dropped,

lowered abruptly, or suspected of being damaged during placement, the string should be removed from the boring and inspected.

In certain instances, the well string may rise after being placed in the borehole due to heaving sands. If this occurs, the driller must not place any drilling equipment (drill pipe, hammers, etc.) to prevent the casing from rising. The rig geologist should note the amount of rise. The rig geologist should then consult with the project geologist for an appropriate course of action.

11. Record the following information on the appropriate forms according to this SOP and/or the project work plans: length of well screen, total depth of well boring, depth from ground surface to top of grout or bentonite plug in bottom of borehole (if present), depth to base of well string and depth to top and bottom of well screen.

12. When using the mud rotary drilling technique, tremie the filter pack into the annular space around the screen. Clean, potable water may be used to assist with the filter pack tremie operation. For all other drilling techniques, the filter pack may be allowed to free-fall or be tremied (deeper boring) according to the project work plans. If using drive casing or augers, the drive casing or augers should be pulled slowly during filter pack installation in increments of roughly 0.5 to 1 foot so that the filter pack can fill the annular space between the well screen and borehole wall.

13. Monitor filter pack settlement by initially measuring the sand level (before beginning to withdraw the drive casing/augers). In addition, repeatedly take depth soundings using a weighted tape to continually monitor the level of the sand. The top of the well casing should also be monitored to detect any movement due to settlement or upward lifting from drive casing/auger removal. If the top of the well casing moves upwards at any time during the well installation process, the driller should not be allowed to set drilling equipment (downhole hammers, drill pipe, etc.) on the top of the casing to prevent further movement.

14. Add filter pack until its height is approximately 2 to 3 feet above the top of the screen (unless otherwise specified in the project work plans), and verify its placement (by sounding). The filter pack may then be gently surged or swabbed in order to settle the pack material and reduce the possibility of bridging.

15. The height of the filter pack should then be re-sounded and additional filter pack placed as necessary. Once the placement of the filter pack is completed, the depth to the top of the pack is measured and recorded on the appropriate forms according to the project work plans. The total volume of filter pack used should be recorded and compared to the pre-installation calculated volume. If the actual volume used is less than the calculated volume, the project geologist should be consulted to help determine if bridging of the sand pack occurred.

16. Install a bentonite seal measuring 2 to 3 feet thick (unless otherwise specified in the project work plans) on top of the filter pack. If pellets or chips are used, they should be added gradually to avoid bridging. Take repeated depth soundings using a weighted tape to ascertain the top of the bentonite seal. The seal should be allowed to hydrate for at least one hour, or as specified in the project work plans, before proceeding with the grouting operation.

17. After hydration of the bentonite seal, place cement grout in the annular space. The grout may be pumped through a tremie pipe and filled from the top of the bentonite seal upward. The bottom of the tremie pipe should be maintained below the top of the grout to prevent free fall and bridging. When using drive casing or hollow-stem auger techniques, the drive casing/augers should be raised in incremental intervals, keeping the bottom of the drive casing/augers below the top of the grout. Grouting will cease when the grout level has risen to within approximately 1 to 2 feet of the ground surface, depending on the surface completion type (flush-mount versus aboveground). The grout levels should be checked for settlement after a time period specified in the project work plans. If settling has occurred, the grout should be topped off to the original level.

18. For above-grade completions, the protective steel casing should be centered over the well casing (riser) and inserted into the grouted annulus. The bottom of the protective casing should be set at a depth of 2 feet below grade. Prior to installation, a 2-inch deep temporary spacer shall be placed between the PVC

well cap and the bottom of the protective casing cover to keep the protective casing from settling onto the well cap.

19. Allow a minimum of 24 hours to elapse after final grouting before installing the concrete pad and steel guard posts for above-grade completions, or street boxes or vaults for flush-mount completions.

20. After the protective casing has set, construct a concrete surface pad (2 feet by 2 feet by 4 inches thick) at ground surface around the protective steel casing. The concrete is sloped away from the protective casing to promote surface drainage from the well.

21. Embed four steel bollards to a depth of approximately 30 inches below surface grade. Install the posts in concrete-filled postholes spaced equally around the well at a distance of approximately 3 feet from the protective steel casing.

22. After the surface pad has set, a drainage hole may be drilled into the protective casing if required by the project work plans. The drainage hole is positioned approximately two inches above ground surface, just above the top of the surface pad.

23. For flush-mount completions, set a street box or vault and cement it in position. The street box or vault will be centered over the well casing (riser). The top of the street box or vault will be positioned slightly above grade and the cement sloped to grade to promote surface drainage away from the well

24. Label the wellhead to identify, at a minimum, the well number, depth, and date of installation. A reference or measuring point for measuring water levels may also be placed or marked at the wellhead.

25. Following well completion and demobilization of the rig, the well site should be cleared of all debris and trash and restored to a neat and clean appearance according to the project work plans. All investigation-derived waste generated at the well site should be appropriately contained and managed according to the project work plans.

26. All measurements should be recorded and all appropriate documentation completed according to this SOP and/or project-specific requirements.

27. The wellhead may be surveyed for location and elevation after completion according to applicable Shaw E & I technical SOPs and/or project-specific requirements.

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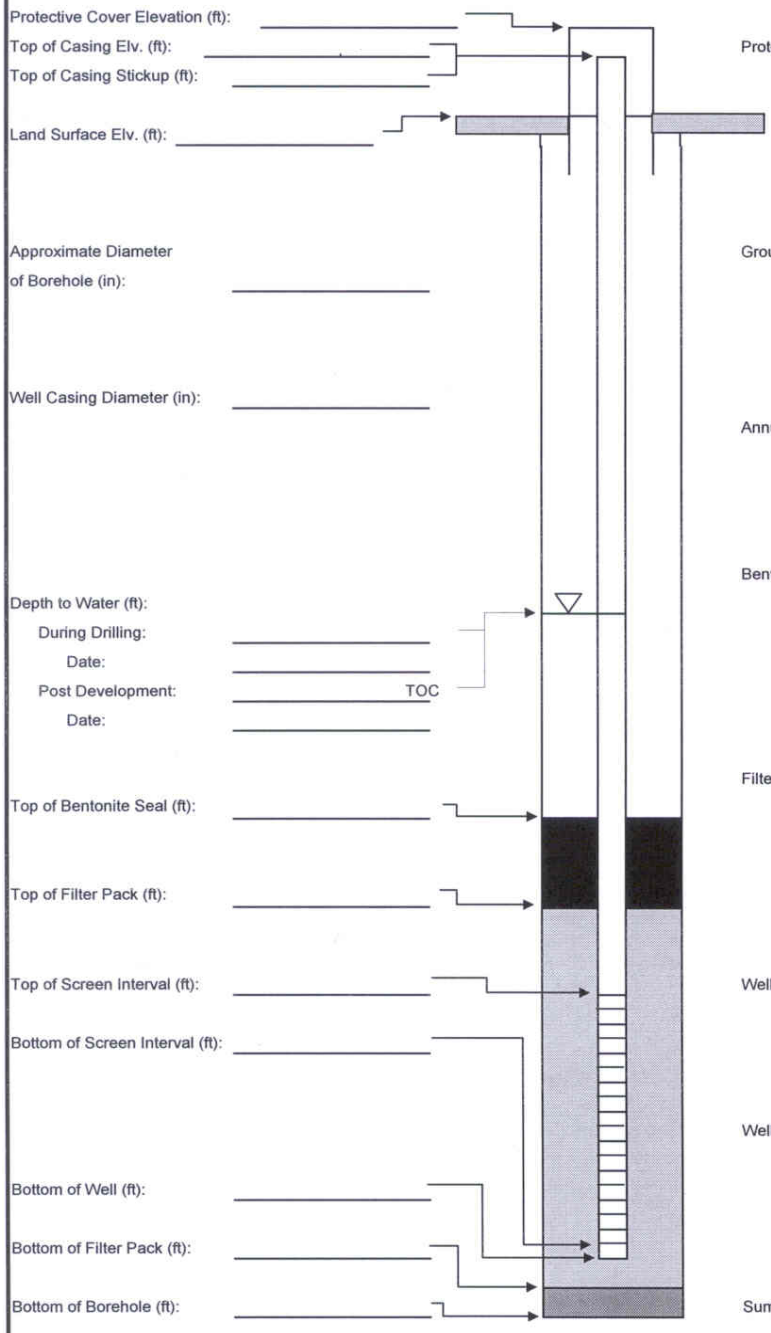
Example Monitoring Well Construction Form

Monitoring Well Construction Form

Project: _____ Well Number: _____
Location: _____ Site Location: _____
Client: _____ Installation Date _____
Subcontractor: _____ Northing: _____
Driller: _____ Easting: _____
IT Field Representative: _____ NAD: _____ NGVD: _____



Protective Cover Elevation (ft): _____
Top of Casing Elv. (ft): _____
Top of Casing Stickup (ft): _____
Land Surface Elv. (ft): _____

Approximate Diameter of Borehole (in): _____

Well Casing Diameter (in): _____

Depth to Water (ft):
During Drilling: _____
Date: _____
Post Development: _____ TOC
Date: _____

Top of Bentonite Seal (ft): _____

Top of Filter Pack (ft): _____

Top of Screen Interval (ft): _____

Bottom of Screen Interval (ft): _____

Bottom of Well (ft): _____

Bottom of Filter Pack (ft): _____

Bottom of Borehole (ft): _____

Protective Casing:
Type: _____
Dimensions (in): _____
Length (ft): _____
Guard Post: _____

Ground Seal (Surface Pad)
Dimensions: _____
Type: Concrete

Annular Space Seal:
Type: Bentonite-Cement Grout
Installation: Gravity Tremie Pumped

Bentonite Seal:
Manufacturer: _____
Type: Pellets Slurry
Installation: 6-in lifts One Section
Gravity Tremie Pumped
Hydration time (hrs): _____

Filter Pack Material:
Manufacturer: _____
Product Name: _____
Size: _____
Volume Added (ft^3): _____
Installation: Gravity Tremie

Well Casing:
Manufacturer: _____
Type: _____
Diameter (in): _____

Well Screen Casing:
Manufacturer: _____
Type: _____
Slot Size (in): _____ %Open
Slot Type: Continuous wrap Factory slot

Sump/End Cap: _____

Backfill Material: _____

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STANDARD OPERATING PROCEDURE

Subject: Standards for Conducting Well Development

1. PURPOSE

This procedure provides the standard practice for development of monitoring, extraction, and injection wells completed primarily in granular formations. The procedure includes the minimum required steps and quality checks that all employees and subcontractors are to follow when performing the subject task.

This procedure may also contain guidance for recommended or suggested practice that is based upon collective professional experience. Recommended practice goes beyond the minimum requirements of the procedure and should be implemented when appropriate.

2. SCOPE

Geosciences Standard Operating Procedure (SOP) EI-GS037 describes standards for well development and outlines how such development activities will be conducted for projects executed by Shaw Environmental & Infrastructure, Inc. (Shaw E & I). The SOP addresses technical requirements and required documentation. Responsibilities of individuals performing the work are also detailed. Additional project-specific requirements for well development may be prepared, as necessary, to supplement this procedure and address project-specific conditions and/or objectives.

3. REFERENCES (STANDARD INDUSTRY PRACTICES)

Well development should follow accepted industry practices. These industry practices are presented in the latest version of the following ASTM Standards:

ASTM D 5521	Standard Guide for Development of Ground-Water Monitoring Wells in Granular Aquifers
ASTM D 5092	Standard Practice for Design and Installation of Ground Water Monitoring Wells in Aquifers.
ASTM D 6724	Standard Guide for Installation of Direct Push Ground Water Monitoring Wells
ASTM D 6725	Standard Guide for Installation of Direct Push Ground Water Monitoring Wells

Additional reference materials, which will be useful for planning and conducting well development, include the following:

- Aller, Linda, B.W. Truman, G. Hackett, R.J. Petty, J.H. Lehr, H. Sedoris, D.M. Nelson, J.E. Denne, 1989, *Handbook of Suggested Practices for the Design and Installation of Ground-Water Monitoring Wells*, National Water Well Association, Dublin, Ohio.
- Driscoll, Fletcher G. 1995, *Groundwater and Wells*, Johnson Division, St. Paul, Minnesota.

- Izraell, Ruth, D. Yeskis, M. Collins, K. Davies, B. Zavala, 1992, *Monitoring Well Development Guidelines for Superfund Project Managers*, U.S. EPA Groundwater Forum, Office of Solid Waste and Emergency Response, April 1992.
- U.S. Environmental Protection Agency, 1986, RCRA Ground-Water Monitoring Technical Enforcement Guidance Document, OSWER-9950.1.

Additional reference materials on well development may be found in regulatory or other governmental links on the Internet.

4. DEFINITIONS

The following definitions are applicable to well development and this SOP.

- **Airlift Pumping**—A method of well development for groundwater production wells. It utilizes an airlift pump consisting of two pipes, with one (the air line) inside the other (the eductor pipe) used to withdraw water from a well. The lower ends of the pipes are submerged, and compressed air is delivered through the inner pipe to form a mixture of air and water. This mixture rises in the outer (eductor) pipe to the surface because the specific gravity of this mixture is less than that of the water column. This method of pumping is not usually recommended by regulatory agencies for development of monitoring wells, since volatile organics may be stripped from the groundwater and since the introduction of air can change formation and groundwater chemistry.
- **Backwashing**—The reversal of water flow (due to the addition of water to a well) that causes water to move through the well screen, through the sand pack, and into the formation to loosen bridges and facilitate the removal of fine-grained materials. Only formation water and a pump without a check valve are used for this process. Water is first discharged from the well and then the pump is shut down. The corresponding water column in the eductor line then flows back down through the pump and into the well, causing the flow reversal.
- **Bailer**—A cylindrical steel, stainless steel, Polyvinyl Chloride (PVC), or Teflon container with a valve at the bottom, and sometimes open at the top, for admission of fluid and sediment. The bailer is attached to a wire line or string and used in recovering and removing water, cuttings, mud, sand, or debris from the bottom of a well.
- **Bailing**—A technique whereby a bailer is lowered to the bottom of a well and then raised to recover and remove water, cuttings, mud, sand, or debris from the well.
- **Eductor Pipe**—The pipe used to transport water discharged to the surface from a pump (during pumping or air lifting).
- **Hydraulic Jetting**—A well development method that employs a jetting tool with nozzles and a high-pressure pump to force water outwardly through the well screen, through the filter pack, and into the adjacent formation to dislodge fine sediment and sand bridges and rehabilitate formation damage from drilling.
- **Overpumping**—Pumping at rates generally greater than those used during sampling, well purging, or general groundwater extraction. Commonly combined with backwashing or surging of the well as part of development.
- **Suction Bailer (Also referred to as a Double Bailer or Moran Bailer or Sand Pump)**—A suction bailer is a specially built bailer that can remove sediment or other foreign objects from the bottom of a monitoring or extraction well. The upward and downward movement of the bailer may also help to surge the well. A suction bailer is one of the tools used by a well development subcontractor.

- **Surge Block**—A plunger-like tool consisting of leather or rubber discs sandwiched between steel or wooden discs that may be solid or valved (vented surge block) that is used in well development. (See "Surging" below.)

- **Surging**—A well development technique using a number of different types of equipment or methods to create a strong inward and outward movement of water through the well screen, through the sand pack, and into the formation.

- **Turbidity**—The state, condition, or quality of opaqueness or reduced clarity of a fluid due to the presence of suspended matter. Also, a measure of the ability of suspended material to disturb or diminish the penetration of light through a fluid; commonly measured as nephelometric turbidity units (NTUs).

- **Washing**—The addition of water to a well to conduct development. This is usually done for wells with the water level in the middle of the well screen interval. That is, part of the sand pack and formation is not saturated. The water is added to develop the unsaturated portion of the well screen, sand pack, and adjoining formation. Potable water from a domestic water supply is commonly used; however, most regulatory agencies do not like the use of this technique for monitoring wells. Any water added to the well must be of known and acceptable chemistry. The effects of the wash water on the formation groundwater chemistry must also be ascertained.

  Well water may also be used to wash the well cap and inside of the casing (above the static water level) of sediment from the development process. This application of washing is usually acceptable to the regulatory community.

- **Well Development**—The use of any number of mechanical techniques to remove fine-grained materials, drilling fluids, and sand bridges from the well screen, sand pack, and adjacent formation to provide sediment-free representative groundwater samples, enhance well yields, and help restore natural hydraulic conditions in the formation.

5. RESPONSIBILITIES

5.1 Procedure Responsibility

The Geosciences Discipline Lead is responsible for the development, maintenance, and revision of this procedure. Any questions, comments, or suggestions regarding this technical SOP should be directed to the Geosciences Discipline Lead. The Geosciences Discipline Lead's location and associated contact information can be found on the Shaw Group intranet site, ShawNet.

5.2 Project Responsibility

Employees conducting well development are responsible for meeting the requirements of this procedure. Employees conducting field technical review of well development activities are also responsible for following appropriate portions of this SOP. Project participants are responsible for recording information in sufficient detail to provide objective documentation (field notes, reports, etc.) that the requirements of this SOP have been met. Such documentation shall be retained as project records.

6. PROCEDURES (TECHNICAL REQUIREMENTS AND STANDARDS)

This section presents information on basic considerations and methods, planning and preparation, basic procedures and requirements, and technical review requirements for well development.

6.1 Basic Considerations and Methods

Well development is conducted to help restore natural hydraulic conditions in the formation, enhance well yields, and provide sediment-free water samples from the wells that are representative of groundwater in the formation. The development process involves use of one or a combination of mechanical methods to 1) recover fluids introduced into the formation and sand pack during drilling; 2) remove fine-grained materials and sand bridges from the sand pack and adjacent formation; 3) remove the "skin" from the borehole wall; and 4) help repair damage to the formation from drilling.

Well development should be conducted on all newly installed wells, after a specified period of time (e.g., a minimum of 48 hours and not more than 7 days after sealing the annular space of the well). State or local regulatory agencies may specify the time period; individuals planning well development activities should be aware of such requirements relative to their specific site(s). Monitoring wells may also be redeveloped after they have not been used for a period of time, when they show evidence of sediment buildup in the bottom of the well, or when they start yielding turbid water samples. Extraction/injection wells may also be redeveloped to restore or improve yield and specific capacity, and after rehabilitation efforts.

Many well development methods are currently in use within the industry. These include surging, bailing, pumping, overpumping, airlifting, washing, backwashing, and jetting. Descriptions and information on these methods are provided in Driscoll (1986) and ASTM D 5521. Some combination of methods are specifically planned and implemented for development of wells relative to specific construction parameters and subsurface conditions at a particular site. For instance, monitoring wells can be developed by surging and pumping; surging and bailing; bailing, pumping, and backwashing; etc. The focus of developing monitoring wells is generally towards cleaning the filter pack to provide representative groundwater samples, though some monitoring wells are used for slug and specific capacity testing and may require more aggressive development. Development methods should be selected to reflect the main objective.

The focus of extraction/injection well development is generally towards restoring the natural hydraulic conditions in the formation and enhancing well yields. Many extraction/injection wells are installed using mud rotary methods. Consequently, development of such wells tends to commonly be a multi-staged process utilizing several different and "aggressive" methods. These methods and operations are utilized to clean the filter pack, breakdown the mud cake, and repair the formation at the filter pack/formation interface. Polyphosphates and/or surfactants may be used to remove drilling mud from the well. Example combinations of methods for extraction/injection well development include airlifting, jetting, and mechanical surging; jetting, pumping, and overpumping; bailing, mechanical surging, and pumping; etc.

The specific combination used should include a method that imparts a surge or flow of water from the well out thorough the sand pack, into the formation, and back through the sand pack into the well. This surge or flow is necessary to remove fine-grained materials and drilling fluids, and to break up sand bridges in the sand pack and formation.

The exact combination of development methods to be used for wells at a site depends on a variety of project- or site-specific factors that include, but are not limited to, the following:

- Development objectives
- Intended use and type of the well
- Well construction parameters
- Drilling methods used, including type of drilling fluids and volume of fluid loss
- Regulatory requirements

- Type(s) of contaminants present, or potentially present, including non-aqueous phase liquids (NAPLs)
- Type and composition of formation at the well completion interval
- Water level position inside the well
- Other previous well development issues or problems occurring at the site
- Types and relative costs of methods available by local subcontractors

Certain special well construction and site conditions may require additional evaluation and consideration for the planning and implementation of well development activities. Some conditions potentially requiring special planning and implementation considerations are listed in Attachment 1.

Individuals planning and selecting appropriate development methods/combinations for their particular wells should consider and evaluate the above information. They should look at methods and techniques used for previous similar wells (completed in the same formations) on site or near the site area. They may also seek the aid of an experienced senior geologist or hydrogeologist. Individuals needing assistance in finding qualified technical assistance may consult internal Shaw technical listings for experts in well development.

6.2 Planning and Preparation

Planning and preparation for well development activities involves the following:

- Identifying specific well development objectives and development methods to be used (including possible limitations to the development methodologies)
- Determining specific well(s) to be developed, locations of the wells, and specific identification numbers for the wells
- Securing construction details and information on the expected condition of each of the wells to be developed
- Listing known or assumed hydrogeologic conditions for each well, e.g., high yield, low yield, potential for presence of non-aqueous phase liquid (NAPL)
- Identifying and listing exact equipment to be used (simple or complex)
- Determining type, duration, and frequency of field parameter measurements to be made during development
- Identifying and listing exact criteria to be used to determine when a well has been sufficiently developed
- Describing the estimated duration(s) of the development effort per well
- Specifying water and sediment handling and disposal requirements
- Identifying site access and restrictions on equipment layout
- Determining and listing expected hardcopy and electronic work products to be generated from the development activities
- Listing all pertinent Health and Safety issues and requirements, including those contained in the project-specific Health and Safety Plan(s), relative to work activities
- Identifying applicable requirements of this and other SOPs and pertinent project-specific requirements for the well development effort

- Determining and describing detailed project-specific procedures for the well development effort
- Identifying all main subcontractor requirements for well development to be compiled into subsequent Statement of Work to procure subcontractor services
- Procuring the appropriate well development subcontractor

The above information is necessary for effective implementation of the well development effort and should be presented in the project work plans, especially the detailed project-specific development procedures.

Prior to initiating well development activities in the field, site personnel and subcontractors should be briefed on the above information and any additional information contained in the project work plans, along with project or corporate health and safety requirements. This is done to familiarize personnel with specific objectives, requirements, procedures, and hazards associated with the site as well as health and safety procedures associated with the field operation. The Project Manager or designee is responsible for ensuring that the briefing is conducted.

6.3 Basic Procedures and Requirements

This text describes the basic method or process for conducting well development. It is not possible to write a single specific procedure for well development applicable to the wide range of sites encountered and methods available. Attachments 2 and 3 provide example general procedures for monitoring well and extraction/injection well development, respectively. These example procedures should be modified or customized, as appropriate, to address specific site conditions and requirements. These detailed project-specific procedures should be presented in the project work plans.

The basic process for monitoring well development is as follows.

- Decontaminate the development rig and all development equipment, including pumps, bailers, riser pipes, etc., in accordance with appropriate Shaw E & I technical SOPs and/or project-specific requirements/procedures.
- Calibrate all field measuring and testing equipment (e.g., pH, temperature, conductivity, turbidity, dissolved oxygen meters, etc.) according to the instrument manufacturer's specifications, and appropriate Shaw E & I technical SOPs and/or project-specific requirements.
- Access the wellhead according to the project work plans; visually inspect the well to ensure that it is undamaged, properly labeled, and secured (locked). Any observed problems with the wellhead should be noted on the appropriate forms and reported to the Site Superintendent.
- Unlock the well and obtain a depth to water level measurement according to applicable Shaw E & I technical SOPs or project-specific procedures/requirements. Sound the total well depth and compare that value with the value shown on the well completion diagram or form. In addition, observe and record any unusual conditions such as possible obstructions or tight-spots as the well tape is lowered or removed from the well. (Do not insert bailers, pumps, or surge blocks into the well if obstructions, parting of the casing, or other damage to the well are suspected. Instead, report the conditions to the Site Superintendent and Project Manager and obtain approval to continue or cease well development activities, as appropriate.)
- Calculate the volume of water in the well (well volume). The equation for the calculation is shown on the Example Well Development Record (Section 8).
- Collect an initial sample of the well water and measure and record field parameters on the appropriate forms according to the project work plans.

- Compare the measured total well depth to the well construction diagram. If sand or sediment is present inside the well, it should be first removed. This is usually done by bailing; however, airlifting may also be used for extraction/injection wells. (Note: during the initial lowering of the bailer into the well, direct the subcontractor to lower the bailer slowly, and not drop the bailer to the bottom of the well. Failure to do this may cause the bailer to stick, break, or dislodge the well bottom cap or sump, resulting in costly repair/replacement of the well).

- Periodically measure the depth to water and check to see that the well recovers sufficiently during and immediately after sediment removal.

- Begin developing by applying the development method or combination of methods as specified in the project work plans. Begin gently at first and then progress as appropriate and specified.

- While development progresses, take periodic water level measurements (as specified in the project work plans) (at least one every 5 to 10 minutes) to determine if drawdown is occurring, and record the measurements on the appropriate forms.

- While development progresses, measure the water discharge and calculate the rate at which water is being removed from the well. Record the volume, time, and rate on the appropriate forms. Record any observations made regarding general well yield and/or recovery.

- While developing, periodically collect water directly from the pump, eductor pipe, or bailer discharge and measure for specified parameters. The time intervals for collection and measurement (e.g., every 15 minutes, etc.) should be listed in the project work plans. The parameters measured usually include temperature, pH, conductivity, and turbidity. Dissolved oxygen (DO) and oxidation/reduction potential (ORP) are optional parameters that may also be measured. All measurements and associated times should be recorded on the appropriate form(s).

- Development should continue until a predetermined set of conditions are met. The exact conditions and criteria should be specified in the project work plans. These can include the following:

  – The well water appears clear and sediment-free to the unaided eye

  – The sediment thickness remaining in the well is less than 1 percent of the screen length

  – A predetermined number of well volumes (previously calculated) of water, usually from three to five, have been removed from the well

  – The final turbidity goal (usually 5 or 10 NTUs) has been attained

  – The measured indicator parameters have stabilized. Stabilization is defined where three or more readings are within tolerances specified in the project work plans. Example tolerances and indicator parameters include 0.1 units for pH; 1 degree F or less for temperature; and 10 percent or less for conductivity.

  – Drilling fluids have been sufficiently removed from the formation, as determined by a review of measured parameters

  – Sand production during pumping is less than or equal to a specified value (e.g., 3 parts per million [ppm])

Terminating development prior to attaining the required water removal and stabilized parameters will require the concurrence of the Project Geologist/Hydrogeologist. The Project Geologist/ Hydrogeologist is responsible for ensuring that development activities are appropriately planned and implemented. The individual selected as the Project Geologist/Hydorgeologist should be a senior professional with experience in planning, implementing, and evaluating well development programs.

- Once development is considered complete, obtain a final water level and turbidity measurement and record on the appropriate form(s). Collect a 1-pint sample of the well water for storage and photographing.
- Remove all equipment from the well and decontaminate appropriately for storage or development of another well according to the project work plans.
- Complete documentation of the well development event on the appropriate form(s). At a minimum, the following information should be recorded:
  - Project name/client name
  - Project number
  - Well I.D. number
  - Location
  - Start and end dates
  - Developer/subcontractor
  - Well diameter
  - Total depth of well as installed and at end of development
  - Top and bottom depth of screen/sand pack
  - Static water level
  - Development method(s) used
  - Equipment used; decontamination method and calibration method
  - Record of water levels, volumes removed, measured parameters, measurement times, and any observations
- Collect and appropriately transport and dispose of water removed from the well in accordance with the project work plans and regulatory requirements.
- Allow the well to recover for a time period specified in the project work plans prior to sampling (generally 24 to 48 hours - check for local and/or regulatory requirements).

6.4 Technical Review

All well development procedures, data analysis, and results (e.g., reports, etc.) should undergo technical review. It is recommended that the technical reviewer also provide review/oversight of the actual field implementation of well development activities. The technical reviewer should be an experienced senior geologist or hydrogeologist. At a minimum, the technical reviewer should be a person capable of planning, conducting, and evaluating well development activities and results. Individuals needing assistance in finding qualified technical reviewers may consult internal Shaw technical listings for experts in well development.

Any issues raised during the technical review should be resolved between the reviewer and staff conducting the well development activities before external (i.e., outside of Shaw) use or submission of the results. The technical review comments and issues, and corresponding resolution, shall be documented and filed with the project records. Such records should be maintained until project closeout.

7. ATTACHMENTS

- Attachment 1, Conditions Potentially Requiring Special Well Development Considerations
- Attachment 2, Example Monitoring Well Development Procedure
- Attachment 3, Example Extraction/Injection Well Development Procedure

8. FORMS

- Example Well Development Record

Attachment 1
Conditions Potentially Requiring Special Well Development Considerations

Wells completed in fine-grain-dominated formation materials (i.e., in units dominated by clay, silt, or fine sand); not in an aquifer – For some of these formations, no well design or development technique can reduce the turbidity of the water or improve the well efficiency or hydraulic conductivity of the formation. Aggressive development of such wells can actually damage the wells or substantially increase the turbidity of the water. Suitable objectives and methods will need to be compiled for the development effort and possibly discussed with the client and regulatory agencies beforehand. Development of such wells should be conducted and progress carefully.

Wells with a minimal height of water column (e.g., less than 2 feet) inside the well screen – Such wells should not be surged, but can be developed with bailing and pumping, and may need to be developed again in stages; that is, come back in the wet season when the water level may be higher. These wells may be developed by bailing (to remove sediment) and pumping, and could also be developed by washing; however, any water added to the well must be of acceptable and known chemistry. The effect of such water on the formation groundwater chemistry must also be ascertained. Such use will also likely require prior regulatory approval. All water added to the well should be removed; this is not always possible.

Damaged wells – Damaged or obstructed wells should never be developed or redeveloped. Such wells first need to be repaired or replaced.

Use of surge blocks in PVC wells/well screens – The use of surge blocks in such wells has a high potential to collapse or damage the PVC well screens. A vented surge block may help. The development subcontractor should use the surge block carefully in a slow and gentle manner when starting to surge a well. When sediment is first removed from the well by bailing, pumping, or airlifting it is important to monitor the water level to see if the well recharges sufficiently. A well that does not recharge sufficiently has a sediment-blocked screen or sand pack; this will result in collapsing of the screen during surging if the blockage isn't removed first.

Small diameter wells (i.e. < 2 inches in diameter) – Such wells are commonly installed using direct-push methods and usually cannot be developed with a surge block. They are commonly developed by bailing and pumping. Because many of these wells are installed in fine-grain-dominated formations, development should be conducted carefully and initially at low discharge rates.

Use of long or heavy bailers with power winch systems – Long stainless steel bailers are commonly used by development subcontractors with power winch systems. At times, the subcontractor lowers the bailer too quickly and the bailer hits and dislodges the bottom cap or well sump. The subcontractor must be instructed to first carefully lower the bailer to the bottom of the well and mark the cable appropriately. Thereafter the subcontractor must lower the bailer carefully, noting when the bailer is approaching the bottom of the well and slowing the winch down appropriately.

Attachment 2
Example Monitoring Well Development Procedure

This text provides an example monitoring well development procedure by bailing, pumping, and back-washing. Other projects and sites may have different conditions and requirements and use different development methods. This example procedure may therefore be modified or customized, as appropriate, to address specific site conditions, requirements, and methods.

The example procedure is as follows:

1. Develop the well no less than 2 days and not more than 7 days after well installation is complete.

2. Decontaminate the development rig and all downhole equipment (e.g., pumps, bailers, discharge pipes, etc.) in accordance with the project work plans and Shaw E & I SOPs. This includes steam cleaning with unchlorinated water from an approved source followed by thorough rinsing with 100-PPM unchlorinated, organic-free water.

3. Inspect the equipment to ensure that it is in good working order. Repair or replace damaged or malfunctioning equipment and decontaminate appropriately.

4. Calibrate and test all measuring and testing equipment prior to use according to manufacturer's specifications and appropriate project-specific requirements and procedures.

5. Access the wellhead according to the project work plans; visually inspect the well to ensure that it is undamaged, properly labeled, and secured (locked). Any observed problems with the wellhead should be noted on the appropriate forms and reported to the Site Superintendent.

6. Unlock the well and obtain a depth-to-water level measurement according to applicable Shaw E & I technical SOPs or project-specific procedures/requirements. Then sound the total well depth and record the measurements on the appropriate forms specified in the project work plans. (If LNAPL or DNAPL is expected, use an interface probe for monitoring according to applicable Shaw E & I technical SOPs.)

   In addition, observe and record any unusual conditions such as possible obstructions or tight-spots as the well tape is lowered or removed from the well. (Do not insert bailers or pumps into the well if obstructions, parting of the casing, or other damage to the well are suspected. Instead, report the conditions to the Site Superintendent and obtain approval to continue or cease well development activities, as appropriate.)

7. Calculate the volume of water in the well (well volume). (The equation for the calculation is shown on the Example Well Development Record [Section 8].)

8. Slowly lower a bailer into the well to mid-screen and collect a water sample. Empty the sample into a vessel and measure and record field parameters on the appropriate forms according to the project work plans and as discussed below.

9. Compare the measured total well depth to the well construction diagram. If sand or sediment is present inside the well, it should be first removed by bailing. After the bailer is initially placed on the bottom of the well, check to make sure that the subcontractor marks the wire line as to the total depth of the well. Bail the sediment from the bottom of the well.

10. Periodically measure the depth to water and check to see that the well recovers sufficiently during and immediately after sediment removal via bailing.

11. Once sediment removal is complete, measure the water level. Allow sufficient equalization of the water level to commence pumping.

12. Lower a decontaminated electric-powered submersible pump (without check valve) into the well and pump the well.

13. Periodically during pumping, the well will be backwashed by turning the power of the pump off and allowing the water in the pump pipe to flow back into the well. (This creates a surging action of water into the screen, sandpack, and formation.) Additionally, the pump will be periodically lifted up and down inside the well screen while the pump is operating. Water will not be added to the well to aid in development, nor will any type of airlift techniques be used.

14. While developing, periodically collect water directly from the pump eductor pipe or bailer discharge every 15 minutes and measure for the following parameters: temperature, pH, conductivity, turbidity, and possibly dissolved oxygen (DO) and oxidation/reduction potential (ORP). Record all measurements and associated times on the appropriate form(s).

15. Rinse the cap and all internal components of the well casing above the water table with well water to remove all traces of soil/sediment/cuttings. Washing will be conducted before and/or during development.

16. Development will proceed until the following conditions are met:

    - The well water appears clear to the unaided eye.
    - The measured turbidity is $\leq$ 5 NTU.
    - The sediment thickness remaining in the well is less than 1 percent of the screen length (the depth to the water/sediment interface will be measured with a weighted tape and the percentage of sediment height to screen length will be calculated).
    - At least three well volumes (including the saturated filter material in the annulus), plus the volume of water/drilling fluid lost during the drilling process has been removed from the well.
    - The pH, temperature, and conductivity of the development water have stabilized. Stabilization is defined as successive readings in which the pH has changed $\leq$ 0.1 pH units, temperature has changed $\leq$ 1 degree F, and conductivity has changed by less than 10%.

17. Once development is considered complete, obtain a final water level and turbidity measurement and record the measurement on the appropriate form(s). Collect a 1-pint sample of the well water; label the jar with the well number and development date. Agitate the sample and immediately photograph with a 35-millimeter camera in a backlit setting so that the clarity of the water is visible. Prepare the sample for storage according to the project work plans.

18. Remove all equipment from the well; if the equipment is to be stored, decontaminate appropriately according to the project work plans.

19. Cap and secure the wellhead.

20. Complete documentation of the well development event on the appropriate form(s). At a minimum, the following information should be recorded:

    - Project name/client name
    - Project number
    - Well I.D. number
    - Location
    - Date of well installation.
    - Start and end dates of development
    - Developer/subcontractor
    - Well diameter

- Height of well casing above ground surface
- Quantity of water lost during drilling
- Total depth of well as installed and at end of development
- Top and bottom depth of screen/sand pack
- Static water Level
- Development method(s); description of pumping technique
- Type and size/capacity of pump used
- Equipment used, decontamination method, and calibration method
- Record of water levels, volumes removed, measured parameters, and measurement times
- Any observations including physical character of removed water and changes in clarity, color, particulates, and odor during development

21. Collect and appropriately transport and dispose of water removed from the well in accordance with the project work plans and regulatory requirements.
22. Allow the well to recover for at least 48 hours prior to sampling.

Attachment 3
Example Extraction/Injection Well Development Procedure

This text provides an example extraction/injection well development procedure by airlifting, jetting, surging, pumping, and overpumping. Other projects and sites may have different conditions and requirements and use different development methods. This example procedure may therefore be modified or customized, as appropriate, to address specific site conditions, requirements, and methods. Extraction and injection well development is a multi-staged process whereby different operations and techniques are utilized to clean the filter pack, breakdown the mud cake, and repair the formation at the filter pack/formation interface.

During extraction/injection well development, chemical additives may need to be used, with prior regulatory agency approval, to assist in breaking down mud cake built up during mud rotary drilling. Drilling mud can be a polymer mud (e.g. Polygel), a bentonite-based mud, or a combination of both (e.g. Quikgel). An example of an additive for the dispersal of polymer drill mud is sodium hypochlorite (which will release free chlorine into the well). An example of using an additive to disperse bentonite mud or other clays is the addition of polyphosphates. Polyphosphates should be added in accordance with the manufacturer's specifications. Whenever using chemical additives, care must be used to remove all chemical additives. Over-pumping of the well is recommended to remove the chemical additives.

The example procedure is as follows:

1. Develop the well no less than 2 days and not more than 7 days after well installation is complete.

2. Decontaminate the development rig and all downhole equipment (e.g., pumps, bailers, surge blocks, jetting tools, discharge pipes, etc.) in accordance with applicable Shaw E & I technical SOPs and project-specific requirements/procedures. This includes steam cleaning with unchlorinated water from an approved source followed by thorough rinsing with 100-ppm unchlorinated, organic-free water.

3. Inspect the equipment to ensure that it is in good working order. Repair or replace any damaged or malfunctioning equipment and decontaminate appropriately.

4. Calibrate and test all measuring and testing equipment prior to use according to manufacturer's specifications and appropriate project-specific requirements and procedures.

5. Access the wellhead according to the project work plans; visually inspect the well to ensure that it is undamaged, properly labeled, and secured (locked). Any observed problems with the wellhead should be noted on the appropriate forms and reported to the Site Superintendent.

6. Unlock the well and obtain a depth-to-water level measurement according to applicable Shaw E & I technical SOPs or project-specific procedures/requirements. Then sound the total well depth and compare that value with the value shown on the well completion diagram or form. In addition, observe and record any unusual conditions such as possible obstructions or tight-spots as the well tape is lowered or removed from the well. (Do not insert bailers, pumps, jetting tools, or surge blocks into the well if obstructions, parting of the casing, or other damage to the well is suspected. Instead, report the conditions to the Site Superintendent and obtain approval to continue or cease well development activities, as appropriate.)

7. Obtain a water level depth measurement and sound the bottom of the well. (If LNAPL or DNAPL is expected, use an interface probe for monitoring according to applicable Shaw E & I technical SOPs.)

8. Calculate the volume of water in the well (well volume). (The equation for the calculation is shown on the Example Well Development Record [Section 8].)

9. Collect an initial sample of the well water and measure and record field parameters on the appropriate forms according to the project work plans and as discussed below.

10. Compare the measured total well depth to the well construction diagram. If sand or sediment is present inside the well, they should be first removed by airlifting. (Note: if the air supply is from an air compressor

and the well will be sampled for petroleum hydrocarbons, an appropriate filter will need to be placed between the airline and the compressor.) Periodically measure the depth to water and check to see that the well recovers sufficiently during and immediately after sediment removal via airlifting.

11. Periodically measure the depth to water and check to see that the well recovers sufficiently during and immediately after sediment removal.

12. Once sediment removal is complete, the entire screen shall be jetted with water using a jetting tool (see page 516 of Driscoll [1995]). The jetting velocity shall be between 150 and 300 feet per second, or using a pressure not to exceed screen manufacturer's recommendations. The Sediment should then be removed from the bottom of the well via airlifting. Two cycles of jetting should be required.

13. Mechanically surge the entire length of the well screen with an approved appropriate-sized surge block to remove sediment from the filter pack. The surging should start slowly at first in the blank casing just above the screen, then get progressively stronger to be effective.

14. The surging shall proceed in 10-foot intervals from just above the top of the screen and working down. Each 10-foot section should be surged for 10 minutes. The rate of ascent and descent of the surge block within the 10-foot section should be increased to about 3 feet per second, or as directed. The section of screen should then be isolated with a shell-catcher, or other device, and pumped at a predetermined rate (the rate will be increased up to the maximum allowable rate) until the return water is clear. The surging shall be repeated until the working section pumps clear after surging. This process shall be continued down the entire length of the well's screened interval. Depending upon the amount of material pulled through the screen into the well, airlifting should be incorporated at any point in this stage of well development to remove sediment and prevent the surge block from becoming sand-locked.

15. Following jetting and surging, a submersible pump will be installed approximately 10 feet below the expected maximum drawdown. The well will be pumped at progressively higher rates until the discharge water is visually clear and sediment free. The pumping rate will be stepped up from the design flow rate to a maximum flow rate of approximately 2 to 5 times higher.

16. While developing, periodically collect water directly from the pump eductor pipe discharge every 15 minutes and measure for the following parameters: temperature, pH, conductivity, turbidity, and possibly dissolved oxygen (DO) and oxidation/reduction potential (ORP). Record all measurements and associated times on the appropriate form(s).

17. Rinse the cap and all internal components of the well casing above the water table with well water to remove all traces of soil/sediment/cuttings. Washing will be conducted before and/or during development.

18. Development will proceed until the following conditions are met:

    - The well water appears clear to the unaided eye.
    - The sediment thickness remaining in the well is less than 1 percent of the screen length (the depth to the water/sediment interface will be measured with a weighted tape and the percentage of sediment height to screen length will be calculated).
    - At least five well volumes (including the saturated filter material in the annulus), plus the volume of water/drilling fluid lost during the drilling process, has been removed from the well.
    - The measured turbidity is $\leq$ 10 NTU.
    - The pH, temperature, and conductivity of the development water have stabilized. Stabilization is defined as successive readings in which the pH has changed $\leq$ 0.1 pH units, temperature has changed $\leq$ 1 degree F, and conductivity has changed by less than 10%.
    - Sand production during pumping is less than 3 parts per million (ppm).

19. Once development is considered complete, obtain a final water level and turbidity measurement and record on the appropriate form(s). Collect a 1-pint sample of the well water; label the jar with the number and development date. Agitate the sample and immediately photograph with a 35-millimeter camera in a backlit setting so that the clarity of the water is visible. Prepare the sample for storage according to the project work plans.

20. Remove all equipment from the well and decontaminate appropriately for storage according to the project work plans.

21. Cap and secure the wellhead.

22. Complete documentation of the well development event on the appropriate form(s). At a minimum, the following information should be recorded:

    - Project name/client name
    - Project number
    - Well I.D. number
    - Location
    - Date of well installation
    - Start and end dates of development
    - Developer/subcontractor
    - Well diameter
    - Height of well casing above ground surface
    - Quantity of water lost during drilling and fluid purging
    - Total depth of well as installed and at the time of development
    - Top and bottom depth of screen/sand pack
    - Static water level
    - Development method(s); description of surging, jetting, and pumping technique
    - Type and size/capacity of pump used
    - Equipment, decontamination method, and calibration methods used
    - Record of water levels, volumes removed, measured parameters, and measurement times
    - Any observations including physical character of removed water and changes in clarity, color, particulates, and odor during development

23. Collect and appropriately transport and dispose of water removed from the well in accordance with the project work plans and regulatory requirements.

24. Allow the well to recover for at least 24 hours prior to sampling.

Shaw® Shaw E & I

EXAMPLE
WELL DEVELOPMENT RECORD

Project Name: _____

Location: _____ Well/Piez. No.: _____

Personnel: _____ Date Installed: _____

Date (Start/End): _____ Csg. Diameter (I.D.): _____

Method of Development: _____ Total Depth (ft. TOC): _____

❑ Surging ❑ Bailing ❑ Pumping ❑ Other (State Method) _____

❑ Original Development ❑ Redevelopment Development Date: _____

Depth to water before developing well: _____

		Volume (V)	Purge Factor	Volume To Purge
Height of Water Column:	_____ feet	_____ =	_____ gal.*	_____ = _____

$V = (B * r_c^2 * L_c * 7.48)+(B*(r_w-r_c)^2*L_s*ø_s*7.48)$= _____ gallons (See Notes below)

Depth purging from: _____ feet Time purging begins: _____

Weather: _____ Screened Interval (ft. BGL): _____

Equipment Nos.: pH Meter _____ EC Meter _____ Turbidity Meter _____

Equipment decontaminated prior to development Y _____ N _____

Describe _____

Date	Time	Water Level (ft. below TOC)	Volume Removed (gal.)	Temp (C or F)	pH	EC	Turbidity	D.O.	Comments

Notes:

- Water levels – Reported to the nearest 0.01 foot.
- pH – Reading rounded to 0.1 pH units
- Electrical conductivity (EC) – Reported to the nearest 10% mhos/cm or
- µmho/cm @25 C or in mS/cm of instrument set range
- Water temperature – Reported to the nearest 0.1 C or F
- Dissolved oxygen (D.O.) report in 0.1 mg/L
- Turbidity report in NTV nearest whole #

Where:

B=3.14

$ø_s$=porosity of the sand pack

r_c =radius of the well casing and screen in feet

L_c=length of water column inside the casing and screen in feet

r_w =radius of the well bore in feet

L_s =length of saturated portion of the sand pack in feet

7.48 gallons/cubic foot=conversion from cubic feet to gallons

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1. PURPOSE

This procedure prescribes the steps to be followed in order to prevent accidents involving the contact with or damage of underground/overhead utilities. The company provides the operational and training practices required to safely execute work where underground/overhead utility hazards may exist.

2. SCOPE

This procedure applies to all excavation and trenching activities.

2.1 Exception Provisions

Anytime a minimum of a 5-foot clearance cannot be obtained by either hand digging, vacuum excavation, or by using geophysical means, the Field Team Leader (FTL) must obtain a variance from the Regional Vice President (or equivalent level such as Operations Director for Federal Business Line) or designee to proceed with drilling operations in that area. This would include an initial verbal variance documented in the field log followed up by a written (email) approval from either the Regional Vice President (or equivalent level or title) or designee. The record of communication will be noted in the field log for the project, and a record of the approval or denial will be placed in the project file. The Health and Safety Department will only serve as a consultant to this procedure and is not required to sign the variance.

A variance form can be obtained in Form EIG-HS-308.1, “Variance Request Form.” A flowchart to assist one in determining how and when a variance should be obtained can be found as Attachment 1, “Flowchart to Obtain a Variance.”

3. REFERENCES

- Shaw Environmental & Infrastructure, Inc. (Shaw E&I) Procedure No. EIG-HS-013, “Health and Safety Procedure Variances”
- Shaw E&I Procedure No. EIG-HS-020, “Accident Prevention Program: Reporting, Investigation, and Review”
- Shaw E&I Procedure No. EIG-HS-050, “Training Requirements”
- Shaw E&I Procedure No. EIG-HS-307, “Excavation and Trenching”
- Shaw E&I Form EIG-HS-308.01, “Variance Request Form”

4. DEFINITIONS

- **Boring Activities**—Any mechanical or manual penetration of the earth’s surface below 5 feet using drilling, Geoprobes, hand auguring equipment, or similar type of equipment. Boring activities also include the installation of stakes or fence posts to a depth of 5 feet or greater.
- **Company**—All wholly-owned subsidiaries of Shaw E&I.
- **Competent Person – Drilling Oversight (CPDO) Training**—When drilling activity is to take place the Shaw FTL must have successfully completed Shaw’s in-house training pertinent to competent person drilling oversight (CPDO Training). The FTL is required not only to have successfully completed CPDO training but to have an appropriate educational background,

coupled with field experience and the authority to make changes to correct deficiencies, or to stop the job if need be.

- **Competent Person – Excavation and Trenching—A person** who is capable of identifying existing and predictable hazards in the excavation/trenching work area and who has the authority to take prompt corrective measures to eliminate them. NOTE: Excavation/Trenching training is required when trenching/excavation hazards are present/anticipated (i.e., spoil piles, use of 3-foot or larger diameter augers, or other circumstances) but only recommended when trenching/excavation hazards are not present/anticipated.
- **Excavation Activities**—Any mechanical or manual penetration of the earth's surface below 5 feet using heavy equipment such as excavators, backhoes, dozers, etc. Excavation activities also include manual use of hand shovels, pick-axes, etc. to a depth of 5 feet or greater. The use of 3-foot or larger diameter augers is also included.
- **Excavation**—Any manmade cut, cavity, trench, or depression in an earth surface formed by earth removal.
- **Underground Utility**—Any active or inactive subsurface or buried structure that is or was designed to service a public or private facility. These may include, but are not limited, to the following:
  - Electric power lines
  - Natural gas lines
  - Telephone lines
  - Telephone cables and fiber optic lines
  - Water lines
  - Steam and pneumatic lines
  - Sewer lines
  - Drain lines
  - Underground storage tanks
  - Septic tanks
  - Process or product lines
- **Overhead Utility**—Any active or inactive overhead structure that is or was designed to service a public or private facility. These may include, but are not limited, to the following:
  - Overhead power lines
  - Overhead telephone lines
  - Overhead fiber optic lines
  - Overhead cables
  - Overhead supports
  - Overhead piping
  - Traffic lights
  - Utility bridges

- **One Call Center**—Each state has a One Call, Dig Safe, Miss Dig, etc. dial-in number for requesting mark-out of buried public utilities, such as gas lines, electrical lines, telephone/cable lines, sewer lines, and water lines. This number is typically called a minimum of 72 hours prior to subsurface activities depending on the particular state in which the work will be conducted. The One Call Center will notify the local public utilities for a line location mark-out for the particular location. The individual public utilities must locate and mark-out the utilities upon request. In most cases, the markouts will not be performed on private property. A confirmation number is established and confirmation report generated and submitted to the requester.

- **As-Built Drawings**—As-built drawings are blueprints that are usually obtained from the facility owner or client. They show original buried utilities and any modifications that have been made.

- **Private Utility Locating Service**—A private utility locating service is a firm established to locate underground utilities using specialized locating equipment, such as ground penetrating radar location devices or radio transmitter type utility locating equipment.

- **Fiber Optic Service Lines**—Fiber optic service lines are communication lines that are buried underground. When damaged, these lines are very expensive to replace. Fiber optic companies routinely provide on-site supervision, if requested. The company encourages this practice.

- **Field Team Leader**—The FTL is the person with whom the responsibility of the execution of the field work resides. This person may be the Project Manager, Senior Geologist, Staff Geologist, etc. This individual must have the sufficient experience, training, and field knowledge to ensure all site configuration information is collected and analyzed.

- **Site Survey**—A site survey is an inspection of the work site to look for signs of other buried utilities that may not be indicated through as-built drawings or through utility locating services. The survey typically involves inspection of overhead electrical services, inspection of basements, utility rooms, garages, etc., for signs of old electrical conduits or fuel/water/septic lines. The FTL must contact the appropriate site representative to provide any additional information that may be marked on the as-builts.

- **Vacuum Excavator**—Equipment that excavates underground utilities with a combination of alternating water-and-air or air-and air pulsations (e.g., Air knife, water knife, etc.)

5. RESPONSIBILITY

5.1 Procedure Responsibility

The Executive Director of Health and Safety is responsible for the issuance, revision, and maintenance of this procedure. Also, see Attachment 2, “Underground/Overhead Utility Contact Prevention Responsibility Matrix,” for matrix of responsibilities.

5.2 Action/Approval Responsibilities

The Responsibility Matrix is Attachment 2.

6. PROCEDURE

Underground/overhead utilities may be encountered at any job site. The guidelines established in this procedure were developed to help identify and mitigate the potential hazards associated with this type of work.

Any subsurface activity is subject to the underground utility locating regulations for the state where the work will be conducted. This procedure authorizes the use of state, local, or other required practices, but requires that the practice, which most limits the liability to Shaw for damaged utilities, is utilized. No variance is required under these circumstances, but the project-specific Health and Safety Plan (HASP) or Work Plan shall fully document these more protective procedures.

6.1 Boring Activity Requirements

6.1.1 Preliminary Requirements

The Project Manager or designee must visit the site to mark the boring locations so they can be clearly identified and then contact the One Call Center for the state in which the work is to be performed in to formally request a utility mark out at the particular work location(s).

Prior to assignment of work the FTL will assure that all affected employees receive an overview of the hazards of encountering underground/overhead utilities. The FTL is responsible to review this procedure, the work practices to control these hazards, and the roles and responsibilities of each worker with the work crew. This procedure and other requirements that may be contained in the site specific HASP shall be reinforced during daily Tailgate Safety Meetings.

6.1.2 Operating Requirements

Prior to conducting any project site activities, the FTL must ensure that all existing underground/overhead utilities in the work area are located per the state or local mark-out protocols. The Pre-Boring/Excavation Checklist (Form EIG-HS-308.02) will assist the FTL with this assessment. Documentation of utility mark-out must be completed using the Utility Mark-out Documentation form (EIG-HS-308.03). No boring work is to be performed until all utility mark-outs are verified.

While on site, the FTL must conduct a site survey to search for signs of other buried or overhead utilities. This will include areas such as garages, basements, etc. The results of such surveys must be documented on the Utility Mark-out Documentation form (EIG-HS-308.03). The property owner, client, or facility operator must be consulted on the issue of underground utilities. All knowledge of past and present utilities must be evaluated prior to conducting work.

After all mark outs have been completed, and the boring locations have been accepted by the FTL prior to drilling, each borehole location must be hand dug or vacuum excavated to a minimum of 5 feet bgs.

If the investigation requires boreholes in an area not covered by a municipal one call system (on private property), then the FTL must utilize appropriate geophysical techniques, hand held utility locating devices, a private utility locating firm, or other approved method to determine the locations of underground utilities. The current accepted geophysical methods for the investigation and location of buried utilities include: Ground Penetrating Radar (GPR), Time Domain and/or Frequency Domain Electromagnetic methods, Magnetometer, and Inductive/Conductive Radio-Magnetic methods. The geophysical methods can be very useful for locating buried utility lines in areas where hand digging is not possible or practical. However, it must be noted that these methods do have limitations that are a function of soil conditions, depth of investigation, imaging resolution, or other factors.

If it is determined that a noninvasive geophysical investigation may be needed, assistance with selecting the appropriate method(s) can be obtained from the Shaw E&I Science and Technology Division, Geophysics & Mapping Group, and a variance request must be submitted and approved prior to the inception of intrusive field activity.

Should the local geology be prone to refusal or should there be any other reason the boring location cannot be cleared to a minimum of 5 feet bgs then the appropriate aforementioned alternative methods should be utilized to ensure the boring location is clear of utilities 5 feet bgs, and a variance request must be submitted for review.

6.2 Excavation Activity Requirements

6.2.1 Preliminary Requirements

The Project Manager or designee must visit the site to mark the excavation locations so they can be clearly identified and then contact the One Call Center for the state in which the work is to be performed in to formally request a utility mark out at the particular work location(s).

Prior to assignment of work the FTL will assure that all affected employees receive an overview of the hazards of encountering underground/overhead utilities. The FTL is responsible for reviewing this procedure, the work practices to control these hazards, and the roles and responsibilities of each worker with the work crew. This procedure and other requirements that may be contained in the site specific HASP shall be reinforced during daily Tailgate Safety Meetings.

6.2.2 Operating Requirements

Prior to conducting any project site activities, the FTL must ensure that all existing underground/overhead utilities in the work area are located per the state or local mark-out protocols. Documentation of utility mark-out must be completed using the Utility Mark-out Documentation form (EIG-HS-308.03). No boring work is to be performed until all utility mark-outs are verified.

While on site, the FTL must conduct a site survey to search for signs of other buried or overhead utilities. This will include areas such as garages, basements, etc. The results of such surveys must be documented on the Utility Mark-out Documentation form (EIG-HS-308.03). The property owner, client, or facility operator must be consulted on the issue of underground utilities. All knowledge of past and present utilities must be evaluated prior to conducting work.

After all mark outs have been completed, and the excavation locations have been accepted by the FTL prior to excavation, each utility identified inside the excavation location must be hand dug (see restrictions under Section 5.3) or vacuum excavated to a verify the utility location. The utility locations must be exposed in enough locations to verify its path of travel. If possible, the excavation location should be moved away from any utilities.

If the investigation requires excavation activities in an area not covered by a municipal one call system (on private property), then the FTL must utilize appropriate geophysical techniques, hand held utility locating devices, a private utility locating firm, or other approved method to determine the locations of underground utilities. The current accepted geophysical methods for the investigation and location of buried utilities include: GPR, Time Domain and/or Frequency Domain Electromagnetic methods, Magnetometer, and Inductive/Conductive Radio-Magnetic methods. The geophysical methods can be very useful for locating buried utility lines in areas where hand digging is not possible or practical. However, it must be noted that these methods do have limitations that are a function of soil conditions, depth of investigation, imaging resolution, or other factors.

If it is determined that a noninvasive geophysical investigation may be needed, assistance with selecting the appropriate method(s) can be obtained from the Shaw E&I Science and Technology Division, Geophysics & Mapping Group, and a variance request must be submitted and approved prior to the inception of intrusive field activity.

6.3 Other Requirements

Only hand digging is permitted within 3 feet of underground high voltage, product, or gas lines. Once the line is exposed heavy equipment can be used, but must remain at least 3 feet from the exposed line.

Only experienced, demonstrably proficient equipment operators, as determined by the Project Manager, will be used to operate such heavy equipment as drill rigs, backhoes, front-end loaders, cranes, etc.

Due to the sensitivity and costs associated with damage to fiber optic cables, the FTL must have documented verbal contact and an agreement with the fiber optic company for all work within 50 feet of the fiber optic cables. Subsurface investigations near fiber optic cables are more fully discussed in site specific HASPs.

6.4 Overhead Utilities Requirements

The FTL is responsible for marking (warning tape, flags, etc.) overhead utility locations where heavy equipment, or other equipment, has the potential for contacting overhead utilities. Conduct a site inspection on a daily basis to determine where activities will take place and the location of overhead utilities and overhead obstructions. Once they have been identified, place warning tape on poles and/or guy wires and attempt to plan the work so that no contact will be made with the overhead utilities or obstructions. Share the information with all site personnel during the tailgate safety meeting.

When working around overhead utilities, one or more of the following conditions shall be met:

- The Project Manager shall confirm with the utility company that the power is de-energized (preferably in writing).
- The minimal clearance distances shall be established and maintained according to Attachment 3, “Minimum Clearance Distances.”
- Insulating blankets shall be used to isolate the power line and the utility company shall provide the minimum safe operating distance in writing to the Project Manager. Insulating blankets must be placed by the utility company.

Maintain at least 10 feet from overhead power lines, up to 50 kilovolts (kV). For voltages over 50 kV, add 0.4 inches per kV to obtain the safe distance between equipment and power lines. If voltage is unknown, remain at least 20 feet from overhead power lines. See Attachment 3 for the Minimum Clearance Distance table. As a precaution, a spotter must be used at all times when it is possible to violate the minimum distance requirements for overhead utilities. If contact is deemed unavoidable, consult with the client and the respective health and safety representative to evaluate the area to determine if the particular overhead utility can be removed prior to engaging in the activity.

6.5 Training Requirements

6.5.1 Competent Person Drilling Oversight Training

The FTL (at least one on-site Shaw person will be performing the drilling oversight) will be required to have successfully completed the approved internal CPDO training. It is the Project Manager’s responsibility to ensure that the FTL has completed the CPDO training prior to overseeing boring activities.

Prior to assignment of work the FTL will assure that all affected employees receive an overview of the hazards of encountering underground/overhead utilities. The FTL is responsible for reviewing

this procedure, the work practices to control these hazards, and the roles and responsibilities of each worker with the work crew. This procedure and other requirements that may be contained in the site specific HASP shall be reinforced during daily tailgate safety meetings. A list of Frequently Asked Questions is provided as Attachment 4, "Frequently Asked Questions."

6.5.2 Trenching/Excavation Training

The FTL or at least one on-site Shaw employee will be required to have successfully completed Trenching/Excavation training prior to the inception of site work activity when excavation activities (i.e., excavations, test pits, use of 3-foot diameter augers, or anytime similar hazards are present) are present/anticipated. NOTE: This training is now recommended rather than required when trenching/excavation hazards are NOT anticipated/required.

6.6 Incident Reporting Requirements

Employees are required to immediately report to their direct supervisor any overhead or underground utility contact incident, or near miss incidents. Any supervisor (but preferably the supervisor directly responsible for the involved employees) with first-hand knowledge of an incident is required to investigate the incident. The Project Manager and respective Health and Safety Manager or Representative shall be informed of the incident immediately.

At a minimum, the incident investigation will require completion of the incident investigation report and General Liability Property Damage and Loss Report form found in Shaw E&I Procedure No. HS020.

In addition, Attachment 5, "Underground Utility Hits – Tip Sheet for Incident Investigations," provides a "Tip Sheet" to help properly assess and investigate the incident causes and recommendations or requirements.

6.7 Local Jurisdiction Requirements

Where local jurisdictions or clients have established requirements different from those in this procedure, the practice which most limits the liability to Shaw for damaged utilities shall be utilized. No variance is required under these circumstances but the project-specific HASP or Work Plan shall fully document the alternate procedures.

7. ATTACHMENTS

- Attachment 1, Flowchart to Obtain a Variance
- Attachment 2, Underground/Overhead Utility Contact Prevention Responsibility Matrix
- Attachment 3, Minimum Clearance Distances
- Attachment 4, Frequently Asked Questions
- Attachment 5, Underground Utility Hits – Tip Sheet for Incident Investigations

8. FORMS

- EIG-HS-308.01, Variance Request Form
- EIG-HS-308.02, Pre-Boring Checklist
- EIG-HS-308.03, Utility Mark-Out Documentation

9. RECORDS

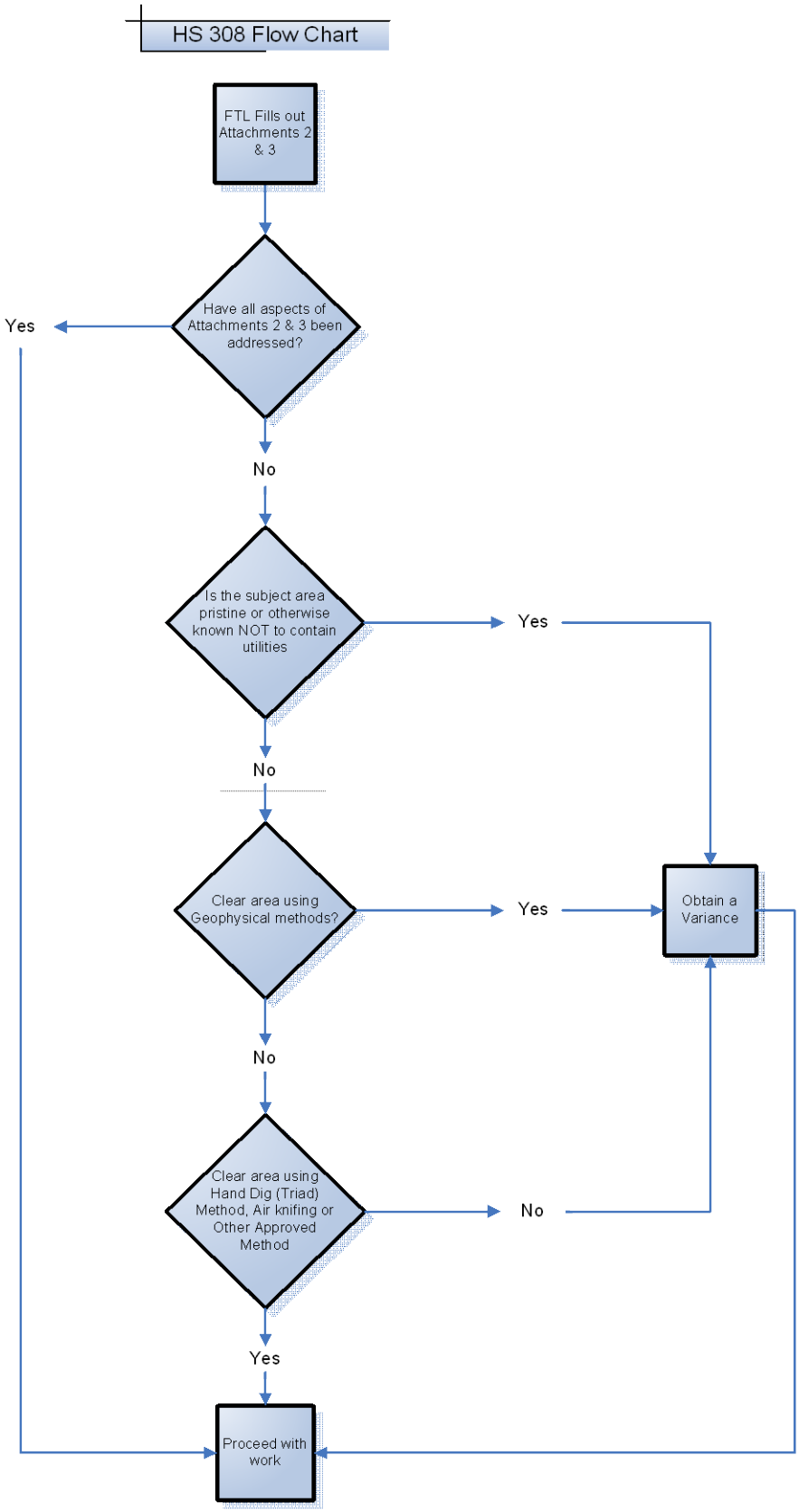
- EIG-HS-308.01, Variance Request Form

- EIG-HS-308.02, Pre-Boring Checklist
- EIG-HS-308.03, Utility Mark-Out Documentation

10. REVISION HISTORY AND APPROVAL

Revision Level Revision Date	Revision Description	Responsible Manager
00 N/A	Initial issue information is unavailable.	N/A
01 2/20/2006	Revision 1 information is unavailable.	Troy Allen
02 9/28/2010	Revised procedure format. Added “boring activities, “excavation activities,” and “vacuum excavator” to definitions section. Provided separate section for “boring activities” and “excavation activities.” After Revision 1 posting and individual found an error that was corrected regarding Competent Person- Drilling Oversight (CPDO) training. The Note that said: “The CPDO training requirement will become effective September 1, 2006> This means that every FTL will have successfully completed CPDO Training prior to August 31, 2006.” Was removed as it was not relevant anymore.	Troy Allen
03 8/25/2011	Modified format only to align with Governance Management framework.	Andrew Johnson

Attachment 1
Flowchart to Obtain a Variance



Attachment 2
Underground/Overhead Utility Contact Prevention Responsibility Matrix

Action	Procedure Section	Vice President	Project Manager	Field Team Leader	Supervisor	HS Representative
Project-specific HASP or Work Plan shall document the practices to be used at a particular site.	6.0		X	X		X
Contact the One Call Center for mark out of utilities at the site	6.1.2		X			
Complete Utility Mark-out Documentation Form	6.1.2		X	X		
Only experienced demonstrably proficient equipment operators will be used to operate such heavy equipment as backhoes, front-end loaders, cranes, etc.	6.3			X		
Provide training*	6.5					
Incident Investigation and Reporting	6.6		X		X	
Exceptions to Procedure	2.1	X	X	X		

*Provided by Shaw's Training Department.

Attachment 3
Minimum Clearance Distances

When work is undertaken near electrical lines, the distance maintained from those lines shall also meet the minimum distances for electrical hazards as defined below:

NOTE: This procedure primarily focuses on electrical overhead utilities; however, all other hazards shall be taken into consideration when performing work.

Normal System Voltage	Required Minimum Clearance Distances
0-50kV	10'
51-100kV	11.6'
101-200kV	15'
201-300kV	18.3'
301-500kV	25'
501-750kV	33.3'
751-1000kV	41.7'

***For those locations where utility companies specify more stringent safe distances, those distances shall be observed.**

Attachment 4
Frequently Asked Questions (FAQ)

During the roll-out of this revision of EIG-HS-308 a variety of questions/comments/concerns arose. These concerns have been put in the form of most frequently asked questions (FAQs) and their respective responses. These FAQs will clear up misunderstanding pertaining to this procedure, and provide valuable information that will help our workforce have a better understanding of how this procedure should be implemented. Please review the FAQs below:

1. *No other competitor of Shaw has felt the need to do anything as extreme as this procedure to ensure minimization of utility hits. Instituting this procedure will put us out of business.*

Response: After thorough review of claims and incidents involving drilling activities and underground utilities, the committee believes that our business/client needs are best served by adopting this policy. And that the likelihood of being put out of business is much greater from continuing to do business the way we currently do it than by adopting this improved policy. The committee realized that 100% adherence to this procedure at all work sites is likely not possible. For those cases where legitimate reasons exist for non-compliance, the committee realized that an effective responsive (variance) system must be in place. The committee believes that the variance procedure, as stated in the policy, should address the exceptions as they occur.

The Committee is not aware of any specific ASTM or true "industry standard". However, the committee is aware that best practices can vary tremendously and many times are client dependent. For example one extremely large Shaw client requires that we continuously probe. On the other end of the spectrum some clients look completely to Shaw for guidance in these matters.

2. *Our clients want us to do the work but do not wish to pay the additional fees involved with this new procedure. Could we offer them a two tiered pricing, one to do it the old way, and one to do it the new way?*

Response: The committee believes that contacting an underground utility of any type, no matter who is at fault or who ultimately pays for fixing, the outcome is a "black eye" for all involved. When these events occur, even if Shaw is not at fault, the committee believes that continued good client relations, and the potential for obtaining future business lessens as utility hits/incidents occur. This procedure is designed to minimize health and safety risks to our workers AND to mitigate liability to Shaw. Receiving the necessary compensation for the precautionary measures outlined in the procedure would be expected, and should be itemized in the initial proposal including a statement as to what will specifically be done in the field to mitigate risks relative to underground utilities and WHY Shaw believes these steps are necessary. However, if the client is willing to assume the entire liability resulting from "hitting" an underground utility, the contract should be written to reflect this and a variance would be in order. Keep in mind that Shaw cannot allow a client's desires to take on liability to affect the health and safety of workers. No matter what the client desires might be, Shaw would still expect the basic procedures to be followed for health and safety purposes. The training though yet to be

finalized will provide project manager's examples of wording to be used in proposals and contracts.

3. *Hand digging to 5' is impossible during frost conditions in Minnesota, Wisconsin and many northern areas. How should this be addressed?*

Response: When conditions present themselves that do not allow for hand digging each borehole, other methods must be used for clearance and a variance must be obtained. The alternative methods include a range of non-invasive geophysical survey techniques designed specifically for locating buried utilities, pipelines, tank (UST), and other buried objects that can interfere with drilling. These non-invasive geophysical methods are suggested and mentioned in the procedure.

4. *What if the field crew runs into refusal during hand dig clearance?*

Response: If refusal occurs and moving to an alternate spot presents the same problem, hand digging may not be possible as mentioned in #2 above. When conditions present themselves that do not allow for hand digging each borehole, other methods must be used for clearance and/or a variance must be obtained. Of course, we expect that the dig safe folks to be contacted, and that a private locating service be utilized if available. Should a private locating service not be available, we can use trained internal sources.

The alternative methods include a range of non-invasive geophysical survey techniques designed specifically for locating buried utilities, pipelines, tank (UST), and other buried objects that can interfere with drilling. The current accepted geophysical methods for the investigation and location of buried utilities include: Ground Penetrating Radar (GPR), Time Domain and/or Frequency Domain Electromagnetic methods, Magnetometer, and Inductive/Conductive Radio-Magnetic methods. These non-invasive geophysical methods are suggested and discussed in the procedures. The geophysical methods can be very useful for locating buried utility lines in areas where drilling and digging are not possible or practical, but these methods do have some limitations that are a function of soil conditions, depth of investigation, and imaging resolution.

If it is determined that a non-invasive geophysical investigation may be needed, assistance with selecting the appropriate method(s) can be obtained from the Shaw E&I Science and Technology Division, Geophysics & Mapping Group. Of course, it is expected that the "dig safe" folks will be contacted, and that a private utility locating service be utilized when appropriate (utility location method is known to be feasible), and if available. Should a private locating service not be available, we can use trained internal Shaw E&I personnel resources to perform utility line location work. Finally, if the Project Manager has determined that a variance to the procedure is justified, a variance request should be submitted for review.

5. *Why is trenching/excavation training required for putting in Geoprobe® boreholes? This seems like tremendous overkill.*

Response: The committee believes that, in general, trenching/excavation training is a good educational tool that promotes overall health and safety awareness and provides important information/techniques for our field staff. Trenching/excavation training provides insights into

fall hazards, spoil pile placement, and many other related safety issues. Many of our drilling jobs have involved oversized auger bits (3' in diameter) where a large deep borehole is created. The committee agrees that when the diameter of the borehole lessens (i.e. use of a Geoprobe®), the impact of trenching/excavation training decreases. Trenching excavation training is now a requirement only when large boreholes are created or other hazards as mentioned above are present, but only recommended training when Geoprobe ® or similar equipment is being used and the result is trenching excavation type hazards do NOT exist. NOTE: Specific training pertinent to drilling/ Geoprobing ®/boring (CPDO training) will be provided and will be mandatory. Additionally, CPDO and trenching / excavation training are both required on projects where 3' or larger diameter boreholes are to be drilled.

6. *Are there any training requirements besides trenching/excavation training?*

Response: The committee evaluated a need for training specific to the HS 308 policy (drilling) and solicited the assistance of the training department and certain operations employees to develop CPDO training. This CPDO training includes basic steps needed to be taken from call the dig-safe number, private utility searches, geo-physical capabilities, probing, hand augering, air knifing, water pumping/knifing, hand digging, and others.

7. *Hand diggings create heat stress, tripping hazards, back injuries, and other hazards and are unnecessary.*

Response: The committee did not envision using a spade and a strong back to dig various 5' holes at the field site. The committee does envision using an air knife, water knife, probe, or other method rather than a hand shovel. The committee understands that not all methods may be acceptable in all states, municipalities or to all clients. The committee was also aware that when all else fails one could consider using a l" diameter stainless steel auger placing 5' bgs hand borings in a triangular pattern where the auger bit could be placed in between these small hand borings. The committee envisions this theme and methodology to be expanded within the upcoming training. Additional information on augering techniques will be provided in the specific training (CPDO) mentioned above.

8. *I need to put borings in pristine farmland next door to a contamination zone. There are no and have never been any utilities in this area. What should I do?*

Response: Once you go through the proper utility locate procedure and are confident that no utilities exist in the subject area, you need to obtain a variance. This would also hold true for pristine forest preserves, wildlife refuges, or other areas not affected by utilities.

9. *Who needs to sign off on a variance?*

Response: Variances are signed by the Area Vice President (or designee, which may be delegated to the BLM for each office) along with the Project/Program Manager/Director. When we know in advance that EIG-HS-308 cannot be adhered to, one should make plans to get a formal variance approval and appropriate paperwork developed two weeks prior to field activity. Variances can also be obtained when field conditions arise that make adherence to EIG-HS-308

impossible. The variance can be obtained via cell phone in the field with the PM and appropriate management with the outcome noted in the field logbook followed up by an appropriate e-mail. This e-mail should be kept in the project file as proof of variance approval. It is recommended that variances be obtained as soon as it is known that they will be required.

10. What constitutes a "probe"? I assume a Geoprobe® is not valid?

Response: A Geoprobe® is NOT a valid probe in that Geoprobes® have caused damage to sewer lines and other utilities. Probes are typically made of a fiberglass-like material that have a pointed end but will not damage subsurface utilities and allows for the field staff to sense if underground items are encountered.

11. Under 5.1, is a subcontractor a designee?

Response: Although a subcontractor can make arrangements to contact dig safe and more, Shaw must ensure that the sub has, in fact, done what they had agreed to do. It should be remembered that typically on drilling projects, from many of our customer's perspective, the liability remains with Shaw, and they will look to Shaw, not our subs, for resolution of any events that occur. Hence, it is incumbent on Shaw to insure that our procedures are followed by Shaw and Shaw subs.

12. Does ground surface include concrete, asphalt or other man-made coverings?

Response: A simple NO. Some of our projects include drilling through airport runways or tarmacs which can be up to 15" in depth. Manmade surfaces do NOT count in the 5' hand dig clearance specification. If we are attempting to advance boreholes below existing concrete surfaces, the geology below the concrete will be exposed by cutting the concrete and removal of the concrete. After the concrete is removed and the geology is exposed, a hand auger can then be used.

Hopefully, the twelve concerns above and the responses to these comments will have helped users understand the implementation of this EIG-HS-308 policy. More importantly the committee realizes that information on this subject will be provided during the training mentioned above. It is the committee's belief that once this program has been completely rolled out the need for variances will be minimal and the interactions of the safety department with operations management with this entire process will make ensure success.

Attachment 5
Underground Utility Hits
Tip Sheet for Incident Investigations

1. Location of the incident.
2. The time of day the incident occurred.
3. What type of utility was hit?
4. How deep was the line hit (in feet)?
5. Who called Designated Locator Service?
6. Note the “One Call” number on the Incident Investigation Follow-up report.
7. Attach the “One Call” record keeping documentation.
8. Were mark-outs completed by the utilities? If so, please identify.
9. Were mark-outs legible at the site?
10. Was the mark-out of the line that was hit accurate?
11. Was the mark-out misinterpreted?
12. Is there a utility damage sheet attached to the Incident Investigation Follow-up Report?
13. Have there been any faults or oversights by any 3rd party? If so, is it documented on the Incident Investigation Follow-up Report?
14. Did the FTL interview the property owner/manager prior to the incident?
15. Was pre-screened by hand digging 5 feet?
16. Were any supplemental utility locator devices used? If so, did we obtain them? If so, were they used on site?
17. Were there blueprints/as built plans available? If so, did we obtain them? If so, were they used on site?
18. Who is paying for the repairs?
19. Please define the total hours and cost estimate/impact to address the utility damage incident:

_____ Site time in hours (not billed to the job)

_____ PM time hours (not billed to the job)

_____ H&S time in hours (not billed to the job)

_____ BLM Time in hours (not billed to the job)

_____ Rework/non-billable time (estimate)

_____ Subcontractor rework/non-billable costs (estimate)

_____ Repair costs to company (estimate)

_____ Repair cost to customer (estimate)

20. Has the FTL completed Shaw's in-house CPDO training?
21. Has the FTL completed trenching/excavation training?
22. Is he/she current with the OSHA 40 hour and 8 hour refresher? If so, what are the dates of the training?
23. Who was the Site Safety Officer on the job site?
24. Does he/she have OSHA 8 hour supervisor training? If so, what are the dates of the training?
25. What was the name of the drilling subcontractor that was on site?
26. Have we researched the training background for this vendor?
27. Was a JSA performed at least once during the day that covered utility contacts and associated hazards?
28. Does this vendor have approved status?
29. Was there a tailgate safety meeting that took place?
30. Were utility mark-outs addressed at the tailgate safety meeting?
31. Were there any markings nearby the "hit" area?

Variance Request Form

Variance Request for Company Procedure: EIG-HS-308-Underground/Overhead Utility Clearance procedure	Date of Request:
Requestor:	Location:
Reason for the variance:	
Alternate Procedure(s) that will be implemented:	
APPROVED	**REJECTED**
Regional VP or Designee	

Pre-Boring Checklist

Purpose: This form is designed to help the FTL make decisions during boring/excavation around underground/overhead utilities.

DATE _____ PROJECT NAME/NUMBER _____

Field Team Leader Name: _____

DURATION/SUMMARY OF WORK TO BE PERFORMED: _____

_____

Consideration	Check	Check	Explanation	Initial
Has the state one-call been contacted?	☐ Yes	☐ No		
Are any as-built drawings available? If so, do they show any utilities?	☐ Yes	☐ No		
Has a visual inspection of the work area(s) been completed?	☐ Yes	☐ No		
If one-call not available has a private locating service or Shaw S&T group been contacted?	☐ Yes	☐ No		
Were any utilities identified through private locating service? If so, indicate on site drawings.	☐ Yes	☐ No		
Are there any fiber optic cables within 50 feet of hole locations?	☐ Yes	☐ No		
If fiber optic cables are within 50 feet has an agreement with the fiber optic company been established?	☐ Yes	☐ No		
Can a test borehole be advanced by hand digging, probing, post hole digging, and/or air knifed to 5 feet bgs?	☐ Yes	☐ No		
If hand digging, probing, post hole digging, and or air knifing to 5 feet bgs is not possible, can a non-invasive geophysical investigation be conducted? If not, why?	☐ Yes	☐ No		
Are you comfortable with approving this authorization?	☐ Yes	☐ No		
Other considerations:				

Utility Mark-Out Documentation

Project Name: _____ **Location:** _____
FTL Name: _____ **Date:** _____
Utility Called: _____ **Confirmation #:** _____
Subcontractor: _____ **Task/Activity:** _____
County of work: _____ **Municipality of work:** _____

Before work is done on any site, contact the appropriate local utility locating service (One Call, Miss Dig, Uloco, etc.) or a local utility contractor to have sub grade utilities marked. NOTE: Boring locations to be placed not in the public right of way are typically not marked out by the public utility mark out, and a private utility locate service must be engaged. Indicate to the utility locator the nearest intersecting street for the site: _____
_____ **Confirmation No:** _____.

List utility firms (public and private) and the utility they will mark.

Utility Marker Emergency Telephone Numbers Major Utilities Marked by Color Code			
Name of Utility Company	Utility	Color Code	Emergency Telephone Number
	Water	**Blue**	
	Gas	**Yellow**	
	Electric	**Red**	
	Telephone/ Cable/ Communication	**Orange**	
	Sewer	**Green**	

"ALL UNDERGROUND UTILITIES MAY NOT BE LOCATED BY THE LOCAL UTILITY SERVICE". Accordingly, you must list other known utilities in the area that the "One Call" service will not contact:

Attach photos of the area prior to placing boreholes.
Take photos of the area indicating minimum 5' hand dig, post hole dig, probe, GPR or other:
NOTE: For any borehole, should 5' minimum clearance not be obtained, you must contact Business Line Vice President or equivalent (Operations Director or other on the Federal Business Line) and obtain a variance.

Completed by: _____
_____

_____ _____ _____
Name **Signature** **Date**

1. PURPOSE

The purpose of this procedure is to provide guidelines to assist Shaw Environmental & Infrastructure Group's (Shaw E&I) Procurement Specialists/Subcontract Administrators (PS/SCA) with pre-award considerations of sourcing, including matters to be considered in securing information from subcontractors/vendors to establish the foundation for qualification, evaluation, and selection to perform work or supply materials to or for Shaw E&I.

Purchases shall be made from, and subcontracts shall be awarded to, responsible firms only. No awards shall be made unless the PS/SCA makes an affirmative determination of responsibility. The PS/SCA signature on the agreement constitutes a determination that the prospective subcontractor or supplier is responsible with respect to that agreement.

2. SCOPE

This procedure applies to procurement and subcontract activities of Shaw E&I as further described below.

3. REFERENCES

3.1 Internal References

- EIG-HS-011 Health and Safety Rules for Contractors
- EIG-PS-203 Terms and Conditions
- EIG-PS-204 Solicitation and Evaluation Criteria
- EIG-PS-211 Cost and Price Analysis
- EIG-PS-213 Acquisition of Commercial Items and Services
- EIG-PS-302 Vendor Performance Evaluation
- SG-AF-SPR-1002 Credit Assessment

3.2 External References

- FAR 9.4, Debarment, Suspension, and Ineligibility
- FAR 22.805 - Procedures
- FAR 52.222-35 Equal Opportunity for Veterans
- FAR 52.225-1 Buy American Act – Supplies
- FAR 52.225-4 Buy American Act – Free Trade Agreements – Israeli Trade Act Certificate
- FAR 52.225-5 Trade Agreements
- FAR 52.225-9 Buy American Act – Construction Materials
- FAR 52.225-11 Buy American Act – Construction Materials under Trade Agreements
- FAR 52.230-1 Cost Accounting Standards Notices and Certifications

- Excluded Parties List System (EPLS)

4. DEFINITIONS

- **Federally Qualified**—A business concern that
  - Has completed and submitted Representations and Certifications
  - Is not on the Excluded Parties Lists System
- **Financially Stable**—A Business Concern that
  - Has a Dun & Bradstreet "Composite Credit Appraisal" of 1, 2 or 3
  - Has acceptable levels of insurance coverage or has granted an insurance waiver
- **Fully-Qualified**—A Business Concern that
  - Is Financially Stable
  - Has an acceptable Quality Control Program
  - Has an approved Heath and Safety Program with the following
    - 40-hour training including 8-hour annual refresher and 3 days on site
    - 8-hour supervisor training
    - Medical Surveillance Program
    - Active drug and alcohol screening and awareness program
    - A written safety program and job-specific safety plan
    - Experience Modification Rate < or = 1 *
    - Written acknowledgment of contractor safety rules
  - Has acceptable Past Performance
  - Has no identifiable Conflicts of Interest
- **Limited-Qualified**—A Business Concern that
  - Is Financially Stable
  - Has an acceptable Quality Control Program
  - Meets Health and Safety Minimum Requirements
    - Provide basic safety training to employees
    - Experience Modification Rate < or = 1 *
    - Written acknowledgment of contractor safety rules
  - Has no identifiable Conflicts of Interest

  NOTE: A Business Concern can be determined less than acceptable in one of these areas: Quality Control Program, Heath and Safety Program, and Past Performance. The project manager can develop with the vendor/subcontractor a mitigation program, providing the project manager has agreed to accept responsibility for implementing and completing the

mitigation program with review and interaction of the appropriate department that did not provide the acceptable rating, and the mitigation program is approved by the business line manager. Once approved, the subcontractor can be receive a Limited-Qualification Ranking for that project only.

- **Low Risk Services**—Defined as follows:
  - That have a low risk of resulting in property damage or bodily injury, and
  - Do not pose a risk to Shaw's ability to perform its scope of work, such as, by way of example, services that are not included as a material element of Shaw's work scope; or services that Shaw will not depend upon in order to fulfill its material contract obligations.

  Examples of such services are:

  1. Simple collection; delivery or drop shipment services (e.g., Federal Express, bottled water suppliers, trash collection, office supply and material deliveries; and any deliveries that would not involve entrance into areas requiring special accesses. This could include areas requiring government security clearances, or contractor restricted areas,)
  2. Utility hookup and service providers for office facilities, such as telephone, electricity, water, etc.
  3. Landscaping/sprinkler installation in areas isolated or removed from other work in progress
  4. On-site repair technicians for equipment that is not part of a process unit, manufacturing line or the like
  5. Unarmed security guards
  6. Miscellaneous painting & striping that does not impact or effect any facility or equipment operations, and which will be conducted in areas removed or isolated from other work in progress
  7. Training for Shaw employees conducted in ordinary course as opposed to, by way of example, project specific training necessary for Shaw's service or operation of project facilities
  8. Plumbing or electrical work inside a building or structure that is not critical to Shaw's ability to fulfill its contract obligations (this does not, in any event, include any outside below grade work, work in an industrial facility or work that ties into a process unit or manufacturing operation)
  9. Janitorial services
  10. Licensed exterminators
  11. Fence installation or repair where location of installation and repair is removed or isolated from work in progress
  12. Paving repair services in an isolated area or otherwise in an area having no third-party access while repair work is being performed

- **Micro-purchase threshold**—An acquisition of supplies or services, generally consisting of COTS or Commercial Items, where the aggregate amount does not exceed $3,000.00. Exceptions to this threshold are noted below.
  - Micro-purchases for construction subject to the Davis Bacon Act are limited to $2,000.00.

- Micro-purchases for services subject to the Service Contract Act are limited to $2,500.00.
- Micro-purchases under commercial prime contracts not subject to funding from federal, state or local governmental entities are $10,000.

- **Qualified**—A Business Concern that
  - Is Financially Stable
  - Has an acceptable Quality Control Program
  - Has an acceptable Heath and Safety Program
    - 24-hour training including 8-hour annual refresher and 3 days on site On-The-Job Training
    - 8-hour supervisor training
    - Medical Surveillance Program
    - Active drug and alcohol screening and awareness program
    - A written safety program and job-specific safety plan
    - Experience Modification Rate < or = 1 *
    - Written acknowledgment of contractor safety rules.
  - Has acceptable Past Performance
  - Has no identifiable Conflicts of Interest
- **Qualified for Engineering Design Work**—A Business Concern that
  - Is Financially Stable.
  - Has an acceptable Quality Control Program.
  - Does not meet the minimum Health and Safety Requirements. All work is accomplished in the office. The Subcontractor is not qualified for any field work and cannot be used for any field applications.
  - Has acceptable Past Performance.
  - Has no identifiable Conflicts of Interest
- **Qualified Suppliers**—A business concern experienced in equipment fabrication that
  - Is Financially Stable
  - Has an acceptable Quality Control Program
  - Has an acceptable Heath and Safety Program
    - Provides basic safety training to employees
    - Experience Modification Rate < or = 1 *
  - Has an acceptable Past Performance
  - Has no identifiable Conflicts of Interest

- **Unacceptable**—A business concern that does not meet one or more the following criteria
  - Is Financially Stable
  - Has an acceptable Quality Control Program
  - Has an acceptable Heath and Safety Program
  - Has an acceptable Past Performance
  - Has no apparent Conflicts of Interest
- **Vendor –** A person or organization selling or leasing commercial or commercial, off-the-shelf items. (See EIG-PS-213 for definitions of commercial and commercial, off-the-shelf items.)

5. RESPONSIBILITIES

5.1 Procurement Specialist/Subcontract Administrator

PS/SCAs have the overall responsibility for implementing this procedure and for determining whether prospective subcontractors are responsible and qualified to be eligible for award of a subcontract.

The PS/SCA shall request clearance from the appropriate Office of Federal Contract Compliance Programs (OFCCP) regional office for first-tier subcontracts if the estimated amount of the subcontract is $10 million or more (excluding construction.) This clearance shall be requested at least 30 days before the proposed award date of any subcontract, including any indefinite delivery subcontract or letter subcontract, or modification of an existing subcontract for new effort that would constitute a subcontract award.

5.2 Project Manager

The Project Manager, or qualified technical designee, is responsible for providing the PS/SCA with the period of performance, estimated value, and all technical requirements, specifications and/or Statement of Work to include any performance qualification criteria with the procurement requisition. The Project Manager, or qualified technical designee, shall assist the PS/SCA in developing evaluation criteria for the particular resource opportunity. The Project Manager may suggest bidders. Once bids are submitted, the Project Manager will assist in determining if a prospective firm's final offer is technically acceptable. The Project Manager, or personnel with the proper authority to approve the requisition, must provide written rationale for the use of a vendor/supplier with a composite rating less than 3.0 in Shaw's supplier performance database.

5.3 Regional Health & Safety Manager

The Regional Health & Safety Manager is responsible for reviewing the Health & Safety portion of the Qualification Questionnaire as required herein; making a determination of the qualifications of the supplier/subcontractor; and documenting their determination and any limitations on the type of work that the supplier/subcontractor can perform or any additional Shaw oversight requirements necessary.

5.4 Regional Quality Assurance Manager

The Regional Quality Assurance Manager is responsible for reviewing the QA portion of the Qualification Questionnaire as required herein; making a determination of the qualifications of the supplier/subcontractor; and documenting their determination and any limitations on the type of work that the supplier/subcontractor can perform or any additional Shaw oversight requirements necessary.

5.5 Corporate Compliance Officer

The Corporate Compliance Officer will make a determination as to whether or not a potential supplier/subcontractor who has answered "yes" on Form EIG-PS-104.01 Qualification Questionnaire (Short Form) Question 2 or Form EIG-PS-104.02 Qualification Questionnaire (Long Form) Question 7 will be eligible to do business with Shaw.

5.6 Regional Procurement Manager

The Regional Procurement Manager shall review the written rationale of the Project Manager and approve use of a supplier/vendor who has a composite rating less than 3.0 in Shaw's supplier performance database. The Regional Procurement Manager shall also notify the Vice President, Subcontracts and Procurement prior to adding the name of any prospective supplier/subcontractor who is found to have failed the determination of responsibility criteria, to Shaw's Supplier Alert List.

5.7 Credit Assessment Group

The Credit Assessment Group is responsible for conducting a credit assessment of existing and potential subcontractors and suppliers where purchase orders/subcontracts, change orders, purchase commitments or other transactions will result in a total outstanding commitment in excess of $5M in accordance with SG-AF-SPR-1002.

6. PROCEDURE

6.1 Qualification Process

The PS/SCA is responsible for assembling and maintaining a potential list of bidders for services, taking into account the selection criteria, recommendations, and restrictions identified in this procedure. Assistance will be solicited from Project Managers, Technical Associates, QA/QC associates, Health and Safety, and other pertinent personnel, where appropriate.

Selection of bidders is determined as each requirement is identified in conjunction with the assembly of a bid list. Development of bid lists and preparation of solicitations is addressed in EIG-PS-204 – Solicitation and Evaluation Criteria.

6.2 Qualification Package

A potential new supplier/subcontractor will be issued a qualification package either in advance of, or with, the solicitation documents. The PS/SCA is responsible for coordinating the review and evaluation process with other evaluation team members. The authorized PS/SCA may adjust the package to a particular procurement. As noted below, there are two different qualification packages – one for low risk services (as defined above) with an award greater than the micro-purchase threshold (as defined above) and one for all other subcontractors or suppliers that will be fabricating equipment or materials.

All packages shall include a cover letter instructing the supplier/subcontractor to complete and execute the forms and to return them along with a Certificate of Insurance which complies with the insurance requirements of the applicable agreement (including all types and amounts of insurance and all required endorsements).

NOTE: In those instances when Shaw is buying or leasing a commercial or commercial, off-the-shelf item, it is not necessary for the vendor to complete a qualification questionnaire, be approved by H&S or QA/QC or supply a Certificate of Insurance. On a federal program where the purchase orders/subcontract is above the micro-purchase threshold the vendor shall complete the applicable Representations & Certifications. This includes instances when Shaw is renting equipment only without an operator. The rental company will request a Certificate of Insurance

from Shaw with limits covering the replacement value of the equipment. The CA shall be consulted to provide this insurance certificate to the PS/SCA.

13. The qualification package for low risk services with an award greater than the micro-purchase threshold shall include:

    - EIG-PS-104.01 Qualification Questionnaire Short Form
    - W-9
    - The appropriate Shaw standard agreement (per EIG-PS-203 Terms and Conditions), if applicable – it is acceptable to utilize PO terms and conditions for low risk services
    - EIG-HS-011 Attachment 2 General Safety Rules for Contractors
    - Federal Programs require the following be added:
        – Representations and Certifications Forms, if applicable (EIG-PS-104.03 Annual Representations and Certifications – General Requirements for United States Owned Entities, EIG-PS-104.04 Cost Accounting Standards Notices and Certification, EIG-PS-104.06 Annual Representations and Certifications – General Requirements for Foreign Owned Entities and EIG-PS-104.07 Buy American Act Supplement to Representations and Certifications if required by the prime contract.)

    NOTE: In those instances when Shaw is buying or leasing a commercial or commercial, off-the-shelf item on a federal program where the purchase orders/subcontract is above the micro-purchase threshold the vendor shall complete the applicable Representations & Certifications. This includes instances when Shaw is renting equipment only without an operator.

14. The qualification package for all other subcontractors or suppliers that will be fabricating equipment or materials shall include all of the above documents, except EIG-PS-104.01 Qualification Questionnaire Short Form shall be replaced with:

    - EIG-PS-104.02 Qualification Questionnaire Long Form

15. Annual Updates of the qualification package for all subcontractors and suppliers shall include

    - Either EIG-PS-104.01 Qualification Questionnaire Short Form or EIG-PS-104.02 Qualification Questionnaire Long Form. The same form completed initially shall be completed for each annual renewal.
    - Federal Programs require the following added:
        – Representations and Certifications Forms, if applicable (EIG-PS-104.03 Annual Representations and Certifications – General Requirements for United States Owned Entities, EIG-PS-104.04 Cost Accounting Standards Notices and Certification, EIG-PS-104.06 Annual Representations and Certifications – General Requirements for Foreign Owned Entities and EI-PS-104.07 Buy American Act Supplement to Representations and Certifications if required by prime contract).

    NOTE: In those instances when Shaw is buying or leasing a commercial or commercial, off-the-shelf item on a federal program where the purchase orders/subcontract is above the micro-purchase threshold the vendor shall complete the applicable Representations & Certifications. This includes instances when Shaw is renting equipment only without an operator.

Any company issues identified during the review process shall be communicated by the PS/SCA to the prospective subcontractor or supplier for action.

Go Kahuna Certification: Special Requirement for Construction Subcontracts greater than $1M - Go Kahuna Certification is required for domestic site subcontractors to be awarded a subcontract on or after September 1, 2007 in the amount of $1 million or greater and are subcontractors performing one of the following types of services: move dirt, drill caissons, drill test holes, place underground utilities, licensed mechanical subcontractors, licensed electrical subcontractors, building construction subcontractors, major equipment installation subcontractors, piping subcontractors, concrete construction contractors, roofing contractors, and any other subcontractor that performs construction site work. To find out more about the Go Kahuna certification program and how to become Go Kahuna certified, please visit www.gokahuna.com."

6.3 Qualification of Subcontractors/Suppliers

Before work is awarded to a prospective subcontractor/supplier, the PS/SCA must determine the firm to be technically and commercially responsible and to have the relevant experience and sufficient resources necessary to complete the awarded requirement within schedule constraints.

The factors to be considered in the qualification process must be determined based on the specific circumstances of a given purchase. Factors such as long-lead engineered goods, critical path schedule or safety related requirements, or high-risk activities increase the importance of the qualification process. A responsible subcontractor/supplier has adequate financial resources necessary to support all financial responsibilities during the performance of the work.

Financial Adequacy: Information can be obtained from a Dun & Bradstreet report, a recognized financial advisory service, a written statement from a recognized source, such as a bank, or a financial report issued by the supplier and certified by an independent accountant. Depending on the value of the award, confirmation of prompt payments of supplier's debts to its creditors may satisfy this requirement. A Dun & Bradstreet report is required for subcontractors or suppliers with an award greater than $1 Million. In addition to a Dun & Bradstreet report, a financial analysis by the Credit Assessment Group is required for subcontractors or suppliers with a total outstanding commitment greater than $5 Million. A Dun & Bradstreet report may be utilized to review the financial adequacy of a subcontractor or vendor with an award less than $1 Million depending on the technicalities or complexity.

6.3.1 A satisfactory record of past performance

Prospective bidders may be excluded for any of the following reasons.

1. Repeated failure to comply with required submittal or delivery schedules
2. Unsatisfactory performance on previous purchase orders

Insight into record of past performance can be obtained from internal Shaw resources, from historical experience, or from references provided by the Subcontractor for representative projects. A formal record shall be created to document any deficiencies noted during discussions with past customers. Recent unsatisfactory performance regarding timeliness of delivery, or quality issues, must be resolved as to its potential impact on the contemplated subcontract prior to making a determination qualifying the bidder for award.

The following types of information are considered vital in evaluating the seriousness of any deficiencies and its potential impact on the contemplated procurement.

1. The nature of the deficiency including its perceived seriousness
2. The quantity involved in relationship to the total produced
3. The cause, if known, and a determination if the circumstances were within or outside the control of the Subcontractor/Supplier

4. Any remedial action taken by the Subcontractor to preclude a repeated occurrence

5. The ability to comply with required performance schedules, taking into consideration all existing business commitments

6. Systems and Capabilities

6.3.2 Technical Capabilities and Experience

To be determined responsible, a subcontractor/supplier must have the necessary experience and technical capabilities required to successfully undertake the specifications or project requirements. Past performance data obtained either from internal or external sources should be an important element in evaluating a Subcontractor's/Supplier's responsibility. Performance of similar work in the past can be used as a qualifying determination. A marginal rating, assigned to a subcontractor/supplier on a previous job or project, may be unsatisfactory for future projects, depending on complexity, cost factors, equipment availability or other criteria.

As part of the qualification process, the PS/SCA shall check the supplier performance database on the Contracts/Procurement department's portal in order to evaluate a firm's past performance. The database should be checked for all subcontractors/suppliers greater than the micro-purchase threshold regardless of the type of award.. The PS/SCA shall document the date he/she checked the database and the composite rating. This information will be annotated in the Remarks/Comments section on EIG-PS-205.05 Award Justification Form or in section IX Technical Evaluation of form EIG-PS-205.06 Procurement Summary. If the subcontractor/supplier has more than one evaluation in the supplier performance database, the PS/SCA shall calculate an average composite rating using the composite rating from each evaluation completed within the last 12 months. If the subcontractor/supplier is not in the supplier performance database then the PS/SCA needs to document the database was checked but no information was available.

For qualification purposes, a vendor must have a composite rating or a summary composite rating of at least 3.0 in order to be awarded a purchase order/subcontract. If a vendor has a composite rating less than 3.0 and the project team still wants to award a purchase order/subcontract to them, the Regional Procurement Manager and the Project Manager or personnel with the proper authority to approve the requisition, must approve this action.

Shaw will rely on the subcontractor's/supplier's existing quality assurance systems as a substitute for Company inspection and testing, unless the customary industry practices for commercially available goods require in-process inspection. The Subcontractor/Supplier shall provide proof of an acceptable quality assurance system. Product literature available in the industry will normally be adequate in evaluating the technical acceptability of the product.

6.3.3 Related Party Status

- EIG-PS-104.01 Qualification Questionnaire Short Form Question 2 – should a potential subcontractor/supplier answer "yes" to this question they will not be eligible to do business with Shaw unless reviewed and approved by the Shaw Corporate Compliance Officer.

- EIG-PS-104.02 Qualification Questionnaire Long Form Question 7 – should a potential subcontractor/supplier answer "yes" to this question they will not be eligible to do business with Shaw unless reviewed and approved by the Shaw Corporate Compliance Officer.

6.3.4 Necessary facilities and technical equipment

Special qualification criteria may be required when experience has demonstrated that expertise or specialized facilities are needed to assure satisfactory performance for the contemplated scope of work. When special qualification criteria are required, the criteria shall be set forth in the

solicitation and shall apply to all subcontractors/suppliers. These must be provided by QA/QC or Project Management, or whichever functional group is identifying the requirement.

6.4 Representations and Certifications

The PS/SCA shall obtain annual Representations and Certifications for each firm doing business with Shaw on Government funded projects. Sources should not be asked to complete EIG-PS-104.04 Cost Accounting Standards Notices and Certification unless award is anticipated to be in excess of the threshold as stated in FAR 52.230-1 Cost Accounting Standards Notices and Certification.

Prior to each award in excessive of the micro-purchase threshold, the PS/SCA shall confirm, by written representation of the offeror, that the Representations and Certifications are current, complete and accurate. **Representations and Certifications should be renewed every year.**

The following basic requirements apply to Representations and Certifications:

- EIG-PS-104.03 Annual Representations and Certifications - General Requirements for United States Owned Entities is required for all firms performing work pursuant to a federal government prime contract. The instructions on the form indicate the level of completion required.
- EIG-PS-104.04 Cost Accounting Standards Notices and Certification must be completed by all firms where there is no competition, the procurement is not for a commercial item, and award will be in excess of the threshold as stated in FAR 52.230-1 Cost Accounting Standards Notices and Certification. The CAS Certification will be specific to a particular procurement and shall be documented in the purchase order/subcontract file.
- EIG-PS-104.06 Annual Representations and Certifications – General Requirements for Foreign Owned Entities must be completed by any firm indicating that it has foreign ownership.
- EIG-PS-104.07 Buy American Act Supplement to Representations and Certifications must be completed by all firms if the prime contract contains FAR 52.225-1 – Buy American Act – Supplies; FAR 52.225-4 – Buy American Act – Free Trade Agreements – Israeli Trade Act; FAR 52.225-5 – Trade Agreements; FAR 52.225-9 – Buy American Act – Construction Materials; OR FAR 52.225-11 – Buy American Act – Construction Materials under Trade Agreements include

NOTE: The Contract Administrator must be consulted to ensure that Representations and Certifications included with solicitations are appropriate under the prime contract.

6.5 Subcontracting With Parties Excluded From Federal Programs:

The Government suspends or debars Contractors to protect the Government's interests. Shaw shall not enter into any subcontract pursuant to a federal prime contract in excess of $30,000 with a Contractor that is debarred, suspended, or proposed for debarment unless there is a compelling reason to do so.

The PS/SCA shall require each proposed first-tier subcontractor to disclose, in writing, whether as of the time of award of the subcontract, the subcontractor, or its principals, is or is not debarred, suspended, or proposed for debarment by the Federal Government. In addition, the PS/SCA shall check the Excluded Parties List System (EPLS), print out the search results, and place them in the purchase order/subcontract file.

In accordance with FAR 9.405(d)(1) and (4), the EPLS shall be checked a minimum of two times throughout the acquisition process to ensure the subcontractor is not excluded from federal programs:

- After the opening of bids or receipt of proposals
- Immediately prior to award

The Contract Administrator shall notify the Contracting Officer, in writing, before entering into a subcontract with a party that is debarred, suspended, or proposed for debarment. The notice must include the following:

- The name of the subcontractor.
- Shaw's knowledge of the reasons for the subcontractor being in the Excluded Parties List System.
- The compelling reason(s) for doing business with the subcontractor notwithstanding its inclusion in the Excluded Parties List System.
- The systems and procedures the Contractor has established to ensure that it is fully protecting the Government's interests when dealing with such subcontractor in view of the specific basis for the party's debarment, suspension, or proposed debarment.

EIG-PS-104.03, Annual Representations and Certifications - General Requirements for United States Owned Entities, includes the subcontractor's written disclosure which states whether it is or is not suspended or proposed for debarment by the Federal Government. This disclosure is required before entering into a purchasing agreement that exceeds $30,000 and is issued in support of a Government Prime Contract.

6.6 Federal Contractor Veterans' Employment Report VETS-100

If the prime contract includes FAR 52.222-35 "Equal Opportunity for Veterans" and the anticipated award is greater than $100,000, then the PS/SCA must verify that the subcontractor has filed with the Department of Labor a VETS-100 form by emailing verify@vets100.com.

Award cannot be made until verification with the Department of Labor is completed.

6.7 Preaward Clearances

In accordance with the requirements of FAR 22.805 – Procedures, the PS/SCA shall request clearance from the appropriate Office of Federal Contract Compliance Programs (OFCCP) regional office for first-tier subcontracts if the estimated amount of the subcontract is $10 million or more (excluding construction.) This clearance shall be requested at least 30 days before the proposed award date of any subcontract, including any indefinite delivery subcontract or letter subcontract, or modification of an existing subcontract for new effort that would constitute a subcontract award. The PS/SCA shall include the following information in the preaward clearance request:

- Name, address, and telephone number of each proposed first-tier subcontractor with a proposed subcontract estimated at $10 million or more.
- Anticipated date of award.
- Information as to whether the first-tier subcontractor(s) have previously held any Government contracts or subcontracts.
- Place or places of performance of the first-tier subcontracts estimated at $10 million or more.
- The estimated dollar amount of each first-tier subcontract.

6.8 Health and Safety

For those subcontractors/suppliers who are required to complete the Health and Safety portion of EIG-PS-104.01 Qualification Questionnaire Short Form or EIG-PS-104.02 Qualification Questionnaire Long Form, the Regional Health & Safety Manager shall review the Health & Safety portion of the questionnaire and make a determination of the qualifications in accordance with Attachment 1, Heath and Safety Rating Instructions Their determination and any limitations on the type of work that the subcontractor/supplier can perform or any additional Shaw oversight requirements necessary shall be documented on EIG-PS-104.09 Qualification Routing and Approval Sheet.

6.9 Quality Assurance

The Regional Quality Assurance representative shall review the QA portion of the subcontractor questionnaire and make a determination of the subcontractor/supplier's qualifications. Their determination and any limitations on type of work that the subcontractor can perform or any additional Shaw oversight requirements necessary will be documented on EIG-PS104.09 Qualification Routing and Approval Sheet.

6.10 Disqualification

A subcontractor/supplier may be disqualified from providing resources or services to Shaw for failure to conform to any of the requirements of this procedure or failure to perform satisfactorily on a project.

When an offer on which an award would otherwise be made is rejected because the prospective vendor/subcontractor is found to have failed the determination of responsibility criteria, the PS/SCA shall document the basis for the determination in the specific file and shall notify the Regional Procurement Manager. The Regional Procurement Manager shall be responsible for first notifying the Vice President, Subcontracts and Procurement prior to adding the name of the subcontractor/supplier to Shaw's Supplier Alert List.

7. ATTACHMENTS

- Attachment 1, Health and Safety Rating Instructions
- Attachment 2, Required Qualification Documents

8. FORMS

- EIG-PS104.01 Qualification Questionnaire Short Form
- EIG-PS104.02 Qualification Questionnaire Long Form
- EIG-PS104.03 Annual Representations and Certifications – General Requirements for United States Owned Entities
- EIG-PS104.04 Cost Accounting Standards Notices and Certification
- *EI-PS104.05 Representations and Certifications Supplement for Department of Defense (ARCHIVED)*
- EIG-PS104.06 Annual Representations and Certifications – General Requirements for Foreign Owned Entities
- EI-PS104.07 Buy American Act Supplement to Representations and Certifications
- *EI-PS104.08 General Safety Rules for Contractors (ARCHIVED)*

- EIG-PS104.09 Qualification Routing and Approval Sheet

9. RECORDS

- EIG-HS-011 Health and Safety Rules for Contractors
- EIG-PS-104.01 Qualification Questionnaire Short Form
- EIG-PS-104.02 Qualification Questionnaire Long Form
- EIG-PS-104.03 Annual Representations and Certifications – General Requirements for United States Owned Entities
- EIG-PS-104.04 Cost Accounting Standards Notices and Certification
- EIG-PS-104.06 Annual Representations and Certifications – General Requirements for Foreign Owned Entities
- EIG-PS-104.07 Buy American Act Supplement to Representations and Certifications
- EIG-PS-104.09 Qualification Routing and Approval Sheet

10. REVISION HISTORY AND APPROVAL

Revision Level / Revision Date	Revision Description	Responsible Manager
00 11/07/2011	Initial Issue.	Jim Pointer
01 04/09/2008	Added Section 6.6 for VETS-100 verification	Jim Pointer
02 11/12/2011	Modified format to align with Governance Management framework, Section 3.1 added two external references; removed the requirement for subcontractors to register in CCR throughout; Section 5 added three departments; Section 6.6 corrected the procedure for verifying VETS-100; various formatting corrections to SOPS and Forms throughout. Added requirement to check EPLS and supplier performance database as part of qualification process. Added paragraph for preaward clearances. Removed references to using ORCA. Revised definition of Low Risk Services. Revised Reps&Certs documents. Updated reference to Health&Safety Rules for Contractors. Added Attachment 2.	Jim Pointer
03 01/11/2012	No changes to procedure; ONLY 3 of the forms. Form EIG-PS-104.02 was updated to include (Rev 3): Fixed #6 section where the "6" was in the last bullet after the letter "e"; Added the #10 to the section between #9 and #11, added check box options before Yes, No and N/A in #19, changed the item after #20 from #17 to #21. Form EIG-PS-104.03 was updated to include (Rev 4): Corrected the spelling error of "Representations" in the title of section 1, removed the various signature blocks at the end of sections 1, 2, and 3. There is now one signature block after section 3 and the end of the form. Made Cage Code. Form EIG-PS-104.06 was updated to include (Rev 4): Deleted the various signature blocks after sections 1, 2, and 3. There is now one signature block after section 3 at the end of the form. Made Duns number and Firm number fillable fields.	Cassie Volpe

Attachment 1

Health and Safety Rating Instructions

All qualification for Health and Safety work must be approved by an assigned Health and Safety Professional. A rating system will be assigned to all contractors regardless of work conditions. The rating system is based on OSHA 1910.120 and is documented as follows:

A FULLY QUALIFIED

Subcontractors may be used for all hazardous waste activities if they meet the following requirements:

- 40-hour training including 8-hour annual refresher and 3 days on site
- 8-hour supervisor training
- Medical Surveillance Program
- Active drug and alcohol screening and awareness program
- A written safety program and job-specific safety plan
- Experience Modification Rate < or = 1 *
- Written acknowledgment of contractor safety rules.
- Insurance

B QUALIFIED

Subcontractor may perform limited site (e.g. non-routine task such as surveying, waste removal, etc.) but may not work in exclusion/contamination reduction zones for extended periods if they meet the following requirements:

- 24-hour training including 8-hour annual refresher and 3 days on site On-The-Job Training
- 8-hour supervisor training
- Medical Surveillance Program
- Active drug and alcohol screening and awareness program
- A written safety program and job-specific safety plan
- Experience Modification Rate, or = 1 *
- Written acknowledgment of contractor safety rules.
- Insurance

C LIMITED QUALIFICATION

Subcontractor may be used in support zone or non-hazardous site activities. For limited activities at a hazardous waste site, the Scope of Work must be reviewed with the Health and Safety Professional before work is started. (Examples: Hydro seeder, landscape service, electricians, software development, training, etc.). The subcontractor must meet the following minimum requirements:

- Provide basic safety training to employees

- Experience Modification Rate, or = 1 *
- Written acknowledgment of contractor safety rules.
- Insurance

D QUALIFIED FOR ENGINEERING DESIGN WORK.

Subcontractor does not meet the minimum requirements. All work is accomplished in the office. Contractor is not qualified for any field work and cannot be used for any field applications unless the minimum requirements outlined in A, B, or C is met.

E UNACCEPTABLE

Subcontractor does not meet the minimum requirement necessary to perform work for SHAW and will not be used for any jobs.

NOTE: Contractors unable to meet SHAW requirements for accident rates or experience modification rates may submit a written safety enhancement program designed to bring project performance in line with SHAW requirements that will be implemented for all work done for SHAW. If approved by the SHAW Health and Safety Professional, the safety enhancement plan will become part of the contractor's job-specific safety plan and the contractor may be approved.

Attachment 2

Required Qualification Documents

Type of Vendor/Subcontractor											
		< or = Micro Purchase Threshold				> Micro Purchase Threshold					
	Form No.	Vendors	Low Risk Services	Other than Low Risk Services & Suppliers	Equipment Rental (without Operator)	Equipment Rental (without Operator)	Vendors	Low Risk Services	Other than Low Risk Services & Suppliers
Short Form Qualification Form	EIG-PS-104.01							X	
Long Form Qualification Form	EIG-PS-104.02			X					X
Applicable Representation & Certification	EIG-PS-104.03, .04, .06, .07					X	X	X	X
W-9		X*	X*	X*	X*	X*	X*	X*	X*
Shaw Standard Terms and Conditions	EIG-PS-203.01, .02, .04, .05	X	X	X	X	X	X	X	X
General Safety Rules for Contractors	EIG-HS-011 Attachment 2			X					X
Certificate of Insurance			X	X				X	X
EPLS						X	X	X	X

*As Applicable

Note: commercial PO/subcontracts issued under a commercial prime contract shall follow the above table with the exception of Reps&Certs. Reps&Certs are not required for PO/Subcontracts issued under a commercial prime contract.
Supplier: a business concern experience in equipment fabrication
Vendor: a person or organization selling or leasing commercial or commercial, off-the-shelf items

Purpose: To obtain information regarding a Supplier/Subcontractor.

Instructions: Complete all sections of this form and return to the Shaw Environmental & Infrastructure, Inc. Shaw representative referenced on the cover letter. Mark sections which are not applicable "NA." Any information which does not fit in the spaces provided or that you feel will be helpful in determining Supplier capability to meet Shaw's needs should be placed in the Supplementary Information Section.

SECTION A: To be completed by all firms.

Company Name:

Company Address:

City/State/Zip Code:

Contact Names & Titles:

Telephone Number:

Emergency (After Hours Contact): Name: Phone No.

Fax Number:

Email Address:

Web Site:

Type of Company: ☐ **Material Supplier** ☐ **Rental Supplier** ☐ **Other** _____

City(ies) and State(s) Business/Occupational Licenses:

Applicable North American Industry Classification System Codes (NAICS):

Description of Supplies/Equipment (i.e. office supplies, excavator):

Catalog or Line Card available upon request: ☐ **Yes** ☐ **No**

Taxpayer ID Number:

Organization Type: **Check appropriate box:**
☐**Individual** ☐**Sole proprietor** ☐**Corporation** ☐**Partnership** ☐ **Other**_____

Duns. Number:

CCR Registered: ☐Yes. Date_____; ☐ No

Business Classification: (Check appropriate boxes)

- ☐ **Large,**
  - ☐ **Women-Owned**
- ☐ **Non-Profit,**
- ☐ **Foreign,**
- ☐ **Small (Check All Subclassifications That Apply),**
  - ☐ **Woman-Owned,**
  - ☐ **Veteran-Owned,**
  - ☐ **Service Disabled Veteran,**
  - ☐ **HUBZone (Copy of SBA Certification Letter Required),**
  - ☐ **Qualified Non-Profit,**
  - ☐ **Disadvantaged (Copy of SBA Certification Letter Required),**
    - ☐ Black American.
    - ☐ Hispanic American.
    - ☐ Native American (American Indians, Eskimos, Aleuts, or Native Hawaiians)
      - ☐ Alaska Native Corporation
      - ☐ Indian Tribe
    - ☐ Asian-Pacific American (persons with origins from Burma, Thailand, Malaysia, Indonesia, Singapore, Brunei, Japan, China, Taiwan, Laos, Cambodia, (Kampuchea), Vietnam, Korea, The Philippines, U.S. Trust Territory of the Pacific Islands (Republic of Palau), Republic of the Marshall Islands, Federated States of Micronesia, the Commonwealth of the Northern Mariana Islands, Guam, Samoa, Macao, Hong Kong, Fiji, Tonga, Kiribati, Tuvalu, or Nauru).
    - ☐ Subcontinent Asian (Asian-Indian) American (persons with origins from India, Pakistan, Bangladesh, Sri Lanka, Bhutan, the Maldives Islands, or Nepal).
    - ☐ Individual/concern, other than one of the preceding

COMMERCIAL SOCIO-ECONOMIC CERTIFICATIONS: Check appropriate box and enter name of State in the field provided

☐ MBE Minority Business Enterprise State(s):_____; _____; Organization:_____;
☐ WBE Women Business Enterprise State(s): _____; _____; Organization: _____;
☐ DBE Disadvantage Business Enterprise State(s): _____; _____; Organization:_____;

1. Does any company officer, partner, owner or their spouse have an ownership and /or management interest in another company? This would include being an officer, partner or owner of another company. **Yes** ☐ **No** ☐

If so, please list:

Name of Officer and Title [Owner, Director, Partner, Spouse] Company Name

_____

_____

2. Are any current company officers, partners, owner or their spouses a relative of any current Shaw employee (including Shaw subsidiaries). **Yes** ☐ **No**☐

If yes, then list the officer and Shaw employee name.

Name of Officer and Title [Owner, Director, Partner, Spouse] Shaw Employee

_____

_____

3.	**How many years in business under your current legal name?**	
4.	**How many employees are currently on your payroll?**	
5.	**Are you privately owned or a publicly traded company"?**	
6.	**Are you union or non-union? ☐ Union ☐Non-union If union, identify union affiliation."**	
7.	**Does your firm accept Master Card for purchases less than $3,000?**	

SECTION B. ANALYTICAL SUPPLIERS: This section only needs to be complete by firms providing analytical analysis.

ANALYTICAL CERTIFICATIONS:

☐ NELAP Certified:
Accrediting State:_____ (*Attach Copy)*
☐ USACE Self Declared (*Attach Copy)*
☐ NFESC Approval Letter (*Attach Copy)*
☐ US Department of Agriculture (Foreign Soils Permit) (*Attach Copy)*
Other Certifications(can attach as a list):
_____; _____; _____

Additional Laboratory Services:

Yes ☐ **No** ☐ Ability to Produce Full Data Deliverable in PDF Format
Yes ☐ **No** ☐ Ability to Produce Reduced Data Deliverable in PDF Format (Format to be provided a project start up)
Yes ☐ **No** ☐ Ability to Produce Standard Electronic Data Deliverables
Yes ☐ **No** ☐ Ability to Produce Custom Electronic Data Deliverables
Yes ☐ **No** ☐ Laboratory Information Management System (LIMs)
Yes ☐ **No** ☐ On-Line Data Retrieval
Yes ☐ **No** ☐ Courier Service, if yes radius from laboratory:_____
Yes ☐ **No** ☐ Field Services
Yes ☐ **No** ☐ Mobile Laboratory Services
Yes ☐ **No** ☐ Service Centers, if yes list locations:_____
Yes ☐ **No** ☐ UFP QAPP Preparation Support

Can you support the following matrices, check all that are applicable:
☐ Soil ☐ Sediment ☐ Water ☐ Tissue ☐ Air

Specialty Analysis:
☐ Mold ☐ Asbestos ☐ Indoor Air Quality ☐ Industrial Hygiene

Can you support the following groups of methodology, it is understood that the laboratory may not support every method, check all that are applicable:
☐ SW-846 ☐ ASTM ☐ Current CLP SOW ☐ Standard Methods ☐ EPA

Standard Laboratory Turnaround time:_____
Can you support the following accelerated turnarounds with prior notification, it is understood that the laboratory may not support these turnarounds for every method :
24 hour ☐ 3 days☐ 5 days☐ 7 days☐

PLEASE INCLUDE COPIES OF THE FOLLOWING:

- Laboratory Statement of Qualifications
- Locations of all Laboratories
- List of all Method Capabilities
- List of all Instrumentation
- Organizational Chart/s
- Resumes of Key Personnel
- Brief Paragraph on Sample Handling which includes sample disposal policies
- List of Project Experience (include a variety of projects past and present and in support of multiple programs)
- Name of one Shaw contact that you are currently performing analytical services for: _____

SECTION C: Health and Safety Information *(to be complete only if personnel will be on a Shaw project site for other than delivery of Supplies or Materials).*

1. Are you willing to comply with the Shaw Environmental & Infrastructure, Inc Health and Safety Program if so directed by contract documents? ☐ Yes ☐ No If no, please explain.

2. Do you have a Health & Safety Orientation Program for new hires and newly hired or promoted supervisors? ☐ Yes ☐ No

3. Do you hold site Health & Safety meeting for:

a. Tailgate/Toolbox Safety Meetings	☐ Yes **If yes box checked, please provide sample copy(s)**	☐ No	Frequency _____
b. Field Supervisors	☐ Yes	☐ No	Frequency _____
c. Employees	☐ Yes	☐ No	Frequency _____
d. Subcontractors	☐ Yes	☐ No	Frequency _____

d. Are the safety meetings documented? ☐ Yes ☐ No

4. Personal Protection Equipment (PPE) Program:
   a. Is applicable PPE provided for employees? ☐ Yes ☐ No
   b. Do you have a program to assure that PPE is inspected and maintained? ☐ Yes ☐ No
   c. What method do you use to prescribe PPE for each task? _____
   d. How are task-specific PPE requirements communicated to workers? _____

5. Employee Safety Program:
   a. Do you use a safety observer program or behavior based safety program? ☐ Yes ☐ No
   b. Do you have a corrective action process for addressing individual health and safety performance deficiencies? ☐ Yes ☐ No
   c. Do you have procedure for injury/illness reporting and investigation? ☐ Yes ☐ No

Inspections and audits:
   a. Do you conduct and document Health and Safety inspections? ☐ Yes ☐ No
   b. Do you conduct and document Health and Safety Program audits? ☐ Yes ☐ No
   c. Are corrections of deficiencies documented? ☐ Yes ☐ No
   d. What method do you use to ensure that identified deficiencies have been corrected? _____

6. Use your OSHA 200/300 logs to record the number of injuries and illnesses for the last three years. Please note that SHAW requires all subcontractors to provide incident statistics, even though certain companies may not be statutorily required to keep OSHA 200/300 logs.

YEAR	_____	_____	_____
a. Number of Fatalities	_____	_____	_____
b. Lost Work Day Incident Rate[1]	_____	_____	_____
c. OSHA Recordable Incident Rate[2]	_____	_____	_____
d. Number of Hours Worked	_____	_____	_____
e. Total Number of Employees on Your Payroll	_____	_____	_____

f. Attach a copy of your OSHA 300 logs for the last three years.

[1] The following formula is used for calculating the **Lost Work Day Incident Rate:**_____ = $\frac{\text{Number of Lost Work Day Cases x 200,000}}{\text{Number of Hours Worked}}$

[2] The following formula is used for calculating the **OSHA Recordable Incident Rate:** _____ = $\frac{\text{Number of OSHA Recordable Cases x 200,000}}{\text{Number of Hours Worked}}$

7. List your company's Worker's Compensation (WC) Experience Modification Rate **(EMR)** for the three (3) most recent years:

	Year	Interstate	Intrastate
a.	_____	_____	_____
b.	_____	_____	_____
c.	_____	_____	_____

d. **Provide a letter from your WC insurance carrier certifying the above EMRs.**

e. **If your WC carrier has not issued your company an EMR because you have not accrued enough WC costs, provide a copy of your WC Loss Run (available from your WC carrier).**

f. **If your current EMR is greater than 1.0, provide a written explanation of the safety methods that are being implemented by your company to reduce this rate.**

8. List activities your company will be performing on SHAW projects and the anticipated hazardous work operations (for example: excavation work, fall protection, ladders, scaffolding, confined space work, heavy equipment etc.)

Activities: _____

HazOps: _____

a. Will you subcontract work to other subcontractors? ☐Yes ☐ No

If yes, **please detail what portion of work:** _____

b. Do you prequalify subcontractors? ☐Yes ☐ No **If yes box checked, please attach method used to qualify subcontractors**

9. Has your company received an OSHA (or State OSHA) citation within the last five (5) years? ☐Yes ☐ No

If yes, provide the following information below: **If yes box checked, please attach copies of the citation(s).**

a. The number and type of violations?_____
b. The penalties assessed by OSHA? _____
c. Were the citations contested/vacated? _____
d. What specific corrective actions were taken to prevent further penalties/injuries? _____

10. Does your company have a written occupational safety and health program? ☐ Yes ☐ No

If yes box checked, please provide a copy of your health & safety program.

11. Does your company conduct field safety inspections to determine compliance with applicable regulations and procedures?

a. ☐Yes ☐No **If yes box checked, please provide sample copy of inspection form.**

b. Who conducts these inspections? (Please provide position/title) _____

c. How often are safety inspections conducted? _____

12. Does your company have the following on your staff or on retainer?

	Yes	No	How Many	Staff	Retainer	**Please give certification number(s)**
Occupational Physician	☐	☐	_____	_____	_____	_____
Certified Industrial Hygienist	☐	☐	_____	_____	_____	_____
Certified Safety Professional	☐	☐	_____	_____	_____	_____
Certified Health Physicist	☐	☐	_____	_____	_____	_____

13. Does your company have an orientation program for new hires? ☐ Yes ☐No

If yes box checked, please provide an outline of the orientation and the topics covered

14. Has your company implemented any of the following training programs?

If yes box checked, please provide the last date this training was provided.

Yes	No	Date		Yes	No	Date	
☐	☐	_____	Asbestos	☐	☐	_____	Hazardous Waste (40-hour)
☐	☐	_____	Blasting/Explosives	☐	☐	_____	Hearing Conservation
☐	☐	_____	Bloodborne Pathogens	☐	☐	_____	Heavy Equipment operation
☐	☐	_____	Confined Space Entry	☐	☐	_____	Laboratory Safety
☐	☐	_____	Construction (OSHA Certified 10 Hours)	☐	☐	_____	Ladder/Scaffolding
☐	☐	_____	Construction (OSHA Certified 30 Hours)	☐	☐	_____	Lead
☐	☐	_____	Cranes Operations	☐	☐	_____	Lockout/Tagout
☐	☐	_____	Electrical Safety	☐	☐	_____	Personal Protective Equipment
☐	☐	_____	Excavation Competent Person	☐	☐	_____	Powder-actuated Tools
☐	☐	_____	Fall Protection	☐	☐	_____	Process Safety Management
☐	☐	_____	Fire Extinguishers	☐	☐	_____	Radiation Protection
☐	☐	_____	First Aid/CPR	☐	☐	_____	Respiratory Protection
☐	☐	_____	Forklift Operations	☐	☐	_____	Welding/Cutting

Who conducts training for your company (name, title)? _____

15. Does your company have a program in place to discipline workers that perform unsafe work practices? ☐Yes ☐ No
If yes box checked, please provide as attachment

16. Does your company have written Accident Investigation Procedures? ☐Yes ☐ No
If yes box checked, please provide as attachment

17. Does your company currently maintain a program in compliance with applicable state "Right to Know" laws and the OSHA Hazard Communication Standard? ☐Yes ☐No **If yes box checked, please provide as attachment**

18. Does your company currently maintain an Accident Prevention Program in compliance with applicable state OSHA regulations? (Required for AlasSCA, California, Minnesota, Nevada and North Carolina) ☐Yes ☐ No ☐ N/A
☒ **If yes box checked, please provide as attachment**

19. Does your company implement a medical surveillance program for employees that work on hazardous waste sites or with hazardous chemicals (i.e., lead, asbestos, benzene, arsenic, formaldehyde, etc.)? Yes ___ No ___ N/A ___
☒ **If yes box checked, please provide as attachment**

20. Does your company have a written Alcohol and Substance Abuse Program? ☐Yes ☐No **If yes box checked, please provide program as attachment.**

If yes, does it include the following?

a. 10-panel substance testing? ☐Yes ☐No

b. Pre-employment/pre-job assignment testing (within 30 days of pre-job assignment)? ☐Yes ☐No

c. Post-accident drug and alcohol testing? ☐Yes ☐No

d. Random testing (10 percent per month)? ☐Yes ☐No

e. Reasonable suspicion drug and alcohol testing? ☐Yes ☐No

17. Has your company worked for SHAW in the past three years? ☐Yes ☐No

If so, what year and what project manager were you working for? Year: _____

Project Manager: _____

SECTION D: Quality Assurance

Does your company have a documented Quality Assurance program applicable to the goods or services to be provided? **Yes** ☐ **No** ☐

If yes, on what industry standard(s) is it based? _____

Will you provide your QA/QC Plan/Manual if requested? **Yes** ☐ **No** ☐

If work is to be performed in your facilities, will you make your facilities and processes available for Shaw Quality audits? **Yes** ☐ **No** ☐

SUPPLEMENTARY INFORMATION (additional pages maybe added)

SIGNATURE/CERTIFICATION

By signing below, the offeror certifies, under penalty of law, that the representations and certifications are accurate, current and complete. The offeror further certifies that it will notify the SHAW E&I Procurement Representative of any changes to these representations and certifications. The representations and certifications made by the offeror, as contained herein, concern matters within the jurisdiction of an agency of the United States and the making of a false, fictitious, or fraudulent representation or certification may render the maker subject to prosecution under Title 18, United States Code, Section 1001.

_____ _____

Signature of Offeror Responsible for Offer *Date*

_____

Typed Name of Person Responsible for the Offer

_____

Title of Person Responsible for the Offer

*NOTE: PENALTIES FOR FALSE MISREPRESENTATION. 1) FAR 52-219(e)(4) – Misrepresentations of business status as a small, small disadvantaged, women-owned small, veteran-owned small (including service disabled), and HUBZone small business concern for the purpose of obtaining a subcontract that is to be included as part or all of a goal contained in the Contractor's subcontracting plan, without remedy, can result in severe penalties. Additionally, 2) Under 15 U.S.C. 645(d), any person who misrepresents a firm's status as a small, small disadvantaged, women-owned small, veteran-owned small (including service disabled), and HUBZone small business concern in order to obtain a contract to be awarded under the preference programs established pursuant to section 8(a), 8(d), 9 or 15 of the Small Business Act or any other provision of Federal law that specifically references section 8(d) for a definition of program eligibility, shall: (i) Be punished by imposition of fine, imprisonment, or both; (ii) Be subject to administrative remedies, including suspension and debarment; and (iii) Be ineligible for participation in programs conducted under the authority of the Act.

Purpose: To obtain information regarding a Supplier/Subcontractor.

Instructions: Complete all sections of this form and return to the Shaw Environmental & Infrastructure, Inc. Shaw representative referenced on the cover letter. Mark sections which are not applicable "NA." Any information which does not fit in the spaces provided or that you feel will be helpful in determining Supplier capability to meet Shaw's needs should be placed in the Supplementary Information Section.

SECTION A: To be completed by all firms.

Company Name: _____

Company Address: _____

City/State/Zip Code: _____

Contact Names & Titles: _____

_____

Telephone Number: _____

Emergency (After Hours Contact): **Name:** _____ **Phone No.** _____

Fax Number: _____

Email Address: _____

Web Site: _____

Type of Company: ☐ Material Supplier ☐ Rental Supplier ☐ Other _____

City(ies) and State(s) Business/Occupational Licenses: _____

Applicable North American Industry Classification System Codes (NAICS):

_____

Description of Services/ Supplies/Equipment (i.e. office supplies, excavator):

_____

Catalog or Line Card available upon request: ☐ Yes ☐ No

Taxpayer ID Number: _____

Organization Type: Check appropriate box:

☐ Individual ☐ Sole proprietor ☐ Corporation ☐ Partnership ☐ Other _____

Duns. Number: _____

CCR Registered: ☐ Yes. Date_____; ☐ No

Business Classification: (Check appropriate boxes)

- ☐ **Large,**
  - ☐ **Women-Owned**
- ☐ **Non-Profit,**
- ☐ **Foreign,**
- ☐ **Small (Check All Subclassifications That Apply),**
  - ☐ **Woman-Owned,**
  - ☐ **Veteran-Owned,**
  - ☐ **Service Disabled Veteran,**
  - ☐ **HUBZone (Copy of SBA Certification Letter Required),**
  - ☐ **Qualified Non-Profit,**
  - ☐ **Disadvantaged (Copy of SBA Certification Letter Required),**
    - ☐ Black American.
    - ☐ Hispanic American.
    - ☐ Native American (American Indians, Eskimos, Aleuts, or Native Hawaiians)
      - ☐ Alaskan Native Corporation
      - ☐ Indian Tribe
    - ☐ Asian-Pacific American (persons with origins from Burma, Thailand, Malaysia, Indonesia, Singapore, Brunei, Japan, China, Taiwan, Laos, Cambodia, (Kampuchea), Vietnam, Korea, The Philippines, U.S. Trust Territory of the Pacific Islands (Republic of Palau), Republic of the Marshall Islands, Federated States of Micronesia, the Commonwealth of the Northern Mariana Islands, Guam, Samoa, Macao, Hong Kong, Fiji, Tonga, Kiribati, Tuvalu, or Nauru).
    - ☐ Subcontinent Asian (Asian-Indian) American (persons with origins from India, Pakistan, Bangladesh, Sri Lanka, Bhutan, the Maldives Islands, or Nepal).
    - ☐ Individual/concern, other than one of the preceding

COMMERCIAL SOCIO-ECONOMIC CERTIFICATIONS: Check appropriate box and enter name of State in the field provided

☐ MBE Minority Business Enterprise State(s):_____; _____; Organization:_____;
☐ WBE Women Business Enterprise State(s): _____; _____; Organization: _____;
☐ DBE Disadvantage Business Enterprise State(s): _____; _____; Organization:_____;

1. Does any company officer, partner, owner or their spouse have an ownership and /or management interest in another company? This would include being an officer, partner or owner of another company. **Yes** ☐ **No** ☐

   If so, please list:

   Name of Officer and Title [Owner, Director, Partner, Spouse] Company Name

   _____

   _____

2. Are any current company officers, partners, owner or their spouses a relative of any current Shaw employee (including Shaw subsidiaries). **Yes** ☐ **No** ☐

   If yes, then list the officer and Shaw employee name.

   Name of Officer and Title [Owner, Director, Partner, Spouse] Shaw Employee

   _____

   _____

3. How many years in business under your current legal name? _____
4. How many employees are currently on your payroll? _____
5. Are you privately owned or a publicly traded company"? _____
6. Are you union or non-union? ☐ Union ☐ Non-union
   If union, identify union affiliation." _____
7. Does your firm accept Master Card for purchases less than $3,000? _____

SECTION B PAST PERFORMANCE:

1. MAJOR CONTRACTS. List five largest contracts completed during that past four years, with special emphasis on hazardous waste/remediation work.

Contract Title/Scope	Client	$ Amount	Year Completed

2. MAJOR CURRENT CONTRACTS. List major contracts now on hand or in progress, with special emphasis on hazardous waste or remediation projects.

Contract Title/Scope	Client	Location	$ Amount

3. PROJECT PERFORMED FOR SHAW ENVIRONMENTAL & INFRASTRUCTURE, INC. (Shaw)
☐ Check this box if no previous experience working for Shaw. Otherwise complete the table below.

Contract Title/Scope	Shaw Project Manager	Location	Period of Performance

4. REFERENCE: List client/agencies, its representative, title and telephone number.

Client/Agency	Representative	Telephone Number

5. CRAFT INFORMATION: Lists crafts regularly employed in the field by your company. Identify any related trade agreements to which you are signatory (if none, check Merit Shop Contractor)

Craft	Trade Agreement	Craft	Trade Agreement
	☐Yes, _____ ☐Merit Shop Contractor		☐Yes, ☐Merit Shop Contractor
	☐Yes, _____ ☐Merit Shop Contractor		☐Yes, _____ ☐Merit Shop Contractor
	☐Yes, _____ ☐Merit Shop Contractor		☐Yes, _____ ☐Merit Shop Contractor
	☐Yes, _____ ☐Merit Shop Contractor		☐Yes, _____ ☐Merit Shop Contractor
	☐Yes, _____ ☐Merit Shop Contractor		☐Yes, _____ ☐Merit Shop Contractor
	☐Yes, _____ ☐Merit Shop Contractor		☐Yes, _____ ☐Merit Shop Contractor
	☐Yes, _____ ☐Merit Shop Contractor		☐Yes, _____ ☐Merit Shop Contractor
	☐Yes, _____ ☐Merit Shop Contractor		☐Yes, _____ ☐Merit Shop Contractor
	☐Yes, _____ ☐Merit Shop Contractor		☐Yes, _____ ☐Merit Shop Contractor

SECTION C. FINANCIAL

1. Provide Banking and Bonding information.

Banking Institute:	Bonding Company:
Contact:	Contact:
Phone:	Phone:
	Bonding Capacity:
	Available Bonding Capacity:
D&B Rating: Date:	

2. Is your firm able to supply the limits of coverage in Column A? In Column B indicate if there is an additional cost for the levels of coverage in Column A. In Column C, state your standard coverage levels.

Insurance	Column A		Column B	Column C
Workers' Compensation – Per Occurrence	$1,000,000	☐Yes ☐No	☐Yes ☐No	_____
Employers Liability – Per Occurrence	$1,000,000	☐Yes ☐No	☐Yes ☐No	_____
Comprehensive General Liablity- combined single limit per occurrence and annual aggregate of not less	$5,000,000	☐Yes ☐No	☐Yes ☐No	_____
Automobile Liability –per accident for bodily injury and property damage	$1,000,000	☐Yes ☐No	☐Yes ☐No	_____
Pollution Liability – per loss for bodily injury, property damage, clean-up cost and defense (for work including drilling, excavating or other obtrusive activities, and environmental remediation work.	**$1,000,000**	☐Yes ☐No	☐Yes ☐No	_____

3. Will your firm be able to satisfy the mandatory requirement that Shaw Environmental & Infrastructure, Inc. be named an additional insured on your Comprehensive General Liability Insurance Policy?
   ☐Yes ☐No.
4. Has your firm completed the "Go Kahuna" Certification program in the last 12 months? ☐Yes ☐No. If yes, please provide copy of certification.
5. STATE LICENSES AND REGISTRATION. Complete the following.

State	Classification/Type (Contractor, Engineer, etc.)	License Number(s)	Expiration Date

SECTION D ANALYTICAL SERVICES: This section only needs to be complete by firms providing analytical analysis. ☐ **Check this box if this section is not applicable.**

ANALYTICAL CERTIFICATIONS:

☐ NELAP Certified:
Accrediting State:_____ *(Attach Copy)*
☐ USACE Self Declared *(Attach Copy)*
☐ NFESC Approval Letter *(Attach Copy)*
☐ US Department of Agriculture (Foreign Soils Permit) *(Attach Copy)*
Other Certifications(can attach as a list):
_____; _____; _____

Additional Laboratory Services:

Yes ☐ **No** ☐ Ability to Produce Full Data Deliverable in PDF Format
Yes ☐ **No** ☐ Ability to Produce Reduced Data Deliverable in PDF Format (Format to be provided a project start up)
Yes ☐ **No** ☐ Ability to Produce Standard Electronic Data Deliverables
Yes ☐ **No** ☐ Ability to Produce Custom Electronic Data Deliverables
Yes ☐ **No** ☐ Laboratory Information Management System (LIMs)
Yes ☐ **No** ☐ On-Line Data Retrieval
Yes ☐ **No** ☐ Courier Service, if yes radius from laboratory:_____
Yes ☐ **No** ☐ Field Services
Yes ☐ **No** ☐ Mobile Laboratory Services
Yes ☐ **No** ☐ Service Centers, if yes list locations:_____
Yes ☐ **No** ☐ UFP QAPP Preparation Support

Can you support the following matrices, check all that are applicable:
☐ Soil ☐ Sediment ☐ Water ☐ Tissue ☐ Air

Specialty Analysis:
☐ Mold ☐ Asbestos ☐ Indoor Air Quality ☐ Industrial Hygiene

Can you support the following groups of methodology, it is understood that the laboratory may not support every method, check all that are applicable:
☐ SW-846 ☐ ASTM ☐ Current CLP SOW ☐ Standard Methods ☐ EPA

Standard Laboratory Turnaround time:_____
Can you support the following accelerated turnarounds with prior notification, it is understood that the laboratory may not support these turnarounds for every method :
24 hour ☐ 3 days☐ 5 days☐ 7 days☐

PLEASE INCLUDE COPIES OF THE FOLLOWING:

1. Laboratory Statement of Qualifications
2. Locations of all Laboratories
3. List of all Method Capabilities
4. List of all Instrumentation
5. Organizational Chart/s
6. Resumes of Key Personnel
7. Brief Paragraph on Sample Handling which includes sample disposal policies
8. List of Project Experience (include a variety of projects past and present and in support of multiple programs)
9. Name of one Shaw contact that you are currently performing analytical services for: _____

SECTION E: Training Practices

1. Do your employees receive training required by 29CFR1910.120 (HAZWOPER)?
   ☐Yes ☐No. If no, go to Section F
2. How many hours of initial HAZWOPER training do your employees receive? _____ Hours
3. Do your employees receive annual 8-hour refresher training? ☐Yes ☐No
4. Do your supervisors have the 8-hour HAZWOPER supervisory training? ☐Yes ☐No
5. Is there any other specific training your employees receive? ☐Yes ☐No
   If yes, what kind of training:_____

SECTION F: Medical Practices

1. Do you conduct initial and annual update medical exams in accordance with 29CFR1910.120(f)? ☐Yes ☐No
   If no, please explain: _____
2. Shaw Environmental & Infrastructure, Inc. requires pre-employment drug screening for all employees and subcontractors performing in work in exclusion zones. Do you currently conduct pre-employment drug screenings? ☐Yes ☐No
   If no, are you willing to conduct drug screening if so directed by contract documents?
   ☐Yes ☐No

SECTION G: Health and Safety Information ***(to be complete only if personnel will be on a Shaw project site for other than delivery of Supplies or Materials).***

1. Are you willing to comply with the Shaw Environmental & Infrastructure, Inc Health and Safety Program if so directed by contract documents? ☐ Yes ☐No If no, please explain.			
2. Do you have a Health & Safety Orientation Program for new hires and newly hired or promoted supervisors? ☐ Yes ☐No			
3. Do you hold site Health & Safety meeting for:			
a. Tailgate/Toolbox Safety Meetings	☐ Yes **If yes box checked, please provide sample copy(s)**	☐ No	Frequency _____
b. Field Supervisors	☐ Yes	☐ No	Frequency _____
c. Employees	☐ Yes	☐ No	Frequency _____
d. Subcontractors	☐ Yes	☐ No	Frequency _____
e. Are the safety meetings documented? ☐ Yes ☐No			
4. Personal Protection Equipment (PPE) Program: a. Is applicable PPE provided for employees? ☐Yes ☐ No b. Do you have a program to assure that PPE is inspected and maintained? ☐Yes ☐No c. What method do you use to prescribe PPE for each task? _____ d. How are task-specific PPE requirements communicated to workers? _____			
5. Employee Safety Program: a. Do you use a safety observer program or behavior based safety program? ☐Yes ☐No b. Do you have a corrective action process for addressing individual health and safety performance deficiencies? ☐Yes ☐No c. Do you have procedure for injury/illness reporting and investigation? ☐Yes ☐No			
6. Inspections and audits: a. Do you conduct and document Health and Safety inspections? ☐Yes ☐No b. Do you conduct and document Health and Safety Program audits? ☐Yes ☐No c. Are corrections of deficiencies documented? ☐Yes ☐No d. What method do you use to ensure that identified deficiencies have been corrected? _____			

e. Use your OSHA 200/300 logs to record the number of injuries and illnesses for the last three years. Please note that SHAW requires all subcontractors to provide incident statistics, even though certain companies may not be statutorily required to keep OSHA 200/300 logs.

YEAR	_____	_____	_____
a. Number of Fatalities	_____	_____	_____
b. Lost Work Day Incident Rate[1]	_____	_____	_____
c. OSHA Recordable Incident Rate[2]	_____	_____	_____
d. Number of Hours Worked	_____	_____	_____
e. Total Number of Employees on Your Payroll	_____	_____	_____

f. Attach a copy of your OSHA 300 logs for the last three years.

[1] The following formula is used for calculating the **Lost Work Day Incident Rate:**_____ = Number of Lost Work Day Cases x 200,000 / Number of Hours Worked

[2] The following formula is used for calculating the **OSHA Recordable Incident Rate:** _____ = Number of OSHA Recordable Cases x 200,000 / Number of Hours Worked

7. List your company's Worker's Compensation (WC) Experience Modification Rate **(EMR)** for the three (3) most recent years:

Year	Interstate	Intrastate
a. _____	_____	_____
b. _____	_____	_____
c. _____	_____	_____

d. **Provide a letter from your WC insurance carrier certifying the above EMRs.**
e. **If your WC carrier has not issued your company an EMR because you have not accrued enough WC costs, provide a copy of your WC Loss Run (available from your WC carrier).**
f. **If your current EMR is greater than 1.0, provide a written explanation of the safety methods that are being implemented by your company to reduce this rate.**

8. List activities your company will be performing on SHAW projects and the anticipated hazardous work operations (for example: excavation work, fall protection, ladders, scaffolding, confined space work, heavy equipment etc.)
Activities: _____
HazOps: _____
a. Will you subcontract work to other subcontractors? ☐ Yes ☐ No
If yes, **please detail what portion of work:** _____
b. Do you prequalify subcontractors? ☐ Yes ☐ No **If yes box checked, please attach method used to qualify subcontractors**

9. Has your company received an OSHA (or State OSHA) citation within the last five (5) years? ☐ Yes ☐ No
If yes, provide the following information below: **If yes box checked, please attach copies of the citation(s).**
a. The number and type of violations?_____
b. The penalties assessed by OSHA? _____
c. Were the citations contested/vacated? _____
d. What specific corrective actions were taken to prevent further penalties/injuries? _____

10. Does your company have a written occupational safety and health program? ☐ Yes ☐ No
If yes box checked, please provide a copy of your health & safety program.

11. Does your company conduct field safety inspections to determine compliance with applicable regulations and procedures?

a. ☐Yes ☐No **If yes box checked, please provide sample copy of inspection form.**

b. Who conducts these inspections? (Please provide position/title) _____

c. How often are safety inspections conducted? _____

12. Does your company have the following on your staff or on retainer?

	Yes	No	How Many	Staff	Retainer	**Please give certification number(s)**
Occupational Physician	☐	☐	_____	_____	_____	_____
Certified Industrial Hygienist	☐	☐	_____	_____	_____	_____
Certified Safety Professional	☐	☐	_____	_____	_____	_____
Certified Health Physicist	☐	☐	_____	_____	_____	_____

13. Does your company have an orientation program for new hires? ☐ Yes ☐No
If yes box checked, please provide an outline of the orientation and the topics covered

14. Has your company implemented any of the following training programs?
If yes box checked, please provide the last date this training was provided.

Yes	No	Date		Yes	No	Date	
☐	☐	_____	Asbestos	☐	☐	_____	Hazardous Waste (40-hour)
☐	☐	_____	Blasting/Explosives	☐	☐	_____	Hearing Conservation
☐	☐	_____	Bloodborne Pathogens	☐	☐	_____	Heavy Equipment operation
☐	☐	_____	Confined Space Entry	☐	☐	_____	Laboratory Safety
☐	☐	_____	Construction (OSHA Certified 10 Hours)	☐	☐	_____	Ladder/Scaffolding
☐	☐	_____	Construction (OSHA Certified 30 Hours)	☐	☐	_____	Lead
☐	☐	_____	Cranes Operations	☐	☐	_____	Lockout/Tagout
☐	☐	_____	Electrical Safety	☐	☐	_____	Personal Protective Equipment
☐	☐	_____	Excavation Competent Person	☐	☐	_____	Powder-actuated Tools
☐	☐	_____	Fall Protection	☐	☐	_____	Process Safety Management
☐	☐	_____	Fire Extinguishers	☐	☐	_____	Radiation Protection
☐	☐	_____	First Aid/CPR	☐	☐	_____	Respiratory Protection
☐	☐	_____	Forklift Operations	☐	☐	_____	Welding/Cutting

Who conducts training for your company (name, title)? _____

15. Does your company have a program in place to discipline workers that perform unsafe work practices? ☐Yes ☐ No
If yes box checked, please provide as attachment

16. Does your company have written Accident Investigation Procedures? ☐Yes ☐ No
If yes box checked, please provide as attachment

17. Does your company currently maintain a program in compliance with applicable state "Right to Know" laws and the OSHA Hazard Communication Standard? ☐Yes ☐No **If yes box checked, please provide as attachment**

18. Does your company currently maintain an Accident Prevention Program in compliance with applicable state OSHA regulations? (Required for AlasSCA, California, Minnesota, Nevada and North Carolina) ☐ Yes ☐ No ☐ N/A
☒ **If yes box checked, please provide as attachment**

19. Does your company implement a medical surveillance program for employees that work on hazardous waste sites or with hazardous chemicals (i.e., lead, asbestos, benzene, arsenic, formaldehyde, etc.)? ☐ Yes ☐ No ☐ N/A
☒ **If yes box checked, please provide as attachment**

20. Does your company have a written Alcohol and Substance Abuse Program? ☐Yes ☐No **If yes box checked, please provide program as attachment.**
If yes, does it include the following?
a. 10-panel substance testing? ☐Yes ☐No
b. Pre-employment/pre-job assignment testing (within 30 days of pre-job assignment)? ☐Yes ☐No
c. Post-accident drug and alcohol testing? ☐Yes ☐No
d. Random testing (10 percent per month)? ☐Yes ☐No
e. Reasonable suspicion drug and alcohol testing? ☐Yes ☐No

21. Has your company worked for SHAW in the past three years? ☐Yes ☐No
If so, what year and what project manager were you working for? Year: _____
Project Manager: _____

SECTION H: Quality Assurance

1. Does your company have a documented Quality Assurance program applicable to the goods, services or work activity to be provided? Yes ☐ No☐
If yes, on what industry standard(s) is it based? _____

2. Will you provide your QA/QC Plan/Manual if requested? Yes ☐ No☐
3. If work is to be performed in your facilities, will you make your facilities and processes available for Shaw Quality audits? Yes ☐ No☐
4. Have you previously been required by contract to have and implement a Quality Assurance Program or work under a client's Quality Assurance Programs? Yes ☐ No☐
If yes, describe participation including when and with whom._____
5. Are you willing to comply with the SE&I QA/QC Program or include specific Shaw Environmental & Infrastructure, Inc. quality requirements in your Quality Assurance Program, if so directed by the contract documents? Yes ☐ No☐
If no, please explain_____
6. Will you provide Shaw Environmental & Infrastructure, Inc. personnel with access to your facilities/operations for the purpose of qualification and in-process quality audits? Yes ☐ No☐
If no, please explain_____
7. Which of the following QA practices do you normally perform?
   a. Design Review(such as checking, data review, peer review) Yes ☐ No☐
   b. Calibration Yes ☐ No☐
   c. Preventive Maintenance Yes ☐ No☐
   d. In-process Inspection Yes ☐ No☐
   e. In-process Testing Yes ☐ No☐
   f. Formal Training Yes ☐ No☐
   g. Personnel Certification Yes ☐ No☐
   h. Corrective Action(identification, reporting, resolution) Yes ☐ No☐
   i. Record Maintenance Yes ☐ No☐
   j. Audits Yes ☐ No☐

SECTION I: MOTOR VEHICLE OPERATION GENERAL REQUIREMENTS

Attached is the Motor Vehicle Operations: General Requirements Procedure H800 (if required). You are required to review this document. Attachments two(2) through six(6) are to be signed and returned with this Qualification Form. Your signature acknowledges your firms acceptance of the requirements.

SECTION J: SUPPLEMENTARY INFORMATION any information related to your company that Shaw Environmental & Infrastructure, Inc. should know that was not asked. (additional pages maybe added)

As they specifically relate to our projects, will you provide applicable safety and quality-related records, IF REQUIRED, by Contract Documents such as certifications and test results, fabrication drawings, as-built drawings, calibration records operation logs, QA sample results, training records, medical examination protocols, injury and illness records? Yes ☐ No☐ If no, please explain:_____

SECTION K SIGNATURE/CERTIFICATION

By signing below, the offeror certifies, under penalty of law, that the representations and certifications are accurate, current and complete. The offeror further certifies that it will notify the SHAW E&I Procurement Representative of any changes to these representations and certifications. The representations and certifications made by the offeror, as contained herein, concern matters within the jurisdiction of an agency of the United States and the making of a false, fictitious, or fraudulent representation or certification may render the maker subject to prosecution under Title 18, United States Code, Section 1001.

_____ _____

Signature of Offeror Responsible for Offer *Date*

_____

Typed Name of Person Responsible for the Offer

_____

Title of Person Responsible for the Offer

*NOTE: PENALTIES FOR FALSE MISREPRESENTATION. 1) FAR 52-219(e)(4) – Misrepresentations of business status as a small, small disadvantaged, women-owned small, veteran-owned small (including service disabled), and HUBZone small business concern for the purpose of obtaining a subcontract that is to be included as part or all of a goal contained in the Contractor's subcontracting plan, without remedy, can result in severe penalties. Additionally, 2) Under 15 U.S.C. 645(d), any person who misrepresents a firm's status as a small, small disadvantaged, women-owned small, veteran-owned small (including service disabled), and HUBZone small business concern in order to obtain a contract to be awarded under the preference programs established pursuant to section 8(a), 8(d), 9 or 15 of the Small Business Act or any other provision of Federal law that specifically references section 8(d) for a definition of program eligibility, shall: (i) Be punished by imposition of fine, imprisonment, or both; (ii) Be subject to administrative remedies, including suspension and debarment; and (iii) Be ineligible for participation in programs conducted under the authority of the Act.

Annual Representations and Certifications—General Requirements for United States–Owned Entities

SHAW E&I is performing work under various U.S. Federal Government prime contracts as well as many state and local government prime contracts. These prime contracts require SHAW E&I to obtain certain information and certifications from your organization. The information requested is in accordance with the Federal Acquisition Regulation (FAR), available at http://www.acquisition.gov/far/, and the related sections of the FAR are cited for your reference. You are required to fully complete the appropriate sections of this form and signed it prior to submission of any proposal to SHAW E&I. The Representations and Certifications must be executed by an individual capable to commit your company. An award to your company cannot be made until this document is completed, executed and received/acknowledged within our GSIS system. Your cooperation is greatly appreciated.

EFFECTIVE PERIOD

This Annual Representation and Certification Document is valid for all orders issued to your company for one year from the date of execution.

Instructions:

The Representations and Certifications contain three parts.

Part I—General Representations and Certifications

Part II—Reporting Executive Compensation and First-Tier Subcontract Awards

Part III—Limitations On Pass Through Charges Certification

Supplementary Representations and Certification information may be requested in addition based upon prime contract requirements. This form and any supplemental forms will be provided to you prior to award of a specific order by the Procurement Function and will have an effective period which will be the same as the period of performance of the order. These forms could include, but are not limited to:

Cost Accounting Standards Notices and Certification

PART I—GENERAL REPRESENTATIONS AND CERTIFICATIONS

North American Industry Classification System (NAICS)		
The small business size status is derived from the receipts, number of employees, assets, barrels of oil, and/or megawatt hours		
NAICS Code	Description	Small Business (Yes or No)

.

OFFEROR HEREBY AFFIRMS THAT THE REPRESENTATIONS AND CERTIFICATIONS MADE HEREIN ARE TRUE AND CORRECT AND AGREES THAT SUCH REPRESENTATIONS AND CERTIFICATIONS SHALL FORM A PART OF ALL CONTRACTS AWARDED.

***CAUTION**: Federal law prescribes penalties and remedies for misrepresentations of business status as small business or small disadvantaged business for the purpose of obtaining a subcontract.*

Company Name: _____

Address: _____

_____

Telephone: _____

Facsimile: _____

Point of Contact: _____

Email Address: _____

Website: _____

** Cage Code: _____

** This is the number assigned by the government to the company address listed—applies only if prime government work has been performed by the company / individual shown above.

DUNS Number: _____

Bureau of Indian Affairs Reporting:

☐ Alaska Native Corporation

☐ Indian Tribe

☐ Written designation is attached.

☐ MBE Certifying State(s): _____

State Supplier Diversity Registration:

Identify state socio-economic business classifications

☐ WBE Certifying State(s):_____

☐ DBE Certifying State(s):_____

1. Taxpayer Identification (FAR 52.204-3) (Oct 1998)

All offerors must submit the information required in paragraphs (a) through (c) of this provision to comply with debt

(a) *Definitions.*

"Common parent," as used in this provision, means that corporate entity that owns or controls an affiliated group of corporations that files its Federal income tax returns on a consolidated basis, and of which the offeror is a member.

"Taxpayer Identification Number (TIN)," as used in this provision, means the number required by the Internal Revenue Service (IRS) to be used by the offeror in reporting income tax and other returns. The TIN may be either a Social Security Number or an Employer Identification Number.

(b) All offerors must submit the information required in paragraphs (d) through (f) of this provision to comply with debt collection requirements of 31 U.S.C. 7701(c) and 3325(d), reporting requirements of 26 U.S.C. 6041, 6041A, and 6050M and implementing regulations issued by the IRS. If the resulting contract is subject to the reporting requirements described in Federal Acquisition Regulation (FAR) 4.904, the failure or refusal by the offeror to furnish the information may result in a 31 percent reduction of payments otherwise due under the contract.

(c) The TIN may be used by the Government to collect and report on any delinquent amounts arising out of the offeror's relationship with the government (31 U.S.C. 7701(c)(3)). If the resulting contract is subject to the payment reporting requirements described in FAR 4.904, the TIN provided hereunder may be matched with IRS records to verify the accuracy of the offeror's TIN.

(d) *Taxpayer Identification Number (TIN)*.

☐TIN:_ _____.

☐TIN has been applied for.

☐TIN is not required because:

☐ Offeror is a nonresident alien, foreign corporation, or foreign partnership that does not have income effectively connected with the conduct of a trade or business in the United States and does not have an office or place of business or a fiscal paying agent in the United States;

☐ Offeror is an agency or instrumentality of a foreign government;

☐ Offeror is an agency or instrumentality of a Federal Government;

(e) *Type of organization.*

☐ Sole proprietorship
☐ Partnership
☐ Corporate entity (not tax-exempt)
☐ Corporate entity (tax-exempt)
☐ Government entity (Federal, State, or local)
☐ Foreign government
☐ International organization per 26 CFR 1.6049-4
☐ Other _____

(f) *Common Parent.*

☐ Offeror is not owned or controlled by a common parent as defined in paragraph (a) of this provision.

☐ Name and TIN of common parent:

Name _____

TIN _____

2. Small Business Program Representations (FAR 52.219-1) (APR 2011)

(a) (1) The North American Industry Classification System (NAICS) code for this acquisition is See Note.*

(2) The small business size standard is See Note.

(3) The small business size standard for a concern which submits an offer in its own name, other than on a construction or service contract, but which proposes to furnish a product which it did not itself manufacture, is 500 employees.

**If you are responding to a Government solicitation for supplies or services under a NAICS code not listed in the table above of this certification, you must provide this certification directly to the Shaw Procurement associate.*

(b) *Representations*.

(1) The offeror represents as part of its offer that it ☐is, ☐ is not a small business concern (see table above).

(2) [*Complete only if the offeror represented itself as a small business concern in paragraph (b)(1) of this provision.*] The offeror represents, for general statistical purposes, that it ☐ is, ☐is not, a small disadvantaged business concern as defined in 13 CFR 124.1002.

(3) [*Complete only if the offeror represented itself as a small business concern in paragraph (b)(1) of this provision.*] The offeror represents as part of its offer that it ☐ is, ☐ is not a women-owned small business concern.

(4) Women-owned small business (WOSB) concern eligible under the WOSB Program. [Complete only if the offeror represented itself as a women-owned small business concern in paragraph (b)(3) of this provision.] The offeror represents as part of its offer that

(i) It ☐ is, ☐ is not a WOSB concern eligible under the WOSB Program, has provided all the required documents to the WOSB Repository, and no change in circumstances or adverse decisions have been issued that affects its eligibility; and

(ii) It ☐ is, ☐ is not a joint venture that complies with the requirements of 13 CFR part 127, and the representation in paragraph (b)(4)(i) of this provision is accurate in reference to the WOSB concern or concerns that are participating in the joint venture. [The offeror shall enter the name or names of the WOSB concern or concerns that are participating in the joint venture: .] Each WOSB

concern participating in the joint venture shall submit a separate signed copy of the WOSB representation.

(5) Economically disadvantaged women-owned small business (EDWOSB) concern. [Complete only if the offeror represented itself as a women-owned small business concern eligible under the WOSB Program in (b)(4) of this provision.] The offeror represents as part of its offer that

(i) It ☐ is, ☐ is not an EDWOSB concern eligible under the WOSB Program, has provided all the required documents to the WOSB Repository, and no change in circumstances or adverse decisions have been issued that affects its eligibility; and

(ii) It ☐ is, ☐ is not a joint venture that complies with the requirements of 13 CFR part 127, and the representation in paragraph (b)(5)(i) of this provision is accurate in reference to the EDWOSB concern or concerns that are participating in the joint venture. [The offeror shall enter the name or names of the EDWOSB concern or concerns that are participating in the joint venture: .] Each EDWOSB concern participating in the joint venture shall submit a separate signed copy of the EDWOSB representation.

(6) [*Complete only if the offeror represented itself as a small business concern in paragraph (b)(1) of this provision.*] The offeror represents as part of its offer that it ☐ is, ☐ is not a veteran-owned small business concern.

(7) [*Complete only if the offeror represented itself as a veteran-owned small business concern in paragraph (b)(6) of this provision.*] The offeror represents as part of its offer that is ☐ is, ☐ is not a service-disabled veteran-owned small business concern.

(8) [*Complete only if the offeror represented itself as a small business concern in paragraph (b)(1) of this provision*.] The offeror represents, as part of its offer, that—

(i) It ☐ is, ☐ is not a HUBZone small business concern listed, on the date of this representation, on the List of Qualified HUBZone Small Business Concerns maintained by the Small Business Administration, and no material change in ownership and control, principal office, or HUBZone employee percentage has occurred since it was certified by the Small Business Administration in accordance with 13 CFR part 126; and

(ii) It ☐ is, ☐ is not a HUBZone joint venture that complies with the requirements of 13 CFR part 126, and the representation in paragraph (b)(8)(i) of this provision is accurate of the HUBZone small business concern participating in the HUBZonejoint venture. [*The offeror shall enter the names of the HUBZone small business concerns participating in the joint venture:* _____.] Each HUBZone small business concern participating in the HUBZone joint venture shall submit a separate signed copy of the HUBZone representation.

(c) *Definitions*. As used in this provision—

"Economically disadvantaged women-owned small business (EDWOSB) concern" means a small business concern that is at least 51 percent directly and unconditionally owned by, and the management and daily business operations of which are controlled by, one or more women who are citizens of the United States and who are economically disadvantaged in accordance with 13 CFR part 127. It automatically qualifies as a women-owned small business concern eligible under the WOSB Program."Service-disabled veteran-owned small business concern"—

(1) Means a small business concern—

(i) Not less than 51 percent of which is owned by one or more service-disabled veterans or, in the case of any publicly owned business, not less than 51 percent of the stock of which is owned by one or more service-disabled veterans; and

(ii) The management and daily business operations of which are controlled by one or more service-disabled veterans or, in the case of a service-disabled veteran with permanent and severe disability, the spouse or permanent caregiver of such veteran.

(2) Service-disabled veteran means a veteran, as defined in 38 U.S.C. 101(2), with a disability that is service-connected, as defined in 38 U.S.C. 101(16).

"Small business concern," means a concern, including its affiliates, that is independently owned and operated, not dominant in the field of operation in which it is bidding on Government contracts, and qualified as a small business under the criteria in 13 CFR Part 121 and the size standard in paragraph (a) of this provision.

"Veteran-owned small business concern" means a small business concern—

(1) Not less than 51 percent of which is owned by one or more veterans (as defined at 38 U.S.C. 101(2)) or, in the case of any publicly owned business, not less than 51 percent of the stock of which is owned by one or more veterans; and

(2) The management and daily business operations of which are controlled by one or more veterans.

"Women-owned small business concern," means a small business concern—

(1) That is at least 51 percent owned by one or more women; or, in the case of any publicly owned business, at least 51 percent of the stock of which is owned by one or more women; and

(2) Whose management and daily business operations are controlled by one or more women."Women-owned small business (WOSB) concern eligible under the WOSB Program (in accordance with 13 CFR part 127)," means a small business concern that is at least 51 percent directly and unconditionally owned by, and the management and daily business operations of which are controlled by, one or more women who are citizens of the United States.

(d) *Notice*.

(1) If this solicitation is for supplies and has been set aside, in whole or in part, for small business concerns, then the clause in this solicitation providing notice of the set-aside contains restrictions on the source of the end items to be furnished.

(2) Under 15 U.S.C. 645(d), any person who misrepresents a firm's status as a business concern that is small, HUBZone small, small disadvantaged, service-disabled veteran-owned small, economically disadvantaged women-owned small, or women-owned small eligible under the WOSB Program in order to obtain a contract to be awarded under the preference programs established pursuant to section 8, 9, 15, 31 and 36 of the Small Business Act or any other provision of Federal law that specifically references section 8(d) for a definition of program eligibility, shall—

(i) Be punished by imposition of fine, imprisonment, or both;
(ii) Be subject to administrative remedies, including suspension and debarment; and
(iii) Be ineligible for participation in programs conducted under the authority of the Act.

3 Historically Black College Or University And Minority Institution Representation (FAR 52.226-2) (OCT 2008)

(a) Definitions. As used in this provision—

Historically black college or university means an institution determined by the Secretary of Education to meet the requirements of 34 CFR 608.2. For the Department of Defense, the National Aeronautics and Space Administration, and the Coast Guard, the term also includes any nonprofit research institution that was an integral part of such a college or university before November 14, 1986.

Minority institution means an institution of higher education meeting the requirements of Section 365(3) of the Higher Education Act of 1965 [20 U.S.C. 1067k including a Hispanic-serving institution of higher education, as defined in Section 502(a) of the Act (20 U.S.C. 1101a)]

(b) Representation. The offeror represents that it—

☐ is ☐ is not a historically black college or university;
☐ is ☐ is not a minority institution.

4. Previous Contracts and Compliance Reports (FAR 52.222-22) (Feb 1999)

The offeror represents that:

(a) ☐ It has, ☐ has not, participated in a previous contract or subcontract subject to the Equal Opportunity clause of this solicitation;

(b) ☐ It has, ☐ has not, filed all required compliance reports (*note that if no reports were required, mark "has" filed all reports*); and

(c) Representations indicating submission of required compliance reports, signed by proposed subcontractors, will be obtained before subcontract awards.

5. Affirmative Action Compliance (FAR 52.222-25) (Apr 1984)

The offeror represents that it: *(Complete either item (a) or (b) only)*

(a) ☐ Has developed and has on file, or ☐ has not developed and does not have on file, at each establishment, affirmative action programs required by the rules and regulations of the Secretary of Labor (41 CFR 60-1 and 60-2), or

(b) ☐ Has not previously had contracts subject to the written affirmative action programs requirement of the rules and regulations of the Secretary of Labor.

6. Certification Regarding Responsibility Matters (FAR 52.209-5) (APR 2010) (Applicable to Subcontracts expected to exceed $30,000)

(a) (1) The offeror certifies, to the best of its knowledge and belief, that:

(i) The offeror and/or any of its Principals:

(A) ☐ Are, ☐ are, not presently debarred, suspended, proposed for debarment, or declared ineligible for the award of contracts by any Federal agency;

(B) ☐ Have, ☐ have not, within a three-year period preceding this offer, been convicted of or had a civil judgment rendered against them for: commission of fraud or a criminal offense in connection with obtaining, attempting to obtain, or performing a public (Federal, state or local) contract or subcontract; violation of Federal or state antitrust statutes relating to the submission of offers; or commission of embezzlement, theft, forgery, bribery, falsification or destruction of records, making false statements, tax evasion, or receiving stolen property (if offeror checks “have”, the offeror shall also see 52.209-7, if included in this solicitation); and

(C) ☐ Are, ☐ are not, presently indicted for, or otherwise criminally or civilly charged by a governmental entity with, commission of any of the offenses enumerated in subdivision (a)(1)(i)(B) of this provision.

(D) Have ☐ have not ☐, within a three year period preceding this offer, been notified of any delinquent Federal taxes in an amount that exceeds $3,000 for which the liability remains unsatisfied.

(1) Federal taxes are considered delinquent if both of the following criteria apply:

(i) The tax liability is finally determined. The liability is finally determined if it has been assessed. A liability is not finally determined if there is a pending administrative or judicial challenge. In the case of a judicial challenge to the liability, the liability is not finally determined until all judicial appeal rights have been exhausted.

(ii) The taxpayer is delinquent in making payment. A taxpayer is delinquent if the taxpayer has failed to pay the tax liability when full payment was due and required. A taxpayer is not delinquent in cases where enforced collection action is precluded.

(2) Examples.

(i) The taxpayer has received a statutory notice of deficiency, under I.R.C. §6212, which entitles the taxpayer to seek Tax Court review of a proposed tax deficiency. This is not a delinquent tax because it is not a final tax liability. Should the taxpayer seek Tax Court review, this will not be a final tax liability until the taxpayer has exercised all judicial appeal rights.

(ii) The IRS has filed a notice of Federal tax lien with respect to an assessed tax liability, and the taxpayer has been issued a notice under I.R.C. §6320 entitling the taxpayer to request a hearing with the IRS Office of Appeals contesting the lien filing, and to further appeal to the Tax Court if the IRS determines to sustain the lien filing. In the course of the hearing, the taxpayer is entitled to contest the underlying tax liability because the taxpayer has had no prior opportunity to contest the liability. This is not a delinquent tax because it is not a final tax liability. Should the taxpayer seek tax court review, this will not be a final tax liability until the taxpayer has exercised all judicial appeal rights.

(iii) The taxpayer has entered into an installment agreement pursuant to I.R.C. §6159. The taxpayer is making timely payments and is in full compliance with the agreement terms. The taxpayer is not delinquent because the taxpayer is not currently required to make full payment.

(iv) The taxpayer has filed for bankruptcy protection. The taxpayer is not delinquent because enforced collection action is stayed under 11 U.S.C. 362 (the Bankruptcy Code).

(ii) The offeror ☐has, ☐ has not, within a three-year period preceding this offer, had one or more contracts terminated for default by any Federal agency.

(2) "Principals," for the purposes of this certification, means officers; directors; owners; partners; and, persons having primary management or supervisory responsibilities within a business entity (*e.g.*, general manager; plant manager; head of a subsidiary, division, or business segment, and similar positions).

This Certification Concerns a Matter Within the Jurisdiction of an Agency of the United States and the Making of a False, Fictitious, or Fraudulent Certification May Render the Maker Subject to Prosecution Under Section 1001, Title 18, United States Code.

(b) The offeror shall provide immediate written notice to the SHAW E&I Contract Administrator if, at any time prior to contract award, the offeror learns that its certification was erroneous when submitted or has become erroneous by reason of changed circumstances.

(c) A certification that any of the items in paragraph (a) of this provision exists will not necessarily result in withholding of an award under this solicitation. However, the certification will be considered in connection with a determination of the offeror's responsibility. Failure of the offeror to furnish a certification or provide such additional information as requested by the SHAW E&I Contract Administrator may render the offeror nonresponsible.

(d) Nothing contained in the foregoing shall be construed to require establishment of a system of records in order to render, in good faith, the certification required by paragraph (a) of this provision. The knowledge and information of an offeror is not required to exceed that which is normally possessed by a prudent person in the ordinary course of business dealings.

(e) The certification in paragraph (a) of this provision is a material representation of fact upon which reliance was placed when making award. If it is later determined that the offeror knowingly rendered an erroneous certification, in addition to other remedies available to SHAW E&I and the Government, the SHAW E&I Contract Administrator may terminate the contract resulting from this solicitation for default.

7. Women-Owned Business (Other than Small Business) (FAR 52.204-5) (May 1999)

Complete the following Representation only if the offeror is a women-owned business concern and has not represented itself as a small business concern in paragraph (b)(1) of FAR 52.219-1, Small Business Program Representations, of these Representations and Certifications.

The offeror represents that it:

☐ Is a women-owned business concern, or is not ☐ a women-owned business concern.

Definition. "Women-owned business concern," as used in this provision, means a concern which is at least 51 percent owned by one or more women; or in the case of any publicly owned business, at least 51 percent of the stock of which is owned by one or more women; and whose management and daily business operations are controlled by one or more women.

8. Certification and Disclosure Regarding Payments to Influence Certain Federal Transactions. (FAR 52.203-11) (Sep 2007)

(a) The definitions and prohibitions contained in the clause at FAR 52.203-12, Limitation on Payments to Influence Certain Federal Transactions, included in this solicitation, are hereby incorporated by reference in paragraph (b) of this certification.

(b) The offeror, by signing its offer, hereby certifies to the best of his or her knowledge and belief that on or after December 23, 1989:

(1) No Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or

employee of Congress or an employee of a Member of Congress on his or her behalf in connection with the awarding of this contract;

(2) If any registrants under the Lobbying Disclosure Act of 1995 have made a lobbying contact on behalf of the offeror with respect to this contract, the offeror shall complete and submit, with its offer, OMB Standard Form LLL, Disclosure of Lobbying Activities, to provide the name of the registrants. The offeror need not report regularly employed officers or employees of the offeror to whom payments of reasonable compensation were made; and

(3) He or she will include the language of this certification in all subcontract awards at any tier and require that all recipients of subcontract awards in excess of $150,000 shall certify and disclose accordingly.

(c) Submission of this certification and disclosure is a prerequisite for making or entering into this contract imposed by section 1352, title 31, United States Code. Any person who makes an expenditure prohibited under this provision or who fails to file or amend the disclosure form to be filed or amended by this provision, shall be subject to a civil penalty of not less than $10,000, and not more than $100,000, for each such failure.

9. Certification of Toxic Chemical Release Reporting (FAR 52.223-13) (Aug 2003) (Applies only if required by the prime contract)

(a) Executive Order 13148, of April 21, 2000, Greening the Government through Leadership in Environmental Management, requires submission of this certification as a prerequisite for contract award.

(b) By signing this offer, the offeror certifies that—

(1) As the owner or operator of facilities that will be used in the performance of this contract that are subject to the filing and reporting requirements described in section 313 of the Emergency Planning and Community Right-to-Know Act of 1986 (EPCRA) (42 U.S.C. 11023) and section 6607 of the Pollution Prevention Act of 1990 (PPA) (42 U.S.C. 13106), the offeror will file and continue to file for such facilities for the life of the contract the Toxic Chemical Release Inventory Form (Form R) as described in section 313(a) and (g) of EPCRA and section 6607 of PPA; or

(2) None of its owned or operated facilities to be used in the performance of this contract is subject to the Form R filing and reporting requirements because each such facility is exempt for at least one of the following reasons: *(Check each block that is applicable.)*

☐ (i) The facility does not manufacture, process or otherwise use any toxic chemicals listed in 40 CFR 372.65;

☐ (ii) The facility does not have 10 or more full-time employees as specified in section 313(b)(1)(A) of EPCRA, 42 U.S.C. 11023(b)(1)(A);

☐ (iii) The facility does not meet the reporting thresholds of toxic chemicals established under section 313(f) of EPCRA, 42 U.S.C. 11023(f) (including alternate thresholds at 40 CFR 372.27, provided an appropriate certification form has been filed with EPA);

☐ (iv) The facility does not fall within the following Standard Industrial Classification (SIC) codes or their corresponding North American Industry Classification System sectors:

A. Major group code 10 (except 1011, 1081, and 1094.

B. Major group code 12 (except 1241).

C. Major group codes 20 through 39.

D. Industry code 4911, 4931, or 4939 (limited to facilities that combust coal and/or oil for the purpose of generating power for distribution in commerce).

E. Industry code 4953 (limited to facilities regulated under the Resource Conservation and Recovery Act, Subtitle C (42 U.S.C. 6921, et seq.), or 5169, or 5171, or 7389 (limited to facilities primarily engaged in solvent recovery services on a contract or fee basis); or

☐ (v) The facility is not located in the United States or its outlying areas.

10. CERTIFICATE OF INDEPENDENT PRICE DETERMINATION (FAR 52.203-2) (APR 1985)

(a) The offeror certifies that—

(1) The prices in this offer have been arrived at independently, without, for the purpose of restricting competition, any consultation, communication, or agreement with any other offeror or competitor relating to

(i) those prices, (ii) the intention to submit a proposal, or (iii) the methods or factors used to calculate the prices offered;

(2) The prices in this offer have not been and will not be knowingly disclosed by the offeror, directly or indirectly, to any other offeror or competitor before bid opening (in the case of a sealed bid solicitation) or contract award (in the case of a negotiated solicitation) unless otherwise required by law; and

(3) No attempt has been made or will be made by the offeror to induce any other concern to submit or not to submit a proposal for the purpose of restricting competition.

(b) Each signature on the offer is considered to be a certification by the signatory that the signatory—

(1) Is the person in the offeror's organization responsible for determining the prices being offered in this bid or proposal, and that the signatory has not participated and will not participate in any action contrary to subparagraphs A(1) through A(3) above; or

(2) (i) Has been authorized, in writing, to act as agent for the following principals in certifying that those principals have not participated and will not participate in any action contrary to subparagraphs A(1) through A(3) above.

_____

[*insert full name of person(s) in the offeror's organization responsible for determining the prices offered in this bid or proposal, and the title of his or her position in the offeror's organization*];

(ii) As an authorized agent, does certify that the principals named in subdivision B(2)(i) above have not participated, and will not participate, in any action contrary to subparagraphs A(1) through A(3) above;

(iii) As an agent, has not personally participated, and will not participate, in any action contrary to subparagraphs A(1) through A(3) above.

(3) If the offeror deletes or modifies subparagraph A(2) above, the offeror must furnish with its proposal a signed statement setting forth in detail the circumstances of the disclosure.

11. Contractor Code of Business Ethics and Conduct:

1. Does your firm have a code of business ethics and conduct? ☐ Yes ☐ No
2. Are your employees provided a copy of the code of business ethics and conduct? ☐ Yes ☐ No
3. Does your firm have a business ethics and compliance training program? ☐ Yes ☐ No
4. Does your firm's internal control procedure address non-compliance with your company's business ethics and conduct? ☐ Yes ☐ No
5. What is your firm's method of communication to your clients on government contracts when you code of business ethics and conduct is breached or internal fraud is detected? _____
6. Does your firm have the Fraud Hotline Poster from the OIG posted in your offices? ☐ Yes ☐ No
7. If requested by Homeland Security, will your firm post the Disaster Assistance Fraud Posters Hot Line posters in your offices? ☐ Yes ☐ No

12. FAR 52.215-6 PLACE OF PERFORMANCE (OCTOBER 1997)

(a) The offeror or quoter, in the performance of any subcontract resulting from this solicitation, ☐ intends / ☐ does not intend (check applicable block) to use one or more plants or facilities located at a different address from the address of the offeror or quoter as indicated in this proposal or quotation.

(b) If the offeror or quoter checks "intends" in paragraph (a) above, it shall insert in the spaces provided below the required information:

Place of Performance (Street, City, State, ZIP)	Name and Address of Owner and Operator of Plant or Facility if Different from Offeror

13. SYSTEM APPROVALS

Accounting System: Do you have an Accounting system that has been deemed adequate by a Federal Government Agency? ☐ YES ☐ NO

Date of reportl:

Cognizant Government Audit Agency: _____

Address: _____

Phone: _____

Property System: Do you have a Property Management system that has been deemed adequate by a Federal Government Agency? ☐ YES ☐ NO

Date of reportl: _____

Approving Agency: _____

Purchasing System: Do you have a Purchasing system that has been deemed adequate by a Federal Government Agency? ☐ YES ☐ NO

Date of report: _____

Approving Agency: _____

14. CONFLICT OF INTEREST CERTIFICATION

The offeror recognizes and endorses the Purchaser's ongoing efforts to comply fully with the Federal procurement laws that govern the Federal work done by Purchaser. The offeror hereby certifies that it knows of no facts or circumstances as a result of its other activities or relationships with other persons or entities that could lead to an organizational conflict of interest as defined in Federal Acquisition Regulation 2.101 and Subpart 9.5 for purposes of this procurement. The offeror recognizes that it has a continuing obligation to examine its other activities and relationships to ensure the work being undertaken or considered will not conflict with or otherwise impair its judgment in performing the subcontract. If at any point during its performance of the subcontract, the offeror becomes aware of any facts or circumstances that could create an organizational conflict of interest, the offeror agrees to immediately disclose such information to Purchaser.

15. FAR 52.203-14 DISPLAY OF HOTLINE POSTER(S)

Pursuant to FAR 52.203-14, does Offeror display a Government-Issued Hotline Poster from any Agency or any appropriate Department of Homeland Security Fraud Hotline Poster during performance in the USA.

Yes [ ] Date Implemented:
No [ ] Planned Implementation Date:

NO SUBCONTRACT OR PURCHASE ORDER WILL BE ISSUED FOR GREATER THAN $5,000,000 FOR NON-COMMERCIAL ITEMS IF OFFEROR DOES NOT MAINTAIN A CODE OF BUSINESS ETHICS AND CONDUCT OR DISPLAY A GOVERNMENT ISSUED HOTLINE POSTER

16. FOREIGN CORRUPT PRACTICES ACT—(Applicable ONLY for work performed outside the United States)

Subcontractor hereby represents and warrants that none of its officers, directors, agents or employees are (a) an official, employee or agent of the Government or any state-owned enterprise, public international organization, candidate for public office, member of a royal family, an officer, director, or employee, or an affiliate of a Shaw E&I client; and (b) as of the date below, no Government official, and no official of any Government agency or instrumentality of the Government, is or will become associated with, or will own or presently owns an interest, whether direct or indirect, in Subcontractor or has or will have any legal or beneficial interest in this Agreement or the payments made by Shaw E&I to Subcontractor hereunder.

17. EXPORT CERTIFICATION

This Export Certification is required and hereby included in the representations and certifications completed for award of all Defense related subcontracts.

Shaw E&I requires that its offerors certify the following information to ensure compliance with the U.S. Government export laws and regulations including the U.S. International Traffic in Arms Regulations (ITAR), 22 C.F.R.
§§ 120 et seq., the Export Administration Regulations (EAR), 15 C.F.R. §§ 730 et seq., and the asset control and sanctions programs administered by the Treasury Department's Office of Foreign Assets Control (OFAC), 31 C.F.R. §§
500 et seq.

A. Offeror is [___], is not [___] a "U.S. Person" as defined in the ITAR 22 CFR Part 120.15 and the EAR 15 CFR Part 772.

ITAR 22 CFR Part 120.15 and the EAR 15 CFR Part 772 defines a U.S. person as a person who is a lawful permanent resident as defined by 8 U.S.C. 1101(a)(2) or who is a protected individual as defined by 8 U.S.C. 1324b(a)(3). It also means any corporation, business, association, a partnership, society, trust, or any other entity, organization or group that is incorporated to do business in the United States. It also includes any governmental (federal, state or local) entity.

B. Offeror is registered (____), is exempt from registration (____), is not registered (____) with the U.S. Department of State, Directorate of Defense Trade Controls per ITAR 22 CFR Part 122.1(a) and (b). Expiration Date of Registration (_____), if registered.

In accordance with ITAR 22 CFR Part 122.1(a) any person who engages in the United States in the business of either manufacturing or exporting defense articles or furnishing defense services is required to register with he Directorate of Defense Trade Controls (DDTC) unless exempted by one of the four conditions listed in ITAR 22 CFR Part 122.1(b).

Furthermore, the offeror is responsible for the protection of any information or defense articles provided to them by Shaw E&I *to assist in the manufacture of a defense article or provision of a defense service. The release of such information by the offeror to a Foreign Person employee or its transfer to another Foreign Person is defined as an export (ITAR 22 CFR parts 120.17 and 124.13 and EAR 15 CFR part 734.2(b)(2)(ii) and supplements 1 and 2 of Part 774 and subject to the licensing requirements of the ITAR and EAR as applicable.*

18. Read each section and complete or check each blank and/or box as appropriate:

1. ☐ The *Buy American Act Certificate* must be completed in solicitations containing the clause FAR 52.225-1 *Buy American Act—Supplies.*

Buy American Act Certificate (FAR 52.225-2) (FEB 2009)

(a) The offeror certifies that each end product, except those listed in paragraph (b) of this provision, is a domestic end product and that for other than COTS items, the offeror has considered components of unknown origin to have been mined, produced, or manufactured outside the United States. The offeror shall list as foreign end products those end products manufactured in the United States that do not qualify as domestic end products. The terms "component," "domestic end product," "end product," "foreign end product," and "United States" are defined in the clause of this solicitation entitled "Buy American Act—Supplies."

(b) Foreign End Products:

Line Item No.:	Country of Origin:

[*List as necessary]*

(c) The Government will evaluate offers in accordance with the policies and procedures of Part 25 of the Federal Acquisition Regulation.

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2. ☐ The *Buy American Act—Free Trade Agreements—Israeli Trade Act Certificate*, must be completed in solicitations containing the clause at FAR 52.225-3 *Buy American Act—Free Trade Agreements—Israeli Trade Act.* If the acquisition value is $25,000 or more but is less than $50,000, use the clause with its Alternate I. If the acquisition value is $50,000 or more but less than $70,079, use the clause with its Alternate II.

Buy American Act—Free Trade Agreements—Israeli Trade Act Certificate (FAR 52-225-4) (Jan 2005)

(a) The offeror certifies that each end product, except those listed in paragraph (b) or (c) of this provision, is a domestic end product and that the offeror has considered components of unknown origin to have been mined, produced, or manufactured outside the United States. The terms "component," "domestic end product," "end product," "end product of Australia, Canada, Chile, Mexico, or Singapore," "foreign end product," "Israeli end product," and "United States" are defined in the clause of this solicitation entitled "Buy American Act—Free Trade Agreements—Israeli Trade Act."

(b) The offeror certifies that the following supplies are end products of Australia, Canada, Chile, Mexico, or Singapore or Israeli end products as defined in the clause of this solicitation entitled "Buy American Act—Free Trade Agreements—Israeli Trade Act"

End Products of Australia, Canada, Chile, Mexico, or Singapore or Israeli End Products:

Line Item No.:	Country of Origin:

[List as necessary]

(c) The offeror shall list those supplies that are foreign end products (other than those listed in paragraph (b) of this provision) as defined in the clause of this solicitation entitled ``Buy American Act—Free Trade Agreement—Israeli Trade Act.'' The offeror shall list as other foreign end products those end products manufactured in the United States that do not qualify as domestic end products.

Other Foreign End Products

Line Item No.:	Country of Origin:

[List as necessary]

(d) The Government will evaluate offers in accordance with the policies and procedures of Part 25 of the Federal Acquisition Regulation.

(End of provision)

Alternate I (Jan 2004). As prescribed in FAR 25.1101 (b)(2)(ii), substitute the following paragraph (b) for paragraph (b) of the basic provision:

(b) The offeror certifies that the following supplies are Canadian end products as defined in the clause of this solicitation entitled "Buy American Act—Free Trade Agreements—Israeli Trade Act":

Canadian End Products:

Line Item No. _____

[List as necessary]

Alternate II (Jan 2004). As prescribed in FAR 25.1101 (b)(2)(iii), substitute the following paragraph (b) for paragraph (b) of the basic provision:

(b) The offeror certifies that the following supplies are Canadian end products or Israeli end products as defined in the clause of this solicitation entitled "Buy American Act— Free Trade Agreements—Israeli Trade Act":

Canadian or Israeli End Products

Line Item No.:	Country of Origin:

[List as necessary]

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3. ☐ The *Trade Agreements Certificate*, must be completed in solicitations containing the clause at FAR 52.225-5 *Trade Agreements.*

Trade Agreements Certificate (FAR 52-225-6) (Jan 2005)

(a) The offeror certifies that each end product, except those listed in paragraph (b) of this provision is a U.S.-made or designated country end product, as defined in the clause of this solicitation entitled "Trade Agreements."

(b) The offeror shall list as other end products those supplies that are not U.S.-made or designated country end products.

Other End Products

Line Item No.	Country of Origin:

[*List as necessary*]

(c) The Government will evaluate offers in accordance with the policies and procedures of Part 25 of the Federal Acquisition Regulation. For line items covered by the WTO GPA, the Government will evaluate offers of U.S.-made or designated country end products without regard to the restrictions of the Buy American Act. The Government will consider for award only offers of U.S.-made or designated country end products unless the Contracting Officer determines that there are no offers for such products or that the offers for those products are insufficient to fulfill the requirements of this solicitation.

(End of Provision)

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4. ☐ The *Notice of Buy American Act Requirement—Construction Materials*, applies in solicitations containing the clause at FAR 52.225-9 *Buy American Act —Construction Materials*.

Notice of Buy American Act Requirement—Construction Materials (FAR 52.225-10) (FEB 2009)

(a) Definitions. "Commercially available off-the-shelf (COTS) item", "Construction material," "domestic construction material," and "foreign construction material," as used in this provision, are defined in the clause of this solicitation entitled "Buy American Act—Construction Materials" (FAR clause 52.225-9).

(b) Requests for determinations of inapplicability. An offeror requesting a determination regarding the inapplicability of the Buy American Act should submit the request to the Contracting Officer in time to allow a determination before submission of offers. The offeror shall include the information and applicable supporting data required by paragraphs (c) and (d) of the clause at FAR 52.225-9 in the request. If an offeror has not requested a determination regarding the inapplicability of the Buy American Act before submitting its offer, or has not received a response to a previous request, the offeror shall include the information and supporting data in the offer.

(c) Evaluation of offers.

(1) The Government will evaluate an offer requesting exception to the requirements of the Buy American Act, based on claimed unreasonable cost of domestic construction material, by adding to the offered price the appropriate percentage of the cost of such foreign construction material, as specified in paragraph (b)(3)(i) of the clause at FAR 52.225-9.

(2) If evaluation results in a tie between an offeror that requested the substitution of foreign construction material based on unreasonable cost and an offeror that did not request an exception, the Contracting Officer will award to the offeror that did not request an exception based on unreasonable cost.

(d) Alternate offers.

(1) When an offer includes foreign construction material not listed by the Government in this solicitation in paragraph (b)(2) of the clause at FAR 52.225-9, the offeror also may submit an alternate offer based on use of equivalent domestic construction material.

(2) If an alternate offer is submitted, the offeror shall submit a separate Standard Form 1442 for the alternate offer, and a separate price comparison table prepared in accordance with paragraphs (c) and (d) of the clause at FAR 52.225-9 for the offer that is based on the use of any foreign construction material for which the Government has not yet determined an exception applies.

(3) If the Government determines that a particular exception requested in accordance with paragraph (c) of the clause at FAR 52.225-9 does not apply, the Government will evaluate only those offers based on use of the equivalent domestic construction material, and the offeror shall be required to furnish such domestic construction material. An offer based on use of the foreign construction material for which an exception was requested—

(i) Will be rejected as nonresponsive if this acquisition is conducted by sealed bidding; or

(ii) May be accepted if revised during negotiations.

(End of provision)

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5. ☐ The *Notice of Buy American Act Requirement—Construction Materials under Trade Agreements*, in solicitations containing the clause at FAR 52.225-11 *Buy American Act—Construction Materials under Trade Agreements*. If insufficient time is available to process a determination regarding the inapplicability of the Buy American Act before receipt of offers, use the provision with its Alternate I. For acquisitions valued at $7,804,000 or more, but less than $9,110,318, use the clause with its Alternate II.

Notice of Buy American Act Requirement—Construction Materials Under Trade Agreements (Jan 2005)

(a) Definitions. "Construction material," "designated country construction material," "domestic construction material," and "foreign construction material," as used in this provision, are defined in the clause of this solicitation entitled "Buy American Act—Construction Materials Under Trade Agreements" (FAR clause 52.225-11).

(b) Requests for determination of inapplicability. An offeror requesting a determination regarding the inapplicability of the Buy American Act should submit the request to the Contracting Officer in time to allow a determination before submission of offers. The offeror shall include the information and applicable supporting data required by paragraphs (c) and (d) of FAR clause 52.225-11 in the request. If an offeror has not requested a determination regarding the inapplicability of the Buy American Act before submitting its offer, or has not received a response to a previous request, the offeror shall include the information and supporting data in the offer.

(c) Evaluation of offers.

(1) The Government will evaluate an offer requesting exception to the requirements of the Buy American Act, based on claimed unreasonable cost of domestic construction materials, by adding to the offered price the appropriate percentage of the cost of such foreign construction material, as specified in paragraph (b)(4)(i) of FAR clause 52.225-11.

(2) If evaluation results in a tie between an offeror that requested the substitution of foreign construction material based on unreasonable cost and an offeror that did not request an exception, the Contracting Officer will award to the offeror that did not request an exception based on unreasonable cost.

(d) Alternate offers.

(1) When an offer includes foreign construction material, other than designated country construction material, that is not listed by the Government in this solicitation in paragraph (b)(3) of FAR clause 52.225-11, the offeror also may submit an alternate offer based on use of equivalent domestic or designated country construction material.

(2) If an alternate offer is submitted, the offeror shall submit a separate Standard Form 1442 for the alternate offer, and a separate price comparison table prepared in accordance with paragraphs (c) and (d) of FAR clause 52.225-11 for the offer that is based on the use of any foreign construction material for which the Government has not yet determined an exception applies.

(3) If the Government determines that a particular exception requested in accordance with paragraph (c) of FAR clause 52.225-11 does not apply, the Government will evaluate only those offers based on use of the equivalent domestic or designated country construction material, and the offeror shall be required to furnish such domestic or designated country construction material. An offer based on use of the foreign construction material for which an exception was requested—

(i) Will be rejected as nonresponsive if this acquisition is conducted by sealed bidding; or

(ii) May be accepted if revised during negotiations.

(End of provision)

Alternate I (May 2002). As prescribed in FAR 25.1102(d)(2), substitute the following paragraph (b) for paragraph (b) of the basic provision:

(b) Requests for determination of inapplicability. An offeror requesting a determination regarding the inapplicability of the Buy American Act shall submit the request with its offer, including the information and applicable supporting data required by paragraphs (c) and (d) of FAR clause 52.225-11.

Alternate II (Jan 2005). As prescribed in FAR 25.1102(d)(3), substitute the following paragraphs (a) and (d) for paragraphs (a) and (d) of the basic provision:

(a) Definitions. "Australian, Chilean, or Moroccan construction material," "Caribbean Basin country construction material," "construction material," "domestic construction material," "foreign construction material," "least developed country construction material," and "WTO GPA country construction material," as used in this provision, are defined in the clause of this solicitation entitled "Buy American Act—Construction Materials Under Trade Agreements" (FAR clause 52.225-11).

(d) *Alternate offers.*

(1) When an offer includes foreign construction material, other than WTO GPA country, Australian, Chilean, or Moroccan, least developed country, or Caribbean Basin country construction material, that is not listed by the Government in this solicitation in paragraph (b)(3) of FAR clause 52.225-11, the offeror also may submit

an alternate offer based on use of equivalent domestic, WTO GPA country, Australian, Chilean, or Moroccan, least developed country or Caribbean Basin country construction material.

(2) If an alternate offer is submitted, the offeror shall submit a separate Standard Form 1442 for the alternate offer, and a separate price comparison table prepared in accordance with paragraphs (c) and (d) of FAR clause 52.225-11 for the offer that is based on the use of any foreign construction material for which the Government has not yet determined an exception applies.

(3) If the Government determines that a particular exception requested in accordance with paragraph (c) of FAR clause 52.225-11 does not apply, the Government will evaluate only those offers based on use of the equivalent domestic, WTO GPA country, Australian, Chilean, or Moroccan, least developed country, or Caribbean Basin country construction material, and the offeror shall be required to furnish such domestic, WTO GPA country, Australian, Chilean, or Moroccan, least developed country, or Caribbean Basin country construction material. An offer based on use of the foreign construction material for which an exception was requested—

(i) Will be rejected as nonresponsive if this acquisition is conducted by sealed bidding; or

(ii) May be accepted if revised during negotiations.

19. DFARS 252.209-7001 DISCLOSURE OF OWNERSHIP OR CONTROL BY THE GOVERNMENT OF A TERRORIST COUNTRY (JAN 2009) *(Applicable over $150,000)*

(a) Definitions. As used in this provision—

(1) "Government of a terrorist country" includes the state and the government of a terrorist country, as well as any political subdivision, agency, or instrumentality thereto.

(2) "Terrorist country" means a country determined by the Secretary of State, under section 6(j)(1)(A) of the Export Administration Act of 1979 [50 U.S.C. App. 2405(j)(i)(A)], to be a country the government of which has repeatedly provided support for acts of international terrorism. As of the date of this provision, terrorist countries include: Cuba, Iran, Iraq, Libya, North Korea, Sudan and Syria.

(3) "Significant interest" means—

(i) Ownership of or beneficial interest in 5 percent or more of the firm's or subsidiary's securities. Beneficial interest includes holding 5 percent or more of any class of the firm's securities in "nominee shares," "street names," or some other method of holding securities that does not disclose the beneficial owner;

(ii) Holding a management position in the firm, such as a director or officer;

(iii) Ability to control or influence the election, appointment, or tenure of directors or officers in the firm;

(iv) Ownership of 10 percent or more of the assets of a firm such as equipment, buildings, real estate, or other tangible assets of the firm; or

(v) Holding 50 percent or more of the indebtedness of a firm.

(b) Prohibition of award.

In accordance with 10 U.S.C. 2327, no contract may be awarded to a firm or a subsidiary of a firm if the government of a terrorist country has a significant interest in the firm or subsidiary or, in the case of a subsidiary, the firm that owns the subsidiary, unless a waiver is granted by the Secretary of Defense.

(c) Disclosure.

If the government of a terrorist country has a significant interest in the Offeror or a subsidiary of the Offeror, the Offeror shall disclose such interest in an attachment to this document. If the Offeror is a subsidiary, it shall also disclose any significant interest the government of a terrorist country has in any firm that owns or controls the subsidiary. The disclosure shall include:

(1) Identification of each government holding a significant interest; and

(2) A description of the significant interest held by each government.

20. DFARS 252.209-7002 DISCLOSURE OF OWNERSHIP OR CONTROL BY A FOREIGN GOVERNMENT (JUN 2010) (Applicable when access to proscribed information is necessary for contract performance)

(a) Definitions

As used in this provision—

(1) "Effectively owned or controlled" means that a foreign government or any entity controlled by a foreign government has the power, either directly or indirectly, whether exercised or exercisable, to control the election, appointment, or tenure of the Officer's officers or a majority of the Officer's board of directors by any means, e.g., ownership, contract, or operation of law (equivalent power for unincorporated organization).

(2) "Entity controlled by a foreign government"

(i) Means—

(A) Any domestic or foreign organization or cooperation that is effectively owned or controlled, either directly or indirectly, by a foreign government if the ownership of that organization or corporation by that foreign government was effective before October 23, 1992.

(B) Any individual acting on behalf of a foreign government.

(ii) Does not include any organization or corporation that is owned, but is not controlled, either directly or indirectly, by a foreign government if the ownership of that organization or corporation by that foreign government was effective before October 23, 1992.

(3) "Foreign government" includes the state and the government of any country (other than the United States and its possessions and trust territories) as well as any political subdivision, agency, or instrumentality therefore.

(4) "Proscribed information" means—

(i) Top Secret information;

(ii) Communications Security (COMSEC) material, excluding controlled cryptographic items when unkeyed or utilized with unclassified keys;

(iii) Restricted Data as defined in the U.S. Atomic Energy Act of 1954, as amended;

(iv) Special Access Program (SAP) information; or

(v) Sensitive Compartmented Information (SCI).

(b) Prohibition on award

No contract under a national security program may be awarded to any entity controlled by a foreign government if that entity requires access to proscribed information to perform the contract, unless the Secretary of Defense or designee has waived application of 10 U.S.C. 2536(a).

(c) Disclosure

The Offeror shall disclose any interest foreign government has in the Offeror when that interest constitutes control by a foreign government as defined in the provision. If the Offeror is a subsidiary, it shall also disclose any reportable interest a foreign government has in any entity that owns or controls the subsidiary, including reportable interest concerning the Offeror's immediate parent,

intermediate parents, and the ultimate parent. Use separate paper when needed, and provide the information in the following format;

Offeror's Point of Contact for Questions about Disclosure: _____

_____

(Name and Phone Number with Country Code, City Code, and Area Code, as applicable)

Name and Address of Offeror: _____

Name and Address of Entity Controlled by a Foreign Government: _____

_____

Description of Interest, Ownership Percentage, and Identification of Foreign Government: _____

_____

_____

21. DFARS 252.247-7022 REPRESENTATION OF EXTENT OF TRANSPORTATION BY SEA (AUG 1992)

(a) The Offeror shall indicate by checking the appropriate blank in paragraph (b) of this provision whether transportation of supplies by sea is anticipated under the resultant contract. The term "supplies" is defined in the Transportation of Supplies by Sea clause of this solicitation.

(b) Representation: The Offeror represents that it—

☐ Does anticipate that supplies will be transported by sea in the performance of any contract or subcontract resulting from this solicitation.

☐ Does not anticipate that supplies will be transported by sea in the performance of any contract or subcontract resulting from this solicitation.

(c) Any contract resulting from this solicitation will include the Transportation of Supplies by Sea clause. If the Offeror represents that it will not use ocean transportation, the resulting contract will also include the Defense FAR Supplement clause at 252.247-7024, Notification of Transportation of Supplies by Sea.

PART II- REPORTING EXECUTIVE COMPENSATION AND FIRST-TIER SUBCONTRACT AWARDS

Instructions: Select and enter the information within the applicable shaded areas below, then save and print this form. Then sign and return.

Reporting Executive Compensation and First-Tier Subcontract Awards
[Authorizing Directive: FAR 52.204-10

Part A: If a subcontract or purchase order award to Offeror has an expected value of $25,000 or more in support of a prime contract which includes FAR 52.204-10, Shaw Environmental & Infrastructure, Inc. (Shaw) must, subject to certain exceptions, gather and publicly report information regarding the award.

Did Offeror have gross income under $300,000 in the previous tax year?

❑ Yes, (or) ❑ No

If Yes, Offeror is not required to complete Part B below. Please complete the Authorized Signature of Offeror.

If No, Offeror must proceed to Part B.

Part B: Total Compensation of Offeror's Executives

(a) Definitions. As used in this provision—"Executive" means officers, managing partners, or any other employees in management positions of Offeror.

"Total Compensation" means the cash and noncash dollar value earned by the Executive during Offeror's preceding fiscal year and includes the following (for more information see 17 CFR 229.402(c)(2)):

(1) Salary and bonus.

(2) Awards of stock, stock options, and stock appreciation rights. Use the dollar amount recognized for financial statement reporting purposes with respect to the fiscal year in accordance with the Statement of Financial Accounting Standards No. 123 (Revised 2004) (FAS 123R), Shared Based Payments.

(3) Earnings for services under non-equity incentive plans. This does not include group life, health, hospitalization or medical reimbursement plans that do not discriminate in favor of Executives, and are available generally to all salaried employees.

(4) Change in pension value. This is the change in present value of defined benefit and actuarial pension plans.

(5) Above-market earnings on deferred compensation which is not tax-qualified.

(6) Other compensation, if the aggregate value of all such other compensation (e.g., severance, termination payments, value of life insurance paid on behalf of the employee, perquisites or property) for the Executive exceeds $10,000.

(b) In Offeror's preceding fiscal year, did Offeror receive 80 percent or more of its annual gross revenues from Federal contracts (and subcontracts), loans, grants (and sub-grants), and cooperative agreements?

❑ Yes, (or) ❑ No

If Yes, proceed to (c), below.
If No, Offeror is not required to complete the remainder of this Section. Please complete the Authorized Signature of Offeror.

(c) In Offeror's preceding fiscal year, did Offeror receive $25,000,000 or more in annual gross revenues from Federal contracts (and subcontracts), loans, grants (and sub-grants), and cooperative agreements?

❑ Yes, (or) ❑ No

If Yes, proceed to (d), below

If No, Offeror is not required to complete the remainder of this section. Please complete the Authorized Signature of Offeror.

(d) Does the public have access to information about the compensation of the Executives through periodic reports filed under section 13(a) or 15(d) of the Securities Exchange Act of 1934 (15 U.S.C. 78m(a), 78o(d)) or section 6104 of the Internal Revenue Code of 1986? (To determine if the public has access to the compensation information, see the U.S. Security and Exchange Commission total compensation filings at http://www.sec.gov/answers/execomb.htm)

❑ Yes, (or) ❑ No

If Yes, Offeror is not required to complete the remainder of this Section. Please complete the Authorized Signature of Offeror.

If No, proceed to (e), below

(e) Offeror must provide in the space below the names and Total Compensation of each of Offeror's five most highly compensated Executives for Offeror's preceding completed fiscal year:

	Executive Name:	Executive Total Compensation:
(1)		_____
(2)	_____	_____
(3)	_____	_____
(4)	_ _____	
(5)	_____	_____

(f) Offeror hereby acknowledges and agrees that Offeror shall, at the time of a subcontract or Purchase Order award by Shaw to Offeror that is subject to FAR 52.204-10, provide Offeror's North American Industry Classification System (NAICS) code(s) that (is) are applicable to the specific subcontract or Purchase Order awarded.

PART III- Limitations On Pass Through Charges Certification

For Proposals: FAR 52.215-22, "Limitations on Pass-Through Charges—Identification of Subcontract Effort"

Offeror agrees to abide by the requirements of 52.215-23 as delineated below, and certifies that Offeror, if applicable, has provided or will provide the required information pursuant to the following:

If the Offeror intends to subcontract more than 70 percent of the total cost of work to be performed under its subcontract, the Offeror shall expressly identify the proposed subcontracting effort in its proposal. This statement shall include the amount of the Offeror's indirect costs and profit/fee applicable to the work to be performed by the lower-tier subcontractors, and a description of the added value provided by the Offeror as related to the work to be performed by the lower-tier subcontractor(s).

Offeror shall provide any additional information required FAR 52.215-22.

For Contracts, Subcontracts, Task Orders, Delivery Orders, Purchase Orders, and any other Contract Form: FAR 52.215-23, "Limitations on Pass-Through Charges"

Offeror agrees to abide by the requirements of 52.215.23 as delineated below: The Offeror shall promptly notify the Shaw Subcontract Administrator in writing if

1. The Offeror changes the amount of subcontract effort after award such that it exceeds 70 percent of the total cost of work to be performed under the contract, task order, or delivery order.

   The notification shall identify the revised cost of the subcontract effort and shall include verification that the Offeror will provide added value; or

2. Any lower tier subcontractor changes the amount of lower-tier subcontractor effort after award such that it exceeds 70 percent of the total cost of the work to be performed under its subcontract.

   The notification shall identify the revised cost of the subcontract effort and shall include verification of the subcontractor's added value as related to the work to be performed by the lower-tier subcontractor(s). If the Offeror is unable to provide verification of its added value, it understands and agrees that its indirect costs and profit/fee applicable to the subcontracted work may be unallowable.

Should Offeror report such change notice action, additional information may be required, as delineated in FAR 52.215-23, and Offeror agrees to provide additional information.

CERTIFICATION STATEMENT

I hereby acknowledge an understanding of the United States Government contracting and subcontracting programs and confirm the accuracy of the statements made above. This certification shall apply to all solicitations, agreements, purchase order or subcontracts received from Shaw E&I and shall be valid for the period of performance of all agreements placed under the document.

The Offeror certifies that no one within our corporation is involved in any manner in the development of materials or oral presentations for the cited solicitation or will be involved in delivery of materials or services on a subsequent award that was employed by the U.S. Government or by another contractor under a U.S. Government contract, as described by FAR 3.104-4.

SIGNATURE/CERTIFICATION

By signing below, the offeror certifies, under penalty of law, that the representations and certifications are accurate, current and complete. The offeror further certifies that it will notify the SHAW E&I Contract Administrator of any errors and/or changes to these representations and certifications which occurs during the effective period of the document. The representations and certifications made by the offeror, as contained herein, concern matters within the jurisdiction of an agency of the United States and the making of a false, fictitious, or fraudulent representation or certification may render the maker subject to prosecution under Title 18, United States Code, Section 1001.

Signature of Offeror Responsible for Offer Date

Typed Name of Person Responsible for the Offer

Title of Person Responsible for the Offer

Name of Organization

*NOTE: PENALTIES FOR FALSE MISREPRESENTATION. 1) FAR 52-219(e)(4)—Misrepresentations of business status as a small, small disadvantaged, women-owned small, veteran-owned small (including service disabled), and HUBZone small business concern for the purpose of obtaining a subcontract that is to be included as part or all of a goal contained in the Contractor's subcontracting plan, without remedy, can result in severe penalties. Additionally, 2) Under 15 U.S.C. 645(d), any person who misrepresents a firm's status as a small, small disadvantaged, women-owned small, veteran-owned small (including service disabled), and HUBZone small business concern in order to obtain a contract to be awarded under the preference programs established pursuant to section 8(a), 8(d), 9 or 15 of the Small Business Act or any other provision of Federal law that specifically references section 8(d) for a definition of program eligibility, shall: (i) Be punished by imposition of fine, imprisonment, or both; (ii) Be subject to administrative remedies, including suspension and debarment; and (iii) Be ineligible for participation in programs conducted under the authority of the Act.

Representations and Certifications – Cost Accounting Standards Notices and Certification

Submitting Firm Name: _____

DUNS Number: _____

Supplemental Representations and Certifications as required by Shaw E&I's Prime Contract No. _____

Cost Accounting Standards Notices and Certification (FAR 52.230-1) (October 2008)

Note: This notice does not apply to small businesses or foreign governments. Check here to indicate that the offeror ☐ is a small business ☐ or foreign government and does not need to complete the following certification. This notice is in three parts, identified by Roman numerals I through III.

Offerors shall examine each part and provide the requested information in order to determine Cost Accounting Standards (CAS) requirements applicable to any resultant contract.

If the offeror is an educational institution, Part II does not apply unless the contemplated contract will be subject to full or modified CAS coverage pursuant to 48 CFR 9903.201-2(c)(5) or 9903.201-2(c)(6), respectively.

I. Disclosure Statement -- Cost Accounting Practices and Certification

(a) Any contract in excess of $650,000 resulting from this solicitation will be subject to the requirements of the Cost Accounting Standards Board (48 CFR Chapter 99), except for those contracts which are exempt as specified in 48 CFR 9903.201-1.

(b) Any offeror submitting a proposal which, if accepted, will result in a contract subject to the requirements of 48 CFR Chapter 99 must, as a condition of contracting, submit a Disclosure Statement as required by 48 CFR 9903.202. When required, the Disclosure Statement must be submitted as a part of the offeror's proposal under this solicitation unless the offeror has already submitted a Disclosure Statement disclosing the practices used in connection with the pricing of this proposal. If an applicable Disclosure Statement has already been submitted, the offeror may satisfy the requirement for submission by providing the information requested in paragraph (c) of Part I of this provision.

Caution: In the absence of specific regulations or agreement, a practice disclosed in a Disclosure Statement shall not, by virtue of such disclosure, be deemed to be a proper, approved, or agreed-to practice for pricing proposals or accumulating and reporting contract performance cost data.

(c) Check the appropriate box below:

☐ (1) *Certificate of Concurrent Submission of Disclosure Statement.* The offeror hereby certifies that, as a part of the offer, copies of the Disclosure Statement have been submitted as follows:

(i) Original and one copy to the cognizant Administrative Contracting Officer (ACO) or cognizant Federal agency official authorized to act in that capacity (Federal official), as applicable; and

(ii) One copy to the cognizant Federal auditor.

(Disclosure must be on Form No. CASB DS-1 or CASB DS-2, as applicable. Forms may be obtained from the cognizant ACO or Federal official and/or from the loose-leaf version of the Federal Acquisition Regulation.)

Date of Disclosure Statement: _____ Name and Address of Cognizant ACO or Federal Official Where Filed: _____

The offeror further certifies that the practices used in estimating costs in pricing this proposal are consistent with the cost accounting practices disclosed in the Disclosure Statement.

☐ (2) *Certificate of Previously Submitted Disclosure Statement.* The offeror hereby certifies that the required Disclosure Statement was filed as follows:

Date of Disclosure Statement: _____ Name and Address of Cognizant ACO or Federal Official Where Filed:_____

The offeror further certifies that the practices used in estimating costs in pricing this proposal are consistent with the cost accounting practices disclosed in the applicable Disclosure Statement.

☐ (3) *Certificate of Monetary Exemption.* The offeror hereby certifies that the offeror, together with all divisions, subsidiaries, and affiliates under common control, did not receive net awards of negotiated prime contracts and subcontracts subject to CAS totaling $50 million or more in the cost accounting period immediately preceding the period in which this proposal was submitted. The offeror further certifies that if such status changes before an award resulting from this proposal, the offeror will advise the Contracting Officer immediately.

☐ (4) *Certificate of Interim Exemption.* The offeror hereby certifies that

(i) the offeror first exceeded the monetary exemption for disclosure, as defined in (3) of this subsection, in the cost accounting period immediately preceding the period in which this offer was submitted and

(ii) in accordance with 48 CFR 9903.202-1, the offeror is not yet required to submit a Disclosure Statement. The offeror further certifies that if an award resulting from this proposal has not been made within 90 days after the end of that period, the offeror will immediately submit a revised certificate to the Contracting Officer, in the form specified under subparagraph (c)(1) or (c)(2) of Part I of this provision, as appropriate, to verify submission of a completed Disclosure Statement.

Caution: Offerors currently required to disclose because they were awarded a CAS-covered prime contract or subcontract of $50 million or more in the current cost accounting period may not claim this exemption (4). Further, the exemption applies only in connection with proposals submitted before expiration of the 90-day period following the cost accounting period in which the monetary exemption was exceeded.

II. Cost Accounting Standards -- Eligibility for Modified Contract Coverage

If the offeror is eligible to use the modified provisions of 48 CFR 9903.201-2(b) and elects to do so, the offeror shall indicate by checking the box below. Checking the box below shall mean that the resultant contract is subject to the Disclosure and Consistency of Cost Accounting Practices clause in lieu of the Cost Accounting Standards clause.

☐ The offeror hereby claims an exemption from the Cost Accounting Standards clause under the provisions of 48 CFR 9903.201-2(b) and certifies that the offeror is eligible for use of the Disclosure and Consistency of Cost Accounting Practices clause because during the cost accounting period immediately preceding the period in which this proposal was submitted, the offeror received less than $50 million in awards of CAS-covered prime contracts and subcontracts. The offeror further certifies that if such status changes before an award resulting from this proposal, the offeror will advise the Contracting Officer immediately.

Caution: An offeror may not claim the above eligibility for modified contract coverage if this proposal is expected to result in the award of a CAS-covered contract of $50 million or more or if, during its current cost accounting period, the offeror has been awarded a single CAS-covered prime contract or subcontract of $50 million or more.

III. Additional Cost Accounting Standards Applicable to Existing Contracts

The offeror shall indicate below whether award of the contemplated contract would, in accordance with subparagraph (a)(3) of the Cost Accounting Standards clause, require a change in established cost accounting practices affecting existing contracts and subcontracts.

☐ yes ☐ no

Note: If the offeror is an educational institution under the transition provisions of 48 CFR 9903.202-1 (f), contact the SHAW E&I Contract Administrator for the appropriate alternate certification.

Proposal Disclosure—Cost Accounting Practice Changes (FAR 52.230-7) (Apr 2005)

The offeror shall check "yes" below if the contract award will result in a required or unilateral change in cost accounting practice, including unilateral changes requested to be desirable changes.

☐ Yes ☐ No

If the offeror checked "Yes" above, the offeror shall--

(1) Prepare the price proposal in response to the solicitation using the changed practice for the period of performance for which the practice will be used; and

(2) Submit a description of the changed cost accounting practice to the Contracting Officer and the Cognizant Federal Agency Official as pricing support for the proposal.

SIGNATURE/CERTIFICATION*

By signing below, the contractor hereby certifies and represents that the information provided is current, accurate, and complete. The contractor further certifies that it will notify the Shaw Environmental and Infrastructure, Inc. Procurement Associate of any changes to said information provided.

COMPANY NAME: _____

ADDRESS: _____

_____

PRINTED NAME: _____ AUTHORIZED SIGNATURE: _____

TITLE: _____ DATE: _____ EMAIL ADDRESS: _____

Annual Representations and Certifications—General Requirements for Foreign Owned Entities

SHAW E&I is performing work under various U.S. Federal Government prime contracts as well as many state and local government prime contracts. These prime contracts require SHAW E&I to obtain certain information and certifications from your organization. The information requested is in accordance with the Federal Acquisition Regulation (FAR), available at http://www.acquisition.gov/far/, and the related sections of the FAR are cited for your reference. You are required to fully complete the appropriate sections of this form and signed it prior to submission of any proposal to SHAW E&I. The Representations and Certifications must be executed by an individual capable to commit your company. An award to your company cannot be made until this document is completed, executed and received/acknowledged within our GSIS system. Your cooperation is greatly appreciated.

EFFECTIVE PERIOD

This Annual Representation and Certification Document is valid for all orders issued to your company for one year from the date of execution.

Instructions:

The Representations and Certifications contain three parts.

Part I—General Representations and Certifications

Part II—Reporting Executive Compensation and First-Tier Subcontract Awards

Part III—Limitations on Pass-Thru Charges Certification

PART I- GENERAL REPRESENTATIONS AND CERTIFICATIONS

Submitting Firm Name: _____

DUNS Number: ____

Read each section and complete or check each blank and/or box as appropriate:

1. DFARS 252.209-7001 DISCLOSURE OF OWNERSHIP OR CONTROL BY THE GOVERNMENT OF A TERRORIST COUNTRY (JAN 2009) *(Applicable over $150,000)*

(a) Definitions. As used in this provision—

(1) "Government of a terrorist country" includes the state and the government of a terrorist country, as well as any political subdivision, agency, or instrumentality thereto.

(2) "Terrorist country" means a country determined by the Secretary of State, under section 6(j)(1)(A) of the Export Administration Act of 1979 [50 U.S.C. App. 2405(j)(i)(A)], to be a country the government of which has repeatedly provided support for acts of international terrorism. As of the date of this provision, terrorist countries include: Cuba, Iran, Iraq, Libya, North Korea, Sudan and Syria.

(3) "Significant interest" means—

(i) Ownership of or beneficial interest in 5 percent or more of the firm's or subsidiary's securities. Beneficial interest includes holding 5 percent or more of any class of the firm's securities in "nominee shares," "street names," or some other method of holding securities that does not disclose the beneficial owner;

(ii) Holding a management position in the firm, such as a director or officer;

(iii) Ability to control or influence the election, appointment, or tenure of directors or officers in the firm;

(iv) Ownership of 10 percent or more of the assets of a firm such as equipment, buildings, real estate, or other tangible assets of the firm; or

(v) Holding 50 percent or more of the indebtedness of a firm.

(b) Prohibition of award.

In accordance with 10 U.S.C. 2327, no contract may be awarded to a firm or a subsidiary of a firm if the government of a terrorist country has a significant interest in the firm or subsidiary or, in the case of a subsidiary, the firm that owns the subsidiary, unless a waiver is granted by the Secretary of Defense.

(c) Disclosure.

If the government of a terrorist country has a significant interest in the Offeror or a subsidiary of the Offeror, the Offeror shall disclose such interest in an attachment to this document. If the Offeror is a subsidiary, it shall also disclose any significant interest the government of a terrorist country has in any firm that owns or controls the subsidiary. The disclosure shall include:

(1) Identification of each government holding a significant interest; and

(2) A description of the significant interest held by each government.

2. DFARS 252.209-7002 DISCLOSURE OF OWNERSHIP OR CONTROL BY A FOREIGN GOVERNMENT (JUN 2010) (Applicable when access to proscribed information is necessary for contract performance)

(a) Definitions

As used in this provision—

(1) “Effectively owned or controlled” means that a foreign government or any entity controlled by a foreign government has the power, either directly or indirectly, whether exercised or exercisable, to control the election, appointment, or tenure of the Officer’s officers or a majority of the Officer’s board of directors by any means, e.g., ownership, contract, or operation of law (equivalent power for unincorporated organization).

(2) “Entity controlled by a foreign government”

(i) Means—

(A) Any domestic or foreign organization or cooperation that is effectively owned or controlled, either directly or indirectly, by a foreign government if the ownership of that organization or corporation by that foreign government was effective before October 23, 1992.

(B) Any individual acting on behalf of a foreign government.

(ii) Does not include any organization or corporation that is owned, but is not controlled, either directly or indirectly, by a foreign government if the ownership of that organization or corporation by that foreign government was effective before October 23, 1992.

(3) “Foreign government” includes the state and the government of any country (other than the United States and its possessions and trust territories) as well as any political subdivision, agency, or instrumentality therefore.

(4) "Proscribed information" means—

(i) Top Secret information;

(ii) Communications Security (COMSEC) material, excluding controlled cryptographic items when unkeyed or utilized with unclassified keys;

(iii) Restricted Data as defined in the U.S. Atomic Energy Act of 1954, as amended;

(iv) Special Access Program (SAP) information; or

(v) Sensitive Compartmented Information (SCI).

(b) Prohibition on award

No contract under a national security program may be awarded to any entity controlled by a foreign government if that entity requires access to proscribed information to perform the contract, unless the Secretary of Defense or designee has waived application of 10 U.S.C. 2536(a).

(c) Disclosure

The Offeror shall disclose any interest foreign government has in the Offeror when that interest constitutes control by a foreign government as defined in the provision. If the Offeror is a subsidiary, it shall also disclose any reportable interest a foreign government has in any entity that owns or controls the subsidiary, including reportable interest concerning the Offeror's immediate parent, intermediate parents, and the ultimate parent. Use separate paper when needed, and provide the information in the following format;

Offeror's Point of Contact for Questions about Disclosure: ____

_____

(Name and Phone Number with Country Code, City Code, and Area Code, as applicable)

Name and Address of Offeror: ____

Name and Address of Entity Controlled by a Foreign Government: _____

_____

Description of Interest, Ownership Percentage, and Identification of Foreign Government: _

_____

3. DFARS 252.247-7022 REPRESENTATION OF EXTENT OF TRANSPORTATION BY SEA (AUG 1992)

(a) The Offeror shall indicate by checking the appropriate blank in paragraph (b) of this provision whether transportation of supplies by sea is anticipated under the resultant contract. The term "supplies" is defined in the Transportation of Supplies by Sea clause of this solicitation.

(b) Representation: The Offeror represents that it—

☐ Does anticipate that supplies will be transported by sea in the performance of any contract or subcontract resulting from this solicitation.

☐ Does not anticipate that supplies will be transported by sea in the performance of any contract or subcontract resulting from this solicitation.

(c) Any contract resulting from this solicitation will include the Transportation of Supplies by Sea clause. If the Offeror represents that it will not use ocean transportation, the resulting contract will also include the Defense FAR Supplement clause at 252.247-7024, Notification of Transportation of Supplies by Sea.

4. Certification Regarding Responsibility Matters (FAR 52.209-5) (APR 2010) (Applicable to Subcontracts expected to exceed the simplified acquisition threshold)

(a) (1) The offeror certifies, to the best of its knowledge and belief, that—

(i) The offeror and/or any of its Principals—

(A) Are ☐ are not ☐ presently debarred, suspended, proposed for debarment or declared ineligible for the award of contracts by any Federal Agency;

(B) Have ☐ have not ☐, within a three year period preceding this offer been convicted of or had a civil judgment rendered against them for: commission of fraud or a criminal offense in connection with obtaining, attempting to obtain, or performing a public (Federal, state, or local) contract or subcontract; violation of Federal or state antitrust statutes relating to the submission of offers; or commission of embezzlement, theft, forgery, bribery, falsification or destruction of records, making false statements, tax evasion, or receiving stolen property (if offeror checks “have”, the offeror shall also see 52.209-7, if included in this solicitation); and

(C) Are ☐ are not ☐ presently indicted for, or otherwise criminally or civilly charged by a governmental entity with, commission of any of the offenses enumerated in paragraph (a)(1)(i)(B) of this provision.

(D) Have ☐ have not ☐, within a three year period preceding this offer, been notified of any delinquent Federal taxes in an amount that exceeds $3,000 for which the liability remains unsatisfied.

(1) Federal taxes are considered delinquent if both of the following criteria apply:

(i) The tax liability is finally determined. The liability is finally determined if it has been assessed. A liability is not finally determined if there is a pending administrative or judicial challenge. In the case of a judicial challenge to the liability, the liability is not finally determined until all judicial appeal rights have been exhausted.

(ii) The taxpayer is delinquent in making payment. A taxpayer is delinquent if the taxpayer has failed to pay the tax liability when full payment was due and required. A taxpayer is not delinquent in cases where enforced collection action is precluded.

(2) Examples.

(i) The taxpayer has received a statutory notice of deficiency, under I.R.C. §6212, which entitles the taxpayer to seek Tax Court review of a proposed tax deficiency. This is not a delinquent tax because it is not a final tax liability. Should the taxpayer seek Tax Court review, this will not be a final tax liability until the taxpayer has exercised all judicial appeal rights.

(ii) The IRS has filed a notice of Federal tax lien with respect to an assessed tax liability, and the taxpayer has been issued a notice under I.R.C. §6320 entitling the taxpayer to request a hearing with the IRS Office of Appeals contesting the lien filing, and to further appeal to the Tax Court if the IRS determines to sustain the lien filing. In the course of the hearing, the taxpayer is entitled to contest the underlying tax liability because the taxpayer has had no prior opportunity to contest the liability. This is not a delinquent tax because it is not a final tax liability. Should

the taxpayer seek tax court review, this will not be a final tax liability until the taxpayer has exercised all judicial appeal rights.

(iii) The taxpayer has entered into an installment agreement pursuant to I.R.C. §6159. The taxpayer is making timely payments and is in full compliance with the agreement terms. The taxpayer is not delinquent because the taxpayer is not currently required to make full payment.

(iv) The taxpayer has filed for bankruptcy protection. The taxpayer is not delinquent because enforced collection action is stayed under 11 U.S.C. 362 (the Bankruptcy Code).

(ii) The offeror has ☐ has not ☐, within a three-year period preceding this offer, had one or more contracts terminated for default by any Federal agency.

5 "Principals," for the purposes of this certification, means officers; directors; owners; partners; and, persons having primary management or supervisory responsibilities within a business entity (e.g., general manager, plant manager, head of a subsidiary, division, or business segment, and similar positions).

THIS CERTIFICATION CONCERNS A MATTER WITHIN THE JURISDICTION OF AN AGENCY OF THE UNITED STATES AND THE MAKING OF A FALSE, FICTITIOUS, OR FRAUDULENT CERTIFICATION MAY RENDER THE MAKER SUBJECT TO PROSECUTION UNDER SECTION 1001, TITLE 18, UNITED STATES CODE.

(a) The offeror shall provide immediate notice to Shaw E&I if, at any time prior to contract award, the Offeror learns that its certification was erroneous when submitted or has become erroneous by reason of changed circumstances.

(b) A certification that any of the items in paragraph (a) of this provision exists will not necessarily result in withholding of an award under this solicitation. However, the certification will be considered in connection with a determination of the Offeror's responsibility. Failure of the Offeror to furnish a certification or provide such additional information as requested by Shaw E&I may render the Offeror non-responsible.

(c) Nothing contained in the foregoing shall be construed to require establishment of a system of records in order to render, in good faith, the certification required by paragraph (a) of this provision. The knowledge and information of an Offeror is not required to exceed that which is normally possessed by a prudent person in the ordinary course of business dealings.

(d) The certification in paragraph (a) of this provision is a material representation of fact upon which reliance was placed when making award. If it is later determined that the Offeror knowingly rendered an erroneous certification, in addition to the other remedies available to the Government *and to Shaw E&I,* may terminate the contract resulting from this solicitation for default.

6. Certification And Disclosure Regarding Payments To Influence Certain Federal Transactions (FAR 52.203-11) (SEP 2007) *(Applicable to Subcontracts expected to exceed $150,000.)*

(a) The definitions and prohibitions contained in the clause, at FAR 52.203-12, Limitation on Payments to Influence Certain Federal Transactions, included in this solicitation are hereby incorporated by reference in paragraph (b) of this certification.

(b) The offeror, by signing its offer, hereby certifies to the best of his or her knowledge and belief that on or after December 23, 1989,—

(1) No Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress on his or her behalf in connection with the awarding of any Federal contract, the

making of any Federal grant, the making of any Federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any Federal contract, grant, loan, or cooperative agreement;

(2) If any registrants under the Lobbying Disclosure Act of 1995 have made a lobbying contact on behalf of the offeror with respect to this contract, the offeror shall complete and submit, with its offer, OMB Standard Form LLL, Disclosure of Lobbying Activities, to provide the name of the registrants. The offeror need not report regularly employed officers or employees of the offeror to whom payments of reasonable compensation were made; and

(3) He or she will include the language of this certification in all subcontract awards at any tier and require that all recipients of subcontract awards in excess of $150,000 shall certify and disclose accordingly.

(c) Submission of this certification and disclosure is a prerequisite for making or entering into this contract imposed by section 1352, title 31, United States Code. Any person who makes an expenditure prohibited under this provision or who fails to file or amend the disclosure form to be filed or amended by this provision, shall be subject to a civil penalty of not less than $10,000, for each such failure.

7. Contractor Code of Business Ethics and Conduct:

1. Does your firm have a code of business ethics and conduct? ☐ Yes ☐ No
2. Are your employees provided a copy of the code of business ethics and conduct? ☐ Yes ☐ No
3. Does your firm have a business ethics and compliance training program? ☐ Yes ☐ No
4. Does your firm's internal control procedure address non-compliance with your company's business ethics and conduct? ☐ Yes ☐ No
5. What is your firm's method of communication to your clients on government contracts when you code of business ethics and conduct is breached or internal fraud is detected? _____
6. Does your firm have the Fraud Hotline Poster from the OIG posted in your offices? ☐ Yes ☐ No
7. If requested by Homeland Security, will your firm post the Disaster Assistance Fraud Posters Hot Line posters in your offices? ☐ Yes ☐ No

8. FAR 52.215-6 PLACE OF PERFORMANCE (OCTOBER 1997)

(a) The offeror or quoter, in the performance of any subcontract resulting from this solicitation, ☐ intends / ☐ does not intend (check applicable block) to use one or more plants or facilities located at a different address from the address of the offeror or quoter as indicated in this proposal or quotation.

(b) If the offeror or quoter checks "intends" in paragraph (a) above, it shall insert in the spaces provided below the required information:

Place of Performance (Street, City, State, ZIP)	Name and Address of Owner and Operator of Plant or Facility if Different from Offeror

9.SYSTEM APPROVALS

Accounting System: Do you have an Accounting system that has been deemed adequate by a Federal Government Agency? ☐ YES ☐ NO

Date of reportl:

Cognizant Government Audit Agency: _____

Address: _____

Phone: _____

Property System: Do you have a Property Management system that has been deemed adequate by a Federal Government Agency? ☐ YES ☐ NO

Date of report: _____

Approving Agency: _____

Purchasing System: Do you have a Purchasing system that has been deemed adequate by a Federal Government Agency? ☐ YES ☐ NO

Date of report: _____

Approving Agency: _____

10. CONFLICT OF INTEREST CERTIFICATION

The offeror recognizes and endorses the Purchaser's ongoing efforts to comply fully with the Federal procurement laws that govern the Federal work done by Purchaser. The offeror hereby certifies that it knows of no facts or circumstances as a result of its other activities or relationships with other persons or entities that could lead to an organizational conflict of interest as defined in Federal Acquisition Regulation 2.101 and Subpart 9.5 for purposes of this procurement. The offeror recognizes that it has a continuing obligation to examine its other activities and relationships to ensure the work being undertaken or considered will not conflict with or otherwise impair its judgment in performing the subcontract. If at any point during its performance of the subcontract, the offeror becomes aware of any facts or circumstances that could create an organizational conflict of interest, the offeror agrees to immediately disclose such information to Purchaser.

11.FAR 52.203-14 DISPLAY OF HOTLINE POSTER(S)

Pursuant to FAR 52.203-14, does Offeror display a Government-Issued Hotline Poster from any Agency or any appropriate Department of Homeland Security Fraud Hotline Poster during performance in the USA.

Yes [X] Date Implemented:

No [ ] Planned Implementation Date:

NO SUBCONTRACT OR PURCHASE ORDER WILL BE ISSUED FOR GREATER THAN $5,000,000 FOR NON-COMMERCIAL ITEMS IF OFFEROR DOES NOT MAINTAIN A CODE OF BUSINESS ETHICS AND CONDUCT OR DISPLAY A GOVERNMENT

ISSUED HOTLINE POSTER

12.FOREIGN CORRUPT PRACTICES ACT—(Applicable ONLY for work performed outside the United States)

Subcontractor hereby represents and warrants that none of its officers, directors, agents or employees are (a) an official, employee or agent of the Government or any state-owned enterprise, public international organization, candidate for public office, member of a royal family, an officer, director, or employee, or an affiliate of a Shaw E&I client; and (b) as of the date below, no Government official, and no official of any Government agency or instrumentality of the Government, is or will become associated with, or will own or presently owns an interest, whether direct or indirect, in Subcontractor or has or will have any legal or beneficial interest in this Agreement or the payments made by Shaw E&I to Subcontractor hereunder.

13.EXPORT CERTIFICATION

This Export Certification is required and hereby included in the representations and certifications completed for award of all Defense related subcontracts.

Shaw E&I requires that its offerors certify the following information to ensure compliance with the U.S. Government export laws and regulations including the U.S. International Traffic in Arms Regulations (ITAR), 22 C.F.R.

§§ 120 et seq., the Export Administration Regulations (EAR), 15 C.F.R. §§ 730 et seq., and the asset control and sanctions programs administered by the Treasury Department's Office of Foreign Assets Control (OFAC), 31 C.F.R. §§

500 et seq.

A. Offeror is [___], is not [___] a "U.S. Person" as defined in the ITAR 22 CFR Part 120.15 and the EAR 15 CFR Part

772.

ITAR 22 CFR Part 120.15 and the EAR 15 CFR Part 772 defines a U.S. person as a person who is a lawful permanent resident as defined by 8 U.S.C. 1101(a)(2) or who is a protected individual as defined by 8 U.S.C. 1324b(a)(3). It also means any corporation, business, association, a partnership, society, trust, or any other entity, organization or group that is incorporated to do business in the United States. It also includes any governmental (federal, state or local) entity.

B. Offeror is registered (____), is exempt from registration (____), is not registered (____) with the U.S. Department of State, Directorate of Defense Trade Controls per ITAR 22 CFR Part 122.1(a) and (b). Expiration Date of Registration (_____), if registered.

In accordance with ITAR 22 CFR Part 122.1(a) any person who engages in the United States in the business of either manufacturing or exporting defense articles or furnishing defense services is required to register with he Directorate of Defense Trade Controls (DDTC) unless exempted by one of the four conditions listed in ITAR 22 CFR Part 122.1(b).

Furthermore, the offeror is responsible for the protection of any information or defense articles provided to them by Shaw E&I *to assist in the manufacture of a defense article or provision of a defense service. The release of such information by the offeror to a Foreign Person employee or its transfer to another Foreign Person is defined as an*

export (ITAR 22 CFR parts 120.17 and 124.13 and EAR 15 CFR part 734.2(b)(2)(ii) and supplements 1 and 2 of Part 774 and subject to the licensing requirements of the ITAR and EAR as applicable.

PART II- REPORTING EXECUTIVE COMPENSATION AND FIRST-TIER SUBCONTRACT AWARDS

Instructions: Select and enter the information within the applicable shaded areas below, then save and print this form. Then sign and return.

Reporting Executive Compensation and First-Tier Subcontract Awards
[Authorizing Directive: FAR 52.204-10

Part A: If a subcontract or purchase order award to Offeror has an expected value of $25,000 or more in support of a prime contract which includes FAR 52.204-10, Shaw Environmental & Infrastructure, Inc. (Shaw) must, subject to certain exceptions, gather and publicly report information regarding the award.

Did Offeror have gross income under $300,000 in the previous tax year?

❑ Yes, (or) ❑ No

If Yes, Offeror is not required to complete Part B below. Please complete the Authorized Signature of Offeror.

If No, Offeror must proceed to Part B.

Part B: Total Compensation of Offeror's Executives

(a) Definitions. As used in this provision—"Executive" means officers, managing partners, or any other employees in management positions of Offeror.

"Total Compensation" means the cash and noncash dollar value earned by the Executive during Offeror's preceding fiscal year and includes the following (for more information see 17 CFR 229.402(c)(2)):

(1) Salary and bonus.

(2) Awards of stock, stock options, and stock appreciation rights. Use the dollar amount recognized for financial statement reporting purposes with respect to the fiscal year in accordance with the Statement of Financial Accounting Standards No. 123 (Revised 2004) (FAS 123R), Shared Based Payments.

(3) Earnings for services under non-equity incentive plans. This does not include group life, health, hospitalization or medical reimbursement plans that do not discriminate in favor of Executives, and are available generally to all salaried employees.

(4) Change in pension value. This is the change in present value of defined benefit and actuarial pension plans.

(5) Above-market earnings on deferred compensation which is not tax-qualified.

(6) Other compensation, if the aggregate value of all such other compensation (e.g., severance, termination payments, value of life insurance paid on behalf of the employee, perquisites or property) for the Executive exceeds $10,000.

(b) In Offeror's preceding fiscal year, did Offeror receive 80 percent or more of its annual gross revenues from Federal contracts (and subcontracts), loans, grants (and sub-grants), and cooperative agreements?

❑ Yes, (or) ❑ No

If Yes, proceed to (c), below.

If No, Offeror is not required to complete the remainder of this Section. Please complete the Authorized Signature of Offeror.

(c) In Offeror's preceding fiscal year, did Offeror receive $25,000,000 or more in annual gross revenues from Federal contracts (and subcontracts), loans, grants (and sub-grants), and cooperative agreements?

❑ Yes, (or) ❑ No

If Yes, proceed to (d), below

If No, Offeror is not required to complete the remainder of this section. Please complete the Authorized Signature of Offeror.

(d) Does the public have access to information about the compensation of the Executives through periodic reports filed under section 13(a) or 15(d) of the Securities Exchange Act of 1934 (15 U.S.C. 78m(a), 78o(d)) or section 6104 of the Internal Revenue Code of 1986? (To determine if the public has access to the compensation information, see the U.S. Security and Exchange Commission total compensation filings at http://www.sec.gov/answers/execomb.htm)

❑ Yes, (or) ❑ No

If Yes, Offeror is not required to complete the remainder of this Section. Please complete the Authorized Signature of Offeror.

If No, proceed to (e), below

(e) Offeror must provide in the space below the names and Total Compensation of each of Offeror's five most highly compensated Executives for Offeror's preceding completed fiscal year:

	Executive Name:	Executive Total Compensation:
(1)	_____	_____
(2)	_____	_____
(3)	_____	_____
(4)	_____	_____
(5)	_____	_____

(f) Offeror hereby acknowledges and agrees that Offeror shall, at the time of a subcontract or Purchase Order award by Shaw to Offeror that is subject to FAR 52.204-10, provide Offeror's North American Industry Classification System (NAICS) code(s) that (is) are applicable to the specific subcontract or Purchase Order awarded.

PART III- Limitations On Pass Through Charges Certification

For Proposals: FAR 52.215-22, "Limitations on Pass-Through Charges—Identification of Subcontract Effort"

Offeror agrees to abide by the requirements of 52.215-23 as delineated below, and certifies that Offeror, if applicable, has provided or will provide the required information pursuant to the following:

If the Offeror intends to subcontract more than 70 percent of the total cost of work to be performed under its subcontract, the Offeror shall expressly identify the proposed subcontracting effort in its proposal. This statement shall include the amount of the Offeror's indirect costs and profit/fee applicable to the work to be performed by the lower-tier subcontractors, and a description of the added value provided by the Offeror as related to the work to be performed by the lower-tier subcontractor(s).

Offeror shall provide any additional information required FAR 52.215-22.

For Contracts, Subcontracts, Task Orders, Delivery Orders, Purchase Orders, and any other Contract Form: FAR 52.215-23, "Limitations on Pass-Through Charges"

Offeror agrees to abide by the requirements of 52.215.23 as delineated below: The Offeror shall promptly notify the Shaw Subcontract Administrator in writing if

1. The Offeror changes the amount of subcontract effort after award such that it exceeds 70 percent of the total cost of work to be performed under the contract, task order, or delivery order.

   The notification shall identify the revised cost of the subcontract effort and shall include verification that the Offeror will provide added value; or

2. Any lower tier subcontractor changes the amount of lower-tier subcontractor effort after award such that it exceeds 70 percent of the total cost of the work to be performed under its subcontract.

   The notification shall identify the revised cost of the subcontract effort and shall include verification of the subcontractor's added value as related to the work to be performed by the lower-tier subcontractor(s). If the Offeror is unable to provide verification of its added value, it understands and agrees that its indirect costs and profit/fee applicable to the subcontracted work may be unallowable.

Should Offeror report such change notice action, additional information may be required, as delineated in FAR 52.215-23, and Offeror agrees to provide additional information.

CERTIFICATION STATEMENT

By signing below, the contractor hereby certifies and represents that the information provided is current, accurate, and complete. The contractor further certifies that it will notify the Shaw Environmental and Infrastructure, Inc. Procurement Associate of any changes to said information provided.

COMPANY NAME: _____

ADDRESS: _____

PRINTED NAME: _____ AUTHORIZED SIGNATURE: _____

TITLE: _____ DATE:_____ EMAIL ADDRESS: _____

Representations and Certifications – Supplemental for Buy American Act Certificates

Submitting Firm Name: _____

DUNS Number: _____

Supplemental Representations and Certifications as required by Shaw E&I's Prime Contract No. _____

Read each section and complete or check each blank and/or box as appropriate:

The following certifications or notices apply to this solicitation if checked.

1. ☐ The *Buy American Act Certificate* must be completed in solicitations containing the clause FAR 52.225-1 *Buy American Act—Supplies.*

Buy American Act Certificate (FAR 52.225-2) (FEB 2009)

(a) The offeror certifies that each end product, except those listed in paragraph (b) of this provision, is a domestic end product and that for other than COTS items, the offeror has considered components of unknown origin to have been mined, produced, or manufactured outside the United States. The offeror shall list as foreign end products those end products manufactured in the United States that do not qualify as domestic end products. The terms "component," "domestic end product," "end product," "foreign end product," and "United States" are defined in the clause of this solicitation entitled "Buy American Act—Supplies."

(b) Foreign End Products:

Line Item No.:	Country of Origin:

[*List as necessary]*

(c) The Government will evaluate offers in accordance with the policies and procedures of Part 25 of the Federal Acquisition Regulation.

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2. ☐ The *Buy American Act--Free Trade Agreements--Israeli Trade Act Certificate*, must be completed in solicitations containing the clause at FAR 52.225-3 *Buy American Act--Free Trade Agreements--Israeli Trade Act.* If the acquisition value is $25,000 or more but is less than $50,000, use the clause with its Alternate I. If the acquisition value is $50,000 or more but less than $70,079, use the clause with its Alternate II.

Buy American Act -- Free Trade Agreements--Israeli Trade Act Certificate (FAR 52-225-4) (Jan 2005)

(a) The offeror certifies that each end product, except those listed in paragraph (b) or (c) of this provision, is a domestic end product and that the offeror has considered components of unknown origin to have been mined, produced, or manufactured outside the United States. The terms "component," "domestic end product," "end product," "end product of Australia, Canada, Chile, Mexico, or Singapore," "foreign end product," "Israeli end product," and

"United States" are defined in the clause of this solicitation entitled "Buy American Act—Free Trade Agreements—Israeli Trade Act."

(b) The offeror certifies that the following supplies are end products of Australia, Canada, Chile, Mexico, or Singapore or Israeli end products as defined in the clause of this solicitation entitled "Buy American Act-- Free Trade Agreements--Israeli Trade Act"

End Products of Australia, Canada, Chile, Mexico, or Singapore or Israeli End Products:

Line Item No.:	Country of Origin:

[List as necessary]

(c) The offeror shall list those supplies that are foreign end products (other than those listed in paragraph (b) of this provision) as defined in the clause of this solicitation entitled ``Buy American Act--Free Trade Agreement--Israeli Trade Act.'' The offeror shall list as other foreign end products those end products manufactured in the United States that do not qualify as domestic end products.

Other Foreign End Products

Line Item No.:	Country of Origin:

[List as necessary]

(d) The Government will evaluate offers in accordance with the policies and procedures of Part 25 of the Federal Acquisition Regulation.

(End of provision)

Alternate I (Jan 2004). As prescribed in FAR 25.1101 (b)(2)(ii), substitute the following paragraph (b) for paragraph (b) of the basic provision:

(b) The offeror certifies that the following supplies are Canadian end products as defined in the clause of this solicitation entitled "Buy American Act--Free Trade Agreements--Israeli Trade Act":

Canadian End Products:

Line Item No. _____

[List as necessary]

Alternate II (Jan 2004). As prescribed in FAR 25.1101 (b)(2)(iii), substitute the following paragraph (b) for paragraph (b) of the basic provision:

(b) The offeror certifies that the following supplies are Canadian end products or Israeli end products as defined in the clause of this solicitation entitled "Buy American Act-- Free Trade Agreements--Israeli Trade Act":

Canadian or Israeli End Products

Line Item No.:	Country of Origin:

[List as necessary]

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3. ☐ The *Trade Agreements Certificate*, must be completed in solicitations containing the clause at FAR 52.225-5 *Trade Agreements.*

Trade Agreements Certificate (FAR 52-225-6) (Jan 2005)

(a) The offeror certifies that each end product, except those listed in paragraph (b) of this provision is a U.S.-made or designated country end product, as defined in the clause of this solicitation entitled "Trade Agreements."

(b) The offeror shall list as other end products those supplies that are not U.S.-made or designated country end products.

Other End Products

Line Item No.	Country of Origin:

[*List as necessary*]

(c) The Government will evaluate offers in accordance with the policies and procedures of Part 25 of the Federal Acquisition Regulation. For line items covered by the WTO GPA, the Government will evaluate offers of U.S.-made or designated country end products without regard to the restrictions of the Buy American Act. The Government will consider for award only offers of U.S.-made or designated country end products unless the Contracting Officer determines that there are no offers for such products or that the offers for those products are insufficient to fulfill the requirements of this solicitation.

(End of Provision)

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4. ☐ The *Notice of Buy American Act Requirement--Construction Materials*, applies in solicitations containing the clause at FAR 52.225-9 *Buy American Act --Construction Materials*.

Notice of Buy American Act Requirement--Construction Materials (FAR 52.225-10) (FEB 2009)

(a) Definitions. "Commercially available off-the-shelf (COTS) item", "Construction material," "domestic construction material," and "foreign construction material," as used in this provision, are defined in the clause of this solicitation entitled "Buy American Act--Construction Materials" (FAR clause 52.225-9).

(b) Requests for determinations of inapplicability. An offeror requesting a determination regarding the inapplicability of the Buy American Act should submit the request to the Contracting Officer in time to allow a determination before submission of offers. The offeror shall include the information and applicable supporting data required by paragraphs (c) and (d) of the clause at FAR 52.225-9 in the request. If an offeror has not requested a determination regarding the inapplicability of the Buy American Act before submitting its offer, or has not received a response to a previous request, the offeror shall include the information and supporting data in the offer.

(c) Evaluation of offers.

(1) The Government will evaluate an offer requesting exception to the requirements of the Buy American Act, based on claimed unreasonable cost of domestic construction material, by adding to the offered price the appropriate percentage of the cost of such foreign construction material, as specified in paragraph (b)(3)(i) of the clause at FAR 52.225-9.

(2) If evaluation results in a tie between an offeror that requested the substitution of foreign construction material based on unreasonable cost and an offeror that did not request an exception, the Contracting Officer will award to the offeror that did not request an exception based on unreasonable cost.

(d) Alternate offers.

(1) When an offer includes foreign construction material not listed by the Government in this solicitation in paragraph (b)(2) of the clause at FAR 52.225-9, the offeror also may submit an alternate offer based on use of equivalent domestic construction material.

(2) If an alternate offer is submitted, the offeror shall submit a separate Standard Form 1442 for the alternate offer, and a separate price comparison table prepared in accordance with paragraphs (c) and (d) of the clause at FAR 52.225-9 for the offer that is based on the use of any foreign construction material for which the Government has not yet determined an exception applies.

(3) If the Government determines that a particular exception requested in accordance with paragraph (c) of the clause at FAR 52.225-9 does not apply, the Government will evaluate only those offers based on use of the equivalent domestic construction material, and the offeror shall be required to furnish such domestic construction material. An offer based on use of the foreign construction material for which an exception was requested—

(i) Will be rejected as nonresponsive if this acquisition is conducted by sealed bidding; or

(ii) May be accepted if revised during negotiations.

(End of provision)

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5. ☐ The *Notice of Buy American Act Requirement--Construction Materials under Trade Agreements*, in solicitations containing the clause at FAR 52.225-11 *Buy American Act--Construction Materials under Trade Agreements*. If insufficient time is available to process a determination regarding the inapplicability of the Buy American Act before receipt of offers, use the provision with its Alternate I. For acquisitions valued at $7,804,000 or more, but less than $9,110,318, use the clause with its Alternate II.

Notice of Buy American Act Requirement—Construction Materials Under Trade Agreements (Jan 2005)

(a) Definitions. "Construction material," "designated country construction material," "domestic construction material," and "foreign construction material," as used in this provision, are defined in the clause of this solicitation entitled "Buy American Act--Construction Materials Under Trade Agreements" (FAR clause 52.225-11).

(b) Requests for determination of inapplicability. An offeror requesting a determination regarding the inapplicability of the Buy American Act should submit the request to the Contracting Officer in time to allow a determination before submission of offers. The offeror shall include the information and applicable supporting data required by paragraphs (c) and (d) of FAR clause 52.225-11 in the request. If an offeror has not requested a determination regarding the inapplicability of the Buy American Act before submitting its offer, or has not received a response to a previous request, the offeror shall include the information and supporting data in the offer.

(c) Evaluation of offers.

(1) The Government will evaluate an offer requesting exception to the requirements of the Buy American Act, based on claimed unreasonable cost of domestic construction materials, by adding to the offered price the appropriate percentage of the cost of such foreign construction material, as specified in paragraph (b)(4)(i) of FAR clause 52.225-11.

(2) If evaluation results in a tie between an offeror that requested the substitution of foreign construction material based on unreasonable cost and an offeror that did not request an exception, the Contracting Officer will award to the offeror that did not request an exception based on unreasonable cost.

(d) Alternate offers.

(1) When an offer includes foreign construction material, other than designated country construction material, that is not listed by the Government in this solicitation in paragraph (b)(3) of FAR clause 52.225-11, the offeror also may submit an alternate offer based on use of equivalent domestic or designated country construction material.

(2) If an alternate offer is submitted, the offeror shall submit a separate Standard Form 1442 for the alternate offer, and a separate price comparison table prepared in accordance with paragraphs (c) and (d) of FAR clause 52.225-11 for the offer that is based on the use of any foreign construction material for which the Government has not yet determined an exception applies.

(3) If the Government determines that a particular exception requested in accordance with paragraph (c) of FAR clause 52.225-11 does not apply, the Government will evaluate only those offers based on use of the equivalent domestic or designated country construction material, and the offeror shall be required to furnish such domestic or designated country construction material. An offer based on use of the foreign construction material for which an exception was requested--

(i) Will be rejected as nonresponsive if this acquisition is conducted by sealed bidding; or

(ii) May be accepted if revised during negotiations.

(End of provision)

Alternate I (May 2002). As prescribed in FAR 25.1102(d)(2), substitute the following paragraph (b) for paragraph (b) of the basic provision:

(b) Requests for determination of inapplicability. An offeror requesting a determination regarding the inapplicability of the Buy American Act shall submit the request with its offer, including the information and applicable supporting data required by paragraphs (c) and (d) of FAR clause 52.225-11.

Alternate II (Jan 2005). As prescribed in FAR 25.1102(d)(3), substitute the following paragraphs (a) and (d) for paragraphs (a) and (d) of the basic provision:

(a) Definitions. "Australian, Chilean, or Moroccan construction material," "Caribbean Basin country construction material," "construction material," "domestic construction material," "foreign construction material," "least developed country construction material," and "WTO GPA country construction material," as used in this provision, are defined in the clause of this solicitation entitled "Buy American Act--Construction Materials Under Trade Agreements" (FAR clause 52.225-11).

(d) *Alternate offers.*

(1) When an offer includes foreign construction material, other than WTO GPA country, Australian, Chilean, or Moroccan, least developed country, or Caribbean Basin country construction material, that is not listed by the Government in this solicitation in paragraph (b)(3) of FAR clause 52.225-11, the offeror also may submit an alternate offer based on use of equivalent domestic, WTO GPA country, Australian, Chilean, or Moroccan, least developed country or Caribbean Basin country construction material.

(2) If an alternate offer is submitted, the offeror shall submit a separate Standard Form 1442 for the alternate offer, and a separate price comparison table prepared in accordance with paragraphs (c) and (d) of FAR clause 52.225-11 for the offer that is based on the use of any foreign construction material for which the Government has not yet determined an exception applies.

(3) If the Government determines that a particular exception requested in accordance with paragraph (c) of FAR clause 52.225-11 does not apply, the Government will evaluate only those offers based on use of the equivalent domestic, WTO GPA country, Australian, Chilean, or Moroccan, least developed country, or Caribbean Basin country construction material, and the offeror shall be required to furnish such domestic, WTO GPA country, Australian, Chilean, or Moroccan, least developed country, or Caribbean Basin country construction material. An offer based on use of the foreign construction material for which an exception was requested--

(i) Will be rejected as nonresponsive if this acquisition is conducted by sealed bidding; or

(ii) May be accepted if revised during negotiations.

SIGNATURE/CERTIFICATION*

By signing below, the contractor hereby certifies and represents that the information provided is current, accurate, and complete. The contractor further certifies that it will notify the Shaw Environmental and Infrastructure, Inc. Procurement Associate of any changes to said information provided.

COMPANY NAME: _____

ADDRESS: _____

_____

PRINTED NAME: _____ AUTHORIZED SIGNATURE: _____

TITLE: _____ DATE: _____ EMAIL ADDRESS: _____

Subcontractor Qualification Routing and Approval Sheet

Company Name:		Date Requested:
Address:		Date Received:
Address: Email:		Vendor #:
Contact Name/Phone Number		
Requestor: Name/Location:		
Health and Safety		
Rating ~ (A) Full Qualified ~ (B) Qualified ~ (C) Limited Qualification ~ (D) Qualified for Engineering Design Work ~ (E) Qualified for Equipment Fabrication ~ (F) Unacceptable	Comments:	
Reviewed by	Title	Date
Quality Assurance		
Status ~ Acceptable ~ Unacceptable	Comments:	
Reviewed by	Title	Date
Subcontracts		
Status ~ Acceptable ~ Unacceptable	Comments:	
Reviewed by	Title	Date

1. PURPOSE

This procedure describes the methods and responsibilities for performing and documenting inspections on project work activities and materials to ensure compliance with established requirements.

2. SCOPE

This procedure applies to inspections performed during the course of performing project work activities.

3. REFERENCES

- EI-MAN-Q001, *Quality Management System Manual*
- EIP-Q-004, “Receipt Inspection”
- EIG-Q-007, “Nonconformance Reporting”
- E&I Construction Inspection Procedures & Checklists

4. DEFINITIONS

- **Inspection**—Examination or measurement to verify whether an item or activity conforms to a specified requirement(s).
- **Inspector**—Personnel performing inspection activities with the necessary expertise in the area to be inspected.
- **Record**—A document stating results achieved or providing evidence of activities performed.
- **Definable Feature of Work**—A task that is separate and distinct from other tasks and has separate control requirements.

5. RESPONSIBILITIES

5.1 Responsible Manager

The Responsible Manager or assigned personnel must ensure that an adequate inspection program is established for the work and is in full support of inspection activities. The Responsible Manager is also responsible for scheduling and providing prior notification to inspection personnel when items, systems, or activities requiring inspection are approaching readiness. The Responsible Manager may be the Project Manager, Construction Manager, Project Engineer, or other qualified designated personnel, depending on the project.

5.2 Project Quality Representative

The Project Quality Representative or assigned personnel is responsible for performing or verifying the status of inspections and tests performed during project activities, and for controlling and recording the unique identification of items where traceability is required.

5.3 Inspectors

Inspectors shall be responsible for conducting inspections in accordance with established criteria. Inspectors shall be responsible for maintaining any external credentials/qualifications for performing inspections deemed necessary by responsible management. Inspectors are

responsible for notifying the Responsible Manager if their qualifications have lapsed or if they are no longer qualified to perform a valid inspection.

6. PROCEDURE

6.1 Qualification of Inspectors

The inspector shall have the necessary expertise and qualifications in the area to be inspected and shall be sufficiently independent of the activity performed.

Prior to the performance of inspection activities, personnel designated for that responsibility shall review and be thoroughly familiar with the procedures, regulations, etc. governing the activities to be inspected.

6.2 Inspections

Inspection activities will be used to monitor project activities and materials. The objective of inspections is to determine whether the properties or composition of materials, or performance of activities, are within established requirements. Inspections shall be performed and documented as required by quality control activities and project requirements. Inspections shall be scheduled and performed to prevent unintended use or installation, to provide monitoring, to minimize delays in work, and to identify nonconformances while they are still correctible without significantly impacting work.

6.2.1 Inspection Requirements and Criteria

Inspections shall be performed upon materials or services to determine compliance with contractual, planning, or other requirements. Materials inspections may include evaluating the quality of components, material assemblies, supporting documentation, and/or techniques employed and verifying installation or performance under specified test conditions. Inspections related to services will include continuous monitoring and review of the service provided. Evaluations will be based upon requirements in the contract or other procurement documentation.

Inspection criteria shall be established prior to the inspection and shall be based upon project specifications, requirements, code specifications, and product acceptability. Acceptance criteria shall be adequate for the material or activity and shall be verified during inspection activities.

Inspections may be performed and verified through visual observation, measurement of materials or equipment, examination of documentation/certifications, evaluation of performance, or testing. Testing may be destructive or nondestructive, and it may be performed on samples taken of materials or may be performed in situ.

6.2.2 Inspection Performance and Documentation

The number and extent of Inspections shall be based upon the complexity of the item or task. Inspections shall be documented, preferably through the use of checklists. An example of an inspection checklist is provided in Section 8. A comprehensive series of generic construction inspection procedures can be found on Governance > Policies and Procedures > Quality Assurance Policies and Procedures > Construction Quality Proceduresand checklists may be found on Governance > Policies and Procedures > Environmental & Infrastructure > QA/QC Forms > Construction Quality Forms on the Shaw intranet. Inspections shall consider and document the following, as applicable:

- Name of project and contract or project number
- Type of inspection to be performed
- Evaluation criteria

- Date of the inspection
- Specification, requirement, or process to be examined
- Pass or fail criterion
- Results of inspection
- Identification of inspectors

6.2.3 Receiving Inspection

Receiving inspections include the examination or measurement of materials from suppliers and vendors. A receiving inspection is performed to verify that materials, parts, components, and assemblies meet specifications and contract requirements. This inspection will be performed for materials where specifications and/or quality requirements have been provided in procurement documentation. Additional information regarding procurement and receiving inspections is provided in Procedure No. EIP-Q-004, "Receipt Inspection."

Items and materials that are purchased and brought on site by a subcontractor shall be inspected. The inspection will ensure the items meet the specifications and requirements in planning, contractual, and/or procurement documents.

6.3 Three-Phase Inspection Process

If warranted by contract requirements or the complexity of the project, the Project Quality Representative, in collaboration with the Project Manager, may require implementation of the Three-Phase Inspection process. This process includes preparatory, initial, and follow-up inspections conducted for inspection elements referred to as "Features of Work." Inspections shall be performed as required and shall be documented on the inspection checklist. This approach is further explained in the following sections. A three-phase inspection shall include the requirements as specified in this section as well as the requirements specified in the above preceding sections.above.

6.3.1 Preparatory Inspections

Preparatory inspections will include all the prerequisites prior to starting any feature of work. A preparatory meeting is usually held prior to beginning work on each definable feature of work to ensure that there is a mutual understanding of the level of quality expected. The inspections shall be performed by the Shaw E & I staff and all associated lower-tier subcontractors. These inspections include the following:

- A review of the scope of work, specifications, and contract requirements with project personnel
- Verification that provisions have been made to provide required field control testing and inspection
- Documented tolerances and workmanship standards
- Examination of the work area to ascertain that all preliminary work has been completed
- Verification of field dimensions, lines, and grades
- Physical examination of materials and equipment
- Confirmation of measuring and test equipment calibrations
- Assurance that required hazards analyses and safety inspections have taken place and been passed

6.3.2 Initial Inspections

Initial inspections are performed when work begins on a particular feature of work. An initial phase meeting should be held at the beginning of each definable feature of work. The initial inspections include an examination of the quality of workmanship and a review of control testing for compliance with contract and work plan requirements. The initial inspection will include the following:

- Establishing the quality and level of workmanship required
- Verifying that acceptable workmanship standards and contractual requirements are met
- Verifying required control inspection and testing requirements
- Verifying compliance with the activity hazard analysis and safety plans

Daily reports will be completed to ensure that control activities are working to provide continued compliance until completion of the task. Deficiencies shall be documented in the report. The Responsible Manager will propose corrective actions and ensure their completion. Inspections and test statuses will be clearly indicated on daily reports and inspection records. Nonconforming items shall be clearly marked or identified appropriately.

6.3.3 Follow-up Inspections

Follow-up inspections are performed at appropriate intervals as the work progresses on any particular definable feature of work to verify compliance with contract requirements. As-built drawings will be checked for accuracy as required during this phase. The inspections will continue until completion of that feature of the work. Final follow-up inspections will be conducted and all deficiencies corrected before the start of additional features of work that may be affected by the deficient work.

6.3.4 Reporting

Documentation of completed inspections shall be included in the daily report when required. When appropriate, additional drawings or inspection information may be attached to the inspection documentation.

Items or activities not conforming to inspection acceptance criteria will be resolved and, when determined necessary, documented as a nonconformance in accordance with Procedure No. EIG-Q-007, “Nonconformance Reporting.” The Nonconformance Report should be referenced on the Daily Quality Control Report.

6.4 Disposition and Corrective Actions

Items, activities, or services that do not meet inspection objectives or requirements will be documented, and corrective actions will be performed. Discrepancies discovered during inspection activities will be resolved by corrective actions which must be completed prior to the start of additional work if future work is affected. The extent of corrective actions must be appropriate for the magnitude of the condition and associated risk factors. Discrepancies that meet the criteria for a nonconformance will be handled in accordance with Procedure No. EIG-Q-007.

7. ATTACHMENTS

None

8. FORMS

- EIP-Q-005.01, Inspection Checklist

9. RECORDS

- EIP-Q-005.01, Inspection Checklists/Report
- Nonconformance Report

10. REVISION HISTORY AND APPROVAL

Revision Level Revision Date	Revision Description	Responsible Manager
00 4/14/2003	Initial issue	Cheryl Prince
01 02/15/2007	Reference to: Shaw Procedure No. PR310, Receipt of Supplies, Materials, and Services was added. Definition for Definable Feature of Work was added, responsibility title changes, extensive revision to procedure.	Bryan Koehler
02 01/04/2012	Modified format to align with Governance Management framework. 3.0 Added x-reference for EIP-Q004, Receipt Inspection & generic construction inspection procedures and checklists 6.2.2 Added x-reference for construction inspecton procedures and checklists	Bryan Koehler

Shaw a world of Solutions	Title: Inspection Checklist	Form No: EIP-Q-005.01_2

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PROJECT NAME: [Project Name]	PROJECT NUMBER: [Project Number]	CONTRACT NO: [Contract Number]
LOCATION: [Location]		
FEATURE OF WORK: [Feature of Work]		SPECIFICATIONS: [Specifications]

Requirements/Reference	Hold Pt.*	Org.	Initials	Remarks
Preparatory/Initial/Follow-up (circle one) Inspection				
1.		Shaw E & I		
2.				
3.				
4.				
5.				
6.				
7.				
8.				
9.				
10.				
11.				
12.				
13.				
14.				
15.				
16.				
17.				
18.				
19.				
20.				
21.				
22.				
23.				
24.				
25.				

*Hold Point—Requires the checklist item to be answered YES for conforms or NO for does not conform

Identification of Participating Organizations

Shaw E&I Personnel _____

Shaw E&I Project Contractor Personnel _____

Client Representative _____

_____ _____

Project Quality Representative Date

1. PURPOSE

To establish the system for documentation, processing, disposition, resolution, and control of hardware nonconformances (i.e., component, equipment, material, and processes).

2. SCOPE

This procedure applies to nonconforming product identified during the course of performing project work activities. Nonconformances may be identified during the execution, monitoring and control, or closure phases of a project or activity. The responsibilities and requirements provided in this procedure are applicable for project or programmatic activities. Deviations of program or procedure requirements that do not result in hardware nonconformances or program or process deficiencies that result in a hardware nonconformance should be documented in accordance with EIG-Q-008, Corrective Action Requests.

3. REFERENCES

- EI-MAN-Q001, *Quality Management System Manual*
- EIG-Q-008, “Corrective Action Requests”

4. DEFINITIONS

- **Conformity**—Fulfillment of a requirement.
- **Disposition**—An evaluation or arrangement provided to determine the fate or condition of use of an item, service, or activity.
  - **Rework**—The process by which a nonconformance is corrected and an item made to conform to original requirements.
  - **Repair**—The process of restoring a nonconforming item to a condition such that the item is capable of functioning reliably and safely even though the item does not conform to original specified requirements.
  - **Use-As-Is**—A disposition authorizing a nonconforming item to be used as originally intended without correcting the nonconformance.
  - **Reject/Scrap**—A disposition indicating that the nonconforming item is not fit for its intended use or is uneconomical to correct.
- **Nonconformance/Nonconformity**—A non-fulfillment of a requirement. An item, condition, material, or service that deviates from drawings, specifications, or other project requirements and cannot be corrected readily within the scope of such requirements or that otherwise requires a disposition. A nonconformance is not a deficiency whereby correction is part of the normal course of work outlined in project requirements (e.g., failing density tests that provide an indication of “in-process” work in a given point in time).
- **Correction**—Action to eliminate a detected nonconformity.
- **Corrective Action**—Action(s) to eliminate the cause(s) of a detected nonconformity, or other undesirable situation.

5. RESPONSIBILITIES

5.1 Responsible Manager

The Responsible Manager of the project, product, or service shall ensure further processing is stopped until a disposition is determined and corrective action is implemented. In addition, the Responsible Manager(s) shall ensure the disposition of nonconforming items to include the segregation of nonconforming products, when practical, to prevent unauthorized use, installation, or delivery.

5.2 Project Quality Representative

The Project Quality Representative is responsible for maintaining a status of nonconformance reports at project or program locations. This includes reviewing nonconformances, logging and tracking nonconformance reports (NCRs), and verifying the satisfactory completion and closure of corrective actions. These activities may be performed by oversight or project personnel independent of the activity.

5.3 All Personnel

Any individual assigned to a project or program location that discovers a nonconforming item, product, or service is responsible for initiating a nonconformance report by describing the condition and for notifying appropriate management. A written description should be provided for legitimate nonconformances.

6. PROCEDURE

6.1 General

Identified nonconformances shall be handled in a controlled system to ensure that the deviating condition is corrected as documented in the flowchart in Attachment 1.

In situations where the Quality Representative, Responsible Manager, or other staff determines that continued work would cause damage, jeopardize the safety of personnel, preclude subsequent inspections, or make corrective actions ineffective, work shall be stopped.

6.2 Identification and Reporting of Nonconformances

The identifying individual shall document the description of the nonconforming condition. The condition description will be clearly written after consultation with the responsible supervisor to ensure that the discrepancy is correctly described. Appropriate project criteria to include specifications, requirements, or codes violated must also be referenced to provide sufficient information to facilitate a proper and complete disposition. Sketches, photographs, reports, or other records may be included to supplement the NCR.

When this section of the NCR is completed, the report is sent to the Project Quality Representative for review. The Quality Representative shall review the NCR to ensure that it is complete and the reported condition(s) meets the criteria for a nonconformance. NCRs that are not complete or do not meet the criteria shall be reviewed with the originator to coordinate resolution. The NCR will be voided and filed if it is determined the criteria is not met. If the NCR is determined to be valid, the Quality Representative will assign a unique number or identifier and forward the NCR to the Responsible Manager for determining and documenting the appropriate corrective actions.

The Project Quality Representative shall maintain a status log of open and closed nonconformances. The log will also serve as the basis for numbering each discrepancy and tracking it through closure.

6.3 Disposition

The Responsible Manager shall evaluate the nonconforming characteristics of the item or service and determine the disposition. Disposition may include reject/scrap, use as is, rework, and/or repair. If a design change approval is required to disposition an item that deviates from a design document, the approved design change documentation should be referenced or a copy attached to the NCR.

Nonconforming product shall be dispositioned by one or more of the following ways: taking action to eliminate the detected nonconformity; authorizing its use, release or acceptance under concession by a relevant authority and, where applicable, by the client; taking action to preclude its original intended use or application; or by taking action appropriate to the effects or potential effects, of the nonconformity when nonconforming product is detected after delivery or use has started. The determination shall be documented on the NCR and a technical justification provided by an appropriate authority when the disposition is determined to be “repair” or “use as is.” The Quality Representative shall concur with the disposition.

Whenever practical, nonconforming items should be segregated from conforming items to prevent their inadvertent installation or use. When practical, identification tags or markings should be used to aid in this segregation.

When required by the contract or determined appropriate, the client shall be notified of the nonconformance by the Responsible Manager. The client must be promptly notified of technical errors in work previously completed and submitted to them.

6.4 Corrective Action

The Responsible Manager shall evaluate the nonconforming characteristics and determine the corrective actions for nonconforming items or services. The required section of the NCR shall be completed by the Responsible Manager who shall document the following:

- Corrective actions to be taken. Actions taken shall be appropriate for the nonconformance.
- Personnel responsible for implementing corrective actions.
- Date when necessary actions are to be completed.

The NCR shall be forwarded to the Project Quality Representative for review. If corrective actions are determined appropriate, then personnel responsible for implementation shall perform the corrective action in accordance with the scheduled due date. Extensions of time may be granted by the Project Quality Representative for extenuating circumstances.

After the completion of corrective actions, the Responsible Manager shall document the resolution on the NCR form, sign the form, and forward it to the Quality Representative. Any objective evidence of the corrective actions shall be included.

6.5 Verification and Closeout

Satisfactory resolution of nonconformances must be verified by the Quality Representative. The Quality Representative shall do the following to achieve resolution:

- Initiate an inspection and/or a review of objective evidence to verify satisfactory completion of the corrective action
- Sign off the NCR, if the work is satisfactory, and remove identification tags or markings as applicable

NCRs are not to be closed until the required corrective measures have been completed to the satisfaction of the Quality Representative. Nonconformances will be monitored until the action is verified as complete and closed as documented on the NCR.

6.6 Records

The original, signed NCR form and associated documentation shall be retained in the project records.

7. ATTACHMENTS

- Attachment 1, Nonconformance Process Flowchart

8. FORMS

- EIG-Q-007.01, Nonconformance Report

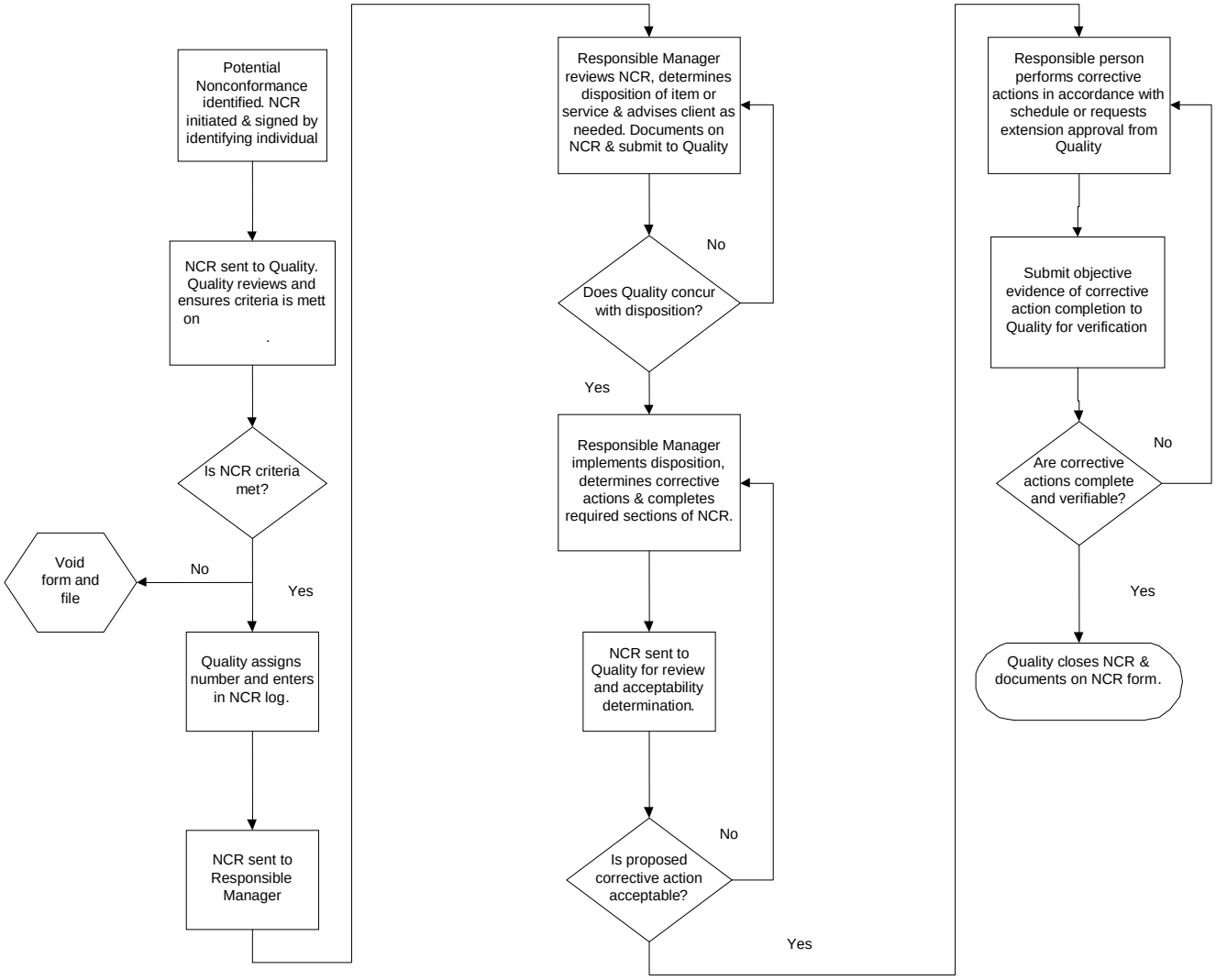
9. RECORDS

- EIG-Q-007.01, Nonconformance Report

10. REVISION HISTORY AND APPROVAL

Revision Level / Revision Date	Revision Description	Responsible Manager
00 04/14/2003	Initial Issue.	Cheryl Prince
01 02/15/2007	Sections 1 & 2 had minor changes, Section 5 Responsibilities was updated. Major re-write of procedure. Attachment 1, Nonconformance Process Flowchart was added.	Bryan Koehler
02 01/06/2012	Sections 1 & 2 minor changes. Definitions were added for Conformity, Rework, Repair, Use-As-Is, Reject/Scrap, and Correction. Updated Responsibilities. Major re-write of procedure. Modified format to align with Governance Management framework.	Bryan Koehler

Attachment 1
Nonconformance Process Flowchart



Shaw a world of Solutions	Title: Nonconformance Report	Form No: EIG-Q-007.01_2

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1) NCR Number:	**2) Project Name and Number (include location):**	**3) Date:**

4) Nonconformance Description And Reference: (Specification __ Drawing __ Code __)

Identified by: _____ **Date**_____

Reviewed By: _____ **Date**_____

(Project Quality Representative)

5) Disposition of Nonconforming Condition (Indicate disposition type):
1) Rework, 2) Repair, 3) Use As Is, 4)Reject/Scrap (Note: Use-As-Is or Repair determinations must be technically justified)5)Other (e.g., Return to Supplier)

Evaluated by: _____ **Date**_____

Responsible Manager

Concurrence: _____ **Date** _____

Quality Representative

6) Corrective Action(s) to be taken (include date when action(s) will be complete):

Corrective Action to be Performed by: _____**Due Date**_____

Responsible Manager: _____**Date**_____

Reviewed by: _____ **Date** _____

Quality Representative

7) Client Notification Required: _____ **Yes** _____**No** **Date Notified:** _____

8) Corrective Action Completion

Comments:

Responsible Manager: _____**Date**_____

9) Corrective Action(s) Completion Verification and Date:

Comments:

Reviewed and Closed By: _____ **Date**_____

(Project Quality Representative)

APPENDIX C1 ACTIVITY HAZARD ANALYSIS FOR MOBILIZATION/SITE SETUP				
Task Breakdown	**Potential Hazards**	**Critical Safety Practices**	**Personal Protective Clothing and Equipment**	**Monitoring Devices**
Mobilization/ Site Setup	Slips, Trips, Falls	• Clear walkways work areas of equipment, tools, vegetation, excavated material and debris • Mark, identify, or barricade other obstructions		
	Spills	• Clean up spills before initiating maintenance • Review maintenance procedures for safety practices		
	Electrical Shock	• De-energize or shut off utility lines at their source before work begins • Use double insulated or properly grounded electric power-operated tools • Provide an equipment-grounding conductor program or employ ground-fault circuit interrupters • Use qualified electricians to hook up electrical circuits • Inspect all extension cords daily for structural integrity, ground continuity, and damaged insulation • Cover or elevate electric wire or flexible cord passing through work areas to protect from damage • Keep all plugs and receptacles out of water • Use approved water-proof, weather-proof type if exposure to moisture is likely • Inspect all electrical power circuits prior to commencing work • Follow Lockout/Tagout procedure HS315 – Control of Hazardous Energy Sources	Lockout/Tagout Devices	Voltage Meter or Tic Tracer

APPENDIX C1 ACTIVITY HAZARD ANALYSIS FOR MOBILIZATION/SITE SETUP				
Task Breakdown	**Potential Hazards**	**Critical Safety Practices**	**Personal Protective Clothing and Equipment**	**Monitoring Devices**
Mobilization/ Site Setup (continued)	Handling Heavy Objects	• Observe proper lifting techniques • Obey sensible lifting limits (60 lb. Maximum per person manual lifting) • Use mechanical lifting equipment (hand carts, trucks) to move large, awkward loads • Avoid carrying heavy objects above shoulder level • Warm up muscles before engaging in manual lifting		
	Sharp Objects	• Wear cut resistant work gloves when the possibility of lacerations or other injury may be caused by sharp edges or objects • Maintain all hand and power tools in a safe condition	Leather gloves	
	High Noise Levels	• Use hearing protection when exposed to excessive noise levels (greater than 85 dBA over an 8-hour work period) • Do not attempt verbal communication in high noise backgrounds	Ear plugs	
	Struck By/ Against Heavy Equipment	• Wear reflective warning vests when exposed to vehicular traffic • Isolate equipment swing areas • Make eye contact with operators before approaching equipment • Understand and review hand signals • Follow hand signals of ground workers for equipment manipulation when placing/loading equipment into bucket. • Step away from equipment when bucket adjustments are made • Do not attempt verbal communication in high noise backgrounds.	Warning vests, Hard hat, Safety glasses, and Steel toe work boots	

APPENDIX C1 ACTIVITY HAZARD ANALYSIS FOR MOBILIZATION/SITE SETUP				
Task Breakdown	**Potential Hazards**	**Critical Safety Practices**	**Personal Protective Clothing and Equipment**	**Monitoring Devices**
Mobilization/ Site Setup (continued)	Struck-by/Against (Vehicle-traffic)	• Wear reflective warning vests when exposed to vehicular traffic • Barricade or enclose the work areas • Restrict entry to the work areas to authorized personnel during work activities • Wear hard hats, safety glasses with side shields, and steel-toe safety boots at all times • Follow FDOT roadway and traffic design standards manual • Personnel will perform all work tasks and remain inside barriered work zones • Spotters to be utilized as necessary	Warning vests, Hard hat, Safety glasses, and steel toe work boots	
	Pinch Points	• Review equipment adjustment procedures, identify pinch points • Isolate/block pinch points to limit motion when inserting pins, fasteners, closing tackles	Leather gloves	
	Burns associated with loading/unloading equipment on trucks	• Identify heavy objects for loading that may have hot surfaces • Allow objects to cool or cover hot surfaces with non-combustible material to protect workers from burns		
	Ladders	• Inspect ladders before use for mud buildup on treads • Clean mud from boots before climbing on ladders • Follow the three point of contact rule		
	High/Low Ambient Temperature	• Monitor for Heat Stress in accordance with Health and Safety Procedures HS400, HS401 • Provide fluids to prevent worker dehydration		
EQUIPMENT REQUIRED		**INSPECTION REQUIREMENTS**	**TRAINING REQUIREMENTS**	
• Vehicles • Hand tools • Ladders • Forklift/Hand carts		• Daily equipment inspections as per manufacturers requirements • Inspection of all emergency equipment (i.e. first aid kits, fire extinguishers)	• Review AHA with all task personnel • Review Site Specific Safety and Occupational Health Program • Review operations/safety manuals for all equipment utilized	

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APPENDIX C2 ACTIVITY HAZARD ANALYSIS FOR GENERAL SITE ACTIVITIES				
Task Breakdown	**Potential Hazards**	**Critical Safety Practices**	**Personal Protective Clothing and Equipment**	**Monitoring Devices**
Travel to/at project site	Operation of motor vehicles and trucks	All company owned, leased, or rented vehicle operations shall comply with the requirements of Shaw Procedure HS800, *Motor Vehicle Operation: General Requirements*. All company owned, leased, or rented commercial vehicle operations shall comply with the requirements of Shaw Procedure HS810, *Commercial Motor Vehicle Operation And Maintenance*. Subcontractors operating motor vehicles at the site shall comply with all federal, state, and local traffic regulations. Subcontractors shall only use vehicles that are in good condition and safe to operate. Subcontractors shall inspect vehicles routinely used at the site on a weekly basis and submit the inspection documentation to the SSHO. All personnel shall drive defensively and wear seat belts while vehicles are in motion. Backing of vehicles shall be avoided when possible. Extra care shall be taken to back vehicles when unavoidable. When parking vehicles into head in parking spaces, vehicles shall be backed into the space whenever possible. Before backing a vehicle that has been parked, the driver shall physically walk to the back of the vehicle to observe the area before entering the vehicle. Spotters shall be used to back vehicles whenever possible.	Seatbelts	

APPENDIX C2 ACTIVITY HAZARD ANALYSIS FOR GENERAL SITE ACTIVITIES				
Task Breakdown	**Potential Hazards**	**Critical Safety Practices**	**Personal Protective Clothing and Equipment**	**Monitoring Devices**
Unload equipment	Unfamiliarity with: site, general site hazards, project safety rules, chain of command, emergency procedures. Heavy lifting/strains, sprains; Use of mechanical equipment;	All personnel shall attend the site orientation training. No individual employee is permitted to lift any object that weighs over 60 pounds. Proper lifting techniques shall be used. Multiple employees or the use of mechanical lifting devices are required for lifting objects over the 60-pound limit. Only qualified personnel shall be permitted to operate equipment. Forklifts and mechanical equipment shall be inspected daily. Deficiencies in equipment shall be noted on the inspection form. Equipment found to be unsafe shall not be used. All equipment shall be operated at safe speeds and in a safe manner. Equipment operators shall wear safety belts and hearing protection. Ground personnel shall not position themselves between equipment and stationary objects and only approach equipment after a signal from the operator. Personnel are prohibited from entering the swing radius of booms. Equipment load capacities shall not be exceeded. Personnel shall ensure all mechanical guards are in place and functioning properly. All equipment shall be shut down with energies dissipated prior to performing maintenance activities - lock out/tag out procedures may apply. Only qualified mechanics shall work on or repair heavy equipment.		

APPENDIX C2 ACTIVITY HAZARD ANALYSIS FOR GENERAL SITE ACTIVITIES				
Task Breakdown	**Potential Hazards**	**Critical Safety Practices**	**Personal Protective Clothing and Equipment**	**Monitoring Devices**
Mobilization/ Site Setup	Slips, Trips, Falls	• Clear walkways work areas of equipment, tools, vegetation, excavated material and debris • Mark, identify, or barricade other obstructions		
	Spills	• Clean up spills before initiating maintenance • Review maintenance procedures for safety practices		
	Electrical Shock	• De-energize or shut off utility lines at their source before work begins • Use double insulated or properly grounded electric power-operated tools • Provide an equipment-grounding conductor program or employ ground-fault circuit interrupters • Use qualified electricians to hook up electrical circuits • Inspect all extension cords daily for structural integrity, ground continuity, and damaged insulation • Cover or elevate electric wire or flexible cord passing through work areas to protect from damage • Keep all plugs and receptacles out of water • Use approved water-proof, weather-proof type if exposure to moisture is likely • Inspect all electrical power circuits prior to commencing work • Follow Lockout/Tagout procedure HS315 – Control of Hazardous Energy Sources	Lockout/Tagout Devices	Voltage Meter or Tic Tracer

APPENDIX C2 ACTIVITY HAZARD ANALYSIS FOR GENERAL SITE ACTIVITIES				
Task Breakdown	**Potential Hazards**	**Critical Safety Practices**	**Personal Protective Clothing and Equipment**	**Monitoring Devices**
Mobilization/ Site Setup (continued)	Handling Heavy Objects	• Observe proper lifting techniques • Obey sensible lifting limits (60 lb. Maximum per person manual lifting) • Use mechanical lifting equipment (hand carts, trucks) to move large, awkward loads • Avoid carrying heavy objects above shoulder level • Warm up muscles before engaging in manual lifting		
	Sharp Objects	• Wear cut resistant work gloves when the possibility of lacerations or other injury may be caused by sharp edges or objects • Maintain all hand and power tools in a safe condition	Leather gloves	
	High Noise Levels	• Use hearing protection when exposed to excessive noise levels (greater than 85 dBA over an 8-hour work period) • Do not attempt verbal communication in high noise backgrounds	Ear plugs	
	Struck By/ Against Heavy Equipment	• Wear reflective warning vests when exposed to vehicular traffic • Isolate equipment swing areas • Make eye contact with operators before approaching equipment • Understand and review hand signals • Follow hand signals of ground workers for equipment manipulation when placing/loading equipment into bucket. • Step away from equipment when bucket adjustments are made • Do not attempt verbal communication in high noise backgrounds.	Warning vests, Hard hat, Safety glasses, and Steel toe work boots	

APPENDIX C2 ACTIVITY HAZARD ANALYSIS FOR GENERAL SITE ACTIVITIES				
Task Breakdown	**Potential Hazards**	**Critical Safety Practices**	**Personal Protective Clothing and Equipment**	**Monitoring Devices**
Mobilization/ Site Setup (continued)	Struck-by/Against (Vehicle-traffic)	• Wear reflective warning vests when exposed to vehicular traffic • Barricade or enclose the work areas • Restrict entry to the work areas to authorized personnel during work activities • Wear hard hats, safety glasses with side shields, and steel-toe safety boots at all times • Follow FDOT roadway and traffic design standards manual • Personnel will perform all work tasks and remain inside barriered work zones • Spotters to be utilized as necessary	Warning vests, Hard hat, Safety glasses, and steel toe work boots	
	Pinch Points	• Review equipment adjustment procedures, identify pinch points • Isolate/block pinch points to limit motion when inserting pins, fasteners, closing tackles	Leather gloves	
	Burns associated with loading/unloading equipment on trucks	• Identify heavy objects for loading that may have hot surfaces • Allow objects to cool or cover hot surfaces with non-combustible material to protect workers from burns		
	Ladders	• Inspect ladders before use for mud buildup on treads • Clean mud from boots before climbing on ladders • Follow the three point of contact rule		
	High/Low Ambient Temperature	• Monitor for Heat Stress in accordance with Health and Safety Procedures HS400, HS401 • Provide fluids to prevent worker dehydration		

EQUIPMENT REQUIRED	**INSPECTION REQUIREMENTS**	**TRAINING REQUIREMENTS**
• Vehicles • Hand tools • Ladders • Forklift/Hand carts	• Daily equipment inspections as per manufacturers requirements • Inspection of all emergency equipment (i.e. first aid kits, fire extinguishers)	• Review AHA with all task personnel • Review Site Specific Safety and Occupational Health Program • Review operations/safety manuals for all equipment utilized

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APPENDIX C3 ACTIVITY HAZARD ANALYSIS FOR COLLECT SURFACE SOIL SAMPLES				
Task Breakdown	**Potential Hazards**	**Critical Safety Practices**	**Personal Protective Clothing and Equipment**	**Monitoring Devices**
Arrival of new personnel at site.	Unfamiliarity with site, general site hazards, project safety rules, chain of command, and emergency procedures.	All personnel shall attend the site orientation training.		
Unload equipment.	Heavy lifting, strains, and sprains.	No individual employee is permitted to lift any object that weighs over 60 pounds. Proper lifting techniques shall be used. Multiple employees or the use of mechanical lifting devices are required for lifting objects over the 60-pound limit.		
	Intrusive activities.	Follow procedure for Intrusive Activities Permit in the SSHP. Underground utilities shall be located and marked prior to commencing sampling activity.		
	Munitions and Explosives of Concern (MEC).	Personnel shall attend MEC Awareness training.		

APPENDIX C3
ACTIVITY HAZARD ANALYSIS FOR COLLECT SURFACE SOIL SAMPLES

Task Breakdown	Potential Hazards	Critical Safety Practices	Personal Protective Clothing and Equipment	Monitoring Devices
Surface Soil Sampling. (Continued)	Use of sampling tools.	Tools shall be inspected daily and before each use. Damaged tools shall be removed from service.		
	Hazardous atmospheres.	Air monitoring, as described in the SSHP shall be performed in areas where there is the possibility of elevated concentrations of toxic chemicals, flammable vapors, or oxygen-deficient atmospheres. Personnel shall immediately notify the Site Safety and Health Officer (SSHO) if odors are detected.		
	Contaminated air, water, soil, or hazardous chemicals	Physical contact with contaminated media or hazardous chemicals shall be avoided. Personal protective equipment use is required when contact is possible. Personnel who sustain skin contact shall immediately wash the affected area with soap and water (eyes should be irrigated for 15 minutes with potable water) and report the incident to the SSHO.		
	Fire	Smoking shall not be permitted in regulated areas. Vehicles shall not be parked in tall dry grass		
	Miscellaneous site activity.	When possible, personnel shall avoid areas that have hazardous activities in progress. When access must be gained in busy areas, the foremen of the activities in the area shall be notified prior to sampling in the area.	High visibility vests shall be worn when working in areas with high vehicular or heavy equipment traffic.	

EQUIPMENT REQUIRED	INSPECTION REQUIREMENTS	TRAINING REQUIREMENTS
• Vehicles • Hand tools	• Daily equipment inspections as per manufacturers requirements • Inspection of all emergency equipment (i.e. first aid kits, fire extinguishers)	• Review AHA with all task personnel • Review Site Specific Safety and Occupational Health Program • Review operations/safety manuals for all equipment utilized

APPENDIX C4 ACTIVITY HAZARD ANALYSIS FOR COLLECT SUBSURFACE SOIL SAMPLES				
Task Breakdown	**Potential Hazards**	**Critical Safety Practices**	**Personal Protective Clothing and Equipment**	**Monitoring Devices**
Arrival of new personnel at site.	Unfamiliarity with: site, general site hazards, project safety rules, chain of command, and emergency procedures.	All personnel shall attend the site orientation training.		
Location surveys.	Use of hand tools.	Hand tools shall be inspected daily and before each use. Tools, which are damaged, shall be removed from service.		
Materials Handling.	Overexertion	Personnel shall work in a manner and pace to reduce strains and overexertion.		
Soil sampling.	Hazardous atmospheres.	Air monitoring shall be performed in areas where there is the possibility of elevated concentrations of toxic chemicals, flammable vapors, or oxygen deficient atmospheres. Personnel shall immediately notify the SSHO if odors are detected. Engineering controls shall be implemented, when feasible, to control hazardous atmospheres to within acceptable limits. When engineering controls are not adequate, administrative controls or the use of PPE is required.		
	Fire.	Smoking shall not be permitted in regulated areas. Vehicles shall not be parked in tall dry grass.		
	Slips, trips, and falls.	Keep work areas clear and maintain housekeeping. Personnel shall not jump from equipment or elevated surfaces. Personnel shall avoid walking on rough or slippery terrain.		

APPENDIX C4 ACTIVITY HAZARD ANALYSIS FOR COLLECT SUBSURFACE SOIL SAMPLES				
Task Breakdown	**Potential Hazards**	**Critical Safety Practices**	**Personal Protective Clothing and Equipment**	**Monitoring Devices**
Soil sampling (continued).	Contaminated air, water, soil, or hazardous chemicals.	Physical contact with contaminated media or hazardous chemicals shall be avoided. Personal protective equipment use is required when contact is possible/probable. Personnel who sustain skin contact shall immediately wash the affected area with soap and water (eyes should be irrigated for 15 minutes with potable water) and report the incident to the SSHO.		
	Use of acidic preservatives (if required).	Personal protective equipment use, including chemical splash goggles, shall be required. A portable eye wash station shall be readily available in the area where acids are being used. Acids will be used in areas with adequate ventilation. All containers shall be properly labeled.		
	Miscellaneous site activity.	Personnel shall avoid areas, when possible, that have hazardous activities in progress. When access must be gained in busy areas, the foremen of the activities in the area shall be notified - prior to sampling in the area. High visibility vests shall be worn when working in areas with high vehicular or heavy equipment traffic.		
	Heat/cold/severe weather.	Follow procedures outlined in SSHP. Follow procedures outlined in SSHP.		
	Biological.			

EQUIPMENT REQUIRED	**INSPECTION REQUIREMENTS**	**TRAINING REQUIREMENTS**
• Vehicles • Hand tools • Ladders • Forklift/Hand carts	• Daily equipment inspections as per manufacturers requirements • Inspection of all emergency equipment (i.e. first aid kits, fire extinguishers)	• Review AHA with all task personnel • Review SSHP • Review operations/safety manuals for all equipment utilized

APPENDIX C5 ACTIVITY HAZARD ANALYSIS FOR COLLECT SURFACE WATER AND GROUNDWATER SAMPLES				
Task Breakdown	**Potential Hazards**	**Critical Safety Practices**	**Personal Protective Clothing and Equipment**	**Monitoring Devices**
Arrival of new personnel at site.	Unfamiliarity with: site, general site hazards, project safety rules, chain of command, and emergency procedures.	All personnel shall attend the site orientation training.		
Location surveys.	Use of hand tools.	Hand tools shall be inspected daily and before each use. Tools, which are damaged, shall be removed from service.		
Materials Handling.	Overexertion	Personnel shall work in a manner and pace to reduce strains and overexertion.		
Water sampling.	Hazardous atmospheres.	Air monitoring shall be performed in areas where there is the possibility of elevated concentrations of toxic chemicals, flammable vapors, or oxygen deficient atmospheres. Personnel shall immediately notify the SSHO if odors are detected. Engineering controls shall be implemented, when feasible, to control hazardous atmospheres to within acceptable limits. When engineering controls are not adequate, administrative controls or the use of PPE is required.		
	Fire.	Smoking shall not be permitted in regulated areas. Vehicles shall not be parked in tall dry grass.		
	Slips, trips, and falls.	Keep work areas clear and maintain housekeeping. Personnel shall not jump from equipment or elevated surfaces. Personnel shall avoid walking on rough or slippery terrain.		

APPENDIX C5 ACTIVITY HAZARD ANALYSIS FOR COLLECT SURFACE WATER AND GROUNDWATER SAMPLES				
Task Breakdown	**Potential Hazards**	**Critical Safety Practices**	**Personal Protective Clothing and Equipment**	**Monitoring Devices**
Water sampling (continued).	Contaminated air, water, soil, or hazardous chemicals.	Physical contact with contaminated media or hazardous chemicals shall be avoided. Personal protective equipment use is required when contact is possible/probable. Personnel who sustain skin contact shall immediately wash the affected area with soap and water (eyes should be irrigated for 15 minutes with potable water) and report the incident to the SSHO.		
	Use of acidic preservatives (if required).	Personal protective equipment use, including chemical splash goggles, shall be required. A portable eye wash station shall be readily available in the area where acids are being used. Acids will be used in areas with adequate ventilation. All containers shall be properly labeled.		
	Miscellaneous site activity.	Personnel shall avoid areas, when possible, that have hazardous activities in progress. When access must be gained in busy areas, the foremen of the activities in the area shall be notified - prior to sampling in the area. High visibility vests shall be worn when working in areas with high vehicular or heavy equipment traffic.		
	Heat/cold/severe weather.	Follow procedures outlined in SSHP.		
	Biological.	Follow procedures outlined in SSHP.		

EQUIPMENT REQUIRED	**INSPECTION REQUIREMENTS**	**TRAINING REQUIREMENTS**
• Vehicles • Hand tools • Ladders • Forklift/Hand carts	• Daily equipment inspections as per manufacturers requirements • Inspection of all emergency equipment (i.e. first aid kits, fire extinguishers)	• Review AHA with all task personnel • Review SSHP • Review operations/safety manuals for all equipment utilized

APPENDIX C6 ACTIVITY HAZARD ANALYSIS FOR WELL DRILLING				
Task Breakdown	**Potential Hazards**	**Critical Safety Practices**	**Personal Protective Clothing and Equipment**	**Monitoring Devices**
Well Installation	Struck by/ Against Heavy Equipment, Flying Debris, Protruding Objects	• Wear reflective warning vests when exposed to vehicular traffic • Isolate equipment swing areas • Make eye contact with operators before approaching equipment • Barricade or enclose the drilling area • Restrict entry to the work area to authorized personnel during drilling activities • Wear hard hats, safety glasses with side shields, or splash/face shields and goggles, and steel-toe safety boots at all times • Understand and review hand signals	Warning vests, Hard hat, Safety glasses, steel toe work boots	
	Sharp Objects	• Wear cut resistant work gloves when the possibility of lacerations or other injury may be caused by sharp edges or objects • Maintain all hand and power tools in a safe condition • Keep guards in place during use • Observe work area and location of other personnel before lifting or moving objects with sharp edges	Leather gloves	
	Underground/ Overhead Utilities	• Identify all utilities around the site before work commences and cease work immediately if unknown utility markers are uncovered • Use manual excavation within 3 feet of known utilities • Utility clearance shall conform with 29 CFR 1926.955 (high voltage >700 kv) 15 feet phase to ground clearance; 31 feet phase to phase clearance		
	High Noise Levels	• Use hearing protection when exposed to excessive noise levels (greater than 85 dBA over an 8-hour work period) and Assess noise level with sound level meter if possibility exists that level may exceed 85dBA TWA	Ear plugs	Sound Level Meter

APPENDIX C6 ACTIVITY HAZARD ANALYSIS FOR WELL DRILLING				
Task Breakdown	**Potential Hazards**	**Critical Safety Practices**	**Personal Protective Clothing and Equipment**	**Monitoring Devices**
Well Installation (continued)	Handling Heavy Objects	• Observe proper lifting techniques • Obey sensible lifting limits (60 lb. Maximum per person manual lifting) • Use mechanical lifting equipment (hand carts, trucks) to move large, awkward loads • Warm up muscles before engaging in manual lifting activities • Review lifting posture/techniques regularly at safety meetings		
	Caught In/ Between Moving Parts	• Identify and understand parts of equipment which may cause crushing, pinching, rotating or similar injuries • Assure guards are in place to protect from these parts of equipment during operation • Provide and wear proper work gloves when the possibility of crush, pinch, or other injury may be caused by moving/stationary edges or objects • Maintain all equipment in a safe condition • Keep all guards in place during use • De-energize and lock-out machinery before maintenance or service		
	Horseplay	• Prohibit horseplay on all project sites • Review rules about horseplay with subcontract supervisors and workers • Remind workers not to respond/participate in horseplay started by others		

APPENDIX C6 ACTIVITY HAZARD ANALYSIS FOR WELL DRILLING				
Task Breakdown	**Potential Hazards**	**Critical Safety Practices**	**Personal Protective Clothing and Equipment**	**Monitoring Devices**
	Slips, Trips, Falls	• Clear walkways, work areas of equipment, drilling overburden, debris and other materials • Mark, identify, or barricade other obstructions		
	Inhalation and Contact with Hazardous Substances	• Provide workers proper skin, eye and respiratory protection based on the exposure hazards present • Review hazardous properties of site contaminants with workers before operations begin	Tyvek coveralls, nitrile gloves, latex or neoprene boots	
Well Installation (continued)	Fire/ Explosion	• Test well-head atmosphere with combustible gas meter • Eliminate sources of ignition from the work area • Prohibit smoking • Provide ABC (or equivalent) fire extinguishers in all work areas, flammable storage areas, generator and compressor locations • Store flammable liquids in well ventilated areas • Prohibit storage, transfer of flammable liquids in plastic containers • Post "NO SMOKING" signs • Store combustible materials away from flammables • Store all compressed gas cylinders upright, caps in place when not in use • Separate Flammables and Oxidizers by 20 feet minimum	Portable fire extinguishers	LEL/O_2
	High/Low Ambient Temperature	• Monitor for Heat/Cold stress in accordance with Shaw Health and Safety Procedures HS400. HS401 • Provide fluids to prevent worker dehydration		

EQUIPMENT REQUIRED	INSPECTION REQUIREMENTS	TRAINING REQUIREMENTS
• Drill Rig • Hand tools	• Daily equipment inspections as per manufacturers requirements • Inspection of all emergency equipment (i.e. first aid kits, fire extinguishers)	• Review JSA with all task personnel • Review SSHP

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APPENDIX C7 ACTIVITY HAZARD ANALYSIS FOR SOIL EXCAVATION				
Task Breakdown	**Potential Hazards**	**Critical Safety Practices**	**Personal Protective Clothing and Equipment**	**Monitoring Devices**
Excavation of Soil	Underground/ Overhead Utilities	• Identify all utilities around the site before work commences • Cease work immediately if unknown utility markers are uncovered • Use manual excavation within 3 feet of known utilities • Utility clearance shall conform with 29 CFR 1926.955 (high voltage >700 kv) 15 feet phase to ground clearance; 31 feet phase to phase clearance		
	Excavation Wall Collapse	• Construct diversion ditches or dikes to prevent surface water from entering excavation • Provide good drainage of area adjacent to excavation • Collect ground water/rain water from excavation and dispose of properly • Store excavated material at least 2 feet from the edge of the excavation; prevent excessive loading of the excavation face • Provide sufficient stairs, ladders, or ramps when workers enter excavations over 4 feet in depth • Place ladders no more than 25 feet apart laterally • Treat excavations over 4 feet deep as confined spaces • Complete confined space permit entry procedure • Monitor atmosphere for flammable/toxic vapors, and oxygen deficiency • Slope, bench, shore, or sheet excavations over 5 feet deep if worker entry is required • Assign a competent person to inspect, decide soil classification, proper sloping, the correct shoring, or sheeting • Inspect excavations (when personnel entry is required) daily, any time conditions change • Provide at least two means of exit for personnel working in excavations	Hard hat, safety glasses, steel toe work boots	

APPENDIX C7 ACTIVITY HAZARD ANALYSIS FOR SOIL EXCAVATION				
Task Breakdown	**Potential Hazards**	**Critical Safety Practices**	**Personal Protective Clothing and Equipment**	**Monitoring Devices**
Excavation of Soil (Continued)	Struck By/ Against Heavy Equipment	• Wear reflective warning vests when exposed to vehicular traffic • Isolate equipment swing areas • Make eye contact with operators before approaching equipment • Understand and review hand signals	Warning vests, hard hat, safety glasses, steel toe work boots	
	Handling Heavy Objects	• Observe proper lifting techniques • Obey sensible lifting limits (60 lb. maximum per person manual lifting) • Use mechanical lifting equipment (hand carts, trucks) to move large, awkward loads		
	Sharp Objects	• Wear cut resistant work gloves when the possibility of lacerations or other injury may be caused by sharp edges or objects • Maintain all hand and power tools in a safe condition • Keep guards in place during use	Leather gloves	
	Slips, Trips, Falls	• Clear walkways, work areas of equipment, vegetation, excavated material, tools, and debris • Mark, identify, or barricade other obstructions • Evaluate fall hazards above 4 ft.; use fall protection equipment (harness/lanyard), standard guardrails or other fall protection systems when working on elevated platforms above 6 ft. • Use Aheavy duty industrial≅ (type IA) ladders • Install and inspect scaffolds according to manufacturers requirements • Only trained operators are permitted to use aerial lifts • Tie-off all straight/extension ladders or manually hold by co-worker at base • Anchorage points for fall arrest systems must support at least 5,400 pounds for each worker		

APPENDIX C7 ACTIVITY HAZARD ANALYSIS FOR SOIL EXCAVATION				
Task Breakdown	**Potential Hazards**	**Critical Safety Practices**	**Personal Protective Clothing and Equipment**	**Monitoring Devices**
Excavation of Soil (Continued)	High Noise Levels	• Use hearing protection when exposed to excessive noise levels (greater than 85 dBA over an 8-hour work period) • Assess noise level with sound level meter if possibility exists that level may exceed 85dBA TWA	Ear plugs	
	Inhalation and Contact with Hazardous Substances	• Provide workers proper skin, eye and respiratory protection based on the exposure hazards present • Review hazardous properties of site contaminants with workers before operations begin • Monitor breathing zone air to determine levels of contaminants • Dampen soil using light water spray to prevent fugitive dust emissions • Cover stockpiled soil with plastic sheeting to prevent fugitive dust emissions • Conduct air monitoring / sampling to determine exposure levels	Tyvek coveralls, nitrile gloves, neoprene boots	LEL/O_2, PID, Mini-RAM, H_2S Monitor; Air sampling pump
	High/Low Ambient Temperature	• Monitor for Heat/Cold stress in accordance with IT Health and Safety Procedures # HS400, HS401 • Provide fluids to prevent worker dehydration • Follow work/rest schedule	Insulated Clothing (subject to ambient temperature)	Meteorological Equipment
EQUIPMENT REQUIRED		**INSPECTION REQUIREMENTS**	**TRAINING REQUIREMENTS**	
• Vehicles • Hand tools • Ladders • Forklift/Hand carts		• Daily equipment inspections as per manufacturers requirements • Inspection of all emergency equipment (i.e. first aid kits, fire extinguishers)	• Review AHA with all task personnel • Review Site Specific Safety and Occupational Health Program • Review operations/safety manuals for all equipment utilized	

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APPENDIX C8 ACTIVITY HAZARD ANALYSIS FOR BACKFILLING AND COMPACTION				
Task Breakdown	**Potential Hazards**	**Critical Safety Practices**	**Personal Protective Clothing and Equipment**	**Monitoring Devices**
Backfill and Compact Soils	Slips, Trips, Falls	• Clear walkways, work areas of equipment, tools, construction debris and other materials • Mark, identify, or barricade other obstructions • Maintain three point contact when ascending/ descending heavy equipment		
	Handling Heavy Objects	• Observe proper lifting techniques • Obey sensible lifting limits (60 lb. maximum per person manual lifting) • Use mechanical lifting equipment (hand carts, trucks) to move large, awkward loads		
	Struck by/ Against Heavy Equipment, Flying Debris, Protruding Objects	• Wear reflective warning vests when exposed to vehicular traffic • Isolate equipment swing areas • Make eye contact with operators before approaching equipment • Verify proper operation of equipment backup alarms • Barricade or enclose the work area • Restrict work area entry to authorized personnel only during construction activities • Wear hard hats, safety glasses with side shields, and steel-toe safety boots • Understand and review hand signals	Warning vests, Hard hat, Safety glasses, Steel toe work boots	
	Vibration	• Rotate compaction tasks to minimize worker exposure to equipment vibration • Use compactors with vibration dampening devices	leather gloves	
	High Noise Levels	• Use hearing protection when exposed to excessive noise levels (greater than 85 dBA over an 8-hour work period) • Assess noise level with sound level meter if possibility exists that level may exceed 85dBA TWA	Ear plugs	Sound Level Meter

APPENDIX C8 ACTIVITY HAZARD ANALYSIS FOR BACKFILLING AND COMPACTION				
Task Breakdown	**Potential Hazards**	**Critical Safety Practices**	**Personal Protective Clothing and Equipment**	**Monitoring Devices**
Backfill and Compact Soils (Continued)	High/Low Ambient Temperature	• Monitor for Heat/Cold stress in accordance with Shaw Health and Safety Procedures # HS400, HS401 • Provide fluids to prevent worker dehydration	Insulated Clothing (subject to ambient temperature)	Meteorological Equipment

EQUIPMENT REQUIRED	**INSPECTION REQUIREMENTS**	**TRAINING REQUIREMENTS**
• Excavator • Shovels, probes • Dump trucks	• Daily equipment inspections as per manufacturers requirements • Excavation inspection/permit • Inspection of all emergency equipment (i.e.: first aid kits, fire extinguishers)	• Review AHA with all task personnel • Review SSHP. • Review operations/safety manuals for all equipment utilized • Review site specific chemical hazards

APPENDIX C9 AHA FOR SITE SURVEY ACTIVITIES				
Task Breakdown	**Potential Hazards**	**Critical Safety Practices**	**Personal Protective Clothing and Equipment**	**Monitoring Devices**
Survey of Site	Struck By/ Against Motor Vehicles/ Operating Equipment	Wear reflective warning vests when exposed to vehicular traffic Isolate potential equipment swing areas Avoid/isolate survey activities in high traffic areas Make eye contact with vehicle operators before approaching/crossing high traffic areas Understand and review hand signals Emphasize The Buddy System where injury potential exists	Hard hat, safety glasses, steel toe work boots, Safety Vest	
	Slips, Trips, Falls	Clear walkways, work areas of equipment and tools Mark, identify, or barricade other obstructions		
	Handling Heavy Objects	Observe proper lifting techniques Obey sensible lifting limits (60 lb. maximum per person manual lifting) Use mechanical lifting equipment (hand carts, trucks) to move large, awkward loads		
	Sharp Objects	Wear cut resistant work gloves when the possibility of lacerations or other injury may be caused by sharp edges or objects Maintain all hand and power tools in a safe condition Keep guards in place during use Close doors, windows on heavy equipment to prevent injuries from tree branches and other vegetation	Leather gloves	
	Insect/ Animal Bites	Review injury potential with workers Avoid insect nests areas, habitats outside work areas Emphasize The Buddy System where such injury potential exists Use insect repellant to protect against sting injuries		

APPENDIX C9 AHA FOR SITE SURVEY ACTIVITIES				
Task Breakdown	**Potential Hazards**	**Critical Safety Practices**	**Personal Protective Clothing and Equipment**	**Monitoring Devices**
Survey of Site (Continued)	Contact Dermatitis	Wear long sleeve shirts / trousers to avoid skin contact with plants or other skin irritants Identify and review poisonous plants with workers Apply protective cream/lotion to exposed skin to prevent poison ivy or similar reactions	latex boot covers	
	High/Low Ambient Temperature	Monitor for Heat/Cold stress in accordance with Shaw Health and Safety Procedures # HS400, HS401 Provide fluids to prevent worker dehydration	Insulated Clothing (subject to ambient temperature)	Meteorological Equipment
EQUIPMENT REQUIRED		**INSPECTION REQUIREMENTS**	**TRAINING REQUIREMENTS**	
• Hand tools		Daily equipment inspections as per manufacturers requirements Inspection of all emergency equipment (i.e. first aid kits, fire extinguishers)	Review JSA with all task personnel Review SSHP	

APPENDIX C10 AHA FOR SITE RESTORATION				
Task Breakdown	**Potential Hazards**	**Critical Safety Practices**	**Personal Protective Clothing and Equipment**	**Monitoring Devices**
Prepare area, fertilize, and sew grass seed.	Use of tractors/mechanical equipment.	Only qualified personnel shall be permitted to operate equipment. The operator shall read the tractor operator manual prior to use. The operator shall review all safety and operational decals applied to the tractor and implements prior to use. The tractor shall be inspected daily (and documented). Inspection forms are located in Appendix D of the SSHP. Do not use unsafe equipment. Deficiencies in equipment shall be noted on the inspection form. Equipment found to be unsafe shall not be used. Keep all shields and guards in place. Do not operate equipment with missing shields or guards. Shut off engine, remove the key, and be sure implement motion has stopped before dismounting the tractor, performing adjustments, or performing maintenance. Personnel shall not wear loose clothing, and stay clear of moving parts. Be careful of pinch points when coupling and uncoupling equipment. Be careful of power take off (PTO) – make sure guards are in place. Never step over the PTO – walk around the tractor or implement. Avoid tight turns that pinch rotating shafts between the tractor and machine.		

APPENDIX C10 AHA FOR SITE RESTORATION				
Task Breakdown	**Potential Hazards**	**Critical Safety Practices**	**Personal Protective Clothing and Equipment**	**Monitoring Devices**
Prepare area, fertilize, and sew grass seed (continued).	Use of tractors/mechanical equipment (continued).	Wear gloves when manually hooking up equipment. Avoid lateral movement on steep slopes where rollover potential may be high. All equipment shall be operated at safe speeds and in a safe manner. Personnel shall ensure all mechanical guards are in place and functioning properly. All equipment shall be shut down with energies dissipated prior to performing maintenance activities - lock out/tag out procedures may apply. Only qualified mechanics shall work on or repair heavy equipment. All equipment shall have backing alarms. The tractor operator shall wear safety belts. Personnel are only permitted to approach equipment after a signal from the operator. Operate the PTO at the speed recommended for the implement being used.		

APPENDIX C10 AHA FOR SITE RESTORATION				
Task Breakdown	**Potential Hazards**	**Critical Safety Practices**	**Personal Protective Clothing and Equipment**	**Monitoring Devices**
Prepare area, fertilize, and sew grass seed (continued).	Slips, trips, falls. Hand injuries. Bright sun (glare) and eye injuries. Fire.	Personnel shall not jump from equipment. Personnel shall be cautious when walking/working on uneven or slippery surfaces. Heavy equipment operators shall use extra care and maintain three-point contact when climbing into or out of equipment. Items to be handled shall be inspected for sharp edges prior to being handled. Personnel shall wear leather gloves when handling sharp materials. Personnel shall be aware of and avoid pinch point hazards. Eye protection equipment shall be worn as necessary. The tractor shall be shut off before refueling. A 2:A-20B:C fire extinguisher shall be available when re-fueling tractor. Smoking shall not be permitted when fueling. The tractor shall be allowed to cool before refueling. Gasoline shall be stored in safety cans with flash arrestors and spring-loaded vents. The tractor shall be equipped with a 5-B:C fire extinguisher. Vehicle shall not be allowed to idle when parked on grass. A Hudson sprayer, filled with water, shall be available at the work location.		

APPENDIX C10 AHA FOR SITE RESTORATION				
Task Breakdown	**Potential Hazards**	**Critical Safety Practices**	**Personal Protective Clothing and Equipment**	**Monitoring Devices**
Prepare area, fertilize, and sew grass seed (continued).	Noise.	Tractor operator shall wear hearing protection to reduce exposures to below the Occupational Safety and Health Administration limits.		
	Heat stress.	Personnel shall keep hydrated by drinking more water than thirst indicates. The heat stress guidelines in the SSHP shall be followed. Personnel shall pace themselves while performing strenuous work and take adequate breaks in a cool area. Personnel shall take adequate breaks in a cool area.		
	Stinging and biting insects.	Follow procedures outlined in SSHP. Use Deep Woods Off (N,N-Diethyl-m-toluamide [DEET]) and Repel Permanone (permethrins), and/or flowers of sulfur to repel chiggers, mosquitoes, and ticks.		
	Use of fertilizer.	Read material safety data sheet for fertilizer prior to use. The precautionary recommendations by the manufacturer shall be followed. Personnel shall avoid contact with the fertilizer. Personnel shall wash their hands and face immediately after using the fertilizer.		

EQUIPMENT REQUIRED	**INSPECTION REQUIREMENTS**	**TRAINING REQUIREMENTS**
Hearing protection Insect repellant Drinking water	Site inspections (daily)	Site orientation Hazard Communication Heat stress procedures

APPENDIX C11
ACTIVITY HAZARD ANALYSIS FOR SOIL BORROW MATERIAL IMPORT (LOADING, TRANSPORTATION, AND DUMPING

Task Breakdown	Potential Hazards	Critical Safety Practices	Personal Protective Clothing and Equipment	Monitoring Devices
Truck Loading and Equipment Operations	Struck By/ Against Heavy Equipment	• Wear reflective warning vests when exposed to vehicular traffic • Obey posted speed limits • Isolate equipment swing areas • . Make eye contact with operators before approaching equipment . Understand and review hand signals	Warning vests, Hard hat, Safety glasses, Steel toe work boots	
	Slips, Trips, Falls	• Clear walk ways, work areas of equipment, tools and debris • . Mark, identify, or barricade other obstructions		
	Sharp Objects	• Wear cut resistant work gloves when the possibility of lacerations or other injury may be caused by sharp edges or objects • Maintain all hand and power tools in a safe condition • Keep guards in place during use	Leather gloves	
	High Noise Levels	• Use hearing protection when exposed to excessive noise levels (Greater than 85 dBA over an 8-hour work period) • Assess noise level with sound level meter if possibility exists that level may exceed 85dBA TWA • Do not attempt verbal communication in high noise backgrounds	Ear plugs	Sound Level Meter
	Handling Heavy Objects	• Observe proper lifting techniques • Obey sensible lifting limits (60 lb. maximum per person manual lifting) • Use mechanical lifting equipment (hand carts, trucks)to move large, awkward loads		

APPENDIX C11
ACTIVITY HAZARD ANALYSIS FOR SOIL BORROW MATERIAL IMPORT (LOADING, TRANSPORTATION, AND DUMPING

Task Breakdown	Potential Hazards	Critical Safety Practices	Personal Protective Clothing and Equipment	Monitoring Devices
Truck Loading and Equipment Operations (Continued)	Caught In/ Between Moving Parts	• Identify and understand parts of equipment which may cause crushing, pinching, rotating or similar motions • Assure guards are in place to protect from these parts of equipment during operation • Wear proper work gloves when the possibility of pinching, or other injury may be caused by moving/ handling large or heavy objects • Maintain all equipment in a safe condition • Keep all guards in place during use • Avoid moving hydraulic, dump or loading equipment		

EQUIPMENT REQUIRED	INSPECTION REQUIREMENTS	TRAINING REQUIREMENTS
• Excavator • Dump trucks • Shovels	• Daily equipment inspections as per manufacturers requirements • Inspection of all emergency equipment (i.e. first aid kits, fire extinguishers)	• Review AHA with all task personnel • Review operations/safety manuals for all equipment utilized

APPENDIX C12 AHA FOR EQUIPMENT DECONTAMINATION				
Task Breakdown	**Potential Hazards**	**Critical Safety Practices**	**Personal Protective Clothing and Equipment**	**Monitoring Devices**
Arrival of new personnel at site.	Unfamiliarity with site, general site hazards, project safety rules, chain of command, and emergency procedures.	All personnel shall attend the site orientation training.		
Unload equipment.	Heavy lifting, strains, and sprains.	No individual employee is permitted to lift any object that weighs over 60 pounds. Proper lifting techniques shall be used. Multiple employees or the use of mechanical lifting devices are required for lifting objects over the 60-pound limit.		
Equipment decontamination.	Use of pressure or steam washer.	All personnel associated with the use of steam/pressure washers shall wear Level D-Modified personal protective equipment (PPE). Rain gear over Saranex or poly-coated Tyvek® coveralls shall be worn by personnel in addition to Nitrile or polyvinyl chloride (PVC) gloves and PVC or Latex boot covers. Physical contact with contaminated media or hazardous chemicals shall be avoided. Personnel who sustain skin contact shall immediately wash the affected area with soap and report the incident to the Site Safety and Health Officer. Personnel shall wash hands and face at the conclusion of decontamination activities and before breaks.		

APPENDIX C12 AHA FOR EQUIPMENT DECONTAMINATION				
Task Breakdown	**Potential Hazards**	**Critical Safety Practices**	**Personal Protective Clothing and Equipment**	**Monitoring Devices**
Equipment decontamination (continued).	Slips, trips, falls. Pressure/steam washing.	Personnel shall be cautious when walking/working on slippery surfaces. Personnel lifts or scaffolding shall be used to access the tops of large/heavy equipment that must be cleaned. Fall protection shall be used when working at heights greater than six feet. Good house keeping shall be maintained in the decontamination area. Hoses and extension cords shall be kept/used in an orderly fashion. All equipment shall be shut off and a positive means taken to prevent its operation prior to decontamination. All dump beds on trucks shall be blocked if bed is cleaned in raised position. The pressure/steam washer shall be inspected before each use. The manufacturer's instruction manual shall be used to guide the inspection process. Personnel shall be trained in the use of the washing equipment. All personnel working in the equipment decontamination area shall be trained in the emergency shut-off procedures for the equipment being used. The minimum amount of steam/pressure that will complete the job should be used. Pressure washers exceeding 3000 psi shall not be used without the approval of the Certified Industrial Hygienist. The spray from such equipment shall only be directed at surfaces to be cleaned and never at body parts or other personnel. Personnel in the immediate area shall use face shields and metatarsal/shin guards.		

APPENDIX C12 AHA FOR EQUIPMENT DECONTAMINATION				
Task Breakdown	**Potential Hazards**	**Critical Safety Practices**	**Personal Protective Clothing and Equipment**	**Monitoring Devices**
Equipment decontamination (continued).	Pressure/steam washing (continued).	Personnel shall keep a firm grip on the wand and not point it at anything that is not being washed. Pressure washer operators must maintain good footing. The trigger on the wand shall never be wired/fixed open. Operators are to take adequate breaks to avoid fatigue. Hot surfaces shall be avoided. Units shall be shut off and allowed to cool prior to re-fueling.		
	Cold stress.	Personnel shall wear clothing commensurate with the ambient temperature. Personnel shall take breaks as necessary to warm up. Hot beverages shall be provided to personnel during breaks. The additional precautionary measures for cold stress, detailed in the Safety, Health, and Emergency Response Plan, may be applicable.		

APPENDIX C12 AHA FOR EQUIPMENT DECONTAMINATION				
Task Breakdown	**Potential Hazards**	**Critical Safety Practices**	**Personal Protective Clothing and Equipment**	**Monitoring Devices**
Equipment decontamination (continued).	Use of methanol.	Methanol shall be kept in storage cabinets when not in use. Methanol shall only be used in areas where smoking is prohibited and all ignition sources have been removed. Methanol will be used outdoors or in areas with adequate ventilation. Personnel using methanol shall wear safety glasses, Silver Shield gloves, and 100% cotton clothing under Saranex coated Tyvek coveralls. A fire extinguisher and charged water hose shall be available in the immediate area where methanol is being used. Physical contact with methanol shall be avoided. Personnel who sustain skin contact shall immediately wash the affected area with soap and water (eyes should be irrigated for 15 minutes with potable water) and report the incident to the Site Safety and Health Officer. A portable eye wash station shall be readily available in the area where methanol is being used. All containers shall be properly labeled.		
EQUIPMENT REQUIRED		**INSPECTION REQUIREMENTS**	**TRAINING REQUIREMENTS**	
• Hand tools • Pressure Washer		Daily equipment inspections as per manufacturers requirements Inspection of all emergency equipment (i.e. first aid kits, fire extinguishers)	Review JSA with all task personnel Review SSHP Hazard communication	

APPENDIX C13 ACTIVITY HAZARD ANALYSIS FOR DEMOBILIZATION				
Task Breakdown	**Potential Hazards**	**Critical Safety Practices**	**Personal Protective Clothing and Equipment**	**Monitoring Devices**
Demobilization/ Tear Down Site	Slips, Trips, Falls	• Clear walkways work areas of equipment, tools, vegetation, excavated material and debris • Mark, identify, or barricade other obstructions		
	Spills	• Clean up spills before initiating maintenance • Review maintenance procedures for safety practices		
	Electrical Shock	• De-energize or shut off utility lines at their source before work begins • Use double insulated or properly grounded electric power-operated tools • Provide an equipment-grounding conductor program or employ ground-fault circuit interrupters • Use qualified electricians to unhook electrical circuits • Inspect all extension cords daily for structural integrity, ground continuity, and damaged insulation • Cover or elevate electric wire or flexible cord passing through work areas to protect from damage • Keep all plugs and receptacles out of water • Use approved water-proof, weather-proof type if exposure to moisture is likely • Inspect all electrical power circuits prior to commencing work • Follow Lockout/Tagout procedure HS315 – Control of Hazardous Energy Sources	Lockout/Tagout Devices	Voltage Meter or Tic Tracer

APPENDIX C13 ACTIVITY HAZARD ANALYSIS FOR DEMOBILIZATION				
Task Breakdown	**Potential Hazards**	**Critical Safety Practices**	**Personal Protective Clothing and Equipment**	**Monitoring Devices**
Demobilization/ Tear Down Site (continued)	Handling Heavy Objects	• Observe proper lifting techniques • Obey sensible lifting limits (60 lb. Maximum per person manual lifting) • Use mechanical lifting equipment (hand carts, trucks) to move large, awkward loads • Avoid carrying heavy objects above shoulder level • Warm up muscles before engaging in manual lifting		
	Sharp Objects	• Wear cut resistant work gloves when the possibility of lacerations or other injury may be caused by sharp edges or objects • Maintain all hand and power tools in a safe condition	Leather gloves	
	High Noise Levels	• Use hearing protection when exposed to excessive noise levels (greater than 85 dBA over an 8-hour work period) • Do not attempt verbal communication in high noise backgrounds	Ear plugs	
	Struck By/ Against Heavy Equipment	• Wear reflective warning vests when exposed to vehicular traffic • Isolate equipment swing areas • Make eye contact with operators before approaching equipment • Understand and review hand signals • Follow hand signals of ground workers for equipment manipulation when placing/loading equipment into bucket. • Step away from equipment when bucket adjustments are made • Do not attempt verbal communication in high noise backgrounds.	Warning vests, Hard hat, Safety glasses, and Steel toe work boots	

APPENDIX C13 ACTIVITY HAZARD ANALYSIS FOR DEMOBILIZATION				
Task Breakdown	**Potential Hazards**	**Critical Safety Practices**	**Personal Protective Clothing and Equipment**	**Monitoring Devices**
Demobilization/ Tear Down Site (continued)	Struck-by/Against (Vehicle-traffic)	• Wear reflective warning vests when exposed to vehicular traffic • Barricade or enclose the work areas • Restrict entry to the work areas to authorized personnel during work activities • Wear hard hats, safety glasses with side shields, and steel-toe safety boots at all times • Follow FDOT roadway and traffic design standards manual • Personnel will perform all work tasks and remain inside barriered work zones • Spotters to be utilized as necessary	Warning vests, Hard hat, Safety glasses, and steel toe work boots	
	Pinch Points	• Review equipment adjustment procedures, identify pinch points • Isolate/block pinch points to limit motion when inserting pins, fasteners, closing tackles	Leather gloves	
	Burns associated with loading/unloading equipment on trucks	• Identify heavy objects for loading that may have hot surfaces • Allow objects to cool or cover hot surfaces with non-combustible material to protect workers from burns		
	Ladders	• Inspect ladders before use for mud buildup on treads • Clean mud from boots before climbing on ladders • Follow the three point of contact rule		
	High/Low Ambient Temperature	• Monitor for Heat Stress in accordance with Health and Safety Procedures HS400, HS401 • Provide fluids to prevent worker dehydration		

EQUIPMENT REQUIRED	**INSPECTION REQUIREMENTS**	**TRAINING REQUIREMENTS**
• Vehicles • Hand tools • Ladders • Forklift/Hand carts	• Daily equipment inspections as per manufacturers requirements • Inspection of all emergency equipment (i.e. first aid kits, fire extinguishers)	• Review AHA with all task personnel • Review Site Specific Safety and Occupational Health Program • Review operations/safety manuals for all equipment utilized

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APPENDIX C14 AHA FOR REFUELING				
Task Breakdown	**Potential Hazards**	**Critical Safety Practices**	**Personal Protective Clothing and Equipment**	**Monitoring Devices**
Fueling operations with gasoline and diesel	Exposures to fuels. Fire: extinguisher requirements.	Personnel shall periodically review the Material Safety Data Sheets (MSDS) for the fuels that are being used at the project. The handling and use of fuels shall be performed in well-ventilated areas – preferably outside of buildings. Personnel shall avoid skin and eye contact with fuels. Safety glasses and disposable nitrile gloves shall be worn while handling fuels. A small eyewash bottle shall be readily available when fueling equipment. If personnel get fuel in their eyes, then the eyes shall be irrigated with the entire contents of the eye wash bottle and then the employee shall seek medical assistance. If personnel sustain skin contact with fuels, then the affected area shall be immediately washed with soap and water. If fuel contact with clothing is made, then clothing shall be removed and changed immediately. A 2-A:10-B:C fire extinguisher shall be readily available when fueling equipment at any location on site. Personnel who intend to extinguish small fires shall be trained in the use of fire extinguishers. Equipment and property are of secondary concern in a fire situation - personnel shall never try to extinguish a fire if there is any doubt that it can be extinguished safely.		

APPENDIX C14 AHA FOR REFUELING				
Task Breakdown	**Potential Hazards**	**Critical Safety Practices**	**Personal Protective Clothing and Equipment**	**Monitoring Devices**
Fueling operations (continued).	Fire: elimination of ignition sources – hot surfaces.	All vehicles and equipment shall be shut down prior to fueling. Small equipment, such as generators, compressors, light plants, etc. shall be allowed to cool prior to re-fueling. Equipment with the fuel cap near the engine or near other hot surfaces shall also be allowed to cool prior to re-fueling.		
	Fire: elimination of ignition sources – arcs/sparks/open flames.	Smoking shall not be allowed within 50 feet of fueling operations. Personnel shall visually survey the immediate area for open flames and other ignition sources prior to commencing fueling operations. Personnel are prohibited from using cell-phones or two-way radios during all fueling operations.		
	Fire: elimination of ignition sources – static electricity.	Personnel shall never fill portable fuel cans that are in the bed of a pickup truck or in the trunk of an automobile. Filling fuel containers on plastic pickup truck bed-liners can cause static electric discharges, which may ignite the fuel. The fuel can(s) shall be removed from the truck bed or automobile trunk and placed on the ground before adding fuel. Electrical continuity shall be maintained between the portable fuel can and the tank being filled. A bonding cable shall be used to maintain continuity between the metal fuel container and the equipment fuel tank. Allowing free-fall of fuel into the tank is prohibited.		

APPENDIX C14 AHA FOR REFUELING				
Task Breakdown	**Potential Hazards**	**Critical Safety Practices**	**Personal Protective Clothing and Equipment**	**Monitoring Devices**
Fueling operations (continued).	Fire: elimination of ignition sources – static electricity. (continued)	Personnel shall not re-enter vehicles while fueling is underway due to the static electric charge generated between clothing and vehicle seats. If you absolutely have to get in your vehicle while the gas is pumping, make sure you get out, close the door touching the metal, before you pull the nozzle out. This way the static from your body will be discharged before you remove the nozzle.		
	Storage and transportation: saddle tanks in pick-up trucks.	Gasoline shall not be transported in portable saddle tanks – only diesel fuel shall be transported in saddle tanks. All portable saddle tanks mounted in pick-up trucks shall be manufactured to meet U.S. Department of Transportation (DOT) specifications. Portable saddle tanks shall be securely mounted to the pick-up truck, as recommended by the manufacturer. Saddle tanks shall be properly marked (see 49 Code of Federal Regulation 172.101) with the proper shipping name and labeled for "No Smoking." No more than 110 gallons of diesel fuel may be transported in a saddle tank unless all the DOT Hazardous Material Regulations are complied with, such as proper packaging, completing shipping papers, placarding, and the appropriate HM 126 Training (as well as having been provided emergency response information and training.) Caps on saddle tanks shall be securely closed. Saddle tanks shall be inspected weekly to check for leaks. Drivers must be notified that they are transporting hazardous materials.		

APPENDIX C14 AHA FOR REFUELING				
Task Breakdown	**Potential Hazards**	**Critical Safety Practices**	**Personal Protective Clothing and Equipment**	**Monitoring Devices**
Fueling operations (continued).	Storage and transportation: five-gallon cans in pick-up trucks.	Gasoline shall be stored and transported in properly marked/labeled five-gallon safety cans (equipped with self-venting cap and flash arrestor). Gasoline cans shall be secured to prevent movement during transportation. No more than six 5 gallon containers of gasoline may be transported in vehicles (back of pick-up trucks or trailers) at the same time unless all the DOT Hazardous Material Regulations are complied with, such as proper packaging, completing shipping papers, placarding (as required), and the appropriate HM 126 Training (as well as having been provided emergency response information and training.) The total quantity of hazardous materials may never exceed 400 pounds total. Hazardous materials must be secured prior to transporting. Drivers must be notified that they are transporting hazardous materials.		
	Storage of gasoline on-site.	Portable gasoline cans must be stored within the flammable materials storage cabinet.		
Other concerns	Spills.	All spills shall be immediately cleaned-up. All spills shall be reported to the Shaw Project Manager.		

EQUIPMENT REQUIRED	**INSPECTION REQUIREMENTS**	**TRAINING REQUIREMENTS**
Five-gallon safety cans (equipped with self-venting cap and flash arrestor	Verify MSDSs for fuels are available in vehicles transporting fuels	Hazard communication Materials of Trade

APPENDIX C15 AHA FOR RIGGING AND LIFTING WITH HYDRAULIC EQUIPMENT				
Task Breakdown	**Potential Hazards**	**Critical Safety Practices**	**Personal Protective Clothing and Equipment**	**Monitoring Devices**
Travel on and off project site (vehicular).	Vehicle Operation.			
Arrival of new personnel at site. Movement of personnel on-site. Prepare for equipment operations, including inspections. Perform equipment operations. Handle equipment and materials. Equipment maintenance.	Newly hired personnel and visitors. Unfamiliarity with: site, general (chemical, physical, environmental) site hazards, project safety rules and hazard control procedures, chain of command, and emergency procedures.	All personnel working on hazardous, toxic, and radioactive waste (HTRW) shall submit HAZWOPER training certificates (40-hour, 8-hour [if applicable], supervisor [if applicable]) to the Site Safety and Health Officer (SSHO). All personnel shall attend a site safety orientation. All site workers shall receive HAZWOPER three-day OJT. After personnel are trained in the contents of the Site Safety and Health Plan (SSHP), they shall sign the SSHP Acknowledgment Form. All training certifications held by personnel shall also be made available and kept in on-site personnel files. Review emergency procedures and evacuation plans.		
Complete Lift Plan Worksheet (Hydraulic Equipment). Rig materials or equipment.	Medical qualifications.	All personnel working on HTRW shall submit current physician's certificate stating that employee is participating in an appropriate medical surveillance program meeting 29 Code of Federal Regulation (CFR) 1910.120.		
Hold pre-lift meeting. Lift materials or equipment.	Allergies.	All personnel should complete the Known Allergies Questionnaire (voluntary only).		

APPENDIX C15 AHA FOR RIGGING AND LIFTING WITH HYDRAULIC EQUIPMENT				
Task Breakdown	**Potential Hazards**	**Critical Safety Practices**	**Personal Protective Clothing and Equipment**	**Monitoring Devices**
See principal steps above.	Complacency.	All personnel shall attend the daily Plan of the Day meetings to re-focus themselves to hazards, emergency procedures and equipment, operational aspects, and change(s) in site/work conditions. Procedures shall be conveyed to control these hazards.		
	Failure to properly plan daily activities.	A Job Safety Analysis (JSA), as required by Shaw Environmental & Infrastructure, Inc. Procedure No. HS045, "Job Safety Analysis (JSA)," shall be prepared by the crew prior to commencing daily activities. The JSA shall be used as a component of the morning Tailgate Safety Meeting. The JSA shall be revised at any time throughout the workday when new tasks are initiated, unforeseen circumstances arise, or if working conditions change. Personnel shall implement Hazard Assessment Resolution Program.		
	Heavy lifting, strains, and sprains.	No individual employee is permitted to lift any object that weighs over 60 pounds. Proper lifting techniques shall be used. Multiple employees or the use of mechanical lifting devices are required for lifting objects over the 60-pound limit.		
	Slips, trips, and falls.	Keep work areas clear and maintain housekeeping. Do not jump from equipment or elevated surfaces. Daily housekeeping will be implemented at the end of each workday. Use three-point contact rule for entering/exiting trucks and equipment. Use extra caution when walking on wet, muddy, frosty, icy, or snow-covered surfaces. Maintain proper illumination in work areas. Fall protection must be provided and used when personnel are exposed to fall hazards greater than six feet.		

APPENDIX C15 AHA FOR RIGGING AND LIFTING WITH HYDRAULIC EQUIPMENT				
Task Breakdown	**Potential Hazards**	**Critical Safety Practices**	**Personal Protective Clothing and Equipment**	**Monitoring Devices**
	Use of mechanical equipment.	Only qualified personnel shall be permitted to operate equipment. Mechanical equipment shall be inspected daily. Deficiencies in equipment shall be noted on the inspection form. Equipment found to be unsafe shall be taken out of serviced. All equipment shall be operated at safe speeds and in a safe manner. Equipment operators shall wear safety belts and hearing protection (as necessary). Ground personnel shall not position themselves between equipment and stationary objects (stay out of swing radius). Personnel are only permitted to approach equipment after a signal from the operator.		
	Hand injuries.	Items to be handled shall be inspected for sharp edges, splinters, burrs, rough surfaces, etc. prior to being handled. Personnel shall wear leather gloves when handling materials with sharp edges, splinters, burrs, rough surfaces, etc. Personnel shall be aware of and avoid pinch point hazards.		
	Fire.	Fire extinguishers shall be available in work areas. The SSHO shall establish smoking areas. Smoke only in designated areas. Only discard cigarette butts in proper receptacles – never discard cigarette butts onto the ground. Engines shall be shut off before refueling. A 2-A:40-B:C fire extinguisher shall be available when refueling at the project site. Smoking shall not be permitted within 50 feet of fueling operations.		

APPENDIX C15 AHA FOR RIGGING AND LIFTING WITH HYDRAULIC EQUIPMENT				
Task Breakdown	**Potential Hazards**	**Critical Safety Practices**	**Personal Protective Clothing and Equipment**	**Monitoring Devices**
See principal steps above.	Chemical hazards.	Perform decontamination as specified in the HASP. The Exclusion Zones and Contamination Reduction Zones shall be set-up and appropriately marked with signage. Avoid contact with contaminated materials. Wear PPE, as specified in the SSHP. The SSHO will perform chemical air monitoring, as specified in the SSHP. Verify emergency eyewash stations have been inspected, cleaned, filled, and in service. Notify all personnel of the emergency eyewash station locations. Project personnel will follow instructions on specific AHA's or as instructed by the SSHO. Project personnel will use appropriate PPE in accordance with the SSHP and as indicated on specific AHA's or as instructed by the SSHO. Barriers such as fences and ropes will be put in place to limit the access to Controlled Areas as specified in the SSHP. Signs will be used to alert persons of specific hazards as specified in the SSHP. Engineering controls (i.e., spraying material with water, calcium chloride solution) will be used as required by the SSHP or as instructed by the SSHO to reduce dust emission. Notify the SSHO if odors are detected.		

APPENDIX C15 AHA FOR RIGGING AND LIFTING WITH HYDRAULIC EQUIPMENT				
Task Breakdown	**Potential Hazards**	**Critical Safety Practices**	**Personal Protective Clothing and Equipment**	**Monitoring Devices**
See principal steps above.	Insect bites and stings.	Review injury and illness potential with workers. Inspect work areas for bee nests and activity prior to commencing work in that area. Wear PPE, such as disposable coveralls, to keep insects away from the skin. Expect to encounter insects when working in warm weather – especially at locations with vegetation present. Use protective insect repellents containing DEET to prevent insect bites, unless individual allergies and sensitivities prevent its use. Check limbs/body for insects/ insect bites upon removing PPE and again during showering. Consider applying Permethrin (Repel Permanone or equivalent) preparations to clothing to repel ticks, chiggers, mosquitoes, and/or spiders. Immediately notify supervisor or SSHO of insect bites, stings, irritations, rashes, or flu-like symptoms.		
	Contact dermatitis from poisonous and irritating plants (poison ivy, poison oak, and poison sumac).	Learn to identify poisonous and irritating plants. Identify workers who are known especially sensitive to poisonous and irritating plants and plan work accordingly. Check around work areas to identify if poisonous and irritating plants are present. Wear long-sleeve shirts/trousers or Tyvek® coveralls to avoid skin contact with plants or other skin irritants. Apply protective cream/lotion to exposed skin to prevent poison ivy or similar reactions. Immediately notify the SSHO if you suspect you contacted an irritating plant. Avoid unnecessary clearing of plant/vegetation areas. Follow additional procedures outlined in the SSHP.		

APPENDIX C15 AHA FOR RIGGING AND LIFTING WITH HYDRAULIC EQUIPMENT				
Task Breakdown	**Potential Hazards**	**Critical Safety Practices**	**Personal Protective Clothing and Equipment**	**Monitoring Devices**
	Severe weather, heat stress, and cold stress.	The SSHO will monitor weather conditions each day in order to plan and prepare for hazardous conditions. The SSHO will identify a suitable storm shelter at each work location. The SSHO will verify that the tornado shelter is accessible and available. Work activities will be suspended prior to weather conditions becoming hazardous so that workers have ample time to seek shelter. Upon seeing lightning or hearing thunder, outdoor activities shall be suspended and personnel shall be evacuated to safe areas (inside vehicles, buildings, or tornado shelters as appropriate). Follow additional procedures outlined in the SSHP. Monitor for heat stress in accordance with Shaw E & I Procedure No. HS400, "Heat Stress" and the requirements of the SSHP. Monitor for cold stress in accordance with Shaw E & I Procedure No. HS401, "Cold Stress" and the requirements of the SSHP. Drink plenty of water and minimal carbonated or caffeine-containing beverages. Perform physiological monitoring as needed. Personnel shall take required breaks to cool down/warm-up as needed. Personnel shall wear insulated clothing based the ambient temperature and wind chill conditions.		
	Struck by and against: • Vehicles • Equipment • Flying debris/projectiles • Splashes.	Wear PPE with high visibility vests when walking or working near moving equipment or vehicles. Stay off roads and streets unless necessary; walk on left side of roads facing on-coming traffic. Personnel shall not be permitted in the swing radius of the equipment. Personnel shall maintain a safe distance from operations. Do not assume equipment and vehicle operators have seen you unless operator have made eye contact with you and signaled to you. Warning signs and signalmen may be necessary.		

APPENDIX C15 AHA FOR RIGGING AND LIFTING WITH HYDRAULIC EQUIPMENT				
Task Breakdown	**Potential Hazards**	**Critical Safety Practices**	**Personal Protective Clothing and Equipment**	**Monitoring Devices**
See principal steps above.	Use of operational chemicals.	Read and follow MSDS for each chemical used. Do not use any chemical that you have not been trained to safely use. Provide ventilation as necessary. Wear proper PPE. Properly label all containers.		
	Noise.	All personnel shall wear hearing protection when exposed to high noise levels. All personnel shall wear hearing protection when operating powered hand tools or noisy equipment. Personnel working in vicinity of noisy tools or equipment shall wear hearing protection. Noise dosimetry shall be performed to verify hearing protection is adequate.		
	Electrical.	Ground-fault circuit interrupters shall be used on all power tools and extension cords. Extension cords, power tools, and lighting equipment shall be inspected before each use, protected from damage, and kept out of wet areas. Keep extension cords off of ground surface. Only qualified electricians are permitted to work on electrical circuits. Electricians must follow NFPA 70 E (2009) when working on electrical circuits.		

APPENDIX C15 AHA FOR RIGGING AND LIFTING WITH HYDRAULIC EQUIPMENT				
Task Breakdown	**Potential Hazards**	**Critical Safety Practices**	**Personal Protective Clothing and Equipment**	**Monitoring Devices**
	Tools.	Select the proper tool – do not improvise. Inspect all power and hand tools before each use (do not use damaged tools). Tools shall be appropriate for the task and maintained in good condition. Only trained and authorized personnel will use hand and power tools. Check your position, footing, and grip before tool use. Avoid distraction, keep your focus, and concentrate on the job. Personnel shall maintain a steady pace when using tools and take adequate rest periods. Keep electric cords untangled and out of the way of rotating tools. Use double-insulated power tools when possible. Protect electric tools with ground fault circuit interrupters (GFCI). Minimum PPE will include safety glasses with side-shields, hard hat, safety-toed work boots, and cut-resistant gloves. Store tools carefully to prevent damage to them and to make the proper tool easier to locate.		
	Dust.	Control dust by maintaining equipment operation rates. Control dust by applying water and/or calcium chloride. Personnel shall stay out of dust and work from upwind when possible. Perform dust monitoring to verify dust control is effective.		

APPENDIX C15 AHA FOR RIGGING AND LIFTING WITH HYDRAULIC EQUIPMENT				
Task Breakdown	**Potential Hazards**	**Critical Safety Practices**	**Personal Protective Clothing and Equipment**	**Monitoring Devices**
	Rigging and lifting with hydraulic equipment.	Determine weight of object to be lifted; never lift any object if weight is unknown. Calculate lift/load capacities using manuals and load capacity charts. Lift supervisor will complete a Lift Plan Worksheet (Hydraulic Equipment) and hold pre-lift meeting prior to attempting lift. Assign operator, rigger, tagline, and signal man responsibilities as necessary. Review lift hand signals with operator, signaler, supervisor, and workers. Select appropriate rigging equipment for the type of lift. Review rigging techniques, position of load, tag lines with workers involved in rigging activities. Perform required daily inspections, of wire ropes, rigging hardware, and attachments. Rigging shall be inspected before each use. Inspect rigging devices to verify slings, straps are free from defects and rated for the lift weight. Deficiencies shall be noted on the inspection form.		

APPENDIX C15 AHA FOR RIGGING AND LIFTING WITH HYDRAULIC EQUIPMENT				
Task Breakdown	**Potential Hazards**	**Critical Safety Practices**	**Personal Protective Clothing and Equipment**	**Monitoring Devices**
See principal steps above.	Rigging and lifting with hydraulic equipment (continued).	Rigging found to be unsafe shall not be used, tagged, and taken out of service. Prohibit use of rigging equipment with missing documentation tags. Verify inspection and maintenance information for hydraulic equipment. Perform daily inspection of mechanical, hydraulic operations of equipment. Establish and isolate swing radius of equipment, rigging and load. Inspect for stability of surfaces beneath the hydraulic excavating equipment. All personnel shall be kept clear when material is being hoisted Hoisting of materials shall be done by use of a shackle that will prevent accidental disengagement. Taglines shall be used for controlling unguided materials. An operational test of equipment and rigging will be conducted in presence of GDA to verify performance. Re-perform operational test if repairs, major maintenance or reconfiguration is required on hydraulic equipment or attachments. Test lift objects for center of gravity. Ensure tag-lines are free of knots and defects. Prohibit looping / winding tag lines around hands or body. Prohibit positioning or moving load using tag lines. Loads shall be lifted at minimum height and carried as low as possible during traveling. Loads shall not be lifted over personnel. Never stand under a suspended load. Maintain adequate clearances from electrical sources. Do not hoist personnel with hydraulic equipment or ride on hoisted load.		

EQUIPMENT REQUIRED	INSPECTION REQUIREMENTS	TRAINING REQUIREMENTS
Personal Protective Equipment Level D: Hard Hat Safety Glasses Safety-Toed Boots Work Gloves ANSI Class 2 reflective warning vests Modified Level D: Refer to SSHP. Equipment: Air monitoring instruments Fire Extinguishers Emergency Eyewash First Aid Kit Insect repellant with DEET Repel Permanone Fall protection Drinking water Weather radio Water truck Rigging	Competent Person (CP) / Qualified Person (QP): CP/SSHO _____ Alternate SSHO/CP _____ QP/First Aid and CPR _____ QP/First Aid and CPR _____ CP/Rigger _____ Training Requirements:	HAZWOPER 40-Hour Site safety orientation Emergency procedures Hazard communication Applicable AHAs Qualified equipment operators Lifting/back safety Fall protection Fire extinguisher use Biological hazard identification and control Tornado shelter location Lightning safety procedures Daily site safety inspection (SSHO) Check training, and medical certifications against personnel roster Mechanized equipment (daily) Overhead and underground utilities Rigging (before each use) Housekeeping (daily) Fire extinguisher (weekly) Vehicle inspection daily Equipment and tools inspection daily and before use Survey areas for poisonous plants, insects, and animals Check body for ticks Verify tornado shelter is available

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APPENDIX C16 ACTIVITY HAZARD ANALYSIS FOR Visual Site Inspection and Surveys				
Task Breakdown	**Potential Hazards**	**Critical Safety Practices**	**Personal Protective Clothing and Equipment**	**Monitoring Devices**
Arrival of new personnel at site	Unfamiliarity with: site, general site hazards, project safety rules, chain of command, and emergency procedures.	• All personnel shall attend the site orientation training.	Warning vests, Hard hat, Safety glasses, and Steel toe work boots	
Visual site inspections and surveys	Slips, Trips, Falls	• Clear walkways work areas of equipment, tools, vegetation, excavated material and debris • Mark, identify, or barricade other obstructions		
	Electrical Shock	• De-energize or shut off utility lines at their source before work begins • Use double insulated or properly grounded electric power-operated tools • Provide an equipment-grounding conductor program or employ ground-fault circuit interrupters • Use qualified electricians to hook up electrical circuits • Inspect all extension cords daily for structural integrity, ground continuity, and damaged insulation • Cover or elevate electric wire or flexible cord passing through work areas to protect from damage • Keep all plugs and receptacles out of water • Use approved water-proof, weather-proof type if exposure to moisture is likely • Inspect all electrical power circuits prior to commencing work • Follow Lockout/Tagout procedure HS315 – Control of Hazardous Energy Sources		

APPENDIX C16 ACTIVITY HAZARD ANALYSIS FOR Visual Site Inspection and Surveys				
Task Breakdown	**Potential Hazards**	**Critical Safety Practices**	**Personal Protective Clothing and Equipment**	**Monitoring Devices**
Visual site inspections and surveys.	Poor planning.	• Complete Job Safety Analysis for each task, as specified in Shaw Environmental & Infrastructure, Inc. Procedure No. HS045, "Job Safety Analysis (JSA)." Use Hazard Assessment Resolution Program frequently – for each task to be completed.		
	Heavy lifting, strains, and sprains.	• No individual employee is permitted to lift any object that weighs over 60 pounds. Proper lifting techniques shall be used. Multiple employees or the use of mechanical lifting devices are required for lifting objects over the 60-pound limit.		
	Struck-by/against.	• Wear reflective warning vests when exposed to vehicular traffic. Personnel working on or near roads and only remain on road long enough to complete work. Personnel walking along roadway shall stay off roadway as far as possible and walk on the side facing traffic.	Warning vests, Hard hat, Safety glasses, and Steel toe work boots	
	Munitions and Explosives of Concern (MEC) / Unexploded Ordnance (UXO).	Personnel shall attend site-specific MEC Awareness (and recognition) Training prior to the commencement of any site activities.	Warning vests, Hard hat, Safety glasses, and steel toe work boots	

APPENDIX C16 ACTIVITY HAZARD ANALYSIS FOR Visual Site Inspection and Surveys				
Task Breakdown	**Potential Hazards**	**Critical Safety Practices**	**Personal Protective Clothing and Equipment**	**Monitoring Devices**
Visual site inspections and surveys (continued)	Hand injuries	• Review equipment adjustment procedures, identify pinch points • Isolate/block pinch points to limit motion when inserting pins, fasteners, closing tackles	Leather gloves	
	Burns associated with loading/unloading equipment on trucks	• Identify heavy objects for loading that may have hot surfaces • Allow objects to cool or cover hot surfaces with non-combustible material to protect workers from burns		
	Insect bites/West Nile virus.	• Wear PPE and tape joints to keep insects away from the skin. Use protective insect repellents containing N,N-diethyl-m-toluamide, such as, Deep Woods OFF, 3M Ultrathon, or equivalent and clothing insecticide preparations containing permethrins (Repel Permanone or equivalent) to prevent insect bites. Check limbs/body for insects/insect bites before showering. Notify Site Safety and Health Officer (SSHO) of flu-like symptoms.		
	Contact dermatitis and poison ivy.	• Check around work areas to identify if poison ivy is present. Wear long-sleeve shirts/trousers or Tyvek® coveralls to avoid skin contact with plants or other skin irritants. Learn to identify poisonous plants. • Avoid unnecessary clearing of plant/vegetation areas. • Cover vegetation with plastic (visqueen) where sampling position raises exposure potential. Apply protective cream / lotion to exposed skin to prevent poison ivy or similar reactions. Identify workers known to contract poison ivy.		

APPENDIX C16 ACTIVITY HAZARD ANALYSIS FOR Visual Site Inspection and Surveys				
Task Breakdown	**Potential Hazards**	**Critical Safety Practices**	**Personal Protective Clothing and Equipment**	**Monitoring Devices**
	Severe weather.	• The SSHO will monitor weather conditions each day in order to plan and prepare for hazardous conditions. The SSHO will identify a suitable tornado shelter at each work location. Work activities will be suspended prior to weather conditions becoming hazardous so that workers have ample time to seek shelter. Upon seeing lightning or hearing thunder, outdoor activities shall be suspended and personnel shall be evacuated to safe areas (inside vehicles, buildings, or tornado shelters as appropriate). Follow procedures outlined in the APP.		
	Hazardous atmospheres	• Personnel shall immediately notify the SSHO if odors are detected.		
	Ladders	• Inspect ladders before use for mud buildup on treads • Clean mud from boots before climbing on ladders • Follow the three point of contact rule		
	High/Low Ambient Temperature	• Monitor for Heat Stress in accordance with Health and Safety Procedures HS400, HS401 • Provide fluids to prevent worker dehydration		
	Fire	• Smoking shall be permitted in designated areas. Vehicles shall not be parked in tall dry grass. • Engines shall be shut off before refueling. • 2A 20-B:C fire extinguisher shall be available when refueling. • Smoking shall not be permitted near fueling areas. Gasoline shall be stored in safety cans with flash arrestors and spring-loaded vents.		

EQUIPMENT REQUIRED	INSPECTION REQUIREMENTS	TRAINING REQUIREMENTS
Survey instrumentation Fire extinguishers Emergency eyewash First aid kit Deep-Woods Off or Ultrathon Repel Permanone Drinking water Weather radio or AM/FM radio	Daily site safety inspection (SSHO) – James Vigerust Daily site safety inspection (QCO) – Check Known Allergies Questionnaire Housekeeping (daily) Fire extinguisher (weekly) Vehicle inspection daily Equipment and tools inspection daily and before use Survey areas for poisonous plants, insects, and animals Check body for ticks Verify tornado shelter available • Monitor approaching storms	Competent Person (CP) / Qualified Person (QP): James Vigerust – CP/SSHO James Vigerust – QP/First Aid and CPR Training Requirements: Site safety orientation HAZWOPER 40-Hour MEC Awareness Lifting/back safety Fire extinguisher use Emergency procedures Biological hazard identification and control Tornado shelter locations National Lightning Safety Institute Lightning Safety procedures

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Contract No. FA8903-09-D-8580, Task Order No. 0013 • Draft • Revision 0 • November 2011 • WERC-09-13-002-3

Appendix D
Safety & Health Forms

AIR MONITORING DATA RECORD

Location: _____ **Project No.:** _____ **Date:** _____

Instrument: Mfg/Model/Serial No.: _____ **Calibrated by:** _____

COMBUSTIBLE GAS/OXYGEN/CARBON MONOXIDE METER CALIBRATION

Time	Battery Charged (Y/N)	Zero Checked (Y/N)			Calibration Standard	Calibration Standard			Actual Meter Reading			Ambient Air Re-Zero Check		
		LEL (0%)	O_2 (20.8%)	CO (0 ppm)		% LEL	% O_2	ppm CO	% LEL	% O_2	ppm CO	LEL (0%)	O_2 (20.8%)	CO (0 ppm)

PHOTOIONIZATION DETECTER/FLAME IONIZATION DETECTER CALIBRATION

Time	Battery Charged (Y/N)	Calibration Standard	Calibration Standard Concentration (ppm)	Expected Meter Reading (ppm)	Actual Meter Reading (ppm)	Comments

REAL TIME AIR MONITORING RESULTS

Date	Instrument Operator	Time	Monitoring Results		Action Level Exceeded (Y or N)	Location/Activity	Corrective Actions
			Compound	Concentration			

Comments: _____

Calibration Q.C.: Calibrations are to be within 5% for validity.
Abbreviations: CO = carbon monoxide, %LEL = percent of the lower explosive limit, O_2 = oxygen

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AIR SAMPLING DATA RECORD

SAMPLING INFORMATION

Date of Sampling		Project Name	
Type of Sample Personal/Area		Project Number	
Employee Sampled		Operation/Task Monitored	
Employee Number			
Employee Social Security Number		Location of Air Sampling	
Employee Job Title		Person Performing Sampling/Employee #	

SAMPLING & PUMP CALIBRATION DATA

PROJECT SPECIFIC SAMPLE IDENTIFICATION NUMBER:

Air Pump Manufacturer/ Model/Number:								Ambient Air Temperature:		
Pre-sampling Calibration Flow Rate (mL/min)				Post-sampling Calibration Flow Rate (mL/min)				Final Sample Flow Rate (mL/min)		
1st flow rate	2nd flow rate	3rd flow rate	Pre-average flow rate	1st flow rate	2nd flow rate	3rd flow rate	Post-average flow rate	Pre-average flow rate	Post-average flow rate	Final average flow rate

Pump start time:	Pump stop time:	Total pump run-time (minutes):	Final average flow rate (mL/min):	Total sample volume (liters):

Analytes sampled for:	Analyte #1: _____ NIOSH Method # _____	Analyte #2: _____ NIOSH Method # _____	Analyte #3: _____ NIOSH Method # _____
Date Sample Shipped to Laboratory:	Remarks:		

HAZARD CONTROL MEASURES (check all that apply):

Respirator	☐ None	☐ Half-face APR	☐ Full-face APR	☐ PAPR	☐ Supplied-air (specify):	
Coveralls	☐ None	☐ Cotton	☐ Nomex	☐ Tyvek®	☐ Poly-coated Tyvek®	☐ Saranex
Gloves	☐ None	☐ Cotton	☐ Leather	☐ Sample	☐ Nitrile	☐ Other:
Boots	☐ Work	☐ Tyvek®	☐ Latex	☐ PVC	☐ Neoprene	☐ Other:
Engineering	☐ None	☐ Negative Air	☐ Ventilation		☐ Other:	

LABORATORY INFORMATION:

Laboratory Used (Name/Address/Telephone/Contact):

ANALYTICAL RESULTS:

Analyte #1	Analyte #2	Analyte #3

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Project Location: _____
Client: _____
Project Number: _____

OPTIONAL ALLERGY/SENSITIVITY QUESTIONNAIRE

This information is requested so that you may be assigned work duties, which minimize your exposure to elements that may cause you to have a threatening medical reaction and will be used only in case of an emergency. Your voluntary cooperation is appreciated so that we can operate a safe working environment.

Name: _____ Contractor Name: _____

Date: _____ Contract/Project No.: _____

Are you allergic/sensitive to bee stings?	Yes ☐	No ☐
If yes, do you carry a bee sting kit? _____		
Are you allergic/sensitive to other insect bites?	Yes ☐	No ☐
Are you allergic/sensitive to animal/reptile bites?	Yes ☐	No ☐
Are you allergic/sensitive to any plant materials?	Yes ☐	No ☐
Are you allergic/sensitive to any cloths or fibers?	Yes ☐	No ☐
Are you allergic/sensitive to latex?	Yes ☐	No ☐
Are you allergic/sensitive to any powders?	Yes ☐	No ☐
Are you allergic/sensitive to any medications?	Yes ☐	No ☐
If yes, which medications? _____		
Are you allergic/sensitive to any metals?	Yes ☐	No ☐
Are you allergic/sensitive to pollens?	Yes ☐	No ☐
Are you allergic/sensitive to dusts	Yes ☐	No ☐
Are you allergic/sensitive to foods (i.e., peanuts, etc.)	Yes ☐	No ☐
Are you aware of any known chemical or petroleum sensitivities?	Yes ☐	No ☐
Are you allergic/sensitive to smoke?	Yes ☐	No ☐
Are you allergic/sensitive to smog/ozone?	Yes ☐	No ☐
Have you ever had an asthmatic attack?	Yes ☐	No ☐
Have you ever experienced exercise induced asthma?	Yes ☐	No ☐

Please comment on any of the above questions or provide special instructions that we should provide to a physician in the case of an emergency.

_____

_____

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Project Location: _____
Client: _____
Project Number: _____

AMBIENT AIR TEMPERATURE LOG

Thermometer Location: _____ Date: _____

Time (hours)	Temp. (°F)	Time (hours)	Temp. (°F)
0000 (Midnight)	_____	1200 (Noon)	_____
0100	_____	1300	_____
0200	_____	1400	_____
0300	_____	1500	_____
0400	_____	1600	_____
0500	_____	1700	_____
0600	_____	1800	_____
0700	_____	1900	_____
0800	_____	2000	_____
0900	_____	2100	_____
1000	_____	2200	_____
1100	_____	2300	_____

Comments: _____

_____

_____

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AIR COMPRESSOR SAFETY INSPECTION CHECKLIST

Project Name: _____

Project Number: _____

Equipment I.D. No.: _____ Equipment Name: _____

Week of: _____

Portable Air Compressors (29 CFR 1910.94(a)(6), EM 385-1-1 Section 20 (B))	**Yes**	**No**	**N/A**
1. Has inspection and performance test been completed?			
2. Have air tanks been tested and certified?			
3. Are records of inspection and test available?			
4. Does discharge from any valve create a hazard?			
5. Is the air pressure gauge in working order?			
6. Is the tank equipped with a safety relief valve?			
7. Is equipment that is subject to whipping or rotation if released provided with an automatic shut-off?			
8. Are safety lashings provided at connections to tools and hose and all quick make-up connections of hose?			
9. Will the compressor automatically shut off before discharge pressure exceeds the maximum working pressure?			
10. Is the compressor located so that flammable, toxic vapors, gases, or dust will not be drawn into the intakes?			
11.No valve shall be installed on the air intake pipe of a compressor with an atmospheric intake?			
12. Is the discharge piping from the compressor to the receiver as large as the discharge opening on the compressor?			
13. Is there a convenient stop valve between the air tank and each stationary piece of equipment?			
14. Are air receivers properly installed and in the proper locations?			
15. Does the air tank have an accessible drain valve?			
Remarks:			

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COLORIMETRIC DETECTOR TUBE LOG

Project Name: _____ Project Number: _____

Date: _____ Sampled by: _____

Pump Type, Mfg/Model/Serial Number: _____

Time	Detector Tube Type/ (Expiration Date)	Measurable Range	Pump Leak Test (Y/N)	Pump Strokes	Measured Concentration	Comments

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ENTRY PERMIT FOR
PERMIT-REQUIRED CONFINED SPACE (PRCS)

Project/Location _____ Project No._____

Location of PRCS _____ Identity of PRCS _____

Describe Hazards of PRCS (Chemical and Physical) _____

_____

Purpose This Permit Authorized _____

CHECKLIST	YES	DOES NOT APPLY
All lines leading to and from the space have been blinded or disconnected.		
Electrical service disconnected or locked out.		
All grounding and bonding cables in place.		
All lighting, fittings, power equipment, and extension cords are rated for anticipated atmosphere.		
Ground Fault Circuit Interrupter (GFCI) checked and functioning.		
All ignition sources have been isolated.		
All respiratory equipment and alarms checked and functional.		
All safety harnesses and lifelines checked.		
All required PPE checked and in use.		
Have all entrants, attendants, and entry supervisors received appropriate training?		
Attendant(s) trained in non-entry rescue procedures.		
Rescue service has been identified and will be available for entry rescue.		
Has rescue service passed evaluation?		
Appropriate rescue equipment available and checked.		
Mechanical ventilation system in use and effective.		
All tests have been completed and indicate that entrance requirements have been met.		
Appropriate warning signs have been posted and unauthorized personnel have been excluded from the PRCS.		
IF ANSWER TO ANY OF THE ABOVE QUESTIONS IS *NO*, ENTRY IS NOT PERMITTED.		

PERSONAL PROTECTIVE EQUIPMENT (Circle)

EYE/FACE
Chemical Goggles Face Shield Safety Glasses

EXTREMITIES
Hard Hat Hoods Boot Covers

Gloves (Material _____)

Boots (Material _____)

RESPIRATORY
SCBA Supplied Air Egress System

Air Purifying (Cartridge _____)

Powered Air Purifying (Cartridge _____)

OTHER
Hearing Protection Harness & Lifeline
Chest or Parachute

RESCUE EQUIPMENT
Mechanical Extraction Device
First Aid Kit SCBA
Other (Specify)_____

COMMUNICATION METHOD
Lifeline "Tug" Signals
Air-powered Horn Signals
Other_____

OTHER PERMITS ISSUED FOR WORK IN PRCS: _____

OTHER HAZARD CONTROL PROCEDURES OR INSTRUCTIONS: _____

RESCUE PROCEDURES: _____

TEST DATA
OXYGEN, FLAMMABILITY, AND TOXIC CONTAMINANT(S)

Time	Percent Oxygen	Percent LEL	_____ (Other)	_____ (Other)	_____ (Other)	_____ (Other)	_____ (Other)	Tester's Initials	Comments

TESTER'S SIGNATURE:

AUTHORIZED ENTRANTS

_____ _____
_____ _____
_____ _____
_____ _____
_____ _____
_____ _____
_____ _____

AUTHORIZED ATTENDANT(S)

_____
_____
_____

RESCUE PERSONNEL

_____
_____
_____

Diagram the confined space indicate location of manways and ventilators. Indicate location(s) where tests conducted.

) (Man-way
∞ Ventilator
X Test Location

ACCEPTABLE ENTRY CONDITIONS

1. Entry Permit completely filled out
2. Oxygen between 19.5 and 23.5%
3. Combustible gases below 10% LEL
4. Permissible Levels of toxic gases (list):
5. Other: _____

PRCS SAFE FOR ENTRY _____

Date/Time _____ / _____

Name of Entry Supervisor _____ Signature _____

Current Entry Supervisor (if different) _____

Entry Permit Expires (no longer than 1 shift): Date/Time _____ / _____

ENTRY PERMIT CANCELED

Date/Time _____ / _____ Signature _____

Reason (√) ☐ Work Complete ☐ Authorized Conditions Not Met ☐ Incident

PROBLEMS DURING ENTRY AND RESOLUTION. Please Describe: _____

RECLASSIFICATION TO NON-PERMIT-REQUIRED CONFINED SPACE

Describe hazard removal methods, without use of ventilation. _____

TESTING VERIFICATION SHOWN AT TIME _____ ON TEST DATA CHART ABOVE.

DATE/TIME / ENTRY SUPERVISOR SIGNATURE

REVIEWED BY:

_____ _____

Health and Safety Representative Signature Date

Project Location: _____
Client: _____
Project Number: _____

DAILY SAFETY INSPECTION REPORT

Inspector name: _____ Date: _____

Supervisor: _____ SSHO: _____

General Project Activities Description: _____

_____

_____

Safety conditions and/or deficiencies:	Corrective actions to be completed:

Note: The status of corrective actions is to be tracked through closure on the Safety and Occupational Health Deficiency Tracking Log.

Signature: _____ Signature: _____
(Supervisor) (Safety Representative)

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Direct-Push Rig Inspection Checklist

Project Name/Number: _____
Make/Model Number: _____
Equipment Number: _____
Hours/Mileage: _____

Rig clean and free of soils, oils, and other debris.		Tracks in good condition.	
All hydraulic fittings and hoses free of damage, tightened, and not leaking.		Tires fully inflated and in good condition.	
Rig controls clearly labeled and in working condition.		Back-up alarm working.	
Rig Kill Switch in working order.		First Aid Kit accessible and stocked.	
All of the Rig's connections tightened and leak-free.		Fire Extinguisher accessible and fully charged.	
Parking brake functions properly.		Eye Wash full and accessible.	
Steering controls in working order and clear of obstacles.		Hearing protection available and is being used during hammering.	
Copy of the manual for all drilling equipment available.		All overhead and underground hazards identified.	

√ = OK
N/A = Not Applicable
X = Defective

These items are to be checked each shift before operating this piece of equipment.
Report all items requiring repair to supervisor.

Notes:
Operator/Inspector: Date:

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Drilling Equipment and Operations Inspection Daily	Contractor:
Drill Rig Manufacturer/Model:	Hours/Mileage:
Inspection Completed By:	Equipment No.:
Project Number:	Date:

Answer each question by checking the appropriate column (Yes, No, or NA). If "no" is checked, an explanation should be provided in the space available. This checklist is to be completed daily by the drilling contractor and reviewed by the Site Safety and Health Officer (SSHO).

Daily Drill Rig Inspection	Yes	No	NA
1. Are applicable drilling materials/supplies Material Safety Data Sheets available at the site and attached to the AHA?	☐	☐	☐
Explanation: _____			
2. Are daily safety meetings attended by the crew and are JSAs being completed daily by the crew?	☐	☐	☐
Explanation: _____			
3. Are all warning and control labels on drill rig clean and legible?	☐	☐	☐
Explanation: _____			
4. Are both "kill switches" installed by the manufacturer in operable condition and all workers at the drill site familiar with their location and how to activate them?	☐	☐	☐
Explanation: _____			
5. Are drive shafts, belts, chain drives, and universal joints guarded to prevent accidental insertion of hand, fingers, or tools?	☐	☐	☐
Explanation: _____			
6. Are all hydraulic fittings and hoses free of damage, tightened, and not leaking (including panel)?	☐	☐	☐
Explanation: _____			
7. Do high-pressure hoses have a safety (chain, cable, or strap) at each end of the hose connection to prevent whipping in the event of a failure (safety lashing)?	☐	☐	☐
Explanation: _____			
8. Is the rig clean and free of soils, oils, and other debris?	☐	☐	☐
Explanation: _____			
9. Is the rig free of any miscellaneous leaks?	☐	☐	☐
Explanation: _____			
10. Do controls operate smoothly; cables and lifting devices do not operate erratically to overcome resistance?	☐	☐	☐
Explanation: _____			
11. Do controls have freedom of movement, not blocked, or locked in an action position?	☐	☐	☐
Explanation: _____			
12. Are all safety devices not bypassed or neutralized?	☐	☐	☐
Explanation: _____			
13. Are all cables free of kinks, frayed wires, "bird cages," and worn or missing sections?	☐	☐	☐

Explanation: _____

Daily Drill Rig Inspection (continued)	Yes	No	NA
14. Are wire rope, sockets, splices, thimbles, and clips adequate and properly applied?	☐	☐	☐
Explanation: _____			
15. Are cables terminated on the working end with a proper eye splice, either swaged coupling or using cable clamps?	☐	☐	☐
Explanation: _____			
16. Are cable clamps installed with the saddle on the live or load side? Clamps should not be alternated and should be of the correct size and number for the cable size to which it is installed. Are clamps complete with no missing parts?	☐	☐	☐
Explanation: _____			
17. Are hooks, safety latches, shackles, rings, etc., in good condition?	☐	☐	☐
Explanation: _____			
18. Are safety latches functional and completely span the entire throat of the hook and have a positive action to close the throat except when manually displaced for connecting or disconnecting a load?	☐	☐	☐
Explanation: _____			
19. Are wedge sockets and hoisting plugs in good condition and properly installed?	☐	☐	☐
Explanation: _____			
20. Have all personnel entered their names on the site log today?	☐	☐	☐
Explanation: _____			
21. Is electronic communication effective for the field crews and checked daily?	☐	☐	☐
Explanation: _____			
22. Has the exclusion zone been set-up with a radius equal to or greater than the boom height?	☐	☐	☐
Explanation: _____			
23. Is a 15-minute supply of fresh water available at the work site (eyewash station)?	☐	☐	☐
Explanation: _____			
24. Is an emergency first aid kit immediately available at the work site?	☐	☐	☐
Explanation: _____			
25. Is potable water available to employees?	☐	☐	☐
Explanation: _____			
26. Are 3M Ultrathon or equivalent (DEET preparation) and Repel Permanone available?	☐	☐	☐
Explanation: _____			
27. Are two 2-A:40-B:C fire extinguishers in good working order (i.e., charged, inspected, and serviced up to date) and present at the work site?	☐	☐	☐
Explanation: _____			
28. Are employees on or near drilling equipment complying with the requirement to wear hearing protection?	☐	☐	☐
Explanation: _____			

Drilling Equipment and Operations Inspection Daily	Contractor:
Project Number:	Date:

Daily Drill Rig Inspection (continued)	Yes	No	NA
29. Are personnel being monitored for temperature stress?	☐	☐	☐
Explanation: _____			
30. Are personnel prohibited from drinking, chewing, smoking, taking medications, or other hand-to-mouth contact while in a regulated exclusion zone?	☐	☐	☐
Explanation: _____			
31. Is proper fall protection provided and used for personnel working over 6 feet in height?	☐	☐	☐
Explanation: _____			
32. Are outriggers extended prior to and whenever the mast is raised off its cradle? Hydraulic outriggers must maintain pressure to continuously support and stabilize the drill rig even when unattended.	☐	☐	☐
Explanation: _____			
33. Are outriggers properly supported on the ground surface to prevent settling into the soil?	☐	☐	☐
Explanation: _____			
34. Are slings, chokers, and lifting devices inspected before using and in proper working order? Are rated capacities legible for the type of configuration to be used? Are damaged units removed from service and properly tagged? Is a competent rigger available for all rigging?	☐	☐	☐
Explanation: _____			
35. Are shackles and clevises in proper working order and pins and screws fully inserted before placing under load?	☐	☐	☐
Explanation: _____			
36. Are hoists being used only for their designed intent, are not loaded beyond their rated capacity, and are steps being taken to prevent two-blocking of hoists?	☐	☐	☐
Explanation: _____			
37. Are the rig's manufacturer's procedures being followed if rope becomes caught in, or objects get pulled into, a cathead?	☐	☐	☐
Explanation: _____			
38. Are drill rods not being run or rotated through rod slipping devices? No more than 1 foot (0.3 meter) of drill rod column shall be hoisted above the top of the drill mast. Drill rod tool joints shall not be made up, tightened, or loosened while the rod column is supported by a rod-slipping device.	☐	☐	☐
Explanation: _____			
39. Is there use of side-feed swivel collars on drill rods restricted to those collars that are retained by either a manufacturer-designed stabilizer or a stabilizer approved by a Professional Engineer?	☐	☐	☐
Explanation: _____			
40. Are rotating parts of the drill string, rod, and augers free of sharp projections or hooks that could entrap clothing of foreign objects?	☐	☐	☐
Explanation: _____			

Daily Drill Rig Inspection (continued)	Yes	No	NA
41. Is the work area around the drill rig kept clear of trip hazards?	☐	☐	☐
Explanation: _____			
42. Are walking surfaces kept free of slippery materials?	☐	☐	☐
Explanation: _____			
43. Are open excavations and mud or circulation pit barricaded or fenced? Is the discharge of drilling fluids being channeled away from the work area to prevent the ponding of water?	☐	☐	☐
Explanation: _____			
44. Does the operator verbally alert employees and visually verify employees are clear from dangerous parts of equipment before starting or engaging equipment?	☐	☐	☐
Explanation: _____			
45. Are personnel not wearing loose-fitting clothing, jewelry, or other items that could get caught in moving machinery?	☐	☐	☐
Explanation: _____			
46. Are augers being cleaned only when the rotating mechanism is in neutral and the auger stopped? Are long-handled shovels only being used to remove cutting from the auger?	☐	☐	☐
Explanation: _____			
47. Are open boreholes being capped and flagged?	☐	☐	☐
Explanation: _____			
48. Is a daily inspection of the drilling area being performed and documented by the driller?	☐	☐	☐
Explanation: _____			
49. Is the air hose free of damage, tightened, and not leaking?	☐	☐	☐
Explanation: _____			
Supplemental Inspection Items (from manufacturer's recommendations)			
50. Are hydraulic fluid levels OK according to manufacturer's recommendations?	☐	☐	☐
Explanation: _____			
51. Are motor oil levels OK according to manufacturer's recommendations?	☐	☐	☐
Explanation: _____			
52. Are coolant levels OK according to manufacturer's recommendations?	☐	☐	☐
Explanation: _____			
53. Are air cleaner systems OK according to manufacturer's recommendations?	☐	☐	☐
Explanation: _____			
54. Are belt and pulley systems OK according to manufacturer's recommendations?	☐	☐	☐
Explanation: _____			
55. Are all guards in place and adjusted properly?	☐	☐	☐
Explanation: _____			
56. Is tub oil level OK (if equipped)?	☐	☐	☐
Explanation: _____			

57. Are hydraulic stabilizer pads OK? ☐ ☐ ☐
Explanation: _____

58. Are welder and generator oil levels OK according to manufacturer's recommendations? ☐ ☐ ☐
Explanation: _____

59. Are fuel levels adequate to run a complete shift? ☐ ☐ ☐
Explanation: _____

60. Are pull down cables inspected and in good condition? ☐ ☐ ☐
Explanation: _____

61. Are pull down cables properly adjusted? ☐ ☐ ☐
Explanation: _____

62. Are pull down cables properly lubricated? ☐ ☐ ☐
Explanation: _____

63.
Explanation: _____

64.
Explanation: _____

65.
Explanation: _____

66.
Explanation: _____

67.
Explanation: _____

68.
Explanation: _____

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The Foundation of Our Targeting Zero Environment Mission

Shaw's E&I Group will achieve its goal of "Targeting Zero" accidents and injuries while working as a team to provide a workplace that is free from recognized hazards.

Vision

We will be recognized and respected as the leading company in our industry and as the standard by which our competitors are benchmarked by providing the leadership, guidance and operations excellence necessary to identify and control all recognized hazards in the workplace.

Values

Leadership – provide the necessary tools to identify and control all hazards in the workplace.
Commitment – we will never be satisfied that we have done enough.
Pride – all employees will own the safety process.
Dedication – to strive for continual improvement.
Appreciation – to embrace the safety of our employees.

Operating Principles

- Safety is a core value.
- We plan work to ensure it is done safely.
- We are a safety team.
- We follow good safety practices in all work that we do.
- We will actively demonstrate our commitment to safety.
- All accidents are preventable.
- We will not perform any job that cannot be performed safely.
- We will not compromise safety in the interest of time or comfort.
- We will constantly review our performance to ensure continuous improvement.
- We will encourage employees to commit to safety as a lifestyle and carry the culture of "Targeting Zero" home with them.

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Shaw® Shaw E & I

Medical Forms
Authorization for Treatment of Occupational Injury/Illness

Employee Name: _____

Social Security #: _____ Injury: ☐ Illness: ☐

Job Title: _____ Incident Date: _____

Project/Location: _____ Location of Accident/Exposure: _____

Telephone Number: _____ H&S Representative: _____

Illness/Injury Description: _____

TO TREATING PHYSICIAN:

In the case of occupational injury/illness, please examine the employee and render necessary conservative treatment directly related to the occupational injury/illness.

Light Duty Work: It is the policy of our company to provide work assignments, whenever possible, for employees with physical activity restrictions resulting from an occupational injury/illness. If the employee will be subject to a restriction, please contact **CORE Health Networks** before releasing the employee, so that a light duty assignment may be arranged.

Medically Unfit to Return to Work: It is the policy of our company to assist employees unable to return to work, due to an injury/illness, in obtaining needed medical care and other available benefits. Medical findings are also used to help evaluate unsafe conditions that may have led to the incident. Please help us assist our employees by contacting **CORE Health Networks** with your findings as soon as possible, preferably before the employee leaves your office, but not later than the close of business on the day of initial treatment.

CORE Health Networks:	Telephone: 1-877-347-7429	Fax: (225) 295-4846
Please Send Reports To	**CORE Health Networks *and***	**The Shaw Group, Inc. Corporate Claims Department**
Both of the Following:	12091 Bricksome Ave Suite B Baton Rouge, LA 70816	4171 Essen Lane Baton Rouge, LA 70809

Please Send Bills To: **The Shaw Group, Inc. Corporate Claims Department**
4171 Essen Lane
Baton Rouge, LA 70809

DOCTOR, Please provide:

Medical Diagnosis: _____

Treatment Provided: _____

Recommended Work Limitation/Restriction: _____

Return Visit Needed: No ☐ Yes ☐ Date if Yes _____ First Aid Only ☐

Physician Name: _____ Physician Telephone: _____

Physician Signature: _____ Date: _____

You must call CORE Health Networks for all occupational injuries/illnesses requiring outside medical treatment: 1-877-347-7429.

Fax completed form to CORE Health Networks (225) 295-4846.

Send Bills to Shaw Corporate Claims Department

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Shaw® Shaw E & I

Injured Employee Statement

MUST BE COMPLETED WITHIN 24 HOURS OF THE INCIDENT

This form should be completed by the injured employee involved in the incident. Describe only the facts for which you have personal knowledge. If you have no knowledge of a particular question, write "no knowledge."

Company: _____

Exact Location of Incident/Accident: _____

Name of Injured Employee: _____

Date of Incident/Accident: _____ Time _____ am pm

Date of this Statement: _____ Time _____ am pm

Time your shift begins? _____ am pm Ends? _____ am pm

Name of Known Witnesses:

Name: _____

Name: _____

Name: _____

Name: _____

Your Immediate Supervisor's Name: _____

If not employed by Shaw E&I, enter name of company and phone number: _____

Have you had prior injury similar to this injury? _____

Was it while you were at work? _____

What date did the prior injury occur? _____

Stating only factual information, describe in detail what happened and include any applicable events leading to the Incident/Accident:

_____

_____

_____

_____

I certify that, to the best of my knowledge, all of the above information is complete, accurate and factual. I acknowledge that the intentional falsification or altering of facts or making misleading statements may be grounds for disciplinary action.

_____ _____

Signature/Date Print Name

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Shaw® Shaw E & I

Medical Forms
Authorization for Release of Protected Medical Information

Printed Name: _____ Date of Birth: _____

Address: _____

Social Security #: _____ Home Telephone: _____

Authority to Release Protected Health Information
I hereby authorize the release of medical information, identified in this authorization form, and provide such information to:

CORE Health Networks
12091 Bricksome Ave Suite B
Baton Rouge, LA 70816
Phone: (877) 347-7429
Fax: (225) 295-4846

AND

The Shaw Group Inc.
4171 Essen Lane
Baton Rouge, Louisiana 70809
Phone: 225-932-2500
Fax: 225-932-2636

The information to be released includes the following:

Complete health record	Discharge summary	Progress notes
History and physical exam	Consultation reports	X-ray films / images
Laboratory test results	X-ray & Image reports	Itemized bill
Diagnosis & treatment codes	Complete billing record	

Other (specify) _____

Purpose of the Requested Disclosure of Protected Health Information

I am authorizing the release of my protected health information.

Drug and/or Alcohol Abuse, and/or Psychiatric, and/or HIV/AIDS Records Release

I understand if my medical or billing record contains information in reference to, psychiatric care, sexually transmitted disease, hepatitis B or C testing, previous drug and/or alcohol abuse and/or other sensitive information, I agree to its release.

Check One: ☐ **Yes** ☐ **No**

I understand if my medical or billing record contains information in reference to HIV/AIDS (Human Immunodeficiency Virus/Acquired Immunodeficiency Syndrome) testing and/or treatment I agree to its release.

Check One: ☐ **Yes** ☐ **No**

Right to Revoke Authorization

Except to the extent that action has already been taken in reliance on this authorization, the authorization may be revoked at any time by submitting a written notice to ***The Corporate Claims Dept.*** **at** ***The Shaw Group Inc., 4171 Essen Lane, Baton Rouge, Louisiana, 70809***. Unless revoked, this authorization will expire at which time completion of treatment for the injury or illness has been accomplished.

Re-disclosure

I understand the information disclosed by this authorization may be subject to re-disclosure by the recipient and no longer be protected by the Health Insurance Portability and Accountability Act of 1996.

Signature of Patient or Personal Representative Who May Request Disclosure

I understand that I do not have to sign this authorization. However, if health care services are being provided to me for the purpose of providing information to a third-party (*e.g.,* fitness-for-work test), I understand that services may be denied if I do not authorize the release of information related to such health care services to the third-party. I can inspect or copy the protected health information to be used or disclosed. **I hereby release and discharge.** ***The Shaw Group Inc.*** **of any liability and the undersigned will hold** ***The Shaw Group Inc.*** **harmless for complying with this Authorization.**

Signature: _____ Date: _____

Description of relationship if not patient: _____

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Shaw® Shaw E & I

Medical Forms
Return-to-Work Examination Form

Exam Date: _____ / _____ / _____ **Employee Name:** _____

Birth Date: _____ / _____ / _____ **Social Security #:** _____ - _____ - _____

Job Title: _____ **Sex:** ☐ Male ☐ Female

Examining Provider: **Please complete this form and fax to CORE Health Networks at (225) 295-4846. Please contact CORE Health Networks at (877) 347-7429 to report status of employee post-treatment.**

Diagnosis: _____

Treatment Plan: _____

Medications: _____

Physical Therapy: _____

Other: _____

☐ May return to full duty work effective ___/___/

☐ May return to limited duty from ___/___/___ to ___/___/

☐ Unable to return to work from ___/___/___ to ___/___/

WORK LIMITATIONS:

☐ Restricted lifting/pushing/pulling: maximum weight in lbs: _____ (Company limits all lifting to ≤ 60 lbs).

☐ Work only with right/left hand.

☐ Restricted repetitive motion right/left hand.

☐ Sitting job only.

☐ Restricted operation of moving equipment.

☐ Other: _____

FOLLOW-UP PLAN:

☐ Release from care.

☐ Schedule for follow-up appointment on ___/___/___.

Time _____ AM/PM

☐ Referral to _____

Appointment date ___/___/___ Time _____ AM/PM

Comments: _____

_____ _____ _____

Examiner's Name (*print)* Examiner's Signature Date

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Shaw® Shaw E & I

Supervisor's Employee Injury/Illness Report Form

EMPLOYEE INFORMATION		
Employees Social Security Number	Claim Number	
Employee's Name:	Home Phone Number:	
Home Address:		Business Line Code:
Male ☐ Female ☐	Date of Birth:	Hire Date:
Dependents:	Dependents under 18:	Marital Status:
Occupation:		Department Name:
State Hired:	Currently Weekly Wage:	Hourly Wage:
Hours/Days Worked Per Week:	Days Per Week:	Hours Worked Per Day:
Employment Status:	Employee Report No.: NA	Employee ID No.: NA
Salaried Continued:	Paid for Date of Injury:	Education No. of Years:
Ever injured on the Job:	Supervisors Name and Phone:	

EMPLOYER INFORMATION	
Employer Name: **The Shaw Group, Inc.**	Work Location:
Project Name:	Project Number:
Contract Name:	Contract Number:
Contact Name: **Troy Allen**	Telephone Number: **1-800-747-3322**
Employer SIC:	Employer Location Code:
Employer FED ID:	Employer Code: NA
Nature of Business:	
Policy Number:	

ACCIDENT INFORMATION	
Date and Time of Injury:	
Did the Accident Occur at the Work Location	If no, where did the accident occur? NA
Accident Address:	
Nature of Accident:	
Give a Full Description of the Accident (Be as factually complete as possible):	
Are Other WC Claims Involved" No	Date and Time Reported to Employer:
Person Reported To:	

WITNESS INFORMATION
Were There Any Witnesses?
If Yes, List Names and How to Contact Them:

INJURY INFORMATION	
Which Part of the Body Was Injured? (*e.g.*, Head, Neck, Arm, Leg)	
What was the Nature of the Injury? (*e.g.*, Fracture, Sprain, Laceration)	
Part of the Body Location? (*e.g.*, Left, Right, Upper, Lower)	
Injury Description:	
Source of Injury:	Is Employee Hospitalized?
Lost Time:	If Yes, What was First Full Day Out:
Date Last Day Worked:	Date Disability Began: NA
Date Returned to Work:	Estimated Return Date: NA

MEDICAL INFORMATION		
ER Treated & Released:	Hospitalized:	Phy./Clinic:
Hospital – Name, Address, Phone Number:	Was Employee Transported via Ambulance: Yes No	
NA		
Clinic – Name, Address, Phone Number:		

ADDITIONAL COMMENTS AND INFORMATION

REPORT PREPARED BY	
Name:	Title:
Signature:	Phone Number:

REPORT ALL WORKER'S COMPENSATION INJURIES TO SHAW CLAIMS DEPARTMENT
FAX REPORT WITHIN 24 HOURS OF INCIDENT TO **225-932-2636**.
Phone all injuries/illnesses to **Shaw Notification Hotline/Helpdesk 1-866-299-3445**

Shaw® Shaw E & I

Incident Investigation Report

*** Must Be Completed Within 72 HOURS & Relevant Support Documentation Must Be Attached/ Submitted***

Investigation Date _____ Date of Incident _____

Employee Name _____ Supervisor Name _____

Project Number _____ Project Name _____

Contract Number _____ Contract Name _____

Location of Incident _____

Incident Classification

Injury	☐ First Aid	Vehicle	☐ Chargeable	DOT	☐ DOT Vehicle
	☐ OSHA Recordable		☐ Non-chargeable		☐ DOT Reportable
	☐ Lost Workday				
	☐ Restricted Workday	Near Miss	☐	General Liability	☐

Description (Provide facts, describe how incident occurred, provide diagram [on back] or photos)

_____

_____

_____

Analysis (What unsafe acts or conditions contributed to the incident?)

_____

_____

_____

Corrective Action(s) (List corrective action items, responsible person, scheduled completion date)

_____

_____

_____

Witness Names (Complete Attachment 6 – Employee Witness Statement)

_____

_____

_____

Investigated By: _____ _____ _____

Print Name Signature Date

Project/Location Mgr.: _____ _____ _____

Print Name Signature Date

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Shaw® Shaw E & I

Employee Witness Statement

MUST BE COMPLETED WITHIN 24 HOURS OF THE INCIDENT

This form should be completed by every employee working in the crew of the injured employee and by every other employee with knowledge of events or circumstances involved in the incident.

This information is being solicited from you so that the company can accurately assess the reported incident to avoid similar occurrences in the future. Describe only the facts for which you have personal knowledge. If you have no knowledge of the incident, write "no knowledge."

Company: _____

Exact Location of Incident/Accident: _____

Name of Injured Employee: _____

Date of Incident/Accident: _____ Time _____ am pm

Date of this Statement: _____ Time _____ am pm

Time your shift begins? _____ am pm Ends _____ am pm

Witness Information:

Name: _____

Home Phone No.: _____

Home Address: _____

County: _____ Zip: _____

Witness' Supervisor Name: _____

If not employed by Shaw E&I, enter name of company: _____

Company Phone Number: _____

Did you see the Incident/Accident? _____

How far from you (approx., in feet) did the Incident/Accident occur? _____

Stating only factual information, describe in detail what happened and include any applicable events leading to the Incident/Accident:

_____

_____

_____

_____

I certify that, to the best of my knowledge, all of the above information is complete, accurate, and factual. I acknowledge that the intentional falsification or altering of facts or making misleading statements may be grounds for disciplinary action.

_____ _____

Witness Signature/Date Print Name

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Shaw® Shaw E & I

Accident Review Board

DATE:	LOCATION:
BOARD MEMBERS:	
ACCIDENT DATE:	EMPLOYEE(S) INVOLVED IN INCIDENT:
INVESTIGATION COMPLETE: YES ☐ NO ☐	ACCIDENT CLASSIFICATION:

The following information must be provided by the Accident Review Board for this incident (print):

SUPERVISOR: _____ **PROJECT/LOCATION MGR.:** _____

POTENTIAL CAUSE OF ACCIDENT:

ACTION BY BOARD*:

* All actions by the Accident Review Board are subject to final review by the Human Resources and Legal Departments.

ACCEPTED:

_____ _____

(Employee Signature) (Supervisor Signature)

APPROVED: REJECTED FOR:

_____ _____

(Project/Location Manager)

APPROVED: REJECTED FOR:

_____ _____

(Business Line Health and Safety Manager or Designee)

APPROVED: REJECTED FOR:

_____ _____

(Business Line Vice President)

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Shaw® Shaw E & I

Vehicle Accident Report

ACCIDENT DESCRIPTION

This report is to be initiated by the employee involved in the accident or his/her direct supervisor. Please answer all questions completely. This report must be forwarded to the appropriate health and safety representative within 24 HOURS of the accident. Attach police report.

ACCIDENT DATE _____ TIME _____ ☐ A.M. or ☐ P.M.
LOCATION OF ACCIDENT (CITY, STATE) _____
DESCRIPTION OF ACCIDENT _____
_____
_____
WITNESS _____ PHONE NO. _____
ADDRESS _____ CITY _____ STATE _____ ZIP _____
POLICE OFFICER'S NAME AND BADGE # _____ DEPARTMENT _____

COMPANY VEHICLE

DRIVER _____ DRIVERS LICENSE NO. _____ STATE _____
ADDRESS _____ CITY _____ STATE _____ ZIP _____
WORK PHONE NO. _(_____)_____ S.S. NO. _____ PROJECT NAME/NO. _____
VEHICLE NO. _____ YEAR _____ MAKE _____ MODEL _____ LICENSE PLATE NO. _____
STATE _____ VEHICLE OWNER: ☐ COMPANY ☐ LEASED/RENTED ☐ PRIVATE VEHICLE
VEHICLE TYPE: ☐ COMMERCIAL MOTOR VEHICLE ☐ NON-COMMERCIAL
IF NOT COMPANY-OWNED: OWNER _____ PHONE NO _(____)_____
ADDRESS _____ CITY _____ STATE _____ ZIP _____
VEHICLE DAMAGE _____
NO. OF VEHICLES TOWED FROM SCENE _____ NUMBER OF INJURIES _____ NUMBER OF FATALITIES _____
WERE HAZARDOUS MATERIALS RELEASED? ☐ NO ☐ YES IF YES, DESCRIBE MATERIALS _____
_____

OTHER VEHICLE

DRIVER _____ DRIVERS LICENSE NO. _____ STATE _____
ADDRESS _____ CITY _____ STATE _____ ZIP _____
PHONE NO. _(_____)_____ S.S. NO. _____
OWNER'S NAME (☐ CHECK IF SAME AS DRIVER) _____
ADDRESS _____ CITY _____ STATE _____ ZIP _____
INSURAMCE COMPANY _____ POLICY NO.: _____
AGENT'S NAME _____ PHONE NO.: _(_____)_____
ADDRESS _____ CITY _____ STATE _____ ZIP _____
VEHICLE YEAR. _____ MAKE _____ MODEL _____ PLATE NO. _____ STATE _____
VEHICLE I.D. NO. _____
VEHICLE DAMAGE _____

PASSENGERS ☐ NO ☐ YES INJURIES ☐ NO ☐ YES (If yes, list names and telephone numbers below)

_____
_____
_____

Shaw® Shaw E & I

Vehicle Accident Report

WEATHER: ❑ Clear ❑ Cloudy ❑Fog ❑Rain ❑Sleet ❑Snow Other ___
PAVEMENT: ❑Asphalt ❑Steel ❑Concrete ❑Wood ❑Gravel/Dirt
❑Brick/Stone Other _____
CONDITION: ❑Dry ❑Wet ❑Icy ❑Pot Holes Other _____
TRAFFIC CONTROL: ❑Traffic Light ❑Stop Sign ❑Railroad ❑No Intersection ❑No Control
ROADWAY: No. of Lanes Each Direction: _____ ❑Residential ❑Divided Highway ❑Undivided Highway

Draw and name <u>roadways</u> showing <u>each vehicle</u>, <u>direction of travel</u>, and <u>point of impact</u>. Indicate travel before the accident with a solid line, and post-accident movement with a broken line.

SYMBOLS:

Your Vehicle ①

Other Vehicle(s) ②③

Pedestrian

Stop Sign

Yield

Railroad ‡

ADDITIONAL INFORMATION: _____

Employee _____ (Print) _____ (Signature) _____ (Date)

Supervisor _____ (Print) _____ (Signature) _____ (Date)

H&S Rep. _____ (Print) _____ (Signature) _____ (Date)

<u>Attach police report to vehicle accident report</u>

Report must be faxed to Corporate Claims Department (Fax: 225-932-2636) within <u>24 hours</u>, or not later than next business day.

Report all vehicle accidents to Shaw Notification Hotline/Helpdesk (Phone: 1-866-299-3445)

Shaw® Shaw E & I

Equipment, Property Damage, and General Liability and Loss Report

This report is to be completed for all losses or damage to company property in excess of $2,500.00 and all third party damage, regardless of value, resulting from company activities.

PROJECT/LOCATION: _____ PROJECT NO.: _____ DATE: _____

PROGRAM NAME: _____ TASK ORDER NUMBER: _____

ADDRESS: _____

HOW DID DAMAGE OR LOSS OCCUR: _____

_____

_____

DESCRIPTION AND VALUE ($) OF DAMAGED/LOST/STOLEN PROPERTY: _____

_____

LOCATION OF DAMAGED/LOST/STOLEN PROPERTY (Before Loss): _____

_____

DATE AND TIME OF DAMAGE, LOSS, OR THEFT: Date: _____ Time: _____ a.m./p.m.

OWNER OF DAMAGED/LOST/STOLEN PROPERTY:

Name _____ Phone No. (____) _____

Address _____ City _____

Employer and Address _____

INJURED PARTIES (Also complete a Supervisor's Employee Injury Report if a Company Employee):

Name _____ Phone No. (____) _____

Address _____ City _____

Employer and Address _____

Description of Injury _____

WITNESSES:

1. Name _____ Phone No. (____) _____

   Home Address _____ City _____

   Employer and Address _____

2. Name _____ Phone No. (____) _____

   Home Address _____ City _____

   Employer and Address _____

WERE PICTURES TAKEN? ☐ YES ☐ NO

WERE POLICE NOTIFIED? ☐ YES ☐ NO DEPT. _____ REPORT NO. _____

COMPLETED BY: _____ _____ _____
(Print) (Signature) (Date)

PROJECT/LOCATION MANAGER: _____ _____ _____
(Print) (Signature) (Date)

REPORT MUST BE FAXED TO:
CORPORATE CLAIMS DEPARTMENT (FAX: 225-932-2636)
WITHIN 24 HOURS, OR NOT LATER THAN NEXT BUSINESS DAY

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EMERGENCY EYEWASH STATION/FIRE EXTINGUISHER INSPECTION CHECKLIST

Location: _____ Project Number: _____

Client: _____ Date: _____

Inspected by: _____

EMERGENCY EYEWASH STATIONS

Inspection Points	Unit #1	Unit #2
Is unit in assigned location?		
Is unit full of water?		
Is unit location well marked?		
Is access to unit unobstructed?		
Is unit in sanitary condition?		
Has water been changed with disinfectant added within the last six months?		
Has inspection tag on unit been signed and dated?		

PORTABLE FIRE EXTINGUISHERS

Inspection Points	Unit #	Unit #	Unit #	Unit #	Unit #
Fire extinguisher is in assigned location?					
Access to fire extinguisher is not obstructed?					
Fire extinguisher is fully charged?					
Lock-pin in place?					
Service tag attached and serviced within past year?					
Has inspection tag on unit been signed and dated?					

√ = OK N/A = Not Applicable X = Defective Comments: _____

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EMPLOYEE NOTIFICATION OF INDUSTRIAL HYGIENE MONITORING RESULTS

Employee Name _____ SS# _____

Project Name _____ Project No. _____

Project Manager _____

Substance Monitored _____ Date Monitored _____ Sample Number _____

Results _____ mg/m^3 _____ ppm Other _____

Exposure Standard _____ mg/m^3 _____ ppm Other _____

Protective Equipment Used _____

For instance where exposures were found to be in excess of an exposure limit, the following corrective action steps (engineer administrative, job techniques, etc.) are being taken to reduce potential future exposures:

H&S Representative: _____ _____ _____

Name Printed Signature Date

Employee monitored: _____ _____ _____

Name Printed Signature Date

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Employee Physiological Monitoring Record For Heat Stress

Employee Name _____ Date _____ Employee SS# _____

PPE used during performance of work: _____ Shift Start Time _____ Location _____

Shift Stop Time _____ Job Number _____

Site Safety & Health Officer _____ Supervisor _____

Temperatures

A. Initial Reading
- 1. Ambient Air Temp. °F _____
- 2. Baseline Body Temp. °F _____
- 3. Time Temp. Taken _____

B. After First Work Period
- 1. Ambient Air Temp. °F _____
- 2. Body Temp. °F _____
- 3. Length of work period _____

C. After Second Work Period
- 1. Ambient Air Temp. °F _____
- 2. Body Temp. °F _____
- 3. Length of work period _____

D. After Third Work Period
- 1. Ambient Air Temp. °F _____
- 2. Body Temp. °F _____
- 3. Length of work period _____

E. After Fourth Work Period
- 1. Ambient Air Temp. °F _____
- 2. Body Temp. °F _____
- 3. Length of work period _____

Heart Rate

A. Initial Reading
- 1. Baseline Heart Rate _____ Beats per minute

B. After First Work Period
- 1. Heart Rate _____ Beats per minute

C. After Second Work Period
- 1. Heart Rate _____ Beats per minute

D. After Third Work Period
- 1. Heart Rate _____ Beats per minute

E. After Fourth Work Period
- 1. Heart Rate _____ Beats per minute

- Baseline Body Temperature and Heart Rate to be taken at project site location at beginning of shift before engaging in physical activity.
- Heart Rate – Each individual will count his/her radial (wrist) pulse as early as possible during each rest period. If the heart rate of any individual exceeds 75 percent of their calculated maximum heart rate (MHR = 200 – age) at the beginning of the rest period, then the work cycle will be decreased by one-third. The rest period will remain the same. An individual is not permitted to return to work until his/her sustained heart rate is below 75 percent of their calculated MHR.
- Temperature – Each individual will measure his/her temperature with a thermometer for one minute as early as possible in the first rest period. If the temperature exceeds 99.6°F at the beginning of the rest period, then the work cycle will be decreased by one-third. The rest period will remain the same.
  An individual is not permitted to return to work if her/her temperature exceeds 100.4 °F. Note: due to the lack of accuracy in measuring body temperatures, heart rate is probably a better measurement of heat stress and should be weighted accordingly.
- This completed form should be retained in project file.

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EMPLOYEE REQUEST FOR MATERIAL SAFETY DATA SHEET (MSDS)

Project Name: _____ Project Number: _____

Employee Name: (Please Print) _____

Employee Number: _____

Job Title/Location: _____

Department/Work Area: _____

I am requesting a copy of the MSDS(s) for the following chemical(s):

(Chemical name, Common name, Trade name)

1. _____

2. _____

3. _____

_____ _____

Signature Date

I have received a copy of the above MSDS(s) I requested.

_____ _____

Signature Date

cc: Local Health and Safety Representative

This page intentionally left blank.

Equipment No: _____ **Date:** _____

Equipment Type: _____ **Location:** _____

Equipment Hrs: _____ **Supervisor:** _____

Shaw™
Shaw Environmental & Infrastructure, Inc.

DAILY EQUIPMENT INSPECTION

List Quantities And Kinds of Fluids Added In Space At Bottom Of Sheet

ITEM		OK	Add	N/A	Comments
1	Check Engine Oil Level And Engine Compartment For Trash, Debris, etc.	☐	☐	☐	☐
2	Check Hydraulic Oil Level, Cap And Vent.	☐	☐	☐	☐
3	Check Radiator Coolant Level And Radiator Fins For Dirt, Leaves, etc.	☐	☐	☐	☐
4	Check Transmission Oil Level (Dozers) or Swing Case (Excavators).	☐	☐	☐	☐
5	Check Oil Level in Frame Joint Bearing, Consult Manual. (Volvo A-40 only)	☐	☐	☐	☐
6	Check For Oil or Coolant Leaks.	☐	☐	☐	☐
7	Check Wheels / Tires / Tracks For Damage, Cuts And Proper Inflation PSI._____	☐	☐	☐	☐
8	Check Ground Engaging Implements, Cutting Edges, Teeth, Blade, etc.	☐	☐	☐	☐
9	Inspect Visible Hydraulic Hoses / Lines For Scuffs, Wear, Leaks, etc.	☐	☐	☐	☐
10	Inspect ROPS, FOPS, For Any Obvious Signs Of Loose Mounts, etc.	☐	☐	☐	☐
11	Check All Guages, Lights, Controls, Backup Alarms, Horn, etc.	☐	☐	☐	☐
12	Inspect Operators Compartment For Debris And Fire Extinguisher Charge. Check Floor For Build-up Of Dirt Around Pedals. Inspect Seat Belts, Lap Bar, Etc. Clean The Windows And Note Any Cracks.	☐	☐	☐	☐
13	Do a Walk Around Inspection Looking For Obvious Signs Of Future Problem Areas. Check Grab Handles and Step Treads, etc.	☐	☐	☐	☐
14	Check Operation Of All Systems, Boom, Bucket, Dump Bed, Grapple, Shears. Look for Leaks, Damage, Warning Signs, Excess Slack, Obvious Wear, etc.	☐	☐	☐	☐
15	Check Under The Machine For Any Loose Or Hanging Objects, Leaks, Or Anything Out Of The Ordinary.	☐	☐	☐	☐
16	Check Fuel Level And Cap Condition, Fill Tank Prior To Beginning Daily Operation.	☐	☐	☐	☐
17	**Lube All Moving Parts**, Such As Blade, Bucket, Stick, Connecting Links Equalizer bar, Cylinder Pins And Any Point That Is Subject To Grease Being Pushed Or Worn Out Due To Daily Use. Consult Manual For Grease Points.	☐	☐	☐	☐
18	Check Breathing Air Sustem (If Used). Make Sure Bottle Is Full And Mask / Hose Assembly Is Clean And In Good Working Condition Before Each Use.	☐	☐	☐	☐
19	**Verify The Presence Of The Operations / Maintenance Manual.**	☐	☐	☐	☐

Report All Damage To Supervisor Immediately

COMMENTS:

USE LINE NUMBER, BE SPECIFIC, NOTIFY REGIONAL MAINTENANCE COORDINATOR IF IMMEDIATE ATTENTION IS NEEDED.

EMPLOYEE NAME: **EMPLOYEE NUMBER:**

THESE SHEETS ARE TO BE RETAINED ON THE PROJECT FOR REVIEW BY ESG PERSONNEL.

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EXCAVATION INSPECTION

THIS INSPECTION IS TO BE COMPLETED BY THE COMPETENT PERSION EACH DAY THAT EMPLOYEES WILL BE ENTERING AN EXCAVATION

Project Name: _____ Project No.: _____

Date: _____ Time: _____ Competent Person: _____

Soil Classification (see Soil Classification Worksheet): _____

Excavation Depth: _____ Excavation Width: _____

Type of Protective System Used: _____

		√		
		Yes	No	N/A
1.	General:			
	Surface encumbrances removed or supported			
	Employees protected from loose rock or soil that could pose a hazard by falling or rolling into the excavation			
	Hard hats, steel-toed boots, and safety glasses worn by all employees.			
	Spoils, materials, and equipment set back at least two (2) feet from the edge of the excavation.			
	Walkways over excavation 6 feet or more above lower levels are equipped with standard guardrails.			
	Warning vest or other highly visible clothing provided and worn by all employees exposed to public vehicular traffic.			
	Employees required to stand away from vehicles being loaded or unloaded.			
	Warning system established and utilized when mobile equipment is operating near excavation edge.			
	Employees prohibited from going under suspended loads.			
2.	Utilities:			
	Initiate “One-Call Utility Protection” at least 48-hours in advance of intrusive activity.			
	Utility company’s contacted and/or utility locations delineated.			
	Underground installations protected, supported, or removed while excavation is open.			
3.	Means of Access and Egress:			
	Lateral travel to means of egress no greater than 25 feet in trench excavations 4 feet or more in depth.			
	Ladders used in excavations secured and extended three (3) feet above the edge of the trench.			
	Structural ramps used by employees designed by a competent person.			
	Structural ramps used for equipment designed by a registered professional engineer.			

EXCAVATION INSPECTION (Page 2 of 2) Date:

		√		
		Yes	No	N/A
4.	Wet Conditions:			
	Precautions taken to protect from the accumulation of water.			
	Water removal equipment monitored by a competent person.			
	Surface water or runoff diverted or controlled to prevent accumulation in the excavation.			
	Inspections made after every rainstorm or other hazard-increasing occurrence.			
5.	Hazardous Atmosphere			
	Atmosphere within the excavation tested where there is a reasonable possibility of an oxygen deficient, combustible, or otherwise hazardous atmosphere.			
	Adequate precautions taken to protect employee from exposure to a hazardous atmosphere.			
	Testing conducted to ensure that the atmosphere remains safe.			
	Emergency equipment, such as breathing apparatus, safety harness and line, and basket stretcher readily available where hazardous atmosphere does exist.			
6.	Support Systems:			
	Materials and/or equipment for support systems selected based on soil analysis, trench depth, and expected loads.			
	Materials and equipment used for protective systems inspected and in good condition.			
	Damaged materials & equipment used for protective systems inspected by a Registered Professional Engineer after repairs and before being placed back into service.			
	Protective systems installed without exposing employees to the hazards of cave-ins, collapses, or from being struck by materials or equipment.			
	Members of support systems securely fastened to prevent failure.			
	Support systems provided to insure stability of adjacent structures, buildings, roadways, sidewalks, walls, etc.			
	Excavations below the level of the base or footings approved by a registered professional engineer.			
	Removal of support systems progresses from the bottom, and members are released slowly as to note any indication of possible failure.			
	Excavation of material to a level of greater than 2 feet below the bottom of the support system and only if the system is designed to support the loads calculated for the full depth.			
	Shield system placed to prevent lateral movement.			
	Employees are prohibited from remaining in shield system during vertical movement.			
7.	Remarks:			
	_____			
	_____			

FIRST AID KIT INSPECTION LOG
(Inventory Kit)

Location: _____ Project Name: _____

Project Number: _____ Client: _____ Date: _____

Inspected by: _____ SSHO Approval Signature: _____

Contents	Fixed Location Kit		Vehicular Kit*			
				Actual Quantity		
	Minimum Required Quantity	Actual Quantity	Required Quantity	Vehicle 1 ID	Vehicle 2 ID	Vehicle 3 ID
Telfa Bandage Compress, 4"x4"	4		2			
Adhesive Bandages, 1"x3-3/8"	25		25			
Ammonia Inhalants	2		1			
Triangular Bandage 40" x 40" x 56"	1		-			
Eye Covering with Means of Attachment	1		-			
Eye Flush, 1oz.	2		2			
Absorbent Compress 24 sq. in.	1		1			
Antiseptic Wipes 1" x 1"	10		5			
Antiseptic Swabs 0.14 fl. oz.	10		5			
Antiseptic Towelettes 24 sq. in.	10		-			
Sterile Pad 3" x 3"	4		2			
Burn Treatment 0.14 fl. Oz.	6		1			
Roller Bandage 4" x 6 yd.	1		-			
Roller Bandage 2" x 6 yd.	2		-			
Kwik-Kold Ice Pak	2		-			
Adhesive Tape, 1" x 5 yd.	2		1			
Scissors and Forceps Kit	1		-			
Tick Removal Kit	1		-			
Emergency Blanket	1		-			
Disposable Gloves	4 pair		2 pair			
Flashlight	1		-			
Cotton-tip Applicators	10		-			
Disposable mouth-to-mouth Resuscitators	2		1			
Multi-Trauma Dressings 8"x10"	2		-			
2" Bandage Compress 2" x 36"	4		-			
3" Bandage Compress 3" x 60"	2		-			
4" Bandage Compress 4" x 72"	1		-			
Supervisor's Employee Injury Report	1		1			
Inventory Kit	1		-			

* Readily available "vehicle-size" first aid kits may be purchased at the local department store to fulfill vehicle kit stocking requirements. The kit contents do not need to be inspected as long as the shrink-wrap sanitary covering is intact.

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HAZARD COMMUNICATION AND RIGHT-TO-KNOW STANDARDS
EMPLOYEE TRAINING RECORD

Project Name: _____ Project Number: _____

		INITIAL:
1.	I have been informed about the Hazard Communication Program, Material Safety Data Sheets (MSDS), their use and location, and the procedures to obtain copies.	
2.	I have been informed that some of my work may involve exposure to toxic substances, the hazards of which will be reviewed with me in tailgate safety meetings or site-specific training.	
3.	I have been informed about the right of employees to have access to relevant exposure and medical records, and the procedures for requesting access.	
4.	I understand that the company must act upon a request in a reasonable amount of time so as to avoid interruption of normal work operations.	
5.	I have been provided access to the applicable regulations governing hazard communication, and access to employee exposure and medical records.	

PRINT NAME: _____

SIGNATURE: _____

EMPLOYEE NUMBER: _____

DATE: _____

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HAZCOM PROGRAM ACKNOWLEDGMENT FORM

Project Name: _____ Project Number: _____

1. I have been informed about the Hazard Communication Program, Material Safety Data Sheets (MSDS), their use and location, and the procedures to obtain copies.

2. I have been informed that some of my work may involve exposure to toxic substances, the hazards of which will be reviewed with me in tailgate safety meetings or site-specific training.

3. I have been informed about the right of employees to have access to relevant exposure and medical records, and the procedures for requesting access.

4. I understand that the company must act upon a request in a reasonable amount of time so as to avoid interruption of normal work operations.

5. I have been provided access to the applicable regulations governing hazard communication, and access to employee exposure and medical records.

Printed Name	Signature	Representing	Date

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HEPATITIS B AND TETANUS VACCINATION DECLINATION

Due to the potential for you to have occupational exposure to potentially infectious materials in your work, the company will provide, and encourages you to accept, vaccinations for Hepatitis B and Tetanus. Information to assist you in this decision is provided below.

Tetanus

- Bacterial disease causing muscle spasms, seizures, and "lockjaw"
- Single injection vaccination has few side effects
- Minimal loss in protection if the vaccination is given at the time of an exposure/injury rather than in advance

Hepatitis B

- Viral infection of the liver
- About 9,500 occupational cases occur annually, mostly in health care workers, with about 200 deaths
- Three-injection vaccination has few side effects
- Vaccination is 90 percent effective for at least 7 years when given prior to exposure
- Vaccination is 70 to 88 percent effective when given within 1 week of exposure
- Can survive in the environment for 24 to 48 hours after drying
- Risk of infection from one cut or puncture wound from a contaminated object:
  - Hepatitis B virus 6 to 30 percent
  - Human Immunodeficiency Virus (AIDS) 0.5 percent

If you wish to talk to a company doctor before making your decision, please ask the Health and Safety Manager to make arrangements for you. *If you choose to decline vaccination at this time, you must print and sign your name, and date the bottom of this form.*

I understand that due to my occupational exposure to blood or other potentially infectious materials I may be at risk of acquiring Hepatitis B Virus (HBV) infection.

I have been given the opportunity to receive the Hepatitis B vaccine, at no charge to myself. However, I decline Hepatitis B vaccination at this time. I understand that by declining this vaccine, I continue to be at risk of acquiring Hepatitis B, a serious disease.

If in the future I continue to have occupational exposure to blood or other potentially infectious materials and I want to be vaccinated with the Hepatitis B vaccine, I can receive this vaccination series at no charge to me.

Name (print) _____

Signature _____ Date _____

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HOT WORK PERMIT

Project Name _____ Project # _____

Good for This Date Only ____/____/____ Time From _____ To _____

Hot Work Area _____

Specific Work to be Done _____

Personal Protective Equipment Required: _____

_____

Emergency Equipment Required: _____

_____

CHECKLIST	INITIAL	
	YES	DOES NOT APPLY
Area personnel have been informed of work to be performed.		
All tanks, lines, valves are disconnected, blinded, or blocked out.		
Electrical service has been locked out and tagged.		
Equipment and all attached piping has been cleaned and purged with: (check blank) Water _____ Steam _____ Inert gas _____ Air		
All grounding/bonding wire in place.		
Surrounding equipment and operations are safe for hot work.		
No open vessels, lines or combustible items within 35 feet of hot work area.		
Fully charged and appropriate fire extinguisher easily accessible.		
Fire watch has been provided.		
No flammable gases greater than 10% LEL in hot work area.		
Compressed gas cylinders kept upright and secured.		
Air monitoring required.		

AIR MONITORING (If Required)						
STATE EXACT LOCATION OF TEST	TIME	% LOWER EXPLOSION LIMIT	% OXYGEN	OTHER TEST _____	OTHER TEST _____	INITIAL

Special Instructions: _____

_____

Completed by: _____ _____ _____

Printed Name Signature Date

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INTRUSIVE ACTIVITIES PERMIT	Permit Number

Project Name: _____ Project Number: _____

Clearance is permitted for intrusive activity at: _____

The attached map indicates the limits of the permitted intrusive activity. The area __has __has not been staked or clearly marked.

Utilities Locate Service Reference Number: _____

Limits of Work Permitted		
Description of permitted work:		
Specific location of permitted work:		
Precautions or comments:		
Date Clearance Permitted:	Date Clearance Terminated:	
Request Initiated By:	Phone No.	Organization

Permission to proceed with intrusive activity granted:

_____ _____

Field Supervisor/Project Manager Date

Permission to proceed with intrusive activity granted:

_____ _____

Site Safety and Health Officer Date

I agree to perform work within the limits of this permit:

_____ _____

Supervisor/Foreman/Contractor Date

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LIFT PLAN WORKSHEET

General Information

Date:_____ Project No:_____

Location: _____ Crane Owner:_____

Item to be Lifted:_____ Equipment No:_____

Item Weight:_____(lbs) _____(lbs)
Actual Calculated Weight (from below)

If actual weight is not known, the item weight must be determined by one of the following methods:
Manufacturer Data Sheet
Truck Weigh Ticket (only for single piece loads)
Calculated Weight

Standard weight per cubic foot of this material: _____

Dimension of item/material: L _____ x W _____ x H _____ = _____ cu. ft.

Cubic feet of item _____ x Standard Weight _____ =
Calculated Weight

Lifting Responsibility

Lift Supervisor:_____ Employee No:_____
(Required for lifts over 75% of capacity)

Lift Supervisor:_____ _____
Print Name Signature

Crane Operator:_____ _____
Print Name Signature

Rig:_____ _____
Print Name Signature

Rigging Personnel:_____ _____
Print Name Signature

Tag Line 1: _____ _____
Print Name Signature

Tag Line 2: _____ _____
Print Name Signature

Crane Capacity Determination

Item Weight: _____

Block Weight: + _____

Stowed Jib: + _____

Spreader Bar Weight: + _____

Sling Weight: + _____

Accessories: + _____

Other: + _____

Lift Total: = _____

Anticipated Maximum Boom Extension: _____ feet

Anticipated Minimum Boom Angle: _____ °

Anticipated Maximum Load Radius: _____ feet

Based on the above configuration, this crane can safely lift * _____ lbs.

*The crane capacity must exceed the lift total while also taking the following into account:

- Crane/Boom Lift Point (i.e. main boom or jib)
- Quadrant of Operation (over front or 360°)
- Line Pull & Reeving Requirements (parts of line required)
- Crane is level and on fully extended outriggers; or
- Within "On Rubber" Capacity chart if not fully extended or a pick and carry lift is required.

Rigging Capacity Determination

_____ x _____ = _____

Item weight (from page 1) | Sling angle factor | Implied Sling Load

Sling capacity must be determined based on the following items:

- When using multiple slings, the sling with the least lifting capacity must be capable of lifting the load.
- Hitch (vertical, basket, chock)
- Number of sling legs for calculation purpose; never use more than 3 legs.
- Sling angle

NOTE: Sling angle factors can be found in Attachment 4.

Rigging Accessories

Shackles: Number _____ Size _____ Capacity

Other: Number _____ Size _____ Capacity

Implied Sling Load: _____ Sling Capacity:

NOTE: Implied sling load must not exceed sling capacity.

Pre-Lift Checklist

- ☐ rigger has inspected all rigging
- ☐ equipment operator has inspected equipment
- ☐ wind conditions acceptable
- ☐ other weather conditions acceptable
- ☐ keep all unnecessary personnel clear of the lift area
- ☐ no personnel allowed down slope during operations done safely
- ☐ use all PPE properly (hard hats, boots, etc.)
- ☐ weight of lift remains unchanged
- ☐ pre-lift meeting with all personnel
- ☐ personnel are qualified
- ☐ equipment in accordance with plan
- ☐ no hazardous conditions in lift area
- ☐ equipment is properly set up
- ☐ signal person assigned if necessary
- ☐ Lift Supervisor (LS) to ensure job
- ☐ LS to stop job if unsafe condition
- ☐ LS to stabilize job if accident occurs

Critical lifts require drawings of lift configuration. Use box below or attach drawing to worksheet.

Lifting Approvals

Lifts which exceed 25 tons or greater outlined on this lift planning worksheet require the approval of a competent civil, structural/mechanical engineer.

_____ _____

Print Name Signature

This page intentionally left blank.

Project Location: _____
Client: _____
Project Number: _____

LOCKOUT LOG

AUTHORIZED EMPLOYEE	DATE	EQUIPMENT NAME	EQUIPMENT NUMBER	REASON FOR LOCKOUT

This page intentionally left blank.

LOCKOUT/TAGOUT FOR COMPRESSED AIR AND GASES

Project Name: _____ Project Number: _____

Job: _____

Device: _____

Location: _____

Authorized Person: _____

Site Supervisors: _____

PREPARATION FOR SHUTDOWN

1. Determine types and shutoff location.
2. Determine if there is more than one energy source.
3. Determine magnitude of compressed air, gas, steam, water, or fluids.
4. Notify affected employees in the area that equipment will be locked out for maintenance.
5. Shutoff main supply to machine.

LOCKOUT/TAGOUT

6. Lock and tag main supply in the OFF position.
7. Bleed line and verify that no air or gases remain in the equipment.
8. Repair equipment.

RETURN TO SERVICE

9. Be sure all connections are made and any unused tools and equipment are removed.
10. Remove lock if necessary to verify proper operations.
11. Remove tag.
12. Notify employees in the area that the equipment is available.

Signature:

Authorized Person: _____

Site Supervisor: _____

This page intentionally left blank.

LOCKOUT/TAGOUT FOR ELECTRICAL EQUIPMENT

Project Name: _____ Project Number: _____

Job: _____

Device: _____

Location: _____

Authorized Person: _____

Site Supervisors: _____

PREPARATION FOR SHUTDOWN

1. Determine power type and shutoff location.
2. Determine if there is more than one energy source.
3. Determine magnitude of power (voltage).
4. Notify affected employees in the area that equipment will be locked out for maintenance.
5. Shutoff power sources to machine.

LOCKOUT/TAGOUT

6. Lock and tag main switches in the OFF position, remove fuses.
7. Verify that no power is available to the equipment using a voltmeter, if necessary.
8. Drain devices such as capacitor banks.
9. Verify that these devices have no stored energy by use of the voltmeter.
10. Repair equipment.

RETURN TO SERVICE

11. Be sure all connections are made and any unused tools and equipment are removed.
12. Remove lock if necessary to verify machine is repaired. The maintenance employee, while verifying the machine is repaired cannot leave the immediate area.
13. Remove tag from machine.
14. Notify employees in the area that the equipment is available.

Signature:

Authorized Person: _____

Site Supervisor: _____

This page intentionally left blank.

LOCKOUT/TAGOUT FOR HYDRAULIC EQUIPMENT

Project Name: _____ Project Number: _____

Job: _____

Device: _____

Location: _____

Authorized Person: _____

Site Supervisors: _____

PREPARATION FOR SHUTDOWN

1. Determine power type and shutoff location.
2. Determine if there is more than one energy source.
3. Determine magnitude of energy (pressure).
4. Notify affected employees in the area that equipment will be locked out for maintenance.
5. Shutoff main hydraulic to equipment.

LOCKOUT/TAGOUT

6. Lock and tag main supply in the OFF position.
7. Drain fluids from shutoff valves to equipment.
8. Verify that the hydraulic fluid is disconnected.
9. Block ram or items controlled by the hydraulic system using the appropriate blocking.
10. Repair equipment.

RETURN TO SERVICE

11. Be sure all connections are made and any unused tools and equipment are removed.
12. Remove lock if necessary to verify machine is repaired. Maintenance employee cannot leave the immediate area, while verifying the machine is repaired.
13. Remove tag from machine.
14. Notify employees in the area that the equipment is available.

Signature:

Authorized Person: _____

Site Supervisor: _____

This page intentionally left blank.

LOCKOUT/TAGOUT FOR STEAM, WATER, AND FLUID LINES

Project Name: _____ Project Number: _____

Job: _____

Device: _____

Location: _____

Authorized Person: _____

Site Supervisors: _____

PREPARATION FOR SHUTDOWN

1. Determine types and shutoff location.
2. Determine if there is more than one energy source.
3. Determine magnitude of compressed air or gas.
4. Notify affected employees in the area that equipment will be locked out for maintenance.
5. Disconnect/shutoff main steam, water, or fluid lines to equipment.

LOCKOUT/TAGOUT

6. Lock and tag main supply (i.e. chaining through valve handle with lock) in the OFF position with a bleeder open on the load side.
7. Drain fluids from shutoff valves to equipment.
8. Repair equipment.

RETURN TO SERVICE

9. Be sure all connections are made and any unused tools and equipment are removed.
10. Remove lock if necessary to verify machine is repaired. The maintenance employee cannot leave the immediate area, while verifying the machine is repaired.
11. Remove tag from machine.
12. Notify employees in the area that the equipment is available.

Signature:

Authorized Person: _____

Site Supervisor: _____

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LOCKOUT/TAGOUT PROCEDURE FOR SPECIFIC EQUIPMENT

Project Name: _____ Project Number: _____

Equipment:		
Cat. No. and Location:		
Serial Number (if available):		
Electrical:	Voltage:	Location:
Describe:		
Air (Type):		Location:
Describe:		
Gases (Type):		Location:
Describe:		
Steam (Type):		Location:
Describe:		
Water:		Location:
Describe:		
Fluids:		Location:
Describe:		
Hydraulic:		Location:
Describe:		
Stored Energy – Capacitors, Springs, Etc.:		
Describe:		

LOG DATA AND RETURN TO SITE-SUPERVISOR

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Near Miss Report

Employee Name (optional): _____

Shaw Location: _____ **Date of Report:** _____

Near Miss

POTENTIAL LOSS		
◉ Injury	◯ Illness	◯ Property Damage
Describe potential loss:		

Incident

EVENTS
Describe event:

Causes

SUBSTANDARD ACTS/PRACTICES	SUBSTANDARD CONDITIONS
◯ Failure to warn	◯ Inclement weather
◯ Failure to secure	◯ Inadequate guards or barriers
◯ Operating at improper speed	◯ Inadequate or improper protective equipment
◯ Making safety devices inoperable	◯ Defective tools, equipment or materials
◯ Removing safety devices	◯ Congestion or restricted action
◯ Using defective equipment	◯ Inadequate warning system
◯ Using equipment improperly	◯ Fire and explosion hazards
◯ Failing to use PPE properly	◯ Poor housekeeping; disorderly workplace
◯ Improper loading	◯ Hazardous environmental conditions: gases,
◯ Improper placement	◯ Dusts, smokes, fumes, vapors
◯ Improper lifting	◯ Noise exposures
◯ Improper position for task	◯ High or low temperature exposures
◯ Servicing equipment in operation	◯ Other
Describe immediate cause(s):	

IMPROVEMENT ACTIONS		
1		
2		
3		
Person responsible for follow-up:	Expected completion date:	Actual completion date:
Verified by:	Validated by:	
Supervisor Name:		
Signature:		

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Noise Dosimeter
Field Data Log

Project Name _____ Project# _____

Date _____ Calibrated by _____

Survey Location _____

Dosimeter Serial No.	Employee Name	Job Description	Calibration dBA (pre)	Dose	Lavg	Lmax	Time	Calibration dBA (post)	Comments

Comments _____

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Noise Survey
Field Data Log

Project Name _____ Project# _____

Date _____ Calibrated by _____

Survey Location _____

Sound Level Meter Serial No.	Employee Name/ Equipment Name	Job Description/ Equipment Location	Time	Calibration dBA (pre-survey)	dBA/ Distance from Source	dBA/ Distance from Source	dBA/ Distance from Source	Calibration dBA (post-survey)	Comments

Comments _____

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PROJECT SAFETY INSPECTION REPORT

DATE _____

BUSINESS LINE: _____

PROJECT NAME/NUMBER: _____

PROGRAM MANAGER: _____ PROJECT MANAGER: _____

GENERAL PROJECT DESCRIPTION: _____

SITE ACTIVITIES AT TIME OF INSPECTION: _____

_____

_____

INTERVIEWED EMPLOYEE: _____

SAFETY ISSUE: _____

CORRECTIVE ACTION: _____

_____

ASSIGNED TO: _____ FOLLOW-UP DATE: _____

CORRECTION VERIFIED BY: _____ DATE: _____

INTERVIEWED EMPLOYEE: _____

SAFETY ISSUE: _____

CORRECTIVE ACTION: _____

_____

ASSIGNED TO: _____ FOLLOW-UP DATE: _____

CORRECTION VERIFIED BY: _____ DATE: _____

INSPECTION COMPLETED BY: _____ DATE: _____

HEALTH AND SAFETY REVIEW BY: _____ DATE: _____

PROJECT SAFETY INSPECTION REPORT

PROJECT _____ DATE _____

	YES	NO	N/A
FIRST AID			
1. Are first aid kit locations identified and accessible?			
2. Are emergency eye wash/safety showers available and inspected monthly?			
3. Are first aid kits inspected weekly?			
4. Is a qualified first aid/CPR provider on-site?			
PERSONAL PROTECTIVE EQUIPMENT			
1. Have levels of personnel protection been established?			
2. Are respirators decontaminated, inspected, and stored according to standard procedures?			
3. Have employees been fit-tested?			
4. Is defective personal protective equipment tagged and taken out of service?			
5. Does compressed breathing air meet CGA Grade "D" minimum?			
6. Are there sufficient sizes and quantities of protective equipment?			
7. At a minimum, are employees utilizing safety glasses, hard hats, and steel toe boots?			
FIRE PREVENTION			
1. Are employees smoking only in designated outdoor areas?			
2. Are fire lanes established and maintained?			
3. Are flammable liquid dispensing systems bonded?			
4. Are approved safety cans available for storage of flammable liquids?			
5. Has the local fire department been contacted?			
6. Are fire extinguishers available and inspected monthly?			
7. Are flammables and combustibles properly stored?			
8. Are flammable storage cabinets available and used when needed?			
AIR MONITORING			
1. Is required air monitoring being conducted?			
2. Are air monitoring instruments calibrated daily?			
3. Are air monitoring logs up to date?			
4. Are instrument user manuals available?			
5. Are instruments being maintained?			
6. Are employees notified of personal sampling results within 5 days of receipt?			
WELDING AND CUTTING			
1. Are fire extinguishers present at welding and cutting operations?			
2. Are confined spaces evaluated prior to and during cutting and welding operations?			
3. Have Hot Work Permits been completed?			
4. Are proper helmets, goggles, aprons, and gloves available for welding and cutting operations?			
5. Are welding machines properly grounded?			
6. Are oxygen and fuel gas cylinders stored a minimum of 20 feet apart?			
7. Are only trained personnel permitted to operate welding and cutting equipment?			
8. Are gas cylinders transported in a secured vertical position with caps in place?			
HAND AND POWER TOOLS			
1. Are defective hand and power tools tagged and taken out of service?			
2. Is eye protection available and used when operating power tools?			
3. Are guards and safety devices in place on power tools?			
4. Are power tools inspected before each use?			
5. Are nonsparking tools available when necessary?			

PROJECT SAFETY INSPECTION REPORT

PROJECT _____ DATE _____

	YES	NO	N/A
HAND AND POWER TOOLS (continued)			
6. Is the correct tool being used for the job?			
MOTOR VEHICLES			
1. Are vehicles regularly inspected?			
2. Are personnel licensed for the vehicles they operate?			
3. Are unsafe vehicles tagged and reported to supervision?			
4. Is vehicle's safety equipment operating properly?			
5. Are loads secure?			
6. Are vehicle occupants using safety belts?			
7. Are current insurance cards and blank accident report forms located in vehicles?			
EMERGENCY PLANS			
1. Are emergency telephone numbers posted?			
2. Have emergency escape routes been designated?			
3. Are employees familiar with the emergency signal?			
4. Has the emergency route to the hospital been established and posted?			
5. Is a vehicle on site that can transport injured employees to the hospital?			
MATERIALS HANDLING			
1. Are materials stacked and stored to prevent sliding or collapsing?			
2. Are tripping hazards identified?			
3. Are semi-trailers chocked?			
4. Are fixed jacks used under semi-trailers?			
5. Are riders prohibited on materials handling equipment?			
6. Are approved manlifts provided for the lifting of personnel?			
7. Are personnel in manlifts wearing approved fall protection devices?			
FIRE PROTECTION			
1. Has a fire alarm system been established?			
2. Do employees know the location and use of all fire extinguishers?			
3. Are fire extinguisher locations posted?			
4. Are combustible materials segregated from open flames?			
5. Have fire extinguishers been professionally inspected during the last year?			
6. Are fire extinguishers visually inspected monthly?			
ELECTRICAL			
1. Is electrical equipment and wiring properly guarded and maintained in good condition?			
2. Are extension cords kept out of wet areas?			
3. Is damaged electrical equipment tagged and taken out of service?			
4. Have underground electrical lines been identified by proper authorities?			
5. Has a lockout/tagout system been established?			
6. Are GFCIs being used on all temporary electrical systems and as needed?			
7. Are extension cords being inspected daily (i.e., group pin in place, no unapproved splices)?			
8. Are warning signs exhibited on high voltage equipment (250V or greater)?			
9. Is adequate distance maintained from overhead electrical lines?			
10. Are switches, circuit breakers, and switchboards installed in wet locations enclosed in weatherproof enclosures?			

PROJECT SAFETY INSPECTION REPORT

PROJECT _____ DATE _____

	YES	NO	N/A
CRANES AND RIGGING			
1. Are cranes inspected daily prior to use?			
2. Are crane swing areas barricaded or demarked?			
3. Is all rigging equipment tagged with an identification number and rated capacity?			
4. Is rigging equipment inspection documented?			
5. Are slings, chains, and rigging inspected before each use?			
6. Are damaged slings, chains, and rigging tagged and taken out of service?			
7. Are slings padded or protected from sharp corners?			
8. Do employees keep clear of suspended loads?			
9. Are rated load capacities and special hazard warnings posted on crane?			
10. Are the records of annual crane inspection available?			
11. Has accessible areas within the swing radius of the rear of the crane been barricaded?			
12. Do crane operators have required training/certification?			
COMPRESSED GAS CYLINDERS			
1. Are breathing air cylinders charged only to prescribed pressures?			
2. Are like cylinders segregated and stored in well-ventilated areas?			
3. Is smoking prohibited in cylinder storage areas?			
4. Are cylinders stored secure and upright?			
5. Are cylinders protected from snow, rain, etc.?			
6. Are cylinder caps in place before cylinders are moved?			
7. Are fuel gas and oxygen cylinders stored a minimum of 20 feet apart?			
8. Are propane cylinders stored and used only outside of buildings?			
SCAFFOLDING			
1. Is scaffolding placed on a flat, firm surface?			
2. Are scaffold planks free of mud, ice, grease, etc.?			
3. Is scaffolding inspected before each use?			
4. Are defective scaffold parts taken out of service?			
5. Have employees completed scaffold user training?			
6. On scaffolds where platforms are overlapped, is planking overlapped a minimum of 12 inches?			
7. Does scaffold planking extend over end supports between 6 to 18 inches (dependent upon platform length)?			
8. Are employees restricted from working on scaffolds during storms and high winds?			
9. Are all pins in place and wheels locked?			
10. Is required perimeter guarding (top rail, mid rail, and toe board) present?			
11. Has a competent person been designated to oversee scaffold construction?			
12. Are employees prohibited from moving mobile scaffold horizontally while employees are on them?			
13. Are all scaffold components manufactured by the same company?			
WALKING AND WORKING SURFACES			
1. Are ladders regularly inspected?			
2. Are accessways, stairways, ramps, and ladders clean of ice, mud, snow, or debris?			
3. Are ladders being used in a safe manner?			
4. Are ladders kept out of passageways, doors, or driveways?			
5. Are broken or damaged ladders tagged and taken out of service?			
6. Are metal ladders prohibited in electrical service?			

WALKING AND WORKING SURFACES (continued)			
7. Are stairways and floor openings guarded?			
8. Are safety feet installed on straight and extension ladders?			
9. Is general housekeeping being maintained?			
10. Are ladders tied off?			
11. Are handrails and side rails installed along the unprotected sides of stairways having 4 or more risers or rising more than 30 inches?			
SITE SAFETY PLAN			
1. Is a site safety plan available on site or accessible to all employees?			
2. Does the safety plan accurately reflect site conditions and tasks?			
3. Have potential hazards been described to employees on site?			
4. Is there a designated safety official on site?			
5. Have all employees signed the safety plan acknowledgment form?			
SITE POSTERS			
1. Are the following posters displayed in a prominent and accessible area?			
A. Minimum Wage			
B. OSHA Job Protection			
C. Equal Employment Opportunity			
2. Are all required state-specific posters displayed?			
SITE CONTROL			
1. Are work zones clearly marked?			
2. Are support trailers located to minimize exposure from a potential release?			
3. Are support trailers accessible for approach by emergency vehicles?			
4. Is the site properly secured during and after work hours?			
5. Is an exclusion zone sign-in/sign-out log maintained?			
6. Are only employees with current training and physicals permitted in exclusion zone?			
HEAVY EQUIPMENT			
1. Is heavy equipment inspected as prescribed by the manufacturer?			
2. Is defective heavy equipment tagged and taken out of service?			
3. Are project roads and structures inspected for load capacities and proper clearances?			
4. Is heavy equipment shut down for fueling and maintenance?			
5. Are backup alarms installed and working on mobile equipment?			
6. Have qualified equipment operators been designated?			
7. Are riders prohibited on heavy equipment?			
8. Are guards and safety appliances in place and used?			
9. Are operators using the "three point" system when mounting/dismounting equipment?			
EXCAVATION			
1. Has a "competent person" been designated to oversee excavation activities?			
2. Prior to opening excavations, are utilities located and marked?			
3. Has a professional engineer evaluated all excavations greater than 20 feet deep?			
4. Is there rescue equipment on site and accessible to the excavation area?			
5. Is excavated material placed a minimum of 24 inches from the excavation?			
6. Are the sides of excavations sloped or shored to prevent cave ins?			
EXCAVATION (continued)			
7. Have excavations greater than 4 feet deep been monitored for hazardous atmospheres (i.e., LEL/O_2 deficiency)?			
8. Are ladders or ramps used in excavations over 4 feet deep?			
9. Are means of egress available so as to require no more than 25 feet of lateral travel?			

PROJECT SAFETY INSPECTION REPORT

PROJECT _____ DATE _____

	YES	NO	N/A
10. Are barriers, i.e., guardrails or fences, placed around excavations near pedestrian or vehicle thoroughfares?			
11. Is excavation inspected daily by competent persons and documented?			
CONFINED SPACES			
1. Have employees been trained in the hazards of confined spaces?			
2. Are confined space permits posted at entrance to confined space?			
3. Is a copy of the confined space entry procedure available?			
4. Has a rescue plan been established?			
5. Is an entry supervisor present at each permit-required entry?			
6. Are required extraction/fall protection devices being used?			
DECONTAMINATION			
1. Are decontamination stations set up on site?			
2. Is decontamination water properly contained and disposed of?			
3. Are all pieces of equipment inspected for proper decontamination before leaving the site?			
4. Are shin/metatarsal guards being used during power washing activities?			
HAZARD COMMUNICATION			
1. Is there a copy of the HAZCOM procedure on site?			
2. Are their MSDSs for required materials/chemicals present on site?			
3. Are all containers properly labeled, as to content, hazard?			
4. Have employees been trained in accordance with the HAZCOM procedure?			
5. Do employees (including subcontractors) know and understand the effects of exposure from the chemicals on site?			
6. Have all personnel signed the HAZCOM acknowledgment form?			
7. Is there an updated list of chemicals maintained on site?			
TRAINING			
1. Are tailgate safety meetings being conducted daily?			
2. Are current training/medical records maintained on site?			
DOCUMENTATION			
1. Is an OSHA 300 Log maintained on site and posted during the months of February, March, and April?			
2. Are accident report forms available?			
3. Is a copy of health and safety policy and procedures available on site?			

PROJECT SAFETY INSPECTION REPORT

PROJECT _____ DATE _____

ALL NEGATIVE RESPONSES	CORRECTIVE ACTION	ASSIGNED TO	DATE ASSIGNED	DATE COMPLETED	VERIFIED BY

DESCRIBE POSITIVE SAFETY OBSERVATIONS

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REAL TIME AEROSOL MONITORING LOG

Project Name: _____ Project No. _____

Date: _____

Sampled By	Instrument Type (Mfg./Model/Serial No.)	Battery Charged (Y/N)	Zeroed (Y/N)	Sample Time		Sample Readings (mg/m^3)			Comments
				Start	Finish	TWA	Shift Average	Direct	

General Weather Conditions _____

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RESCUE SERVICE EVALUATION

INITIAL EVALUATION

Project/Location _____ Project No. _____

Identity of PRCS _____

Name of Rescue Service _____

Address _____

Contact Person/Phone Number _____

Required Response Time _____ Estimated Response Time _____

Availability of Rescue Service _____

PERFORMANCE EVALUATION (Observe Test Rescue and Answer Following Questions)	YES	NO
Have all members of the service been trained in the potential hazards of the permit space(s), or of a representative permit space(s) from which rescue may be needed?		
Can team members recognize the signs, symptoms, and consequences of exposure to any hazardous atmospheres that may be present in the permit space(s)?		
Is every team member provided with, and properly trained in, the use and need for PPE which may be required to perform permit space rescues?		
Is every team member properly trained to perform his/her functions and make rescues, and to use any rescue equipment, such as ropes and backboards, that may be needed in a rescue attempt?		
Are team members trained in the first aid and medical skills needed to treat victims overcome or injured by the types of hazards that may be encountered in the permit space(s)?		
Do all team members perform their functions safely and efficiently?		
Do rescue service personnel focus on their own safety before considering the safety of the victim?		
Can the rescue service properly test the atmosphere of the identified PRCS?		
Can the rescue personnel identify information pertinent to the rescue from entry permits, hot work permits, and MSDSs?		
Has the rescue service been informed of any hazards to personnel that may arise from outside the space, such as those that may be caused by future work near the space?		
Can the rescue service safely perform rescue(s) from the identified PRCS?		
Does the rescue service have a plan for rescue from the identified PRCS?		
Is the plan adequate for all types of rescue operations that may be needed?		

I certify that the evaluated rescue service is equipped and capable of providing rescue services during entry activities for the identified PRCS.

Evaluator:

_____ _____ _____

Name Signature Date

I acknowledge our responsibility to provide rescue services during entry activities for the identified PRCS.

Rescue Service Representative:

_____ _____ _____

Name Signature Date

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Safety and Occupational Health Deficiency Tracking Log

Section and Item #	Date Deficiency Identified	Description of Deficiency or Comment	Recommended Action	Person Responsible for Correcting Deficiency	Projected Resolution Date	Date Deficiency Actually Resolved

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SAFETY MEETING / TRAINING LOG

- ☐ Tailgate (daily)
- ☐ Activity Hazard Analysis (prior to new task or operation)
- ☐ Job Safety Analysis (prior to new task or operation)
- ☐ Site Safety Orientation (new personnel)
- ☐ Supervisor's (monthly)
- ☐ Supervisor's (weekly)
- ☐ UXO Awareness
- ☐ Asbestos Awareness
- ☐ Health and Safety Plan Addendum: _____
- ☐ Other: _____

Date/Time: _____ Client: _____

Location: _____ Job No.: _____

Meeting/training conducted by: _____

Work Activities: _____

Safety / Training Topics Presented

Chemical Hazards: _____

Physical Hazards: _____

Specific Safety Topic(s): _____

_____

Specific Training Covered: _____

_____

Attendees

Name Printed and Employee Number:	Signature:

SAFETY MEETING / TRAINING LOG
(Continued)

Date: ________________________ Job No.: ________________________

Attendees

Name Printed and Employee Number:	Signature:

SITE ENTRY LOG

Date: _____ Client: _____

Location: _____ Job No.: _____

Name	Representing	Time In	Time Out

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SOILS CLASSIFICATION WORKSHEET

The following worksheet outlines the visual and manual tests that the competent person must perform at least once, and each time soil conditions change. At least one visual and one manual test must be performed; however, performing several tests is recommended so that the condition of the excavation is thoroughly examined.

Project Name: _____ Project Number: _____

Date: _____ Time: _____

Where was the sample taken from? _____

I.	**Visual Tests:** *One or more visual tests are required for each classification and each time conditions change*		
1.	Estimate range of particle sizes:	a. primarily fine-grained = cohesive material b. primarily coarse-grained = granular material	
2.	Observe excavated soil:	a. clumps = cohesive material b. breaks up easily = granular material	
3.	Observe sides and adjacent surface area of opened excavation:	a. crack like openings = fissured material b. soil spills off vertical sides = possible fissured material	
4.	Previous excavation activities:	a. previously disturbed soil	b. not previously disturbed soil
5.	Observe opened side of excavation:	a. layered systems c. estimate degree of slope of layers:	b. layers sloped towards excavation _____
6.	Water condition:	a. evidence of surface water c. depth of water table:	b. water seeping from sides _____
7.	Vibration present:	a. Area adjacent to excavation	b. Area within excavation
II.	**Manual Tests** – *One or more manual tests are required for classification and each time soil conditions change*		
1.	Plastically – soil is cohesive if following is true:	a. mold soil samples into a small ball b. roll ball into thread ___ " diameter c. pick up 2" length of ___ " thread by one end without breaking	
2.	Dry Soil Strength:	a. crumbles on its own or with moderate pressure = granular b. falls into clumps which break into smaller clumps that are only broken with difficulty = clay with gravel, sand, or silt. c. breaks into clumps which do not break into smaller clumps and can only be broken with difficulty with no visual indication of fissures = unfissured.	
3.	Thumb penetration test: *(These tests are to be run on a large clump of material as soon as it is excavated).*	a. can be easily indented by the thumb but penetrated by thumb only with great effort = Type a b. easily penetrated several inches by thumb and molded by light finger pressure = Type c	
4.	Unconfined Compressive Strength: *(Saturated Soil Needed)*	a. Pocket Penetrometer reading (take 10 readings and average) 0 – 0.5 = Type C, 0.5 – 1.5 = Type B, 1.5 – 2.0 – Type A b. Shear Vane reading X2: 0 – 0.5 = Type C, 0.5 – 1.5 = Type B, 1.5 – 2.0 = Type A	
5.	Drying Test: (A dry soil sample 1" thick X 6" diameter is needed)	a. develops cracks = fissured material dries without cracks and breaks by hand with considerable force significant b. cohesive content = unfissured cohesive material c. sample breaks easily by hand = fissured cohesive or granular material d. easily pulverized dry clumps by hand or by stepping on them = granular e. don't pulverize easily = fissured cohesive.	

Soil Classification: Type A Type B Type C Stable Rock Other _____

Competent Person: _____ (Print Name) _____ (Signature) _____ (Date)

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Sound Level Meter/Noise Dosimeter Calibration Log

Project Name _____ Project# _____

Date _____ Calibrated by _____

Instrument: Manufacturer/Model Number _____

Time	Battery Charged (Y/N)	Sound Level Meter/Dosimeter Serial No.	Calibration Standard dBA	Span Setting (if applicable)	Meter Scale Setting (if applicable)	Zeroed (Y/N)	Expected Meter Reading	Actual Meter Reading	Comments

Comments _____

This page intentionally left blank.

Project: _____

Project Number: _____

TRAINING ACKNOWLEDGMENT FORM

By signing this certificate, you are acknowledging that you have completed the following formal training courses that meet OSHA's requirements:

Training	Date Completed
24-Hour HAZWOPER	_____
40-Hour HAZWOPER	_____
8-Hour Refresher	_____
8-Hour Supervisor	_____

Site-specific Training: I have been provided and have completed the site-specific training. The Site Safety and Health Officer conducted the training.

_____
Employee/Visitor Initials

Respiratory Protection: I have been trained in accordance with the criteria in Shaw Environmental, Inc.'s/my Employer's Respiratory Protection Program. I have been trained in the proper work procedures and use and limitations of the respirator(s) I will potentially wear. I have been trained in and will abide by the facial hair policy.

_____
Employee/Visitor Initials

Respirator Fit-test Training: I have been trained in the proper selection, fit, use, care, cleaning, and maintenance, and storage of the respirator(s) that I will potentially wear. I have been fit-tested in accordance with the criteria in Shaw Environmental, Inc.'s/my Employer's Respiratory Protection Program and have received a satisfactory fit. I have been assigned my individual respirator. I have been taught how to properly perform positive and negative pressure fit-check upon donning negative pressure respirators each time.

_____
Employee/Visitor Initials

Medical Examination: I have had a medical examination within the last twelve months which was paid for by my employer. The examination included: health history, pulmonary function tests and may have included an evaluation of a chest x-ray. A physician made a determination regarding my physical capacity to perform work tasks on the project while wearing protective equipment including a respirator. I was personally provided a copy and informed of the results of that examination. The Site Safety and Health Officer evaluated the medical certification provided by the physician and signed the appropriate blank below. The physician determined that there:

Were no limitations to performing the required work tasks:

_____
Employee/Visitor Initials

Were identified physical limitations to performing the required work tasks:

_____
Employee/Visitor Initials

[Employee's] [Visitor's] Signature _____

Date _____

Printed Name _____

Site Safety and Health Officer Signature _____

Date _____

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U.S. ARMY CORPS OF ENGINEERS
Safety Inspection Checklist for Construction Equipment
(Including Cranes, Derricks, and Hoisting Equipment)

Project Name:	Project Number:	Client:
Project	Contractor	Contract No.
Type and Make of Equipment	Model	Serial No.

Before any machinery or mechanized equipment is placed in use it shall be inspected and tested by a competent mechanic and certified to be in good operating condition. Records of tests and inspections shall be maintained as part of the active contract File at Project or Resident Office. Checklist set forth herein requires the application of EM 385-1-1, US Army Corps of Engineers Safety and Health Requirements Manual, September 1996. The appropriate EM paragraph to be applied is listed at the end of each testing requirement.

CHECKLIST	Yes	No	N/A
1. Are adequate and serviceable fire extinguishers provided? (09.E.01 through 09.E.03)			
2. Are all wire rope cables in good condition? (15.B.01 and 15.B.02)			
3. Are wire rope, sockets, splices, thimbles, and clips and adequate and properly applied? (15.B.03 through 15.B.08)			
4. Are hooks, safety nooks, shackles, rings, etc., in good condition?			
5. Are necessary platforms, foot-walks, etc., provided? (22.A.01 and 22.A.02)			
6. Are access steps, platforms, etc., provided with non-slip surfaces? (21.A.13)			
7. Is operator protected against the elements, falling or flying objects, swinging loads, and similar hazards? (16.B.10, 16.B.11, and 21.A.11)			
8. Are all glasses in operator's compartment safety glass and in good repair? (16.B.10 and 18.A.07)			
9. Is suitable access provided at lubrication points? (16.B.13)			
10. Do all modifications, extensions, replacement parts, and/or repairs to equipment maintain the same factor of safety as original designed equipment? (16.A.18)			
11. Are drums for load lines equipped with at least one positive holding device, applied directly to the motor shaft or some part of the train gear?			
12. Is there sufficient cable to allow three full wraps of cable on drums at all working positions? (16.C.10)			
13. Are adequate headlights, taillights, and turn signals provided and are they in proper operating condition (16.A.07 and 18.A.02 through 18.A.04)			
14. Are all approved brakes on wheeled equipment and in good operating condition? (16.A.07, 18.A.02, and 18.A.05)			
15. Do windshields have wipers in proper operating condition? (16.A.07, 18.A.02, and 18.A.06)			

This form has been amended by ECC to update the references to the September 1996 edition of EM 385-1-1.

CHECKLIST	Yes	No	N/A
16. Are rear view mirrors provided? (18.A.02 and 18.A.06)			
17. Are operating levers equipped with latch and other devices to prevent accidental starting? (18.A.10)			
18. Is engine equipped with power-operated starting device in operative condition? (18.A.06)			
19. Do all pressure vessels have valid inspection certificates? (20.A.03)			
20. Are reverse signal alarms on equipment? (16.B.01)			
21. Are belts, gears, shafts, electrical contacts, etc., adequately guarded? (16.B.03)			
22. Are all hot pipes and surfaces suitably guarded? (16.B.03)			
23. Are fuel tanks located so that spills or overflows will not come in contact with engine or exhaust? (16.B.04)			
24. Are exhausts and discharges so directed as not to endanger workmen or obstruct view of operator? (16.B.05)			
25. Are guards in place on equipment with drop type skip pans? (16.B.03)			
26. Are adequate seats provided for all riders? (16.A.07 and 18.C.01)			
27. Are tires in serviceable condition? Are testing/inspections documented? (18.A.02)			
28. Are steering linkage and tie rod in good operating condition? Are testing/inspections documented? (18.A.02)			
29. Are dump bodies provided with holding device or other suitable device for locking body in raised position? (18.A.10)			
30. Are tailgate dumping devices so arranged that operator will be in the clear while dumping loads? (18.A.10)			
31. Are trip handles provided on tailgates to facilitate handling? (18.A.10)			
32. Is the air hose free from leaks or defects? (20.B.03)			
33. Are safety lashings for quick make-up type connections provided? (20.A.16)			
34. Is an acceptable spark arrestor installed and working?			
35. Do heating devices comply with references?			
36. Does welding equipment comply with code requirements? (10.A.10 and 10.E.01)			
37. Is equipment adequately grounded? (10.E.04 and 10.E.07)			
38. Do electrical components comply with code? (10.E.01)			
39. Are required pressure, temperature, or relief gages and valves installed and operable? (20.A.10 through 20.A.13 and 20.B.02)			
40. Are approved seat belts and rollover protection provided? (16.B.08, 16.B.12, and 18.B.02)			
41. Is recommended preventive maintenance being followed? (16.A.08 and 18.A.02)			
42. Do helicopter cranes meet construction requirements (16.J.01)			
43. Does hydraulic equipment meet special safety conditions (11.H.08, 11.H.09, and 13.A.09)			
44. Is concrete equipment fitted with adequate safety devices? (27.A.04)			

This form has been amended by ECC to update the references to the September 1996 edition of EM 385-1-1.

CHECKLIST	Yes	No	N/A
45. Are elevating and rotating work platforms in conformance with ANSI A92.2? (22.K.01)			
46. Do conveyors, cableways, and related equipment conform to ANSI 320.01?			
47. Are pile drivers equipped with all appropriate safety devices? (16.L)			
48. Do material hoists conform to ANSI A10.5? (16.K.01)			
49. Do passenger elevators conform to ANSI A10.4? Do temporary hoists conform to ANSI A10.22: (21.H)			
50. Do hand and power tools comply with applicable ANSI standards (13.A through 13.G)			
51. Is high voltage sign posted?			
52. Is equipment fitted with positive stops for rotation when near power lines? (11.E and 16.D.06)			
53. Is there any visible evidence of damage to boom? (16.C.12 and Appendix H)			
54. Is the boom position indicator operating and visible to operator? (16.D.01 and 16.D.04)			
55. Have all operators had a current physical examination? (1.C and 16.C.04)			
56. Is breaking equipment capable of effectively braking, lowering, and safely holding a load of at least the full rated load as required?			

Remarks:

Certification: I hereby certify that this item of equipment is in good operating condition and that it meets all above requirements except as noted in the remarks.

_____ _____

Signature of Competent Mechanic Date

_____ _____

Signature of Superintendent/Quality Control Engineer Date

This form has been amended by ECC to update the references to the September 1996 edition of EM 385-1-1.

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UTILITY MARK-OUT DOCUMENTATION

Project Name: _____ Location: _____
FTL Name: _____ Date: _____
Utility Called: _____ Confirmation #: _____
Subcontractor: _____ Task/Activity: _____
County of work: _____ Municipality of work: _____

Before work is done on any site, contact the appropriate local utility locating service (One Call, Miss Dig, Uloco, etc.) or a local utility contractor to have sub grade utilities marked. NOTE: Boring locations to be placed not in the public right of way are typically not marked out by the public utility mark out, and a private utility locate service must be engaged. Indicate to the utility locator the nearest intersecting street for the site: _____

_____ Confirmation No: _____.

List utility firms (public and private) and the utility they will mark.

Utility Marker Emergency Telephone Numbers Major Utilities Marked by Color Code			
Name of Utility Company	Utility	Color Code	Emergency Telephone Number
	Water	Blue	
	Gas	Yellow	
	Electric	Red	
	Telephone/Cable/ Communication	Orange	
	Sewer	Green	
"ALL UNDERGROUND UTILITIES MAY NOT BE LOCATED BY THE LOCAL UTILITY SERVICE." Accordingly, you must list other known utilities in the area that the "One Call" service will not contact:			

Attach photos of the area prior to placing boreholes.
Take photos of the area indicating minimum 5 feet hand dig, post hole dig, probe, GPR, or other.
NOTE: For any borehole, should 5 feet minimum clearance not be obtained, you must contact Business Line VP or equivalent (Operations Director or other on the Federal Business Line) and obtain a variance.

Completed by:

_____ _____ _____
Name Signature Date

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Equipment Services Group

VEHICLE INSPECTION

UNIT NO: _____ **DATE:** _____
MILEAGE: _____ **CURRENT PROJECT NO:** _____
VEHICLE TYPE: _____ **LICENSE NUMBER:** _____
INSPECTED BY: _____ **FUEL FRONT:** _____
EMPLOYEE NUMBER: _____ **FUEL REAR:** _____

For Authorized Repairs On Donlen Vehicles, Call 1-800-323-1483

RETAIN THIS INSPECTION DOCUMENT IN PROJECT FILES

PRE-TRIP **Yes / No** **DAILY (USACE Project)** **Yes / No**

N / A = NOT APPLICABLE **C** = COMMENTS **O** = OKAY **N** = NEEDS ATTENTION

_____	Exterior / Interior Clean	_____	Engine Oil, Oil Pressure
_____	Lights: Head-Tail-Turn-Stop-Emergency-Backup	_____	Transmission Oil & Drive Line
_____	Operating Controls / Gauges	_____	Radiator / Cooling System
_____	Battery / Starter / Horn	_____	Exhaust / Muffler
_____	Air Conditioner / Heater / Defroster	_____	Front Axle / Steering / Suspension System
_____	Back-up Alarm (Trucks)	_____	Donlen Coupon Book
_____	Windshield, Other Glass, Wipers / Washers	_____	First Aid Kit
_____	Mirrors: Inside-Outside (Convex - trucks)	_____	Fire Extinguisher (mounted/accessible/charged)
_____	Insurance Card & Accident Report Kit	_____	Emergency Flares or Reflective Markers
_____	Emergency Phone Number List	_____	Tires / Wheels / Rims
_____	Map to Urgent Care Facility & Hospital	_____	Spare Tire, Jack, Lug Wrench
_____	Current Registration, Plates	_____	Frame / Bumpers
_____	Service Brakes, Emergency/Parking Brakes	_____	Seat Belts (One for Each Passenger)
_____	Trailer Aux Brake Controller/Electrical Connection	_____	Visible Damage to Body
_____	Coupling Devices/Safety Chain Anchor Point	_____	Driver Safety Notification Sticker
_____	Wheel Chocks (When Equipped With Trailer)	_____	Other, Please Enter Comments Below

Was Unit Serviced? Y / N **DATE** **MILES**

COMMENTS: _____

I am authorized to operate this vehicle. _____ Initials

I am licensed to operate this vehicle. _____ Initials

INSPECTORS SIGNATURE: _____ **DATE:** _____

REPORT ALL DEFICIENCIES TO YOUR SUPERVISOR

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Zero Accident Pledge

Shaw® Shaw Environmental, Inc.

We, the undersigned personnel of the _____ Project are committed to a goal of **ZERO ACCIDENTS** for the duration of the project.

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Contract No. FA8903-09-D-8580, Task Order No. 0013 • Draft • Revision 0 • November 2011 • WERC-09-13-002-3

Appendix E
Hazardous Chemical Inventory List and Material Safety Data Sheets

Chemical Inventory
November 1, 2011

Argon
Bentonite
Bleach
Calcium Hydroxide (Hydrated Lime)
Diesel Fuel
Fire extinguisher
Gasoline
Gear lubricant
Grease
Hand cleaner
Hydraulic oil
Hydrochloric Acid
Argon (cryogenic liquified gas)
Hydrogen peroxide (20% - 60% sol)
Isobutylene
Liquinox
Motor oil
Portland cement
Potassium permanganate
Silica sand

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Section 1 - Chemical Product and Company Identification 61

Material Name: Argon
CAS Number: 7440-37-1
Chemical Formula: Ar
Structural Chemical Formula: Ar
EINECS Number: 231-147-0
ACX Number: X1002784-0
Synonyms: Argon; ARGON; ARGON-40
General Use: To provide an inert i.e. non reactive, non oxidizing atmosphere for gas welding; usually TIG and MIG welding.
Used in incandescent and fluorescent tubes, also with mixtures of neon for neon lights. Argon alone produces a bluish-purplish light.
As an inerting gas in rectifier tubes; in thermometers above mercury; in lasers; in chromatography and ionization chambers and particle counters.

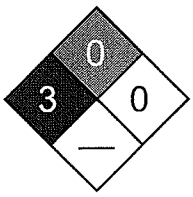
Section 2 - Composition / Information on Ingredients

Name	CAS	%
argon	7440-37-1	>99

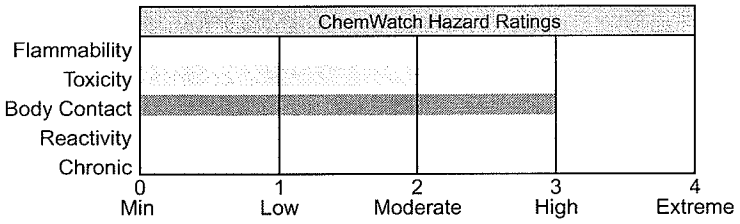
OSHA PEL **NIOSH REL**

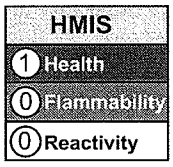
ACGIH TLV

Section 3 - Hazards Identification



Fire Diamond





ANSI Signal Word
Warning!


Compressed Gas

☆☆☆☆☆ Emergency Overview ☆☆☆☆☆

Odorless, colorless gas. Stored as a compressed gas which may cause frostbite. Other Acute Effects: simple asphyxiant.

Potential Health Effects

Target Organs: central nervous system (CNS) (gas as an indirect effect of lack of oxygen), skin (liquid)
Primary Entry Routes: inhalation, skin contact
Acute Effects
Inhalation: The gas is a simple asphyxiant (precludes access to oxygen) and inhalation may cause loss of consciousness.
Material is highly volatile and may quickly form concentrated atmosphere in confined or unventilated area. Vapor is heavier than air and may displace and replace air in breathing zone, acting as a simple asphyxiant. This may happen with little warning of overexposure.
Symptoms of asphyxia (suffocation) may include headache, dizziness, shortness of breath, muscular weakness, drowsiness and ringing in the ears.

If the asphyxia is allowed to progress, there may be nausea and vomiting, further physical weakness and unconsciousness and, finally, convulsions, coma and death. Significant concentrations of the non-toxic gas reduce the oxygen level in the air. As the amount of oxygen is reduced from 21 to 14 volume %, the pulse rate accelerates and the rate and volume of breathing increase. The ability to maintain attention and think clearly is diminished and muscular coordination is somewhat disturbed. As oxygen decreases from 14-10% judgement becomes faulty; severe injuries may cause no pain. Muscular exertion leads to rapid fatigue. Further reduction to 6% may produce nausea and vomiting and the ability to move may be lost.

Permanent brain damage may result even after resuscitation at exposures to this lower oxygen level. Below 6% breathing is in gasps and convulsions may occur. Inhalation of a mixture containing no oxygen may result in unconsciousness from the first breath and death will follow in a few minutes.

Eye: The gas is non-irritating and non-toxic.

The liquid is capable of causing severe cold burns and is capable of causing severe damage with loss of sight.

Skin: The gas is non-irritating and non-toxic.

Vaporizing liquid causes rapid cooling and contact may cause cold burns, frostbite.

Ingestion: Overexposure is unlikely in this form.

Considered an unlikely route of entry in commercial/industrial environments.

Carcinogenicity: NTP - Not listed; IARC - Not listed; OSHA - Not listed; NIOSH - Not listed; ACGIH - Not listed; EPA - Not listed; MAK - Not listed.

Chronic Effects: No data found.

Section 4 - First Aid Measures

Inhalation: Remove to fresh air.

Lay patient down. Keep warm and rested.

If breathing is shallow or has stopped, ensure clear airway and apply resuscitation. Transport to hospital or doctor.

Eye Contact: In case of contact with liquid: promptly flush eyes with tepid water. Seek medical attention immediately.

Skin Contact: In case of cold burns (frost-bite): Bathe the affected area immediately in cold water for 10 to 15 minutes, immersing if possible and without rubbing.

Do not apply hot water or radiant heat. Apply a clean, dry dressing.

Transport to hospital or doctor.

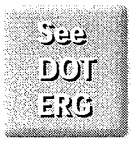
Ingestion: Not applicable.

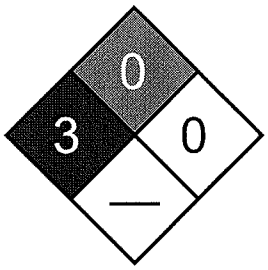
After first aid, get appropriate in-plant, paramedic, or community medical support.

Note to Physicians: Treat symptomatically.

Give oxygen therapy following asphyxiation.

Section 5 - Fire-Fighting Measures





Fire Diamond

Flash Point: Will not burn

Autoignition Temperature: Nonflammable

LEL: Not applicable

UEL: Not applicable

Extinguishing Media: There is no restriction on the type of extinguisher which may be used.

Use fire fighting procedures suitable for surrounding area.

General Fire Hazards/Hazardous Combustion Products: Noncombustible. Heating may cause expansion or decomposition leading to violent rupture of containers.

Fire Incompatibility: Very inert, chemically.

Fire-Fighting Instructions: Contact fire department and tell them location and nature of hazard.

Product is not combustible. No special firefighting procedures required.

Use fire fighting procedures suitable for surrounding area.

Wear breathing apparatus plus protective gloves. May be washed to drain with large quantities of water.

Cool fire-exposed containers with water spray from a protected location.

If safe to do so, remove containers from path of fire.

Section 6 - Accidental Release Measures

Small Spills: Increase ventilation. Avoid breathing vapors and contact with skin and eyes.

Apply leak detection solution to suspected sites in lines and equipment.

Stop leak if safe to do so.

Large Spills: Clear area of personnel.

Wear breathing apparatus plus protective gloves. May be washed to drain with large quantities of water.

Increase ventilation.
Stop leak if safe to do so.
Remove leaking cylinders to a safe place if possible. Release pressure under safe, controlled conditions by opening the valve.
Regulatory Requirements: Follow applicable OSHA regulations (29 CFR 1910.120).

Section 7 - Handling and Storage

Handling Precautions: Avoid breathing vapors and contact with skin and eyes. Avoid sources of heat.
Avoid physical damage to containers.
Use in a well-ventilated area.
Keep containers securely sealed when not in use.
Prevent concentration in hollows and sumps. DO NOT enter confined spaces until atmosphere has been checked.
Recommended Storage Methods: Check that containers are clearly labeled. Cylinder. Ensure the use of equipment rated for cylinder pressure.
Ensure the use of compatible materials of construction.
Valve protection cap to be in place until cylinder is secured, connected.
Cylinder must be properly secured either in use or in storage.
Cylinder valve must be closed when not in use or when empty.
Segregate full from empty cylinders.
WARNING: Suckback into cylinder may result in rupture.
Use back-flow preventive device in piping.
Regulatory Requirements: Follow applicable OSHA regulations.

Section 8 - Exposure Controls / Personal Protection

Engineering Controls: General exhaust is adequate under normal operating conditions. Air-line hood.
If risk of overexposure exists, wear air supplied breathing apparatus.
Provide adequate ventilation in warehouse or closed storage areas.
Personal Protective Clothing/Equipment:
Eyes: Safety glasses with side shields; or as required, chemical goggles.
Contact lenses pose a special hazard; soft lenses may absorb irritants and all lenses concentrate them.
Hands/Feet: Wear chemical protective gloves, eg. PVC. Wear safety footwear.
Other: Overalls. Eyewash unit.

Section 9 - Physical and Chemical Properties

Appearance/General Info: Colorless, odorless compressed gas. Constitutes approximately 0.93% of dry atmospheric air. An element characterized by its extreme lack of chemical reactivity. Permanent gas: Critical temperature; -122.4 °C. Critical pressure: 4864 kPa.

Physical State: Compressed gas
Vapor Density (Air=1): 1.38
Formula Weight: 39.95
Specific Gravity (H_2O=1, at 4 °C): Not applicable
Evaporation Rate: > 1
pH: Not applicable
pH (1% Solution): Not applicable
Boiling Point: -185.8 °C (-302 °F)
Freezing/Melting Point: -192.2 °C (-313.96 °F)
Volatile Component (% Vol): 100
Decomposition Temperature (°C): Not applicable
Water Solubility: Slightly soluble in water

Section 10 - Stability and Reactivity

Stability/Polymerization/Conditions to Avoid: Product is considered stable. Hazardous polymerization will not occur.
Storage Incompatibilities: Very inert, chemically.

Section 11 - Toxicological Information

No relevant toxicological data found at time of research.

See *RTECS* CF 2300000, for additional data.

Section 12 - Ecological Information

Environmental Fate: No data found.
Ecotoxicity: No data found.

Section 13 - Disposal Considerations

Disposal: Return empty containers to supplier.

Section 14 - Transport Information

DOT Hazardous Materials Table Data (49 CFR 172.101):

Shipping Name and Description: Argon, compressed
ID: UN1006
Hazard Class: 2.2 - Non-flammable compressed gas
Packing Group:
Symbols:
Label Codes: 2.2 - Non-Flammable Gas
Special Provisions:
Packaging: **Exceptions:** 306 **Non-bulk:** 302 **Bulk:** 314, 315
Quantity Limitations: **Passenger aircraft/rail:** 75 kg **Cargo aircraft only:** 150 kg
Vessel Stowage: **Location:** A **Other:**

Section 15 - Regulatory Information

EPA Regulations:
RCRA 40 CFR: Not listed
CERCLA 40 CFR 302.4: Not listed
SARA 40 CFR 372.65: Not listed
SARA EHS 40 CFR 355: Not listed
TSCA: Listed

Section 16 - Other Information

Disclaimer: Judgments as to the suitability of information herein for the purchaser's purposes are necessarily the purchaser's responsibility. Although reasonable care has been taken in the preparation of such information, Genium Group, Inc. extends no warranties, makes no representations, and assumes no responsibility as to the accuracy or suitability of such information for application to the purchaser's intended purpose or for consequences of its use.

BAROID DRILLING FLUIDS
BENTONITE PELLETS 3\8 INCH **Revised: 01/03/2008**

MSDS Contents

HALLIBURTON

MATERIAL SAFETY DATA SHEET

PRODUCT TRADE NAME: BENTONITE PELLETS 3\8 INCH

REVISION DATE: 03-JAN-2008

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

PRODUCT TRADE NAME: BENTONITE PELLETS 3\8 INCH

SYNONYMS: NONE

CHEMICAL FAMILY: MINERAL

APPLICATION: WEIGHT ADDITIVE

MANUFACTURER/SUPPLIER:
BAROID FLUID SERVICES
PRODUCT SERVICE LINE OF HALLIBURTON
P.O. BOX 1675
HOUSTON, TX 77251

TELEPHONE: (281) 871-4000

EMERGENCY TELEPHONE: (281) 575-5000

PREPARED BY: CHEMICAL COMPLIANCE

TELEPHONE: 1-580-251-4335

E-MAIL: FDUNEXCHEM@HALLIBURTON.COM

2. COMPOSITION/INFORMATION ON INGREDIENTS

SUBSTANCE	CAS NUMBER	PERCENT

CRYSTALLINE SILICA, CRISTOBALITE	14464-46-1	0 - 1%
CRYSTALLINE SILICA, TRIDYMITE	15468-32-3	0 - 1%
CRYSTALLINE SILICA, QUARTZ	14808-60-7	<3
BENTONITE	1302-78-9	60 - 100%

SUBSTANCE	ACGIH TLV-TWA	OSHA PEL-TWA
CRYSTALLINE SILICA, CRISTOBALITE	0.025 MG/M3	1/2 X 10 MG/M3/ %SiO2 + 2
CRYSTALLINE SILICA, TRIDYMITE	0.05 MG/M3	1/2 X 10 MG/M3/ %SiO2 + 2
CRYSTALLINE SILICA, QUARTZ	0.025 MG/M3	10 MG/M3/ %SiO2 + 2
BENTONITE	NOT APPLICABLE	NOT APPLICABLE

MORE RESTRICTIVE EXPOSURE LIMITS MAY BE ENFORCED BY SOME STATES, AGENCIES, OR OTHER AUTHORITIES.

3. HAZARDS IDENTIFICATION

HAZARD OVERVIEW:

CAUTION!

ACUTE HEALTH HAZARD: MAY CAUSE EYE AND RESPIRATORY IRRITATION.

DANGER!

CHRONIC HEALTH HAZARD:
BREATHING CRYSTALLINE SILICA CAN CAUSE LUNG DISEASE, INCLUDING SILICOSIS AND LUNG CANCER. CRYSTALLINE SILICA HAS ALSO BEEN ASSOCIATED WITH SCLERODERMA AND KIDNEY DISEASE.

THIS PRODUCT CONTAINS QUARTZ, CRISTOBALITE, AND/OR TRIDYMITE WHICH MAY BECOME AIRBORNE WITHOUT A VISIBLE CLOUD. AVOID BREATHING DUST. AVOID CREATING DUSTY CONDITIONS. USE ONLY WITH ADEQUATE VENTILATION TO KEEP EXPOSURES BELOW RECOMMENDED EXPOSURE LIMITS. WEAR A NIOSH CERTIFIED, EUROPEAN STANDARD EN 149, OR EQUIVALENT RESPIRATOR WHEN USING THIS PRODUCT. REVIEW THE MATERIAL SAFETY DATA SHEET (MSDS) FOR THIS PRODUCT, WHICH HAS BEEN PROVIDED TO YOUR EMPLOYER.

4. FIRST AID MEASURES

INHALATION:
IF INHALED, REMOVE FROM AREA TO FRESH AIR. GET MEDICAL ATTENTION IF RESPIRATORY IRRITATION DEVELOPS OR IF BREATHING BECOMES DIFFICULT.

SKIN: WASH WITH SOAP AND WATER. GET MEDICAL ATTENTION IF IRRITATION PERSISTS.

EYES:
IN CASE OF CONTACT, IMMEDIATELY FLUSH EYES WITH PLENTY OF WATER FOR AT LEAST 15 MINUTES AND GET MEDICAL ATTENTION IF IRRITATION PERSISTS.

INGESTION: UNDER NORMAL CONDITIONS, FIRST AID PROCEDURES ARE NOT REQUIRED.

NOTES TO PHYSICIAN: TREAT SYMPTOMATICALLY.

5. FIRE FIGHTING MEASURES

FLASH POINT/RANGE (F): NOT DETERMINED
FLASH POINT/RANGE (C): NOT DETERMINED
FLASH POINT METHOD: NOT DETERMINED

AUTOIGNITION TEMPERATURE (F): NOT DETERMINED

AUTOIGNITION TEMPERATURE (C): NOT DETERMINED

FLAMMABILITY LIMITS IN AIR - LOWER (%): NOT DETERMINED
FLAMMABILITY LIMITS IN AIR - UPPER (%): NOT DETERMINED

FIRE EXTINGUISHING MEDIA: ALL STANDARD FIREFIGHTING MEDIA.

SPECIAL EXPOSURE HAZARDS: NOT APPLICABLE.

SPECIAL PROTECTIVE EQUIPMENT FOR FIRE-FIGHTERS: NOT APPLICABLE.

NFPA RATINGS:
HEALTH 0
FLAMMABILITY 0
REACTIVITY 0

HMIS RATINGS:
HEALTH 0*
FLAMMABILITY 0
REACTIVITY 0

6. ACCIDENTAL RELEASE MEASURES

PERSONAL PRECAUTIONARY MEASURES:
USE APPROPRIATE PROTECTIVE EQUIPMENT. AVOID CREATING AND BREATHING DUST.

ENVIRONMENTAL PRECAUTIONARY MEASURES: NONE KNOWN.

PROCEDURE FOR CLEANING / ABSORPTION:
COLLECT USING DUSTLESS METHOD AND HOLD FOR APPROPRIATE DISPOSAL. CONSIDER POSSIBLE TOXIC OR FIRE HAZARDS ASSOCIATED WITH CONTAMINATING SUBSTANCES AND USE APPROPRIATE METHODS FOR COLLECTION, STORAGE AND DISPOSAL.

7. HANDLING AND STORAGE

HANDLING PRECAUTIONS:
THIS PRODUCT CONTAINS QUARTZ, CRISTOBALITE, AND/OR TRIDYMITE WHICH MAY BECOME AIRBORNE WITHOUT A VISIBLE CLOUD. AVOID BREATHING DUST. AVOID CREATING DUSTY CONDITIONS. USE ONLY WITH ADEQUATE VENTILATION TO KEEP EXPOSURE BELOW RECOMMENDED EXPOSURE LIMITS. WEAR A NIOSH CERTIFIED, EUROPEAN STANDARD EN 149, OR EQUIVALENT RESPIRATOR WHEN USING THIS PRODUCT. MATERIAL IS SLIPPERY WHEN WET.

STORAGE INFORMATION:

USE GOOD HOUSEKEEPING IN STORAGE AND WORK AREAS TO PREVENT ACCUMULATION OF DUST.

CLOSE CONTAINER WHEN NOT IN USE. DO NOT REUSE EMPTY CONTAINER.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

ENGINEERING CONTROLS:
USE APPROVED INDUSTRIAL VENTILATION AND LOCAL EXHAUST AS REQUIRED TO MAINTAIN EXPOSURES BELOW APPLICABLE EXPOSURE LIMITS LISTED IN SECTION 2.

RESPIRATORY PROTECTION:
WEAR A NIOSH CERTIFIED, EUROPEAN STANDARD EN 149, OR EQUIVALENT RESPIRATOR WHEN USING THIS PRODUCT.

HAND PROTECTION: NORMAL WORK GLOVES.

SKIN PROTECTION:
WEAR CLOTHING APPROPRIATE FOR THE WORK ENVIRONMENT. DUSTY CLOTHING SHOULD BE LAUNDERED BEFORE REUSE. USE PRECAUTIONARY MEASURES TO AVOID CREATING DUST WHEN REMOVING OR LAUNDERING CLOTHING.

EYE PROTECTION: WEAR SAFETY GLASSES OR GOGGLES TO PROTECT AGAINST EXPOSURE.

OTHER PRECAUTIONS: NONE KNOWN.

9. PHYSICAL AND CHEMICAL PROPERTIES

PHYSICAL STATE: SOLID

COLOR: VARIOUS

ODOR: ODORLESS

pH: 8 - 10

SPECIFIC GRAVITY @ 20 C (WATER=1): 2.55

DENSITY @ 20 C (LBS./GALLON): 62

BULK DENSITY @ 20 C (LBS/FT3): 71

BOILING POINT/RANGE (F): NOT DETERMINED
BOILING POINT/RANGE (C): NOT DETERMINED

FREEZING POINT/RANGE (F): NOT DETERMINED
FREEZING POINT/RANGE (C): NOT DETERMINED

VAPOR PRESSURE @ 20 C (MMHg): NOT DETERMINED

VAPOR DENSITY (AIR=1): NOT DETERMINED

PERCENT VOLATILES: NOT DETERMINED

EVAPORATION RATE (BUTYL ACETATE=1): NOT DETERMINED

SOLUBILITY IN WATER (G/100 ML): INSOLUBLE

SOLUBILITY IN SOLVENTS (G/100 ML): NOT DETERMINED

VOCS (LBS./GALLON): NOT DETERMINED

VISCOSITY, DYNAMIC @ 20 C (CENTIPOISE): NOT DETERMINED

VISCOSITY, KINEMATIC @ 20 C (CENTISTROKES): NOT DETERMINED

PARTITION COEFFICIENT/n-OCTANOL/WATER: NOT DETERMINED

MOLECULAR WEIGHT (G/MOLE): NOT DETERMINED

10. STABILITY AND REACTIVITY

STABILITY DATA: STABLE

HAZARDOUS POLYMERIZATION: WILL NOT OCCUR

CONDITIONS TO AVOID: NONE ANTICIPATED

INCOMPATIBILITY (MATERIALS TO AVOID): HYDROFLUORIC ACID.

HAZARDOUS DECOMPOSITION PRODUCTS:
AMORPHOUS SILICA MAY TRANSFORM AT ELEVATED TEMPERATURES TO TRIDYMITE (870 C) OR CRISTOBALITE (1470 C).

ADDITIONAL GUIDELINES: NOT APPLICABLE

11. TOXICOLOGICAL INFORMATION

PRINCIPLE ROUTE OF EXPOSURE: EYE OR SKIN CONTACT, INHALATION.

INHALATION:
INHALED CRYSTALLINE SILICA IN THE FORM OF QUARTZ OR CRISTOBALITE FROM OCCUPATIONAL SOURCES IS CARCINOGENIC TO HUMANS (IARC, GROUP 1). THERE IS SUFFICIENT EVIDENCE IN EXPERIMENTAL ANIMALS FOR THE CARCINOGENICITY OF TRIDYMITE (IARC, GROUP 2A).

BREATHING SILICA DUST MAY CAUSE IRRITATION OF THE NOSE, THROAT, AND RESPIRATORY PASSAGES. BREATHING SILICA DUST MAY NOT CAUSE NOTICEABLE INJURY OR ILLNESS EVEN THOUGH PERMANENT LUNG DAMAGE MAY BE OCCURRING. INHALATION OF DUST MAY ALSO HAVE SERIOUS CHRONIC HEALTH EFFECTS (SEE "CHRONIC EFFECTS/CARCINOGENICITY" SUBSECTION BELOW).

SKIN CONTACT: MAY CAUSE MECHANICAL SKIN IRRITATION.

EYE CONTACT: MAY CAUSE EYE IRRITATION.

INGESTION: NONE KNOWN

AGGRAVATED MEDICAL CONDITIONS:
INDIVIDUALS WITH RESPIRATORY DISEASE, INCLUDING BUT NOT LIMITED TO ASTHMA AND BRONCHITIS, OR SUBJECT TO EYE IRRITATION, SHOULD NOT BE EXPOSED TO QUARTZ DUST.

CHRONIC EFFECTS/CARCINOGENICITY:

SILICOSIS:
EXCESSIVE INHALATION OF RESPIRABLE CRYSTALLINE SILICA DUST MAY CAUSE A PROGRESSIVE, DISABLING, AND SOMETIMES-FATAL LUNG DISEASE CALLED SILICOSIS.

SYMPTOMS INCLUDE COUGH, SHORTNESS OF BREATH, WHEEZING, NON-SPECIFIC CHEST ILLNESS, AND REDUCED PULMONARY FUNCTION. THIS DISEASE IS EXACERBATED BY SMOKING. INDIVIDUALS WITH SILICOSIS ARE PREDISPOSED TO DEVELOP TUBERCULOSIS.

CANCER STATUS:
THE INTERNATIONAL AGENCY FOR RESEARCH ON CANCER (IARC) HAS DETERMINED THAT CRYSTALLINE SILICA INHALED IN THE FORM OF QUARTZ OR CRISTOBALITE FROM OCCUPATIONAL SOURCES CAN CAUSE LUNG CANCER IN HUMANS (GROUP 1 - CARCINOGENIC TO HUMANS) AND HAS DETERMINED THAT THERE IS SUFFICIENT EVIDENCE IN EXPERIMENTAL ANIMALS FOR THE CARCINOGENICITY OF TRIDYMITE (GROUP 2A - POSSIBLE CARCINOGEN TO HUMANS). REFER TO IARC MONOGRAPH 68, SILICA, SOME SILICATES AND ORGANIC FIBRES (JUNE 1997) IN CONJUNCTION WITH THE USE OF THESE MINERALS. THE NATIONAL TOXICOLOGY PROGRAM CLASSIFIES RESPIRABLE CRYSTALLINE SILICA AS "KNOWN TO BE A HUMAN CARCINOGEN". REFER TO THE 9TH REPORT ON CARCINOGENS (2000). THE AMERICAN CONFERENCE OF GOVERNMENTAL INDUSTRIAL HYGIENISTS (ACGIH) CLASSIFIES CRYSTALLINE SILICA, QUARTZ, AS A SUSPECTED HUMAN CARCINOGEN (A2).

THERE IS SOME EVIDENCE THAT BREATHING RESPIRABLE CRYSTALLINE SILICA OR THE DISEASE SILICOSIS IS ASSOCIATED WITH AN INCREASED INCIDENCE OF SIGNIFICANT DISEASE ENDPOINTS SUCH AS SCLERODERMA (AN IMMUNE SYSTEM DISORDER MANIFESTED BY SCARRING OF THE LUNGS, SKIN, AND OTHER INTERNAL ORGANS) AND KIDNEY DISEASE.

OTHER INFORMATION:
FOR FURTHER INFORMATION CONSULT "ADVERSE EFFECTS OF CRYSTALLINE SILICA EXPOSURE" PUBLISHED BY THE AMERICAN THORACIC SOCIETY MEDICAL SECTION OF THE AMERICAN LUNG ASSOCIATION, AMERICAN JOURNAL OF RESPIRATORY AND CRITICAL CARE MEDICINE, VOLUME 155, PAGES 761-768 (1997).

TOXICITY TESTS:
ORAL TOXICITY: NOT DETERMINED
DERMAL TOXICITY: NOT DETERMINED
INHALATION TOXICITY: NOT DETERMINED
PRIMARY IRRITATION EFFECT: NOT DETERMINED

CARCINOGENICITY:
REFER TO IARC MONOGRAPH 68, SILICA, SOME SILICATES AND ORGANIC FIBRES (JUNE 1997).

GENOTOXICITY: NOT DETERMINED

REPRODUCTIVE / DEVELOPMENTAL TOXICITY: NOT DETERMINED

12. ECOLOGICAL INFORMATION

MOBILITY (WATER/SOIL/AIR): NOT DETERMINED

PERSISTENCE/DEGRADABILITY: NOT DETERMINED

BIO-ACCUMULATION: NOT DETERMINED

ECOTOXICOLOGICAL INFORMATION:

ACUTE FISH TOXICITY: NOT DETERMINED

ACUTE CRUSTACEANS TOXICITY:NOT DETERMINED

ACUTE ALGAE TOXICITY: NOT DETERMINED

CHEMICAL FATE INFORMATION: NOT DETERMINED

OTHER INFORMATION: NOT APPLICABLE

13. DISPOSAL CONSIDERATIONS

DISPOSAL METHOD:
BURY IN A LICENSED LANDFILL ACCORDING TO FEDERAL, STATE, AND LOCAL REGULATIONS.

CONTAMINATED PACKAGING: FOLLOW ALL APPLICABLE NATIONAL OR LOCAL REGULATIONS.

14. TRANSPORT INFORMATION

LAND TRANSPORTATION:
DOT: NOT RESTRICTED
CANADIAN TDG: NOT RESTRICTED
ADR: NOT RESTRICTED

AIR TRANSPORTATION:
ICAO/IATA: NOT RESTRICTED

SEA TRANSPORTATION:
IMDG: NOT RESTRICTED

OTHER SHIPPING INFORMATION:
LABELS: NONE

15. REGULATORY INFORMATION

US REGULATIONS:

US TSCA INVENTORY: ALL COMPONENTS LISTED ON INVENTORY.

EPA SARA TITLE III EXTREMELY HAZARDOUS SUBSTANCES: NOT APPLICABLE

EPA SARA (311,312) HAZARD CLASS:
ACUTE HEALTH HAZARD
CHRONIC HEALTH HAZARD

EPA SARA (313) CHEMICALS:
THIS PRODUCT DOES NOT CONTAIN A TOXIC CHEMICAL FOR ROUTINE ANNUAL "TOXIC CHEMICAL RELEASE REPORTING" UNDER SECTION 313 (40 CFR 372).

EPA CERCLA/SUPERFUND REPORTABLE SPILL QUANTITY: NOT APPLICABLE.

EPA RCRA HAZARDOUS WASTE CLASSIFICATION:
IF PRODUCT BECOMES A WASTE, IT DOES NOT MEET THE CRITERIA OF A HAZARDOUS WASTE AS DEFINED BY THE US EPA.

CALIFORNIA PROPOSITION 65:
THE CALIFORNIA PROPOSITION 65 REGULATIONS APPLY TO THIS PRODUCT.

MA RIGHT-TO-KNOW LAW: ONE OR MORE COMPONENTS LISTED.

NJ RIGHT-TO-KNOW LAW: ONE OR MORE COMPONENTS LISTED.

PA RIGHT-TO-KNOW LAW: ONE OR MORE COMPONENTS LISTED.

CANADIAN REGULATIONS:

CANADIAN DSL INVENTORY: ALL COMPONENTS LISTED ON INVENTORY.

WHMIS HAZARD CLASS:
D2A: VERY TOXIC MATERIALS CRYSTALLINE SILICA

16. OTHER INFORMATION

THE FOLLOWING SECTIONS HAVE BEEN REVISED SINCE THE LAST ISSUE OF THIS MSDS:
NOT APPLICABLE

ADDITIONAL INFORMATION:
FOR ADDITIONAL INFORMATION ON THE USE OF THIS PRODUCT, CONTACT YOUR LOCAL HALLIBURTON REPRESENTATIVE.

FOR QUESTIONS ABOUT THE MATERIAL SAFETY DATA SHEET FOR THIS OR OTHER HALLIBURTON PRODUCTS, CONTACT CHEMICAL COMPLIANCE AT:
1-580-251-4335.

DISCLAIMER STATEMENT:
THIS INFORMATION IS FURNISHED WITHOUT WARRANTY, EXPRESSED OR IMPLIED, AS TO ACCURACY OR COMPLETENESS. THE INFORMATION IS OBTAINED FROM VARIOUS SOURCES INCLUDING THE MANUFACTURER AND OTHER THIRD PARTY SOURCES. THE INFORMATION MAY NOT BE VALID UNDER ALL CONDITIONS NOR IF THIS MATERIAL IS USED IN COMBINATION WITH OTHER MATERIALS OR IN ANY PROCESS. FINAL DETERMINATION OF SUITABILITY OF ANY MATERIAL IS THE SOLE RESPONSIBILITY OF THE USER.

ADVANCED BLENDING
DETERGENT, BLEACH LAUNDRY FEDERAL STOCK 7930-01-236-7280 **Revised: 07/04/1999**

MSDS Contents

MATERIAL SAFETY DATA SHEET

MAY BE USED TO COMPLY WITH OSHA'S HAZARD COMMUNICATION STANDARD, 29 CFR 1910.1200. STANDARD MUST BE CONSULTED FOR SPECIFIC REQUIREMENTS.

U.S. DEPARTMENT OF LABOR

OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION (NON-MANDATORY FORM)

FORMS APPROVED OMB NO.: 1218-0072

N/A-NOT APPLICABLE
N/D-NOT DETERMINED
N/E-NOT ESTIMATED

IDENTITY (AS USED ON LABEL AND LIST):
DETERGENT, BLEACH LAUNDRY FEDERAL STOCK # 7930-01-236-7280

NOTE:
BLANK SPACES ARE NOT PERMITTED. IF ANY ITEM IS NOT APPLICABLE, OR NO INFORMATION IS AVAILABLE, THE SPACE MUST BE MARKED TO INDICATE THAT.

SECTION 1. COMPANY IDENTIFICATION

MANUFACTURER'S NAME: ADVANCED BLENDING

ADDRESS:
645 TOWER DR.
KENNEDALE, TX 76060

EMERGENCY TELEPHONE NUMBER: 817-572-7722 (8-5 PM EST)

NUMBER FOR INFORMATION: SAME

DATE PREPARED: 7/4/99

CONTRACT NUMBER: TC GS 07F-J0119

SECTION 2. HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

HAZARDOUS COMPONENTS (SPECIFIC CHEMICAL IDENTITY; COMMON NAMES)	OSHA PEL	ACGIH TLV	OTHER LIMITS
NO HAZARDOUS COMPONENTS.			

SECTION 3. HAZARDOUS INFORMATION

THIS PRODUCT IS NOT CLASSIFIED AS A HAZARDOUS MATERIAL BY THE U.S. DEPARTMENT OF TRANSPORTATION.

SECTION 4. PHYSICAL CHARACTERISTICS

BOILING POINT: ND

SPECIFIC GRAVITY (H2O = 1): ND

VAPOR PRESSURE (MMHg.): ND

MELTING POINT: NA

VAPOR DENSITY (AIR = 1): ND

EVAPORATION RATE (BUTYL ACETATE = 1): ND

SOLUBILITY IN WATER: COMPLETE

APPEARANCE & ODOR: WHITE POWDER.

SECTION 5. FIRE & EXPLOSION & HAZARD DATA

FLASH POINT (METHOD USED): NA

FLAMMABLE LIMITS: NA
LEL: NA
UEL: NA

EXTINGUISHING MEDIA:
NOT COMBUSTIBLE. WATER SPRAY, DRY CHEMICAL, CO2 OR FOAM MAY BE USED IN AREAS WHERE PRODUCT IS STORED.

SPECIAL FIRE FIGHTING PROCEDURES:
PRODUCT PRESENTS NO UNUSUAL FIRE HAZARD AND REQUIRES NO SPECIAL PROCEDURES.

UNUSUAL FIRE AND EXPLOSION HAZARDS: NONE KNOWN

SECTION 6. REACTIVITY DATA

STABILITY: STABLE

CONDITIONS TO AVOID: STRONG ACIDS

INCOMPATIBILITY (MATERIALS TO AVOID): STRONG ACIDS

HAZARDOUS DECOMPOSITION OR BYPRODUCTS: NONE

HAZARDOUS POLYMERIZATION: WILL NOT OCCUR

CONDITIONS TO AVOID: N/A

SECTION 7. HEALTH HAZARD DATA

ROUTES OF ENTRY:
EYES (X)
INHALATION (X)
SKIN (X)
INGESTION (X)

HEALTH HAZARD (ACUTE & CHRONIC):
MAY BE IRRITATING TO EYES OR SKIN WITH SOME INDIVIDUALS.

CARCINOGENICITY: NONE
NTP:
IARC MONOGRAPHS:
OSHA REGULATED:

SECTION 8. FIRST AID MEASURES

INGESTION: IF INGESTED IN LARGE QUANTITIES, SEEK MEDICAL ATTENTION.

EYES:
IMMEDIATELY FLUSH WITH A DIRECTED STREAM OF WATER FOR AT LEAST 15 MINUTES
HOLDING THE EYELID APART THE ENSURE COMPLETE IRRIGATION OF THE EYE.

SECTION 9. PRECAUTIONS FOR SAFE HANDLING & USE

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED:
IF SPILLED, STEPS SHOULD BE TAKEN TO CONTAIN SPILL, CLEAN AREA OF SPILL
IMMEDIATELY. FOLLOW PROTECTIVE MEASURES PROVIDED UNDER CONTROL MEASURES IN
SECTION 9.

PRECAUTIONS TO BE TAKEN IN HANDLING OR STORING:
FOR BEST PRODUCT PERFORMANCE STORE IN COOL, DRY AREA.

OTHER PRECAUTIONS: KEEP OUT OF THE REACH OF CHILDREN.

SECTION 10. CONTROL MEASURES

RESPIRATORY PROTECTION (SPECIFY TYPE): NONE

VENTILATION:
LOCAL EXHAUST: NA
SPECIAL: NA
MECHANICAL (GENERAL): NA

OTHER: NA

PROTECTIVE GLOVES: NA

EYE PROTECTION: REQUIRED

OTHER PROTECTIVE CLOTHING OR EQUIPMENT: NONE

WORK/HYGIENIC PRACTICES:
CLEAN ALL SPILLS IMMEDIATELY. OBSERVE PERSONAL HYGIENE.

SECTION 11. TOXICOLOGICAL INFORMATION

PRODUCT MAY BE CONSIDERED ALKALINE.

SECTION 12. ECOLOGICAL INFORMATION

THERE IS LIMITED INFORMATION AVAILABLE ON THE ENVIRONMENTAL FATE AND EFFECTS OF THIS MATERIAL. IT IS MISCIBLE IN WATER. THIS COMPOUND IS ALKALINE AND MAY RAISE THE pH OF SURFACE WATERS WITH LOW BUFFERING CAPACITY IF SPILLED. DUE CAUTION SHOULD BE EXERCISED TO PREVENT THE ACCIDENTAL RELEASE OF THIS MATERIAL TO THE ENVIRONMENT. IN CONCENTRATED FORM THIS PRODUCT MAY SHOW TRACE LEVELS OF TOXICITY TO AQUATIC ORGANISMS.

SECTION 13. DISPOSAL CONSIDERATIONS

DISPOSE OF ALL WASTE AND CONTAMINATED EQUIPMENT IN ACCORDANCE WITH ALL APPLICABLE FEDERAL, STATE AND LOCAL HEALTH AND ENVIRONMENTAL REGULATIONS.

SECTION 14. TRANSPORTATION INFORMATION

THIS PRODUCT IS NOT REGULATED.

SECTION 15. REGULATORY INFORMATION

WE REQUEST THAT YOU MAKE ALL INFORMATION IN THIS MATERIAL SAFETY DATA SHEET AVAILABLE TO ALL EMPLOYEES.

SARA/TITLE III HAZARD CATEGORIES:
IF THE WORD "YES" APPEARS NEXT TO ANY CATEGORY, THIS PRODUCT MAY BE REPORTABLE BY YOU UNDER THE REQUIREMENTS OF 40 CFR 370. PLEASE CONSULT THOSE REGULATIONS FOR DETAILS.
IMMEDIATE (ACUTE) HEALTH: YES
DELAYED (CHRONIC) HEALTH: NO
FIRE HAZARD: NO
REACTIVE HAZARD: NO
SUDDEN RELEASE OF PRESSURE: NO

HMIS HAZARD RATINGS:
HEALTH HAZARD 1

FIRE HAZARD 0
REACTIVITY 0

INTERNATIONAL REGULATIONS: CONSULT THE REGULATIONS OF THE IMPORTING COUNTRY.

SECTION 16. OTHER INFORMATION

MSDS LEGEND:
CAS = CHEMICAL ABSTRACTS SERVICE REGISTRY NUMBER
CEILING LIMIT = CEILING LIMIT (15 MINUTES)
OSHA = OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION
TLV = THRESHOLD LIMIT VALUE (ACGIH)
ACGIH = AMERICAN CONFERENCE OF GOVERNMENTAL INDUSTRIAL HYGIENISTS

IMPORTANT:
THE INFORMATION PRESENTED HEREIN, WHILE NOT GUARANTEED, WAS PREPARED BY COMPETENT TECHNICAL PERSONNEL AND IS TRUE AND ACCURATE TO THE BEST OF OUR KNOWLEDGE. WHILE OUR TECHNICAL PERSONNEL WILL BE HAPPY TO RESPOND TO QUESTIONS REGARDING SAFE HANDLING AND USE PROCEDURES, SAFE HANDLING AND USE REMAINS THE RESPONSIBILITY OF THE USER. NO SUGGESTIONS FOR USE ARE INTENDED AS, AND NOTHING HEREIN SHALL BE CONSTRUED AS A RECOMMENDATION TO INFRINGE ANY EXISTING PATENTS OR VIOLATE ANY FEDERAL, STATE, OR LOCAL LAWS, RULES, REGULATIONS OR ORDINANCES.

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Genium group inc.
1171 RiverFront Center, Amsterdam, NY 12010
(518) 842-4111

Issue Date: 2006-06

Section 1 - Chemical Product and Company Identification 61

Material Name: Calcium Hydroxide **CAS Number:** 1305-62-0
Chemical Formula: CaH_2O_2
Structural Chemical Formula: $Ca(OH)_2$
EINECS Number: 215-137-3
ACX Number: X1000175-3
Synonyms: BELL MINE; BIOCALC; CALCIUM DIHYDROXIDE; CALCIUM HYDRATE; CALCIUM HYDROXIDE; CALVIT; CALVITAL; CARBOXIDE; CAUSTIC LIME; HYDRATED LIME; KALKHYDRATE; KEMIKAL; LIMBUX; LIME; LIME MILK; LIME WATER; MILK OF LIME; SLAKED LIME
General Use: Laboratory reagent. A large volume industrial chemical. Manufacture of calcium salts. A binder in mortar, plaster, cement and in building and paving materials. A component in drilling muds, pesticides, fireproof coatings, water paints. As an acid neutralizing agent in water and sewage treatment. Disinfectant. As a flux in steel production; in manufacture of paper pulp. Depilatory, dehairing hides. Poultry food additive - shell forming agent. In purification of sugar.

Section 2 - Composition / Information on Ingredients

Name	CAS	%
calcium hydroxide	1305-62-0	>95

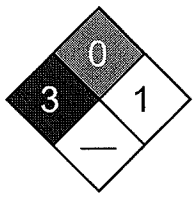
OSHA PEL
TWA: 15 mg/m^3 (total), 5 mg/m^3 (respirable).

NIOSH REL
TWA: 5 mg/m^3.

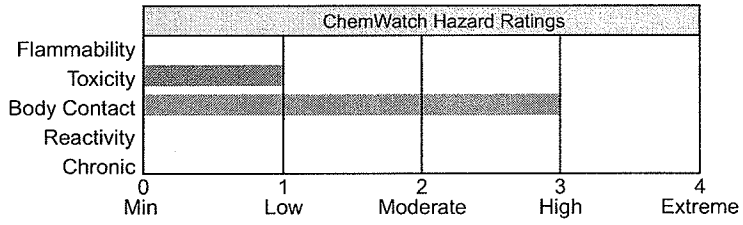
ACGIH TLV
TWA: 5 mg/m^3.

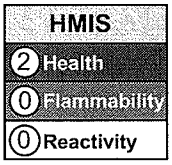
EU OEL
TWA: 5 mg/m^3.

Section 3 - Hazards Identification



Fire Diamond





ANSI Signal Word
Danger!


Corrosive

☆☆☆☆☆ Emergency Overview ☆☆☆☆☆

Odorless, colorless or white crystals or powder. Corrosive, causes severe burns to eyes/skin/respiratory tract.
Chronic Effects: repeated skin contact can cause dermatitis.

Potential Health Effects

Target Organs: eyes, skin, mucous membranes
Primary Entry Routes: inhalation, ingestion, eye contact, skin contact
Acute Effects
Inhalation: The dust may be discomforting if inhaled.
Reactions may not occur on exposure but response may be delayed with symptoms only appearing many hours later.
Minor exposures / slow dissolution in body fluids in the upper respiratory tract and lungs may produce delayed severe irritation or burning sensation.
Severe acute dust inhalation may produce laryngitis and pulmonary edema.

Eye: The dust may be extremely discomforting to the eyes and is capable of causing pain and severe conjunctivitis.
Corneal injury may develop, with possible permanent impairment of vision, if not promptly and adequately treated.
The material may produce severe irritation to the eye causing pronounced inflammation. Repeated or prolonged exposure to irritants may produce conjunctivitis.

Skin: The material is moderately discomforting to the skin and may cause drying of the skin which may lead to dermatitis or if exposure is prolonged may cause blisters or burns.
Solution of material in moisture on the skin or in perspiration may markedly increase skin corrosion and accelerate tissue destruction.
Open cuts, abraded or irritated skin should not be exposed to this material.
The material may accentuate any pre-existing skin condition.

Ingestion: Considered an unlikely route of entry in commercial/industrial environments.
Small amounts or low dose rates are regarded as practically non-harmful.
The material is highly discomforting and may be harmful if swallowed in large quantity.

Carcinogenicity: NTP - Not listed; IARC - Not listed; OSHA - Not listed; NIOSH - Not listed; ACGIH - Not listed; EPA - Not listed; MAK - Not listed.

Chronic Effects: Chronic exposure symptom is narrowing of the esophagus, with difficulty in swallowing. This may happen after weeks, months or years of exposure.

Section 4 - First Aid Measures

Inhalation: Remove to fresh air.
Encourage patient to blow nose to ensure clear breathing passages. Rinse mouth with water. Consider drinking water to remove dust from throat.
Seek medical attention if irritation or discomfort persist.

Eye Contact: Immediately hold the eyes open and flush continuously for at least 15 minutes with fresh running water. Ensure irrigation under eyelids by occasionally lifting the upper and lower lids.
Transport to hospital or doctor without delay. Removal of contact lenses after an eye injury should only be undertaken by skilled personnel.

Skin Contact: Immediately remove all contaminated clothing, including footwear (after rinsing with water).
Wash affected areas thoroughly with water (and soap if available).
Seek medical attention in event of irritation.

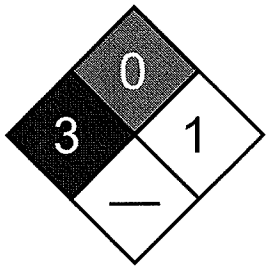
Ingestion: Rinse mouth out with plenty of water. DO NOT induce vomiting.
Observe the patient carefully. Never give liquid to a person showing signs of being sleepy or with reduced awareness; i.e. becoming unconscious.
Give water (or milk) to rinse out mouth. Then provide liquid slowly and as much as casualty can comfortably drink.
Transport to hospital or doctor without delay.

After first aid, get appropriate in-plant, paramedic, or community medical support.

Note to Physicians: For acute or short-term repeated exposures to highly alkaline materials:
1.Respiratory stress is uncommon but presents occasionally because of soft tissue edema.
2.Unless endotracheal intubation can be accomplished under direct vision, cricothyroidotomy or tracheotomy may be necessary.
3.Oxygen is given as indicated.
4.The presence of shock suggests perforation and mandates an intravenous line and fluid administration.
5.Alkali corrosives cause damage by liquefaction necrosis whereby the saponification of fats and solubilization of proteins allow deep penetration into the tissue.
Alkalis continue to cause damage after exposure.
INGESTION:
1.Milk and water are the preferred dilutents. No more than 2 glasses of water should be given to an adult.
2.Neutralizing agents should never be given since exothermic heat reaction may compound injury.
* Catharsis and emesis are absolutely contra-indicated.
* Activated charcoal does not absorb alkali.
* Gastric lavage should not be used.
Supportive care involves the following.
1. Withhold oral feedings initially.
2. If endoscopy confirms transmucosal injury start steroids only within the first 48 hours.
3. Carefully evaluate the amount of tissue necrosis before assessing the need for surgical intervention.
4. Patients should be instructed to seek medical attention whenever they develop difficulty in swallowing (dysphagia).
SKIN AND EYE:
Injury should be irrigated for 20-30 minutes. Eye injuries require saline.

Section 5 - Fire-Fighting Measures

Flash Point: Nonflammable
Autoignition Temperature: Not applicable
LEL: Not applicable
UEL: Not applicable
Extinguishing Media: There is no restriction on the type of extinguisher which may be used.
General Fire Hazards/Hazardous Combustion Products: Noncombustible.
Not considered to be a significant fire risk; however, containers may burn.
In a fire may decompose on heating and produce toxic/corrosive fumes.
Fire Incompatibility: Reacts violently with maleic anhydride, phosphorus, acids.
Reacts with aluminum/zinc producing flammable, explosive hydrogen gas.
Fire-Fighting Instructions: Contact fire department and tell them location and nature of hazard.
Wear breathing apparatus plus protective gloves for fire only. Prevent, by any means available, spillage from entering drains or waterways.
Use fire fighting procedures suitable for surrounding area.
Do not approach containers suspected to be hot.
Cool fire-exposed containers with water spray from a protected location.
If safe to do so, remove containers from path of fire.
Equipment should be thoroughly decontaminated after use.



Fire Diamond

Section 6 - Accidental Release Measures

Small Spills: Clean up all spills immediately. Avoid contact with skin and eyes.
Wear impervious gloves and safety glasses.
Use dry clean-up procedures and avoid generating dust.
Place spilled material in clean, dry, sealable, labeled container.
Large Spills: Clear area of personnel and move upwind.
Contact fire department and tell them location and nature of hazard.
Control personal contact by using protective equipment.
Stop leak if safe to do so.
Use dry clean-up procedures and avoid generating dust.
Collect recoverable product into labeled containers for recycling.
Collect residues and place in labeled polyethylene bag.
Wash area down with large quantity of water and prevent runoff into drains.
After clean-up operations, decontaminate and launder all protective clothing and equipment before storing and reusing.
If contamination of drains or waterways occurs, advise emergency services.
Regulatory Requirements: Follow applicable OSHA regulations (29 CFR 1910.120).

Section 7 - Handling and Storage

Handling Precautions: Use good occupational work practices. Observe manufacturer's storing and handling recommendations.
Atmosphere should be regularly checked against established exposure standards to ensure safe working conditions are maintained.
Avoid all personal contact, including inhalation.
Avoid generating and breathing dust.
Wear personal protective equipment when handling.
Use in a well-ventilated area.
Avoid contact with incompatible materials.
When handling, DO NOT eat, drink or smoke.
Keep containers securely sealed when not in use.
Avoid physical damage to containers.
Always wash hands with soap and water after handling. Work clothes should be laundered separately.
Launder contaminated clothing before reuse.
Recommended Storage Methods: Multi-ply paper bag with sealed plastic liner or heavy gauge plastic bag. Check that all containers are clearly labeled and free from leaks. Packing as recommended by manufacturer.
Regulatory Requirements: Follow applicable OSHA regulations.

Section 8 - Exposure Controls / Personal Protection

Engineering Controls: Use in a well-ventilated area.

General exhaust is adequate under normal operating conditions.
If exposure to workplace dust is not controlled, respiratory protection is required; wear NIOSH-approved dust respirator.
Provide adequate ventilation in warehouse or closed storage areas.

Personal Protective Clothing/Equipment:

Eyes: Safety glasses with side shields; or as required, chemical goggles.
Contact lenses pose a special hazard; soft lenses may absorb irritants and all lenses concentrate them.

Hands/Feet: Barrier cream. Wear physical protective gloves, eg. leather or Cotton gloves or PVC gloves.
Wear safety footwear.

Respiratory Protection:

Exposure Range >5 to 50 mg/m^3: Air Purifying, Negative Pressure, Half Mask
Exposure Range >50 to 500 mg/m^3: Air Purifying, Negative Pressure, Full Face
Exposure Range >500 to 5000 mg/m^3: Supplied Air, Constant Flow/Pressure Demand, Full Face
Exposure Range >5000 to unlimited mg/m^3: Self-contained Breathing Apparatus, Pressure Demand, Full Face
Cartridge Color: dust/mist filter (use P100 or consult supervisor for appropriate dust/mist filter)

Other: Overalls. Eyewash unit. Ensure there is ready access to a safety shower.

Glove Selection Index:

NATURAL RUBBER..... Best selection
NATURAL+NEOPRENE..... Best selection

Section 9 - Physical and Chemical Properties

Appearance/General Info: White or off white amorphous odorless powder with bitter, alkaline taste; insoluble in alcohol. Readily absorbs carbon dioxide from the air to form calcium carbonate; and loses water when heated strongly to form calcium oxide. Soluble in glycerol, sugar or ammonium chloride solutions. Soluble in acids with evolution of heat. Bulk density: 400-500 kg/m^3. Grades available: Builders Lime, technical, Pure, BP sterilized.

Physical State: Divided solid
Vapor Pressure (kPa): Negligible
Vapor Density (Air=1): Not applicable
Formula Weight: 74.10
Specific Gravity (H_2O=1, at 4 °C): 2.2-2.3
Evaporation Rate: Non-volatile
pH: Not applicable
pH (1% Solution): 12.4 (saturated)
Boiling Point: Decomposes
Freezing/Melting Point: 580 °C (1076 °F) (loses water)
Volatile Component (% Vol): Nil
Decomposition Temperature (°C): 580
Water Solubility: 0.185 g/100 cc at 0 °C

Section 10 - Stability and Reactivity

Stability/Polymerization/Conditions to Avoid: Product is considered stable. Hazardous polymerization will not occur.
Storage Incompatibilities: Avoid storage with acids, maleic anhydride, ammonium salts, nitromethane, nitroethane, nitropropane, nitroparaffins, phosphorus.
Forms salts with nitroparaffins in the presence of water which are explosive when dried.
DO NOT use aluminum or galvanized containers.

Section 11 - Toxicological Information

Toxicity
Oral (rat) LD_{50}: 7340 mg/kg

Irritation
Eye (rabbit): 10 mg - SEVERE

See *RTECS* EW 2800000, for additional data.

Section 12 - Ecological Information

Environmental Fate: No data found.
Ecotoxicity: Aquatic toxicity: 92 ppm/7 hr/trout/toxic/fresh water 240 ppm/24 hr/mosquito fish/TL_m/fresh water

Section 13 - Disposal Considerations

Disposal: Recycle wherever possible. Consult manufacturer for recycling options.
Follow applicable federal, state, and local regulations.
Bury residue in an authorized landfill.
Decontaminate empty containers.

Section 14 - Transport Information

DOT Hazardous Materials Table Data (49 CFR 172.101):

Shipping Name and Description: None

Section 15 - Regulatory Information

EPA Regulations:

RCRA 40 CFR: Not listed
CERCLA 40 CFR 302.4: Not listed
SARA 40 CFR 372.65: Not listed
SARA EHS 40 CFR 355: Not listed
TSCA: Listed

Section 16 - Other Information

Disclaimer: Judgments as to the suitability of information herein for the purchaser's purposes are necessarily the purchaser's responsibility. Although reasonable care has been taken in the preparation of such information, Genium Group, Inc. extends no warranties, makes no representations, and assumes no responsibility as to the accuracy or suitability of such information for application to the purchaser's intended purpose or for consequences of its use.

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Material Safety Data Sheet Collection
Genium group inc.
1171 RiverFront Center, Amsterdam, NY 12010
(518) 842-4111

Diesel Fuel Oil No. 2-D
DIE1400

Issue Date: 2006-06

Section 1 - Chemical Product and Company Identification 61

Material Name: Diesel Fuel Oil No. 2-D **CAS Number:** 68334-30-5
Chemical Formula: Un
Structural Chemical Formula: Unspecified; variable
EINECS Number: 269-822-7
ACX Number: X1012054-0
Synonyms: AUTOMOTIVE DIESEL OIL; DIESEL FUEL; DIESEL FUEL OIL NO. 2-D; DIESEL OIL (PETROLEUM); DIESEL OILS; DIESEL TEST FUEL; FUELS,DIESEL; OLEJ NAPEDOWY III; SANTOS MOOMBA DISTILLATE
Derivation: Fuel oil may be a distilled fraction of petroleum, a residuum from refinery operations, a crude petroleum or a blend of two or more of these.
General Use: This medium viscosity residual fuel oil has both light and heavy grades, and is used in furnaces and boilers of utility and industrial power plants, ships, locomotives, and metallurgical operations.

Section 2 - Composition / Information on Ingredients

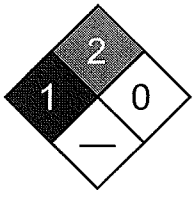
Name	CAS	%
Diesel fuel oil no. 2-D	68334-30-5	ca 100% vol;

diesel fuels consist primarily of aliphatic (64% vol), aromatic (35% vol), and olefinic (1-2% vol) hydrocarbons.
Trace Impurities: May contain sulfur (< 0.5), benzene (<100 ppm), and additives such as sulfurized esters.

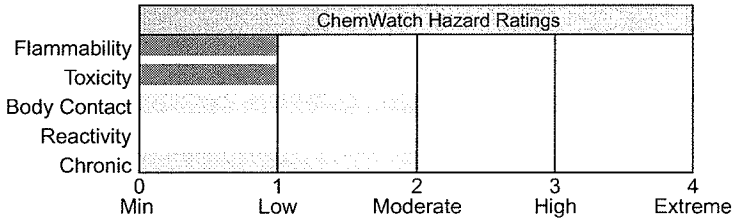
OSHA PEL **NIOSH REL**

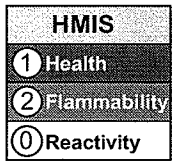
ACGIH TLV
TWA: 100 mg/m^3; skin.

Section 3 - Hazards Identification



Fire Diamond





ANSI Signal Word
Warning!


Flammable

☆☆☆☆☆ Emergency Overview ☆☆☆☆☆

Brown, slightly viscous liquid; kerosene-like odor. Irritating to skin/respiratory tract. Other Acute Effects: headache, nausea, vomiting, diarrhea, CNS depression, tachycardia, cyanosis, pulmonary edema, liver/kidney injury. Flammable.

Potential Health Effects

Target Organs: Skin, CNS, cardiovascular system (CVS), respiratory system, liver, kidneys
Primary Entry Routes: Inhalation, ingestion, skin contact/absorption
Acute Effects
Inhalation: Euphoria, respiratory irritation, cardiac dysrhythmia, increased respiration rates, cyanosis, pulmonary edema, hemoptysis (spitting up blood from the respiratory tract), respiratory arrest, renal (kidney) and liver injury, and CNS toxicity can result from inhalation of diesel fuel oil no. 2-D mist or vapor.
Eye: Contact may result in irritation.
Skin: Contact may cause irritation, systemic effects, and block the sebaceous (oil) glands, resulting in a rash of acne-like pimples and spots, usually on the arms and legs.

Ingestion: Gastrointestinal irritation, vomiting, diarrhea, and in severe cases, CNS depression progressing to coma and death and other systemic effects can result. Aspiration can result in transient CNS depression or excitement, hypoxia, infection, pneumatocele (abnormal cavities in lungs) formation, and chronic lung dysfunction.

Carcinogenicity: NTP - Not listed; IARC - Group 3, Not classifiable as to carcinogenicity to humans; OSHA - Not listed; NIOSH - Not listed; ACGIH - Not listed; EPA - Not listed; MAK - Not listed.

Medical Conditions Aggravated by Long-Term Exposure: None reported.

Chronic Effects: Prolonged or repeated skin contact causes dermatitis and possible systemic toxicity. Prolonged or repeated inhalation can cause CNS and peripheral nervous system damage.

Section 4 - First Aid Measures

See DOT ERG

Inhalation: Remove exposed person to fresh air and support breathing as needed.

Eye Contact: *Do not* allow victim to rub or keep eyes tightly shut. Gently lift eyelids and flush immediately and continuously with flooding amounts of water for at least 15 minutes. Consult a physician or ophthalmologist if pain and/or irritation develops.

Skin Contact: Quickly remove contaminated clothing. Rinse with flooding amounts of water followed by washing the exposed area with soap and water. For reddened or blistered skin, consult a physician.

Ingestion: Never give anything by mouth to an unconscious or convulsing person. Have the *conscious and alert* person drink 1 to 2 glasses of water. Contact a poison control center. Because of aspiration risk, *do not* induce vomiting unless the poison control center advises otherwise.

After first aid, get appropriate in-plant, paramedic, or community medical support.

Note to Physicians: Gastric lavage is contraindicated due to aspiration risk. Instead, consider administration of charcoal or milk. If ingestion amount is large, gastric emptying in the alert patient can be accomplished through administration of Syrup of Ipecac. Treat overexposure symptomatically and supportively.

Section 5 - Fire-Fighting Measures

See DOT ERG

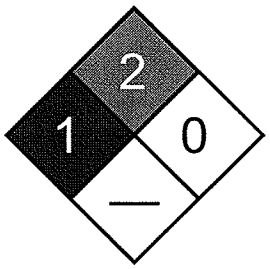
Flash Point: 100.4 °F (38 °C), Closed Cup

Autoignition Temperature: 351-624 °F (177-329 °C)

LEL: 1.3% v/v

UEL: 75% v/v

Flammability Classification: OSHA Class II Combustible Liquid



Fire Diamond

Extinguishing Media: Use dry chemical, carbon dioxide, foam, low velocity water fog or spray. Use a smothering technique to extinguish fire. Water may be ineffective in putting out a fire involving diesel fuel oil no. 2-D, and a solid water stream may spread the flames; however, a water spray may be used to cool fire-exposed containers, and flush spills away from ignition sources.

General Fire Hazards/Hazardous Combustion Products: Heating diesel fuel oil no. 2-D to decomposition can produce acrid smoke and irritating vapors. Vapor or mist can form explosive mixtures in air. In still air, the heavier-than-air vapors of diesel fuel oil no. 2-D from a large source may travel along low-lying surfaces to distant sources of ignition and flash back to the material source. Containers may explode in heat of fire.

Fire-Fighting Instructions: *Do not* release runoff from fire control methods to sewers or waterways. Because fire may produce toxic thermal decomposition products, wear a self-contained breathing apparatus (SCBA) with a full facepiece operated in pressure-demand or positive-pressure mode.

Section 6 - Accidental Release Measures

See DOT ERG

Spill/Leak Procedures: Eliminate all ignition sources (no smoking, flares, sparks or flames in immediate area). Ground all equipment used when handling this product. *Do not* touch or walk through spilled material. Stop leak if you can do it without risk. Prevent entry into waterways, sewers, basements or confined areas. A fire fighting foam may be used to suppress vapors. Absorb or cover with dry earth, sand or other non-combustible material and transfer to containers. Use clean non-sparking tools to collect absorbed material.

Small Spills: Absorb diesel fuel oil no. 2-D with vermiculite, earth, sand or similar material.

Large Spills: For large spills, consider downwind evacuation of at least 1000 ft (300 m). Dike far ahead of liquid spill for later disposal. *Do not* release into sewers or waterways. Ground all equipment. Use non-sparking tools. Spills can be absorbed with materials such as peat, activated carbon, polyurethane foam, or straw. Sinking agents, gelling agents, dispersants, and mechanical systems can also be use to treat oil spills.

Regulatory Requirements: Follow applicable OSHA regulations (29 CFR 1910.120).

Section 7 - Handling and Storage

Handling Precautions: Avoid vapor or mist inhalation, and skin and eye contact. Use only with ventilation sufficient to reduce airborne concentrations to non-hazardous levels (see Sec. 2). Wear protective gloves (or use barrier cream), and clothing (see Sec. 8). Keep away from heat and ignition sources. Ground and bond all containers during transfers to prevent static sparks. Use non-sparking tools to open and close containers. .

Never eat, drink, or smoke in work areas. Practice good personal hygiene after using this material, especially before eating, drinking, smoking, using the toilet, or applying cosmetics.

Recommended Storage Methods: Store in tightly closed container in cool, well-ventilated area, away from heat, ignition sources and incompatibles (see Sec. 10). Periodically inspect stored materials. Equip drums with self-closing valves, pressure vacuum bungs, and flame arrestors.

Regulatory Requirements: Follow applicable OSHA regulations. Also 29 CFR 1910.106 for Class II Combustible Liquid.

Section 8 - Exposure Controls / Personal Protection

Engineering Controls: To prevent static sparks, electrically ground and bond all containers and equipment used in shipping, receiving, or transferring operations. Provide general or local exhaust ventilation systems to maintain airborne concentrations as low as possible. Local exhaust ventilation is preferred because it prevents contaminant dispersion into the work area by controlling it at its source.

Administrative Controls: Enclose operations and/or provide local exhaust ventilation appropriately designed for flammable mist and vapor at the site of chemical release. Where possible, transfer diesel fuel oil no. 2-D from drums or other storage containers directly to process containers. Minimize sources of ignition in surrounding low-lying areas.

Personal Protective Clothing/Equipment: Wear chemically protective gloves, boots, aprons, and gauntlets. Wear protective eyeglasses, per OSHA eye- and face-protection regulations (29 CFR 1910.133). Contact lenses are not eye protective devices. Appropriate eye protection must be worn instead of, or in conjunction with contact lenses.

Respiratory Protection: Seek professional advice prior to respirator selection and use. Follow OSHA respirator regulations (29 CFR 1910.134) and, if necessary, wear a MSHA/NIOSH-approved respirator. Select respirator based on its suitability to provide adequate worker protection for given working conditions, level of airborne contamination, and presence of sufficient oxygen. For emergency or nonroutine operations (cleaning spills, reactor vessels, or storage tanks), use an SCBA. *Warning! Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.* If respirators are used, OSHA requires a written respiratory protection program that includes at least: medical certification, training, fit-testing, periodic environmental monitoring, maintenance, inspection, cleaning, and convenient, sanitary storage areas.

Other: Separate contaminated work clothes from street clothes. Launder before reuse. Remove this material from your shoes and clean personal protective equipment. Make emergency eyewash stations, safety/quick-drench showers, and washing facilities available in work area.

Section 9 - Physical and Chemical Properties

Appearance/General Info: Brown, slightly viscous; kerosene-like odor.

Physical State: Liquid

Odor Threshold: 0.7 ppm

Vapor Pressure (kPa): < 0.1 mm Hg at 68 °F (20 °C)

Vapor Density (Air=1): > 6

Formula Weight: N/A

Specific Gravity (H_2O=1, at 4 °C): < 0.86

Boiling Point: 340-676 °F (171-358 °C)

Freezing/Melting Point: -29.2 °F (-34 °C)

Viscosity: 1.9-4.1 centistoke at 104 °F (40 °C)

Surface Tension: 23-32 dynes/cm at 68 °F (20 °C)

Water Solubility: Insoluble

Section 10 - Stability and Reactivity

Stability/Polymerization/Conditions to Avoid: Diesel fuel oil no. 2-D is stable at room temperature in closed containers under normal storage and handling conditions. Hazardous polymerization cannot occur. Exposure to heat and ignition sources.

Storage Incompatibilities: Include strong oxidizing agents.

Hazardous Decomposition Products: Thermal oxidative decomposition of diesel fuel oil no. 2-D can produce low molecular weight hydrocarbons, hydrocarbon derivatives, carbon oxides (CO_x), and sulfur oxides (SO_x).

Section 11 - Toxicological Information

Acute Oral Effects:
Rat, oral, LD_{50}: 7500 mg/kg.
Acute Skin Effects:
Rabbit, skin, LD: > 5 mL/kg.
Irritation Effects:
Rabbit, skin, standard Draize test: 500 µL/24 hr, resulted in severe reaction.
Other Effects:
Rat, inhalation: 2 g/m^3/6 hr/3 weeks, intermittently, resulted in changes in blood erythrocyte (RBC) count, and focal fibrosis (pneumonoconiosis) and other changes in the lung, thorax or respiration.
Rat, inhalation: 400 $\mu g/m^3$/16 hr/2.5 years, intermittently, caused other changes in the blood, and biochemical effects - transaminases.
Rabbit, skin: 80 mL/kg/12 days, continuously, resulted in other changes in the liver, kidney, ureter, and bladder, and death.

See *RTECS* HZ1800000, for additional data.

Section 12 - Ecological Information

Environmental Fate: Diesel fuel oil no. 2-D will evaporate from water or soil. In surface water, it may partition from the water column to suspended sediments. Biodegradation may occur in soil and water.
Ecotoxicity: Juvenile American shad, salt water TL_m: 204 mg/L/24 hr; mallard duck, LD_{50}=20 mg/kg.

Section 13 - Disposal Considerations

Disposal: Contact your supplier or a licensed contractor for detailed recommendations. Follow applicable Federal, state, and local regulations.

Section 14 - Transport Information

DOT Hazardous Materials Table Data (49 CFR 172.101):

Note: This material has multiple possible HMT entries. Choose the appropriate one based on state and condition of specific material when shipped.

Shipping Name and Description: Diesel fuel
ID: NA1993
Hazard Class: 3 - Flammable and combustible liquid
Packing Group: III - Minor Danger
Symbols: D - Domestic transportation
Label Codes: None
Special Provisions: 144, B1, IB3, T4, TP1, TP29
Packaging: **Exceptions:** 150 **Non-bulk:** 203 **Bulk:** 242
Quantity Limitations: **Passenger aircraft/rail:** 60 L **Cargo aircraft only:** 220 L
Vessel Stowage: **Location:** A **Other:**

Shipping Name and Description: Diesel fuel
ID: UN1202
Hazard Class: 3 - Flammable and combustible liquid
Packing Group: III - Minor Danger
Symbols: I - International transportation
Label Codes: 3 - Flammable Liquid
Special Provisions: 144, B1, IB3, T2, TP1
Packaging: **Exceptions:** 150 **Non-bulk:** 203 **Bulk:** 242
Quantity Limitations: **Passenger aircraft/rail:** 60 L **Cargo aircraft only:** 220 L
Vessel Stowage: **Location:** A **Other:**

Section 15 - Regulatory Information

EPA Regulations:
RCRA 40 CFR: Not listed
CERCLA 40 CFR 302.4: Not listed
SARA 40 CFR 372.65: Not listed
SARA EHS 40 CFR 355: Not listed
TSCA: Listed

Section 16 - Other Information

Disclaimer: Judgments as to the suitability of information herein for the purchaser's purposes are necessarily the purchaser's responsibility. Although reasonable care has been taken in the preparation of such information, Genium Group, Inc. extends no warranties, makes no representations, and assumes no responsibility as to the accuracy or suitability of such information for application to the purchaser's intended purpose or for consequences of its use.

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ANSUL FIRE PROTECTION
ABC FIRE EXTINGUISHER Revised: 11/06/2002

MSDS Contents

CRL ONLINE

MATERIAL SAFETY DATA SHEET

COMPANY NAME: ANSUL FIRE PROTECTION

ADDRESS: ONE STANTON ST.
CITY / STATE / ZIP: MARINETTE / WI / 54143

US-CHEMTREC PHONE (I): (800) 424-9300
US-CHEMTREC PHONE (II): (703) 527-3887
CAN-CANUTEC PHONE: (613) 996-6666

VENDOR UPDATE: 11/6/2002

DATE PREPARED: 11/6/2002

MSDS NUMBER: 2025AV; 2100AH

I. CHEMICAL PRODUCT IDENTIFICATION

PRODUCT NAME: ABC FIRE EXTINGUISHER

HMIS RATINGS:
HEALTH 1 SLIGHT
FLAMMABILITY 0 MINIMAL
INSTABILITY/REACTIVITY 0 MINIMAL

NFPA RATINGS:

II. COMPOSITION, INFORMATION ON INGREDIENTS

CHEMICAL INGREDIENTS	CAS. NUMBER	% BY WEIGHT
MUSCOVITE MICA	12001-26-2	

NOTES:

MAGNESIUM ALUMINUM SILICATE (ATTAPULGITE CLAY)	8031-18-3
MONOAMMONIUM PHOSPHATE	7722-76-1
AMMONIUM SULFATE	7783-20-2
METHYL HYDROGEN POLYSILOXANE	63148-57-2
YELLOW PIGMENT	5468-75-7

NOTES:

CHEMICAL INGREDIENTS	ACGIH TLV TWA/STEL	OSHA PEL TWA/STEL	OTHER TWA/STEL	LD50	LC50
MUSCOVITE MICA	20 MILLION PARTICLES PER CUBIC FOOT			NO DATA AVAILABLE	
MAGNESIUM ALUMINUM SILICATE (ATTAPULGITE CLAY)	10 MG/M3			NO DATA AVAILABLE	
MONOAMMONIUM PHOSPHATE				ORAL (RAT): 5750 MG/KG	
AMMONIUM SULFATE				ORAL (RAT): 3000 MG/KG	
METHYL HYDROGEN POLYSILOXANE				NO DATA AVAILABLE	
YELLOW PIGMENT				NO DATA AVAILABLE	

NOTES:

OTHER:

TLV:
OSHA NUISANCE DUST LIMIT OF 15 MG/M3 OR ACGIH NUISANCE DUST VALUE OF 10 MG/M3 FOR THE EIGHT HOUR TIME-WEIGHTED AVERAGE.

CHEMICAL LISTED AS CARCINOGEN OR POTENTIAL:
NTP: NO
IARC MONOGRAPH: NO

OSHA: NO

III. HAZARDS IDENTIFICATION PRIMARY ROUTE OF ENTRY

EYES: MILDLY IRRITATING FOR A SHORT PERIOD OF TIME.

SKIN: MAY BE MILDLY IRRITATING.

INGESTION: NOT AN EXPECTED ROUTE OF ENTRY.

INHALATION:
TREAT AS A MINERAL DUST, IRRITANT TO THE RESPIRATORY TRACT.

SIGNS AND SYMPTOMS OF EXPOSURE:
ACUTE OVEREXPOSURE: TRANSIENT COUGH, SHORTNESS OF BREATH.
CHRONIC OVEREXPOSURE: CHRONIC FIBROSIS OF THE LUNG, PNEUMOCONIOSIS.

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: REACTIVE AIRWAY.

IV. FIRST AID MEASURES

EYES:
FLUSH WITH LARGE AMOUNTS OF WATER; IF IRRITATION PERSIST, SEEK MEDICAL ATTENTION.

SKIN:
WASH WITH SOAP AND WATER; IF IRRITATION PERSISTS, SEEK MEDICAL ATTENTION.

INGESTION:
IF PATIENT IS CONSCIOUS, GIVE LARGE AMOUNTS OF WATER AND INDUCE VOMITING.
SEEK MEDICAL HELP.

INHALATION:
REMOVE VICTIM TO FRESH AIR. SEEK MEDICAL ATTENTION IF DISCOMFORT CONTINUES.

V. FIRE FIGHTING MEASURES

FLASH POINT: NONE

UNUSUAL FIRE OR EXPLOSION HAZARDS: NONE - THIS IS AN EXTINGUISHING AGENT

FIRE FIGHTING PROCEDURES: NONE

VI. ACCIDENTAL RELEASE MEASURES

CONTAINMENT/CLEANUP: SWEEP UP.

VII. HANDLING AND STORAGE

OTHER:

SHOULD BE STORED IN ORIGINAL CONTAINER OR ANSUL FIRE EXTINGUISHER.

OTHER PRECAUTIONS: DO NOT MIX AGENTS.

VIII. EXPOSURE CONTROLS/PERSONAL PROTECTION

EYES: RECOMMENDED AS MECHANICAL BARRIER FOR PROLONGED EXPOSURE.

SKIN:
N/A
IF IRRITATION OCCURS, LONG SLEEVES AND IMPERVIOUS GLOVES SHOULD BE WORN.

RESPIRATORY:
DUST MASK WHERE DUSTINESS IS PREVALENT, OR TLV EXCEEDED. MECHANICAL FILTER RESPIRATOR IF EXPOSURE IS PROLONGED.

ENGINEERING:
LOCAL EXHAUST: DISCRETIONARY
MECHANICAL (GENERAL): RECOMMENDED.

IX. PHYSICAL AND CHEMICAL PROPERTIES

APPEARANCE: YELLOW COLORED POWDER

BOILING POINT: N/A

SOLUBILITY IN WATER: SLIGHT

SPECIFIC GRAVITY: N/A

VAPOR PRESSURE: N/A

VAPOR DENSITY: N/A

VOLATILE CONTENT: N/A

X. STABILITY AND REACTIVITY

STABILITY: STABLE

HAZARDOUS POLYMERIZATION: WILL NOT OCCUR

HAZARDOUS DECOMPOSITION PRODUCTS: NH3 AND/OR POx MAY BE EVOLVED.

INCOMPATIBLE PRODUCTS:
STRONG ALKALIS, MG, OXIDIZERS THAT CAN RELEASE CHLORINE PER NFPA 43A.

CONDITIONS TO AVOID: N/A

XI. TOXICOLOGICAL INFORMATION

XII. ECOLOGICAL INFORMATION

ECOTOXICITY:

XIII. DISPOSAL CONSIDERATIONS

DISPOSAL METHOD:
DISPOSE OF IN COMPLIANCE WITH LOCAL, STATE, AND FEDERAL REGULATIONS.

XIV. TRANSPORT INFORMATION

XV. REGULATORY INFORMATION

SUPPLEMENTAL STATE COMPLIANCE INFORMATION:

XVI. OTHER INFORMATION

WARRANTY INFORMATION:
THIS INFORMATION IS OFFERED IN GOOD FAITH AS TYPICAL VALUES AND NOT AS A PRODUCT SPECIFICATION. NO WARRANTY, EXPRESSED OR IMPLIED, IS HEREBY MADE. THE RECOMMENDED INDUSTRIAL HYGIENE AND SAFE HANDLING PROCEDURES ARE BELIEVED TO BE GENERALLY APPLICABLE. HOWEVER, EACH USER SHOULD REVIEW THESE RECOMMENDATIONS IN THE SPECIFIC CONTEXT OF THE INTENDED USE AND DETERMINE WHETHER THEY ARE APPROPRIATE.

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Gasoline

Material Safety Data Sheet Collection
Genium group inc.
1171 RiverFront Center, Amsterdam, NY 12010
(518) 842-4111

Issue Date: 2006-06

Unleaded Petrol
AUT5000

Section 1 - Chemical Product and Company Identification 61

Material Name: Unleaded Petrol **CAS Number:** 8006-61-9
Chemical Formula: Mixture of hydrocarbons
EINECS Number: 232-349-1
ACX Number: X1003056-5
Synonyms: AUTOMOTIVE GASOLINE, LEAD-FREE; GASOLINE; MOTOR FUEL; MOTOR SPIRITS; NATURAL GASOLINE; PETROL; UNLEADED PETROL
General Use: Lead free motor fuel for internal combustion engines, 2-stroke and 4-stroke.

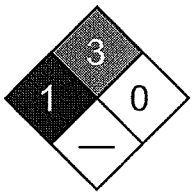
Section 2 - Composition / Information on Ingredients

Name	CAS	%
gasoline	8006-61-9	>90
benzene	71-43-2	5 max.

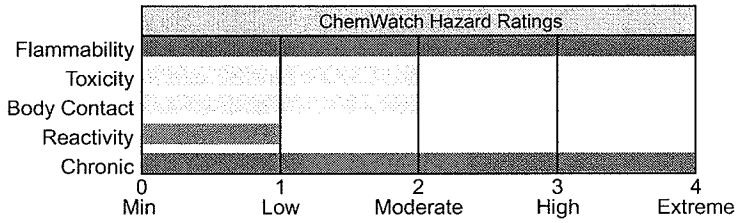
OSHA PEL **NIOSH REL**

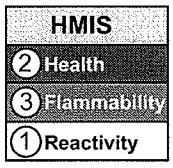
ACGIH TLV
TWA: 300 ppm, 890 mg/m^3;
STEL: 500 ppm, 1480 mg/m^3.

Section 3 - Hazards Identification



Fire Diamond





ANSI Signal Word
Danger!


Flammable

☆☆☆☆☆ Emergency Overview ☆☆☆☆☆

Clear liquid; distinctive odor. Irritating to eyes/skin/respiratory tract. Other Acute Effects: dizziness, drunkenness, unconsciousness. Chronic Effects: dermatitis. Possible cancer hazard. Flammable.

Potential Health Effects

Target Organs: skin, eye, respiratory system, central nervous system (CNS)
Primary Entry Routes: inhalation, ingestion, skin contact

Acute Effects

Inhalation: The vapor is discomforting to the upper respiratory tract and may be harmful if exposure is prolonged. Inhalation hazard is increased at higher temperatures. Acute effects from inhalation of high concentrations of vapor are pulmonary irritation, including coughing, with nausea; central nervous system depression - characterized by headache and dizziness, increased reaction time, fatigue and loss of coordination. If exposure to highly concentrated solvent atmosphere is prolonged this may lead to narcosis, unconsciousness, even coma and possible death. WARNING: Intentional misuse by concentrating/inhaling contents may be lethal. High inhaled concentrations of mixed hydrocarbons may produce narcosis characterized by nausea, vomiting and lightheadedness. Inhalation of aerosols may produce severe pulmonary edema, pneumonitis and pulmonary hemorrhage. Inhalation of petroleum hydrocarbons consisting substantially of low molecular weight species may produce irritation of mucous membranes, incoordination, giddiness, nausea, vertigo, confusion, headache, appetite loss, drowziness, tremors and anesthetic stupor. Massive exposures may produce central nervous system depression with sudden collapse and deep coma; fatalities have been recorded. Irritation of the brain and/or apneic anoxia may produce convulsions. Although recovery following overexposure is generally complete, cerebral micro- hemorrhage of focal post-inflammatory scarring may produce eleptiform seizures some months after the exposure. Pulmonary episodes may include chemical pneumonitis with edema and hemorrhage. The lighter hydrocarbons may produce kidney and neurotoxic effects. Liquid paraffins may produce anesthesia and depressant actions leading to weakness, dizziness, slow and shallow respiration, unconsciousness, convulsions and death. C_{5-7} paraffins may also produce polyneuropathy. Aromatic hydrocarbons accumulate in lipid-rich tissues (typically the brain, spinal cord and peripheral nerves) and may produce functional impairment manifested by nonspecific symptoms such as nausea, weakness, fatigue, vertigo; severe exposures may produce inebriation or unconsciousness. Many of the petroleum hydrocarbons are cardiac sensitizers and may cause ventricular fibrillations.

Eye: The liquid may produce eye discomfort and is capable of causing temporary impairment of vision and/or transient eye inflammation, ulceration. The vapor is discomforting to the eyes. Petroleum hydrocarbons may produce pain after direct contact with the eyes. Slight, but transient, disturbances of the corneal epithelium may also result. The aromatic fraction may produce irritation and lachrymation. The material may produce moderate eye irritation leading to inflammation. Repeated or prolonged exposure to irritants may produce conjunctivitis.

Skin: The material is moderately discomforting to the skin if exposure is prolonged. The material contains a component that may be absorbed through the skin and may cause drying of the skin, which may lead to dermatitis from repeated exposures over long periods. Toxic effects may result from skin absorption. Open cuts, abraded or irritated skin should not be exposed to this material. The material may accentuate any pre-existing dermatitis condition.

Ingestion: Considered an unlikely route of entry in commercial/industrial environments. The liquid may produce gastrointestinal discomfort and may be harmful if swallowed. Ingestion may result in nausea, pain and vomiting. Vomit entering the lungs by aspiration may cause potentially lethal chemical pneumonitis. Ingestion of petroleum hydrocarbons may produce irritation of the pharynx, esophagus, stomach and small intestine with edema and mucosal ulceration. Resulting symptoms include a burning sensation in the mouth and throat. Large amounts may produce narcosis with nausea and vomiting, weakness or dizziness, slow and shallow respiration, swelling of the abdomen, unconsciousness and convulsions. Myocardial injury may produce arrhythmias, ventricular fibrillation and electrocardiographic changes. Central nervous system depression may also occur. Light aromatic hydrocarbons produce a warm, sharp, tingling sensation on contact with taste buds and may anesthetize the tongue. Aspiration into the lungs may produce coughing, gagging, and a chemical pneumonitis with pulmonary edema and hemorrhage.

Carcinogenicity: NTP - Not listed; IARC - Group 2B, Possibly carcinogenic to humans; OSHA - Not listed; NIOSH - Listed as carcinogen; ACGIH - Class A3, Animal carcinogen; EPA - Not listed; MAK - Not listed.

Chronic Effects: Chronic solvent inhalation exposures may result in nervous system impairment and liver and blood changes. Prolonged or continuous skin contact with the liquid may cause defatting with drying, cracking, irritation and dermatitis following. Chronic poisoning may occur from vapor inhalation or skin absorption. The most significant toxic effect is insidious and irreversible injury to the blood-forming tissue by benzene. Leukemia may develop. Chronic exposure may cause headache, fatigue, loss of appetite and lassitude with incipient blood effects including anemia and blood changes. Gasoline "sniffing" has caused severe nerve damage. Repeated or prolonged exposure to mixed hydrocarbons may produce narcosis with dizziness, weakness, irritability, concentration and/or memory loss, tremor in the fingers and tongue, vertigo, olfactory disorders, constriction of visual field, paresthesias of the extremities, weight loss and anemia and degenerative changes in the liver and kidney. Chronic exposure by petroleum workers to the lighter hydrocarbons has been associated with visual disturbances, damage to the central nervous system, peripheral neuropathies (including numbness and paresthesias), psychological and neurophysiological deficits, bone marrow toxicities (including hypoplasia, possibly due to benzene) and hepatic and renal involvement. Chronic dermal exposure to petroleum hydrocarbons may result in defatting which produces localized dermatoses. Surface cracking and erosion may also increase susceptibility to infection by microorganisms.

Section 4 - First Aid Measures

Inhalation: Remove to fresh air. Lay patient down. Keep warm and rested.
If breathing is shallow or has stopped, ensure clear airway and apply resuscitation. Transport to hospital, or doctor.

See DOT ERG

Eye Contact: Immediately hold the eyes open and wash continuously for at least 15 minutes with fresh running water. Ensure irrigation under eyelids by occasionally lifting the upper and lower lids. Transport to hospital or doctor without delay. Removal of contact lenses after an eye injury should only be undertaken by skilled personnel.

Skin Contact: Immediately remove all contaminated clothing, including footwear (after rinsing with water). Wash affected areas thoroughly with water (and soap if available). Seek medical attention in event of irritation.

Ingestion: Contact a Poison Control Center. If swallowed, do NOT induce vomiting. Give a glass of water.

After first aid, get appropriate in-plant, paramedic, or community medical support.

Note to Physicians: For acute or short term repeated exposures to petroleum distillates or related hydrocarbons:

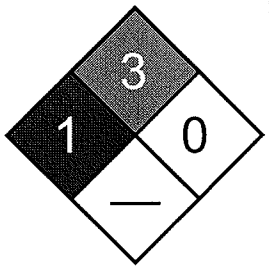
1. Primary threat to life from pure petroleum distillate ingestion and/or inhalation is respiratory failure.
2. Patients should be quickly evaluated for signs of respiratory distress (e.g. cyanosis, tachypnea, intercostal retraction, obtundation) and given oxygen. Patients with inadequate tidal volumes or poor arterial blood gases (pO_2 <50 mm Hg or pCO_2 >50 mm Hg) should be intubated.
3. Arrhythmias complicate some hydrocarbon ingestion and/or inhalation and electrocardiographic evidence of myocardial injury has been reported; intravenous lines and cardiac monitors should be established in obviously symptomatic patients. The lungs excrete inhaled solvents, so that hyperventilation improves clearance.
4. A chest x-ray should be taken immediately after stabilization of breathing and circulation to document aspiration and detect the presence of pneumothorax.
5. Epinephrine (adrenalin) is not recommended for treatment of bronchospasm because of potential myocardial sensitization to catecholamines.
Inhaled cardioselective bronchodilators (e.g. Alupent, Salbutamol) are the preferred agents, with aminophylline a second choice.
6. Lavage is indicated in patients who require decontamination; ensure use of cuffed endotracheal tube in adult patients.

Section 5 - Fire-Fighting Measures

Flash Point: -43 °C
Autoignition Temperature: 280 °C
LEL: 1.4% v/v
UEL: 7.6% v/v

See DOT ERG

Extinguishing Media: Foam. Dry chemical powder.
Bromochlorodifluoromethane (BCF) (where regulations permit). Carbon dioxide.



Fire Diamond

General Fire Hazards/Hazardous Combustion Products: Liquid and vapor are highly flammable. Severe fire hazard when exposed to heat, flame and/or oxidizers. Vapor forms an explosive mixture with air. Severe explosion hazard, in the form of vapor, when exposed to flame or spark. Vapor may travel a considerable distance to source of ignition. Heating may cause expansion/decomposition with violent rupture of containers. On combustion, may emit toxic fumes of carbon monoxide (CO).

Fire Incompatibility: Avoid contamination with oxidizing agents, i.e. nitrates, oxidizing acids, chlorine bleaches, pool chlorine etc., as ignition may result.

Fire-Fighting Instructions: Alert fire department and tell them location and nature of hazard. May be violently or explosively reactive. Wear breathing apparatus plus protective gloves. Prevent, by any means available, spillage from entering drains or water ways. If safe, switch off electrical equipment until vapour fire hazard removed. Use water delivered as a fine spray to control fire and cool adjacent area. Avoid spraying water onto liquid pools. Do not approach containers suspected to be hot. Cool fire exposed containers with water spray from a protected location. If safe to do so, remove containers from path of fire.

Section 6 - Accidental Release Measures

Small Spills: Remove all ignition sources. Clean up all spills immediately. Avoid breathing vapors and contact with skin and eyes. Control personal contact by using protective equipment. Contain and absorb small quantities with vermiculite or other absorbent material. Wipe up. Collect residues in a flammable waste container.

See DOT ERG

Large Spills: Clear area of personnel and move upwind. Alert fire department and tell them location and nature of hazard. May be violently or explosively reactive. Wear breathing apparatus plus protective gloves. Prevent, by any means available, spillage from entering drains or water ways. No smoking, naked lights or ignition sources. Increase ventilation. Stop leak if safe to do so.
Water spray or fog may be used to disperse/absorb vapor. Contain spill with sand, earth or vermiculite. Use only

spark-free shovels and explosion proof equipment. Collect recoverable product into labeled containers for recycling. Absorb remaining product with sand, earth or vermiculite. Collect solid residues and seal in labelled drums for disposal. Wash area and prevent runoff into drains.
If contamination of drains or waterways occurs, advise emergency services.
Regulatory Requirements: Follow applicable OSHA regulations (29 CFR 1910.120).

Section 7 - Handling and Storage

Handling Precautions: Avoid generating and breathing mist. Avoid all personal contact, including inhalation. Wear protective clothing when risk of exposure occurs. Use in a well-ventilated area. Prevent concentration in hollows and sumps. DO NOT enter confined spaces until atmosphere has been checked. Avoid smoking, bare lights, heat or ignition sources. When handling, DO NOT eat, drink or smoke. Vapor may ignite on pumping or pouring due to static electricity. DO NOT use plastic buckets. Ground and secure metal containers when dispensing or pouring product. Use spark-free tools when handling. Avoid contact with incompatible materials. Keep containers securely sealed. Avoid physical damage to containers. Always wash hands with soap and water after handling. Work clothes should be laundered separately. Use good occupational work practices. Observe manufacturer's storing and handling recommendations. Atmosphere should be regularly checked against established exposure standards to ensure safe working conditions.
Recommended Storage Methods: Metal can, metal drum. Packing as recommended by manufacturer. Check all containers are clearly labeled and free from leaks.
Regulatory Requirements: Follow applicable OSHA regulations.

Section 8 - Exposure Controls / Personal Protection

Engineering Controls: CARE: Use of a quantity of this material in confined space or poorly ventilated area, where rapid build-up of concentrated atmosphere may occur, could require increased ventilation and/or protective gear. Use in a well-ventilated area. If inhalation risk of overexposure exists, wear a NIOSH approved organic-vapor respirator. Correct respirator fit is essential to obtain adequate protection. In confined spaces where there is inadequate ventilation, wear full-face air supplied breathing apparatus. Provide adequate ventilation in warehouse or closed storage areas.
Personal Protective Clothing/Equipment:
Eyes: Safety glasses with side shields; or as required, chemical goggles.
Contact lenses pose a special hazard; soft lenses may absorb irritants and all lenses concentrate them.
Hands/Feet: Barrier cream with polyethylene gloves or PVC gloves. Safety footwear. Do NOT use this product to clean the skin.
Respiratory Protection:
Exposure Range >300 to 1000 ppm: Air Purifying, Negative Pressure, Half Mask
Exposure Range >1000 to 15,000 ppm: Air Purifying, Negative Pressure, Full Face
Exposure Range >15,000 to 300,000 ppm: Supplied Air, Constant Flow/Pressure Demand, Full Face
Exposure Range >300,000 to unlimited ppm: Self-contained Breathing Apparatus, Pressure Demand, Full Face
Cartridge Color: black
Other: Overalls. Ensure that there is ready access to eye wash unit. Ensure there is ready access to an emergency shower.

Section 9 - Physical and Chemical Properties

Appearance/General Info: Purple, highly flammable, volatile liquid with characteristic sharp odor. Floats on water. Consists of a complex mixture of hydrocarbons with small amounts of residual benzene from the refining operations.

Physical State: Liquid
Odor Threshold: 0.005 ppm
Vapor Pressure (kPa): 53.33 at 20 °C
Vapor Density (Air=1): > 2
Formula Weight: Not applicable.
Specific Gravity (H_2O=1, at 4 °C): 0.72-0.735 at 15 °C
Evaporation Rate: Fast

pH: Not applicable
pH (1% Solution): Not applicable.
Boiling Point: 38.89 °C (102 °F)
Freezing/Melting Point: Not available
Volatile Component (% Vol): 100
Decomposition Temperature (°C): Not available.
Water Solubility: Insoluble

Section 10 - Stability and Reactivity

Stability/Polymerization/Conditions to Avoid: Presence of incompatible materials. Product is considered stable. Hazardous polymerization will not occur.
Storage Incompatibilities: Avoid storage with oxidizers.

Section 11 - Toxicological Information

Toxicity
Oral (rat) LD_{50}: 18800 mg/kg

Irritation
Skin (rabbit): 500 mg/24h mild

Section 12 - Ecological Information

Environmental Fate: No data found.
Ecotoxicity: No data found.
Biochemical Oxygen Demand (BOD): 8%, 5 days

Section 13 - Disposal Considerations

Disposal: Consult manufacturer for recycling options and recycle where possible. Follow all applicable federal, state, and local laws. Incinerate residue at an approved site. Recycle containers where possible, or dispose of in an authorized landfil.
BEWARE: Empty solvent, paint, lacquer and flammable liquid drums present a severe explosion hazard if cut by flame torch or welded. Even when thoroughly cleaned or reconditioned, the drum seams may retain sufficient solvent to generate an explosive atmosphere in the drum.

Section 14 - Transport Information

DOT Hazardous Materials Table Data (49 CFR 172.101):

Shipping Name and Description: Gasoline
ID: UN1203
Hazard Class: 3 - Flammable and combustible liquid
Packing Group: II - Medium Danger
Symbols:
Label Codes: 3 - Flammable Liquid
Special Provisions: 139, B33, B101, T8
Packaging: **Exceptions:** 150 **Non-bulk:** 202 **Bulk:** 242
Quantity Limitations: **Passenger aircraft/rail:** 5 L **Cargo aircraft only:** 60 L
Vessel Stowage: **Location:** E **Other:**

Section 15 - Regulatory Information

EPA Regulations:
RCRA 40 CFR: Not listed
CERCLA 40 CFR 302.4: Not listed
SARA 40 CFR 372.65: Not listed
SARA EHS 40 CFR 355: Not listed
TSCA: Listed

Section 16 - Other Information

Disclaimer: Judgments as to the suitability of information herein for the purchaser's purposes are necessarily the purchaser's responsibility. Although reasonable care has been taken in the preparation of such information, Genium Group, Inc. extends no warranties, makes no representations, and assumes no responsibility as to the accuracy or suitability of such information for application to the purchaser's intended purpose or for consequences of its use.

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BENCH PRODUCTS
HAND CLEANER DEGREASER **Revised: 01/02/1991**

MSDS Contents

BENCH PRODUCTS INC.

MATERIAL SAFETY DATA SHEET

REVISED 1/2/91

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MANUFACTURER'S NAME: BENCH PRODUCTS

ADDRESS: 4124 SO. 500 W.
SALT LAKE CITY, UT 84123

EMERGENCY PHONE: 801-261-3666
801-268-6320

TRADE NAME: SPARKLENE HAND CLEANER DEGREASER

HAZARDOUS INGREDIENTS

PAINTS, SOLVENTS PRESERVATIVES	(0)	TLV UNITS	ALLOYS AND METALS	(0)	TLV UNITS
PIGMENTS	(0)		BASE METAL	(0)	
CATALYST	(0)		ALLOYS	(0)	
VEHICLE	(0)		METALLIC COATINGS	(0)	
SOLVENTS	(0)		FILLER MATERIAL AND COATINGS	(0)	
ADDITIVES	(0)		OTHERS	(0)	
OTHERS	(0)				

HAZARDOUS MIXTURES OF OTHER LIQUIDS, SOLIDS OR GASES (%) (0) TLV UNITS

CONTAINS:
NONIONIC SURFACTANT & GANTREZ AN119 WHICH CONTAINS BENZENE BUT THIS FORMULA CONTAINS LESS THAN 1/10%

PHYSICAL DATA

BOILING POINT (F): NA

SPECIFIC GRAVITY (WATER = 1): NA

VAPOR PRESSURE (MMHG): NA

VOLATILE (% BY VOLUME): NA

VAPOR DENSITY (AIR=1): NA

EVAPORATION RATE (=1): NA

SOLUBILITY IN WATER: 100%

APPEARANCE AND ODOR: LIGHT BLUE LIQUID WITH LEMON FRAGRANCE.

FIRE AND EXPLOSION

FLASH POINT (METHOD USED):

FLAMMABILITY LIMITS: NOT FLAMMABLE

EXTINGUISHING MEDIA: NOT FLAMMABLE

SPECIAL FIRE PROCEDURES: NONE

UNUSUAL FIRE AND EXPLOSION HAZARDS: NONE

HEALTH HAZARD DATA

THRESHOLD LIMIT VALUE: NOT ESTABLISHED

EFFECTS OF OVER EXPOSURE: NONE

EMERGENCY AND FIRST AID PROCEDURES:

EXTERNAL:
FLUSH WITH WATER FOR 15 MINUTES, CALL PHYSICIAN IF IRRITATION PERSISTS.

INTERNAL:
GIVE LARGE QUANTITIES OF MILK OR WATER, CALL A PHYSICIAN.

REACTIVITY DATA

STABILITY: UNSTABLE ( )
STABLE (X)

CONDITIONS TO AVOID:
MIXING WITH ALKALINE PRODUCTS.

INCOMPATIBILITY: (MATERIALS TO AVOID):
COMPATIBLE WITH MOST OTHER HOUSEHOLD CLEANERS.

HAZARDOUS DECOMPOSITION PRODUCTS: NONE.

HAZARDOUS POLYMERIZATION:
MAY OCCUR ( )
MAY NOT OCCUR (X)

CONDITIONS TO AVOID:
MIXING WITH ALKALINE PRODUCTS.

SPILL OR LEAK PROCEDURES

STEPS TO BE TAKEN IN CASE OF MATERIAL SPILL: RINSE AREA WITH WATER.

WASTE DISPOSAL METHOD:
IN LAND FILL IN ACCORDANCE TO ALL STATE AND LOCAL REGULATIONS.

SPECIAL PROTECTION INFORMATION

RESPIRATORY PROTECTION (SPECIFY TYPE): NOT NORMALLY NEEDED.

VENTILATION: (NA) LOCAL EXHAUST: (NA)
MECHANICAL: (NA)
SPECIAL: (NA)
OTHER: (NA)

PROTECTIVE GLOVES: REGULAR HOUSEHOLD RUBBER GLOVES.

EYE PROTECTION: SIMPLE GOGGLES CAN BE USED.

OTHER PROTECTIVE EQUIPMENT: NONE

SPECIAL PRECAUTIONS

OTHER PRECAUTIONS:
AVOID CONTACT WITH MUCOUS MEMBRANES.

BENCH PRODUCTS INC.

HAND CLEANER DEGREASER

THIS HEAVY DUTY CLEANER HAS BEEN FORMULATED WITH A UNIQUE BLEND OF WETTING AGENTS, DETERGENTS AND GENTLE SURFACTANTS TO HELP REMOVE GROUND IN DIRT AND GREASE. FORTIFIED WITH SPECIAL EMMOLLIENTS TO HELP THE SKIN.

PRODUCT SPECIFICATIONS:

COLOR:	ORANGE
ODOR :	ALMOND
FLASH POINT:	NONE
P.H.	5
DENSITY	8.4 LBS PER GALLON
STORAGE STABILITY:	EXCELLENT. 1 YEAR MINIMUM

FREEZING STABILITY:
WILL FREEZE. USABLE AFTER THAWING WITH NO CHANGE IN PERFORMANCE.
AGITATE AFTER THAWING AND BEFORE USE.

PHOSPHATE FREE	YES
BIODEGRADABLE	YES

DIRECTIONS:

WET HANDS WITH WATER, APPLY A SMALL AMOUNT TO HANDS AND WORK INTO A LATHER; RINSE CLEAN WITH WATER.

CAUTION:
KEEP AWAY FROM CHILDREN, IF SWALLOWED GIVE A GLASSFUL OF WATER, CALL A PHYSICIAN. IF CONTACT WITH EYES, FLUSH WITH WATER FOR 15 MINUTES, CALL A PHYSICIAN.

PACKAGING:	SPARKLENE:	GALLONS (6 PER CASE)
	PRIVATE LABEL:	GALLONS (6 PER CASE)
		5 GALLON PAILS, 55 GALLON DRUMS.

WARRANTY:
CUSTOMER SATISFACTION GUARANTEED. ALL PRODUCTS ARE GUARANTEED FOR ONE YEAR FROM THE DATE OF INVOICE. ANY RETURNED PRODUCT SHOULD BE AVAILABLE AT THE DISTRIBUTORS WAREHOUSE FOR INSPECTION. LIABILITY TO THE MANUFACTURER IS LIMITED TO THE OPTION OF REPLACEMENT OF GOODS OR CREDIT OF INVOICE.

DISCLAIMER:
MANUFACTURER OR SELLER MAKES NO WARRANTY EXPRESS OR IMPLIED CONCERNING THE USE OF THIS PRODUCT OTHER THAN FOR THE PURPOSE INDICATED ON THE LABEL. MANUFACTURER OR SELLER IS NOT LIABLE FOR ANY INJURY OR DAMAGE CAUSED BY THIS PRODUCT DUE TO MISUSE, MISHANDLING OR ANY APPLICATION NOT SPECIFICALLY DESCRIBED AND RECOMMENDED ON THE LABEL.

BENCH PRODUCTS INC., SALT LAKE CITY, UTAH 84123

76 LUBRICANTS
UNOBA MOLY XD GREASE 2 Revised: 01/01/2002

MSDS Contents

76 UNOBA MOLY XD GREASE 2

(MSDS #5477020000)

MATERIAL SAFETY DATA SHEET

76 LUBRICANTS COMPANY
A DIVISION OF TOSCO CORPORATION

76 UNOBA MOLY XD GREASE 2

1. PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME: 76 UNOBA MOLY XD GREASE 2

PRODUCT CODE: 5477020000

SAP CODE:

INTENDED USE: GREASE

CHEMICAL FAMILY: PETROLEUM HYDROCARBON

RESPONSIBLE PARTY:
PHILLIPS 66 COMPANY
LUBRICANTS DIVISION
P.O. BOX 25376
SANTA ANA, CA 92799-5376

FOR ADDITIONAL MSDSS: 800-762-0942

TECHNICAL INFORMATION:
THE INTENDED USE OF THIS PRODUCT IS INDICATED ABOVE. IF ANY ADDITIONAL USE IS KNOWN, PLEASE CONTACT US AT THE TECHNICAL INFORMATION NUMBER LISTED.

EMERGENCY OVERVIEW:

24 HOUR EMERGENCY TELEPHONE NUMBERS:
SPILL, LEAK, FIRE OR ACCIDENT:
CALL CHEMTREC:
NORTH AMERICA: (800) 424-9300

OTHERS: (703) 527-3887 (COLLECT)

CALIFORNIA POISON CONTROL SYSTEM: (800) 356-3129

HEALTH HAZARDS/PRECAUTIONARY MEASURES:
AVOID CONTACT WITH EYES, SKIN AND CLOTHING. WASH THOROUGHLY AFTER HANDLING.

PHYSICAL HAZARDS/PRECAUTIONARY MEASURES:
KEEP AWAY FROM ALL SOURCES OF IGNITION.

APPEARANCE: BLACK

PHYSICAL FORM: SEMI-SOLID

ODOR: CHARACTERISTIC PETROLEUM

NFPA HAZARD CLASS:
HEALTH 1 (SLIGHT)
FLAMMABILITY 1 (SLIGHT)
REACTIVITY 0 (LEAST)

HMIS HAZARD CLASS: NOT EVALUATED

2. COMPOSITION/INFORMATION ON INGREDIENTS

HAZARDOUS COMPONENTS	% WEIGHT	EXPOSURE GUIDELINE LIMITS	AGENCY	TYPE
DEASPHALTED RESIDUUM C24 CAS#: 64741-95-3	30-50	(SEE: OIL MIST, IF GENERATED)		
MOLYBDENUM DISULFIDE CAS#: 1317-33-5	1-5	(SEE: MOLYBDENUM, INSOLUBLE COMPOUNDS (AS Mo))		
ZINC COMPOUND CAS#: PROPRIETARY	<1	NOT ESTABLISHED		

OTHER COMPONENTS	% WEIGHT	EXPOSURE GUIDELINE LIMITS	AGENCY	TYPE
LUBRICANT BASE OIL (PETROLEUM) CAS#: VARIOUS	50-70	(SEE: OIL MIST, IF GENERATED)		
ADDITIVES CAS#: PROPRIETARY	5-13	NOT ESTABLISHED		

REFERENCE	EXPOSURE GUIDELINE LIMITS	AGENCY	TYPE
MOLYBDENUM, INSOLUBLE COMPOUNDS (AS Mo) CAS#: NONE	10 MG/M3	ACGIH	TWA
	3 MG/M3	ACGIH	TWA-RESP.
	15 MG/M3	OSHA	TWA-TOT.
OIL MIST, IF GENERATED CAS#: NONE	5 MG/M3	ACGIH	TWA
	10 MG/M3	ACGIH	STEL
	5 MG/M3	OSHA	TWA
	2500 MG/M3	NIOSH	IDLH

ALL COMPONENTS ARE LISTED ON THE TSCA INVENTORY

THE BASE OIL FOR THIS PRODUCT CAN BE A MIXTURE OF ANY OF THE FOLLOWING HIGHLY REFINED PETROLEUM STREAMS:
CAS 64741-88-4; CAS 64741-89-5; CAS 64741-96-4; CAS 64741-97-5;
CAS 64742-01-4; CAS 64742-52-5; CAS 64742-53-6; CAS 64742-54-7;
CAS 64742-55-8; CAS 64742-56-9; CAS 64742-57-0; CAS 64742-62-7;
CAS 64742-63-8; CAS 64742-65-0; CAS 72623-85-9; CAS 72623-86-0;
CAS 72623-87-1

NOTE:
STATE, LOCAL OR OTHER AGENCIES OR ADVISORY GROUPS MAY HAVE ESTABLISHED MORE STRINGENT LIMITS. CONSULT AN INDUSTRIAL HYGIENIST OR SIMILAR PROFESSIONAL, OR YOUR LOCAL AGENCIES, FOR FURTHER INFORMATION.

3. HAZARDS IDENTIFICATION

POTENTIAL HEALTH EFFECTS:

EYE:
CONTACT MAY CAUSE MILD EYE IRRITATION INCLUDING STINGING, WATERING, AND REDNESS.

SKIN:
CONTACT MAY CAUSE MILD SKIN IRRITATION INCLUDING REDNESS, AND A BURNING SENSATION. PROLONGED OR REPEATED CONTACT CAN WORSEN IRRITATION BY CAUSING DRYING AND CRACKING OF THE SKIN LEADING TO DERMATITIS (INFLAMMATION). NO HARMFUL EFFECTS FROM SKIN ABSORPTION ARE EXPECTED.

INHALATION (BREATHING):
NO DATA AVAILABLE. HOWEVER, INHALATION IS NOT AN EXPECTED ROUTE OF EXPOSURE.

INGESTION (SWALLOWING): LOW DEGREE OF TOXICITY BY INGESTION.

SIGNS AND SYMPTOMS:
EFFECTS OF OVEREXPOSURE MAY INCLUDE IRRITATION OF THE NOSE AND THROAT, IRRITATION OF THE DIGESTIVE TRACT, IRRITATION OF THE RESPIRATORY TRACT, NAUSEA AND DIARRHEA.

CANCER:
INADEQUATE EVIDENCE AVAILABLE TO EVALUATE THE CANCER HAZARD OF THIS MATERIAL. SEE SECTION 11 FOR CARCINOGENICITY INFORMATION OF INDIVIDUAL COMPONENTS, IF ANY.

TARGET ORGANS: NO DATA AVAILABLE FOR THIS MATERIAL.

DEVELOPMENTAL: NO DATA AVAILABLE FOR THIS MATERIAL.

PRE-EXISTING MEDICAL CONDITIONS:
CONDITIONS AGGRAVATED BY EXPOSURE MAY INCLUDE SKIN DISORDERS.

4. FIRST AND MEASURES

EYE:
IF IRRITATION OR REDNESS DEVELOPS, MOVE VICTIM AWAY FROM EXPOSURE AND INTO FRESH AIR. FLUSH EYES WITH CLEAN WATER. IF SYMPTOMS PERSIST, SEEK MEDICAL ATTENTION.

SKIN:
WIPE MATERIAL FROM SKIN AND REMOVE CONTAMINATED SHOES AND CLOTHING. CLEANSE

AFFECTED AREA(S) THOROUGHLY BY WASHING WITH MILD SOAP AND WATER AND, IF NECESSARY, A WATERLESS SKIN CLEANSER. IF IRRITATION OR REDNESS DEVELOPS AND PERSISTS, SEEK MEDICAL ATTENTION.

INHALATION (BREATHING):
FIRST AID IS NOT NORMALLY REQUIRED. IF BREATHING DIFFICULTIES DEVELOP, MOVE VICTIM AWAY FROM SOURCE OF EXPOSURE AND INTO FRESH AIR. SEEK IMMEDIATE MEDICAL ATTENTION.

INGESTION (SWALLOWING):
FIRST AID IS NOT NORMALLY REQUIRED; HOWEVER, IF SWALLOWED AND SYMPTOMS DEVELOP, SEEK MEDICAL ATTENTION.

NOTE TO PHYSICIANS:
HIGH-PRESSURE HYDROCARBON INJECTION INJURIES MAY PRODUCE SUBSTANTIAL NECROSIS OF UNDERLYING TISSUE DESPITE AN INNOCUOUS APPEARING EXTERNAL WOUND. OFTEN THESE INJURIES REQUIRE EXTENSIVE EMERGENCY SURGICAL DEBRIDEMENT AND ALL INJURIES SHOULD BE EVALUATED BY A SPECIALIST IN ORDER TO ASSESS THE EXTENT OF INJURY.

5. FIRE FIGHTING MEASURES

FLAMMABLE PROPERTIES:

FLASHPOINT: 450 DEG. F/232 DEG. C (COC)

OSHA FLAMMABILITY CLASS: NOT APPLICABLE

LEL%: 0.9
UEL%: 7.0

AUTOIGNITION TEMPERATURE: NO DATA

BURN RATE (SOLIDS): NO DATA

UNUSUAL FIRE & EXPLOSION HAZARDS:
THIS MATERIAL MAY BURN, BUT WILL NOT IGNITE READILY.

EXTINGUISHING MEDIA:
DRY CHEMICAL, CARBON DIOXIDE, FOAM, WATER, SAND, OR EARTH IS RECOMMENDED. CARBON DIOXIDE CAN DISPLACE OXYGEN. USE CAUTION WHEN APPLYING CARBON DIOXIDE IN CONFINES SPACES.

FIRE FIGHTING INSTRUCTIONS:
FOR FIRES BEYOND THE INCIPIENT STAGE, EMERGENCY RESPONDERS IN THE IMMEDIATE HAZARD AREA SHOULD WEAR BUNKER GEAR. WHEN THE POTENTIAL CHEMICAL HAZARD IS UNKNOWN, IN ENCLOSED OR CONFINED SPACES, OR WHEN EXPLICITY REQUIRED BY DOT, A SELF CONTAINED BREATHING APPARATUS SHOULD BE WORN. IN ADDITION, WEAR OTHER APPROPRIATE PROTECTIVE EQUIPMENT AS CONDITIONS WARRANT (SEE SECTION 8).

ISOLATE IMMEDIATE HAZARD AREA, KEEP UNAUTHORIZED PERSONNEL OUT. CONTAIN SPILL IF IT CAN BE DONE WITH MINIMAL RISK. MOVE UNDAMAGED CONTAINERS FROM IMMEDIATE HAZARD AREA IF IT CAN BE DONE WITH MINIMAL RISK.

COOL EQUIPMENT EXPOSED TO FIRE WITH WATER, IF IT CAN BE DONE WITH MINIMAL RISK.

6. ACCIDENTAL RELEASE MEASURES

THIS MATERIAL MAY BURN, BUT WILL NOT IGNITE READILY. KEEP ALL SOURCES OF IGNITION AWAY FROM SPILL/RELEASE. STAY UPWIND AND AWAY FROM SPILL. NOTIFY PERSONS DOWN WIND OF THE SPILL/RELEASE, ISOLATE IMMEDIATE HAZARD AREA AND KEEP UNAUTHORIZED PERSONNEL OUT. CONTAIN SPILL IF IT CAN BE DONE WITH MINIMAL RISK. WEAR APPROPRIATE PROTECTIVE EQUIPMENT INCLUDING RESPIRATORY PROTECTION AS CONDITIONS WARRANT (SEE SECTION 8).

PREVENT SPILLED MATERIAL FROM ENTERING SEWERS, STORM DRAINS, OTHER UNAUTHORIZED DRAINAGE SYSTEMS, AND NATURAL WATERWAYS. NOTIFY FIRE AUTHORITIES AND APPROPRIATE FEDERAL, STATE, AND LOCAL AGENCIES. CLEANUP UNDER EXPERT SUPERVISION IS ADVISED. MINIMIZE DUST GENERATION. SWEEP UP AND PACKAGE APPROPRIATELY FOR DISPOSAL. IF SPILL OF ANY AMOUNT IS MADE INTO OR UPON NAVIGABLE WATERS, THE CONTIGUOUS ZONE, OR ADJOINING SHORELINES, NOTIFY THE NATIONAL RESPONSE CENTER (PHONE NUMBER 800-424-8802).

7. HANDLING AND STORAGE

HANDLING:
THE USE OF APPROPRIATE RESPIRATORY PROTECTION IS ADVISED WHEN CONCENTRATIONS EXCEED ANY ESTABLISHED EXPOSURE LIMITS (SEE SECTIONS 2 AND 8).

DO NOT WEAR CONTAMINATED CLOTHING OR SHOES. USE GOOD PERSONAL HYGIENE PRACTICES.

HIGH PRESSURE INJECTION OF HYDROCARBON FUELS, HYDRAULIC OILS OR GREASES UNDER THE SKIN MAY HAVE SERIOUS CONSEQUENCES EVEN THOUGH NO SYMPTOMS OR INJURY MAY BE APPARENT. THIS CAN HAPPEN ACCIDENTALLY WHEN USING HIGH PRESSURE EQUIPMENT SUCH AS HIGH PRESSURE GREASE GUNS, FUEL INJECTION APPARATUS OR FROM PINHOLE LEAKS IN TUBING OF HIGH PRESSURE HYDRAULIC OIL EQUIPMENT.

"EMPTY" CONTAINERS RETAIN RESIDUE AND MAY BE DANGEROUS. DO NOT PRESSURIZE, CUT, WELD, BRAZE, SOLDER, DRILL, GRIND, OR EXPOSE SUCH CONTAINERS TO HEAT, FLAME, SPARKS, OR OTHER SOURCES OF IGNITION. THEY MAY EXPLODE AND CAUSE INJURY OR DEATH. "EMPTY" DRUMS SHOULD BE COMPLETELY DRAINED, PROPERLY BUNGED, AND PROMPTLY SHIPPED TO THE SUPPLIER OR A DRUM RECONDITIONER. ALL CONTAINERS SHOULD BE DISPOSED OF IN AN ENVIRONMENTALLY SAFE MANNER AND IN ACCORDANCE WITH GOVERNMENTAL REGULATIONS.

BEFORE WORKING ON OR IN TANKS WHICH CONTAIN OR HAVE CONTAINED THIS MATERIAL, REFER TO OSHA REGULATIONS, ANSI Z49.1 AND OTHER REFERENCES PERTAINING TO CLEANING, REPAIRING, WELDING, OR OTHER CONTEMPLATED OPERATIONS.

STORAGE:
KEEP CONTAINER(S) TIGHTLY CLOSED. USE AND STORE THIS MATERIAL IN COOL, DRY, WELL-VENTILATED AREAS AWAY FROM HEAT AND ALL SOURCES OF IGNITION. STORE ONLY IN APPROVED CONTAINERS. KEEP AWAY FROM ANY INCOMPATIBLE MATERIAL (SEE SECTION 10). PROTECT CONTAINER(S) AGAINST PHYSICAL DAMAGE.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

ENGINEERING CONTROLS:
IF CURRENT VENTILATION PRACTICES ARE NOT ADEQUATE TO MAINTAIN AIRBORNE CONCENTRATIONS BELOW THE ESTABLISHED EXPOSURE LIMITS (SEE SECTION 2), ADDITIONAL VENTILATION OR EXHAUST SYSTEMS MAY BE REQUIRED.

PERSONAL PROTECTIVE EQUIPMENT (PPE):

RESPIRATORY:

INHALATION IS NOT AN EXPECTED ROUTE OF EXPOSURE. HOWEVER, A NIOSH CERTIFIED AIR PURIFYING RESPIRATOR WITH A TYPE 95 (R OR P) PARTICULATE FILTER MAY BE USED UNDER CONDITIONS WHERE AIRBORNE CONCENTRATIONS ARE EXPECTED TO EXCEED EXPOSURE LIMITS (SEE SECTION 2).

PROTECTION PROVIDED BY AIR PURIFYING RESPIRATORS IS LIMITED (SEE MANUFACTURER'S RESPIRATOR SELECTION GUIDE). USE A POSITIVE PRESSURE AIR SUPPLIED RESPIRATOR IF THERE IS POTENTIAL FOR UNCONTROLLED RELEASE, EXPOSURE LEVELS ARE NOT KNOWN, OR ANY OTHER CIRCUMSTANCES WHERE AIR PURIFYING RESPIRATORS MAY NOT PROVIDE ADEQUATE PROTECTION.

A RESPIRATORY PROTECTION PROGRAM THAT MEETS OSHA'S 29 CFR 1910.134 AND ANSI Z88.2 REQUIREMENTS MUST BE FOLLOWED WHENEVER WORKPLACE CONDITIONS WARRANT A RESPIRATOR'S USE.

SKIN:
THE USE OF GLOVES IMPERVIOUS TO THE SPECIFIC MATERIAL HANDLED IS ADVISED TO PREVENT SKIN CONTACT, POSSIBLE IRRITATION, AND ABSORPTION (SEE GLOVE MANUFACTURER LITERATURE FOR INFORMATION ON PERMEABILITY).

EYE/FACE:
APPROVED EYE PROTECTION TO SAFEGUARD AGAINST POTENTIAL EYE CONTACT, IRRITATION, OR INJURY IS RECOMMENDED. DEPENDING ON CONDITIONS OF USE, A FACE SHIELD MAY BE NECESSARY.

OTHER PROTECTIVE EQUIPMENT:
A SOURCE OF CLEAN WATER SHOULD BE AVAILABLE IN THE WORK AREA FOR FLUSHING EYES AND SKIN. IMPERVIOUS CLOTHING SHOULD BE WORN AS NEEDED.

9. PHYSICAL AND CHEMICAL PROPERTIES

NOTE:
UNLESS OTHERWISE STATED, VALUES ARE DETERMINED AT 20 DEG. C (68 DEG. F) AND 760 MMHg (1 ATM).

BURN RATE (SOLIDS ONLY): NO DATA

APPEARANCE: BLACK

PHYSICAL STATE: SEMI-SOLID

ODOR: CHARACTERISTIC PETROLEUM

VAPOR PRESSURE (MMHg): <0.01

VAPOR DENSITY (AIR = 1): >5

BOILING POINT/RANGE: NO DATA

FREEZING/MELTING POINT: 365 DEG. F/185 DEG. C

SOLUBILITY IN WATER: NEGLIGIBLE

SPECIFIC GRAVITY: 0.90 @ 60 DEG. F

PERCENT VOLATILE: NEGLIGIBLE

EVAPORATION RATE (nBuAc = 1): <0.01

BULK DENSITY: 7.50 LBS/GAL

FLASHPOINT: 450 DEG. F / 232 DEG. C (COC)

FLAMMABLE/EXPLOSIVE LIMITS (%):
LEL: 0.9
UEL: 7.0

10. STABILITY AND REACTIVITY

STABILITY:
STABLE UNDER NORMAL AMBIENT AND ANTICIPATED STORAGE AND HANDLING CONDITIONS OF TEMPERATURE AND PRESSURE.

CONDITIONS TO AVOID:
EXTENDED EXPOSURE TO HIGH TEMPERATURES CAN CAUSE DECOMPOSITION.

MATERIALS TO AVOID (INCOMPATIBLE MATERIALS):
AVOID CONTACT WITH STRONG OXIDANTS SUCH AS LIQUID CHLORINE, CONCENTRATED OXYGEN, SODIUM HYPOCHLORITE OR CALCIUM HYPOCHLORITE.

HAZARDOUS DECOMPOSITION PRODUCTS:
COMBUSTION CAN YIELD MAJOR AMOUNTS OF OXIDES OF CARBON AND MINOR AMOUNTS OF OXIDES OF SULFUR AND NITROGEN. OXIDES OF MOLYBDENUM MAY ALSO BE FORMED.

HAZARDOUS POLYMERIZATION: WILL NOT OCCUR.

11. TOXICOLOGICAL INFORMATION

LUBRICANT BASE OIL (PETROLEUM (CAS# VARIOUS):

CARCINOGENICITY:
THE PETROLEUM BASE OILS CONTAINED IN THIS PRODUCT HAVE BEEN HIGHLY REFINED BY A VARIETY OF PROCESSES INCLUDING SOLVENT EXTRACTION, HYDROTREATING, AND DEWAXING TO REMOVE AROMATICS AND IMPROVE PERFORMANCE CHARACTERISTICS. NONE OF THE OILS USED ARE LISTED AS A CARCINOGEN BY NTP, IARC, OR OSHA.

DEASPHALTED RESIDUUM.. C24 (CAS# 64741-95-3):

CARCINOGENICITY:
SKIN APPLICATION OF A SIMILAR MATERIAL, VACUUM TOWER BOTTOMS, PRODUCED EQUIVOCAL RESULTS IN MOUSE TUMOR BIOASSAYS, BUT NEGATIVE RESULTS IN BOTH SKIN TUMOR INITIATION AND PROMOTION STUDIES. UNTREATED VACUUM DISTILLATES HAVE BEEN IDENTIFIED AS A CARCINOGEN BY IARC.

12. ECOLOGICAL INFORMATION

NOT EVALUATED AT THIS TIME

13. DISPOSAL CONSIDERATIONS

THIS MATERIAL, IF DISCARDED AS PRODUCED, IS NOT A RCRA "LISTED" OR "CHARACTERISTIC" HAZARDOUS WASTE. USE WHICH RESULTS IN CHEMICAL OR PHYSICAL CHANGE OR CONTAMINATION MAY SUBJECT IT TO REGULATION AS A HAZARDOUS WASTE. ALONG WITH PROPERLY CHARACTERIZING ALL WASTE MATERIALS, CONSULT STATE AND LOCAL REGULATIONS REGARDING THE PROPER DISPOSAL OF THIS MATERIAL.

14. TRANSPORT INFORMATION

NOTE: NOT CLASSIFIED AS HAZARDOUS

15. REGULATORY INFORMATION

EPA SARA 311/312 (TITLE III HAZARD CATEGORIES):
ACUTE HEALTH: NO
CHRONIC HEALTH: NO
FIRE HAZARD: NO
PRESSURE HAZARD: NO
REACTIVE HAZARD: NO

SARA 313 AND 40 CFR 372:
THIS MATERIAL CONTAINS THE FOLLOWING CHEMICALS SUBJECT TO THE REPORTING REQUIREMENTS OF SARA 313 AND 40 CFR 372:

COMPONENT	CAS NUMBER	WEIGHT %
ZINC COMPOUND	PROPRIETARY	<1

CALIFORNIA PROPOSITION 65:

WARNING:
THIS MATERIAL CONTAINS THE FOLLOWING CHEMICALS WHICH ARE KNOWN TO THE STATE OF CALIFORNIA TO CAUSE CANCER, BIRTH DEFECTS OR OTHER REPRODUCTIVE HARM, AND ARE SUBJECT TO THE REQUIREMENTS OF CALIFORNIA PROPOSITION 65 (CA HEALTH & SAFETY CODE SECTION 25249.5):

COMPONENT	EFFECT
RESIDUAL FUEL OILS	SKIN CANCER

CARCINOGEN IDENTIFICATION:
THIS MATERIAL HAS NOT BEEN IDENTIFIED AS A CARCINOGEN BY NTP, IARC, OR OSHA, SEE SECTION 11 FOR CARCINOGENICITY INFORMATION OF INDIVIDUAL COMPONENTS, IF ANY.

EPA (CERCLA) REPORTABLE QUANTITY: NONE

16. OTHER INFORMATION

ISSUE DATE: 01/01/02

PREVIOUS ISSUE DATE: 05/31/01

PRODUCT CODE: 5477020000

REVISED SECTIONS: NONE

PREVIOUS PRODUCT CODE: 5477020000

MSDS NUMBER: 5477020000

DISCLAIMER OF EXPRESSED AND IMPLIED WARRANTIES:

THE INFORMATION PRESENTED IN THIS MATERIAL SAFETY DATA SHEET IS BASED ON DATA BELIEVED TO BE ACCURATE AS OF THE DATE THIS MATERIAL SAFETY DATA SHEET WAS PREPARED. HOWEVER, NO WARRANTY OF MERCHANTABILITY, FITNESS FOR ANY PARTICULAR PURPOSE, OR ANY OTHER WARRANTY IS EXPRESSED OR IS TO BE IMPLIED REGARDING THE ACCURACY OR COMPLETENESS OF THE INFORMATION PROVIDED ABOVE, THE RESULTS TO BE OBTAINED FROM THE USE OF THIS INFORMATION OR THE PRODUCT, THE SAFETY OF THIS PRODUCT, OR THE HAZARDS RELATED TO ITS USE. NO RESPONSIBILITY IS ASSUMED FOR ANY DAMAGE OR INJURY RESULTING FROM ABNORMAL USE OR FROM ANY FAILURE TO ADHERE TO RECOMMENDED PRACTICES. THE INFORMATION PROVIDED ABOVE, AND THE PRODUCT, ARE FURNISHED ON THE CONDITION THAT THE PERSON RECEIVING THEM SHALL MAKE THEIR OWN DETERMINATION AS TO THE SUITABILITY OF THE PRODUCT FOR THEIR PARTICULAR PURPOSE AND ON THE CONDITION THAT THEY ASSUME THE RISK OF THEIR USE. IN ADDITION, NO AUTHORIZATION IS GIVEN NOR IMPLIED TO PRACTICE ANY PATENTED INVENTION WITHOUT A LICENSE.

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76 LUBRICANTS
EXTRA DUTY GEAR LUBE (ALL GRADES) **Revised: 02/22/2005**

MSDS Contents

MSDS CODE: 720080

STATUS: FINAL

DATE OF ISSUE: 22-FEB-2005

76 LUBRICANTS

MATERIAL SAFETY DATA SHEET

76 EXTRA DUTY GEAR LUBE (ALL GRADES)

1. PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME: 76 EXTRA DUTY GEAR LUBE (ALL GRADES)

PRODUCT CODE: 47601, 47602, 47603, 47604, 47605, 47606, 47607, 47609

INTENDED USE: GEAR LUBRICANT

SYNONYMS:
76 EXTRA DUTY GEAR LUBE 2EP
76 EXTRA DUTY GEAR LUBE 3EP
76 EXTRA DUTY GEAR LUBE 4EP
76 EXTRA DUTY GEAR LUBE 5EP
76 EXTRA DUTY GEAR LUBE 6EP
76 EXTRA DUTY GEAR LUBE 7EP
76 EXTRA DUTY GEAR LUBE 8EP
76 EXTRA DUTY GEAR LUBE 9EP

CHEMICAL FAMILY: PETROLEUM HYDROCARBON

RESPONSIBLE PARTY:
76 LUBRICANTS
A DIVISION OF CONOCO PHILLIPS
600 N. DAIRY ASHFORD
HOUSTON, TEXAS 77079-1175

CUSTOMER SERVICE: 888-766-7676

TECHNICAL INFORMATION: 800-435-7761

THE INTENDED USE OF THIS PRODUCT IS INDICATED ABOVE. IF ANY ADDITIONAL USE
IS KNOWN, PLEASE CONTACT US AT THE TECHNICAL INFORMATION NUMBER LISTED.

EMERGENCY OVERVIEW:

24 HOUR EMERGENCY TELEPHONE NUMBERS:
SPILL, LEAK, FIRE OR ACCIDENT CALL CHEMTREC:
NORTH AMERICA: (800) 424-9300
OTHERS: (703) 527-3887 (COLLECT)

CALIFORNIA POISON CONTROL SYSTEM: (800) 356-3219

HEALTH HAZARDS/PRECAUTIONARY MEASURES:
AVOID CONTACT WITH EYES, SKIN AND CLOTHING. WASH THOROUGHLY AFTER HANDLING.

PHYSICAL HAZARDS/PRECAUTIONARY MEASURES:
KEEP AWAY FROM ALL SOURCES OF IGNITION.

APPEARANCE: CLEAR AND BRIGHT

PHYSICAL FORM: LIQUID

ODOR: CHARACTERISTIC PETROLEUM

NFPA 704 HAZARD CLASS:
HEALTH 1 (SLIGHT)
FLAMMABILITY 1 (SLIGHT)
INSTABILITY 0 (LEAST)

HMIS HAZARD CLASS:
HEALTH 1 (SLIGHT)
FLAMMABILITY 1 (SLIGHT)
PHYSICAL HAZARDS 0 (LEAST)

2. COMPOSITION / INFORMATION ON INGREDIENTS

NON-HAZARDOUS COMPONENTS:

COMPONENT	CAS NO	PERCENT (%)	ACGIH	OSHA	NIOSH	OTHER
LUBRICANT BASE OIL (PETROLEUM)	VARIOUS	97-98	5 MG/M3 TWA 10 MG/M3 STEL	5 MG/M3 TWA	2500 MG/M3 IDLH	AS OIL MIST, IF GENERATED 5 MG/M3 NOHSC TWA
ADDITIVES	PROP-RIETARY	2-3	NE	NE	NE	NE

ALL COMPONENTS ARE LISTED ON THE TSCA INVENTORY.

THE BASE OIL FOR THIS PRODUCT CAN BE A MIXTURE OF ANY OF THE FOLLOWING HIGHLY
REFINED PETROLEUM STREAMS:
CAS 64741-88-4; CAS 64741-89-5; CAS 64741-96-4; CAS 64741-97-5;
CAS 64742-01-4; CAS 64742-52-5; CAS 64742-53-6; CAS 64742-54-7;
CAS 64742-55-8; CAS 64742-56-9; CAS 64742-57-0; CAS 64742-62-7;
CAS 64742-63-8; CAS 64742-65-0; CAS 72623-83-7; CAS 72623-85-9;
CAS 72623-86-0; CAS 72623-87-1

NOTE:
STATE, LOCAL OR OTHER AGENCIES OR ADVISORY GROUPS MAY HAVE ESTABLISHED MORE

STRINGENT LIMITS. CONSULT AN INDUSTRIAL HYGIENIST OR SIMILAR PROFESSIONAL, OR YOUR LOCAL AGENCIES, FOR FURTHER INFORMATION.

1%=10,000 PPM.
NE=NOT ESTABLISHED

3. HAZARDS IDENTIFICATION

POTENTIAL HEALTH EFFECTS:

EYE:
CONTACT MAY CAUSE MILD EYE IRRITATION INCLUDING STINGING, WATERING, AND REDNESS.

SKIN:
CONTACT MAY CAUSE MILD SKIN IRRITATION INCLUDING REDNESS, AND A BURNING SENSATION. PROLONGED OR REPEATED CONTACT CAN WORSEN IRRITATION BY CAUSING DRYING AND CRACKING OF THE SKIN LEADING TO DERMATITIS (INFLAMMATION). NO HARMFUL EFFECTS FROM SKIN ABSORPTION ARE EXPECTED.

INHALATION (BREATHING):
NO INFORMATION AVAILABLE. STUDIES BY OTHER EXPOSURE ROUTES SUGGEST A LOW DEGREE OF TOXICITY BY INHALATION.

INGESTION (SWALLOWING): NO HARMFUL EFFECTS EXPECTED FROM INGESTION.

SIGNS AND SYMPTOMS:
EFFECTS OF OVEREXPOSURE MAY INCLUDE IRRITATION OF THE EYES, IRRITATION OF THE NOSE AND THROAT, IRRITATION OF THE DIGESTIVE TRACT, IRRITATION OF THE RESPIRATORY TRACT, NAUSEA, DIARRHEA.

CANCER:
INADEQUATE EVIDENCE AVAILABLE TO EVALUATE THE CANCER HAZARD OF THIS MATERIAL. SEE SECTION 11 FOR CARCINOGENICITY INFORMATION OF INDIVIDUAL COMPONENTS, IF ANY.

TARGET ORGANS: NO DATA AVAILABLE FOR THIS MATERIAL.

DEVELOPMENTAL: NO DATA AVAILABLE FOR THIS MATERIAL.

PRE-EXISTING MEDICAL CONDITIONS:
CONDITIONS AGGRAVATED BY EXPOSURE MAY INCLUDE SKIN DISORDERS, RESPIRATORY (ASTHMA-LIKE) DISORDERS.

4. FIRST AID MEASURES

EYE:
IF IRRITATION OR REDNESS DEVELOPS, MOVE VICTIM AWAY FROM EXPOSURE AND INTO FRESH AIR. FLUSH EYES WITH CLEAN WATER. IF SYMPTOMS PERSIST, SEEK MEDICAL ATTENTION.

SKIN:
REMOVE CONTAMINATED SHOES AND CLOTHING AND CLEANSE AFFECTED AREA(S) THOROUGHLY BY WASHING WITH MILD SOAP AND WATER. IF IRRITATION OR REDNESS DEVELOPS AND PERSISTS, SEEK MEDICAL ATTENTION.

INHALATION (BREATHING):
IF RESPIRATORY SYMPTOMS DEVELOP, MOVE VICTIM AWAY FROM SOURCE OF EXPOSURE AND INTO FRESH AIR. IF SYMPTOMS PERSIST, SEEK MEDICAL ATTENTION. IF VICTIM

IS NOT BREATHING, CLEAR AIRWAY AND IMMEDIATELY BEGIN ARTIFICIAL RESPIRATION.
IF BREATHING DIFFICULTIES DEVELOP, OXYGEN SHOULD BE ADMINISTERED BY QUALIFIED
PERSONNEL. SEEK IMMEDIATE MEDICAL ATTENTION.

INGESTION (SWALLOWING):
FIRST AID IS NOT NORMALLY REQUIRED; HOWEVER, IF SWALLOWED AND SYMPTOMS
DEVELOP, SEEK MEDICAL ATTENTION.

NOTES TO PHYSICIAN:
HIGH-PRESSURE HYDROCARBON INJECTION INJURIES MAY PRODUCE SUBSTANTIAL
NECROSIS OF UNDERLYING TISSUE DESPITE AN INNOCUOUS APPEARING EXTERNAL WOUND.
OFTEN THESE INJURIES REQUIRE EXTENSIVE EMERGENCY SURGICAL DEBRIDEMENT AND
ALL INJURIES SHOULD BE EVALUATED BY A SPECIALIST IN ORDER TO ASSESS THE
EXTENT OF INJURY.

ACUTE ASPIRATIONS OF LARGE AMOUNTS OF OIL-LADEN MATERIAL MAY PRODUCE A
SERIOUS ASPIRATION PNEUMONIA. PATIENTS WHO ASPIRATE THESE OILS SHOULD BE
FOLLOWED FOR THE DEVELOPMENT OF LONG-TERM SEQUELAE. INHALATION EXPOSURE TO
OIL MISTS BELOW CURRENT WORKPLACE EXPOSURE LIMITS IS UNLIKELY TO CAUSE
PULMONARY ABNORMALITIES.

5. FIRE-FIGHTING MEASURES

FLAMMABLE PROPERTIES:

FLASH POINT: >399 DEG. F / 204 DEG. C

OSHA FLAMMABILITY CLASS: NOT APPLICABLE

NFPA FLAMMABILITY CLASS: NO DATA

LEL%: NO DATA
UEL%: NO DATA

AUTOIGNITION TEMPERATURE: NO DATA

UNUSUAL FIRE & EXPLOSION HAZARDS:
THIS MATERIAL MAY BURN, BUT WILL NOT IGNITE READILY. VAPORS ARE HEAVIER THAN
AIR AND CAN ACCUMULATE IN LOW AREAS. IF CONTAINER IS NOT PROPERLY COOLED, IT
CAN RUPTURE IN THE HEAT OF A FIRE.

EXTINGUISHING MEDIA:
DRY CHEMICAL, CARBON DIOXIDE, FOAM, OR WATER SPRAY IS RECOMMENDED. WATER OR
FOAM MAY CAUSE FROTHING OF MATERIALS HEATED ABOVE 212 DEG. F CARBON DIOXIDE
CAN DISPLACE OXYGEN. USE CAUTION WHEN APPLYING CARBON DIOXIDE IN CONFINED
SPACES.

FIRE FIGHTING INSTRUCTIONS:
FOR FIRES BEYOND THE INCIPIENT STAGE, EMERGENCY RESPONDERS IN THE IMMEDIATE
HAZARD AREA SHOULD WEAR BUNKER GEAR. WHEN THE POTENTIAL CHEMICAL HAZARD IS
UNKNOWN, IN ENCLOSED OR CONFINED SPACES, OR WHEN EXPLICITLY REQUIRED BY DOT,
A SELF CONTAINED BREATHING APPARATUS SHOULD BE WORN. IN ADDITION, WEAR OTHER
APPROPRIATE PROTECTIVE EQUIPMENT AS CONDITIONS WARRANT (SEE SECTION 8).

ISOLATE IMMEDIATE HAZARD AREA, KEEP UNAUTHORIZED PERSONNEL OUT. STOP
SPILL/RELEASE IF IT CAN BE DONE WITH MINIMAL RISK. MOVE UNDAMAGED CONTAINERS
FROM IMMEDIATE HAZARD AREA IF IT CAN BE DONE WITH MINIMAL RISK.

WATER SPRAY MAY BE USEFUL IN MINIMIZING OR DISPERSING VAPORS AND TO PROTECT
PERSONNEL. COOL EQUIPMENT EXPOSED TO FIRE WITH WATER, IF IT CAN BE DONE WITH
MINIMAL RISK. AVOID SPREADING BURNING LIQUID WITH WATER USED FOR COOLING
PURPOSES.

6. ACCIDENTAL RELEASE MEASURES

THIS MATERIAL MAY BURN, BUT WILL NOT IGNITE READILY. KEEP ALL SOURCES OF IGNITION AWAY FROM SPILL/RELEASE.

STAY UPWIND AND AWAY FROM SPILL/RELEASE. NOTIFY PERSONS DOWN WIND OF THE SPILL/RELEASE, ISOLATE IMMEDIATE HAZARD AREA AND KEEP UNAUTHORIZED PERSONNEL OUT. STOP SPILL/RELEASE IF IT CAN BE DONE WITH MINIMAL RISK. WEAR APPROPRIATE PROTECTIVE EQUIPMENT INCLUDING RESPIRATORY PROTECTION AS CONDITIONS WARRANT (SEE SECTION 8).

PREVENT SPILLED MATERIAL FROM ENTERING SEWERS, STORM DRAINS, OTHER UNAUTHORIZED DRAINAGE SYSTEMS, AND NATURAL WATERWAYS. DIKE FAR AHEAD OF SPILL FOR LATER RECOVERY OR DISPOSAL. SPILLED MATERIAL MAY BE ABSORBED INTO AN APPROPRIATE ABSORBENT MATERIAL.

NOTIFY FIRE AUTHORITIES AND APPROPRIATE FEDERAL, STATE, AND LOCAL AGENCIES. IMMEDIATE CLEANUP OF ANY SPILL IS RECOMMENDED. IF SPILL OF ANY AMOUNT IS MADE INTO OR UPON NAVIGABLE WATERS, THE CONTIGUOUS ZONE, OR ADJOINING SHORELINES, NOTIFY THE NATIONAL RESPONSE CENTER (PHONE NUMBER 800-424-8802).

7. HANDLING AND STORAGE

HANDLING:
DO NOT ENTER CONFINED SPACES SUCH AS TANKS OR PITS WITHOUT FOLLOWING PROPER ENTRY PROCEDURES SUCH AS ASTM D-4276 AND 29 CFR 1910.146. THE USE OF APPROPRIATE RESPIRATORY PROTECTION IS ADVISED WHEN CONCENTRATIONS EXCEED ANY ESTABLISHED EXPOSURE LIMITS (SEE SECTIONS 2 AND 8).

DO NOT WEAR CONTAMINATED CLOTHING OR SHOES. USE GOOD PERSONAL HYGIENE PRACTICES.

"EMPTY" CONTAINERS RETAIN RESIDUE AND MAY BE DANGEROUS. DO NOT PRESSURIZE, CUT, WELD, BRAZE, SOLDER, DRILL, GRIND, OR EXPOSE SUCH CONTAINERS TO HEAT, FLAME, SPARKS, OR OTHER SOURCES OF IGNITION. THEY MAY EXPLODE AND CAUSE INJURY OR DEATH. "EMPTY" DRUMS SHOULD BE COMPLETELY DRAINED, PROPERLY BUNGED, AND PROMPTLY SHIPPED TO THE SUPPLIER OR A DRUM RECONDITIONER. ALL CONTAINERS SHOULD BE DISPOSED OF IN AN ENVIRONMENTALLY SAFE MANNER AND IN ACCORDANCE WITH GOVERNMENTAL REGULATIONS.

HIGH PRESSURE INJECTION OF HYDROCARBON FUELS, HYDRAULIC OILS OR GREASES UNDER THE SKIN MAY HAVE SERIOUS CONSEQUENCES EVEN THOUGH NO SYMPTOMS OR INJURY MAY BE APPARENT. THIS CAN HAPPEN ACCIDENTALLY WHEN USING HIGH PRESSURE EQUIPMENT SUCH AS HIGH PRESSURE GREASE GUNS, FUEL INJECTION APPARATUS OR FROM PINHOLE LEAKS IN TUBING OF HIGH PRESSURE HYDRAULIC OIL EQUIPMENT.

BEFORE WORKING ON OR IN TANKS WHICH CONTAIN OR HAVE CONTAINED THIS MATERIAL, REFER TO OSHA REGULATIONS, ANSI Z49.1, AND OTHER REFERENCES PERTAINING TO CLEANING, REPAIRING, WELDING, OR OTHER CONTEMPLATED OPERATIONS.

STORAGE:
KEEP CONTAINER(S) TIGHTLY CLOSED. USE AND STORE THIS MATERIAL IN COOL, DRY, WELL-VENTILATED AREAS AWAY FROM HEAT AND ALL SOURCES OF IGNITION. STORE ONLY IN APPROVED CONTAINERS. KEEP AWAY FROM ANY INCOMPATIBLE MATERIAL (SEE SECTION 10). PROTECT CONTAINER(S) AGAINST PHYSICAL DAMAGE.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

ENGINEERING CONTROLS:
IF CURRENT VENTILATION PRACTICES ARE NOT ADEQUATE TO MAINTAIN AIRBORNE CONCENTRATIONS BELOW THE ESTABLISHED EXPOSURE LIMITS (SEE SECTION 2), ADDITIONAL ENGINEERING CONTROLS MAY BE REQUIRED.

PERSONAL PROTECTIVE EQUIPMENT (PPE):

RESPIRATORY:
A NIOSH CERTIFIED AIR PURIFYING RESPIRATOR WITH A TYPE 95 (R OR P) PARTICULATE FILTER MAY BE USED UNDER CONDITIONS WHERE AIRBORNE CONCENTRATIONS ARE EXPECTED TO EXCEED EXPOSURE LIMITS (SEE SECTION 2).

PROTECTION PROVIDED BY AIR PURIFYING RESPIRATORS IS LIMITED (SEE MANUFACTURER'S RESPIRATOR SELECTION GUIDE). USE A NIOSH APPROVED SELF-CONTAINED BREATHING APPARATUS (SCBA) OR EQUIVALENT OPERATED IN A PRESSURE DEMAND OR OTHER POSITIVE PRESSURE MODE IF THERE IS POTENTIAL FOR AN UNCONTROLLED RELEASE, EXPOSURE LEVELS ARE NOT KNOWN, OR ANY OTHER CIRCUMSTANCES WHERE AIR PURIFYING RESPIRATORS MAY NOT PROVIDE ADEQUATE PROTECTION.

A RESPIRATORY PROTECTION PROGRAM THAT MEETS OSHA'S 29 CFR 1910.134 AND ANSI Z88.2 REQUIREMENTS MUST BE FOLLOWED WHENEVER WORKPLACE CONDITIONS WARRANT A RESPIRATOR'S USE.

SKIN:
THE USE OF GLOVES IMPERVIOUS TO THE SPECIFIC MATERIAL HANDLED IS ADVISED TO PREVENT SKIN CONTACT AND POSSIBLE IRRITATION (SEE MANUFACTURERS LITERATURE FOR INFORMATION ON PERMEABILITY).

EYE/FACE:
APPROVED EYE PROTECTION TO SAFEGUARD AGAINST POTENTIAL EYE CONTACT, IRRITATION, OR INJURY IS RECOMMENDED. DEPENDING ON CONDITIONS OF USE, A FACE SHIELD MAY BE NECESSARY.

OTHER PROTECTIVE EQUIPMENT:
A SOURCE OF CLEAN WATER SHOULD BE AVAILABLE IN THE WORK AREA FOR FLUSHING EYES AND SKIN. IMPERVIOUS CLOTHING SHOULD BE WORN AS NEEDED.

SUGGESTIONS FOR THE USE OF SPECIFIC PROTECTIVE MATERIALS ARE BASED ON READILY AVAILABLE PUBLISHED DATA. USERS SHOULD CHECK WITH SPECIFIC MANUFACTURERS TO CONFIRM THE PERFORMANCE OF THEIR PRODUCTS.

9. PHYSICAL AND CHEMICAL PROPERTIES

NOTE:
UNLESS OTHERWISE STATED, VALUES ARE DETERMINED AT 20 DEG. C (68 DEG. F) AND 760 MMHg (1 ATM).

APPEARANCE: CLEAR AND BRIGHT

PHYSICAL FORM: LIQUID

ODOR: CHARACTERISTIC PETROLEUM

ODOR THRESHOLD: NO DATA

pH: NOT APPLICABLE

VAPOR PRESSURE (MMHg): <1

VAPOR DENSITY (AIR=1): >1

BOILING POINT: NO DATA

MELTING/FREEZING POINT: <5 DEG. F / -15 DEG. C

SOLUBILITY IN WATER: NEGLIGIBLE

PARTITION COEFFICIENT (n-OCTANOL/WATER): NO DATA

SPECIFIC GRAVITY: 0.87-0.91

BULK DENSITY: 7.3-7.6
BULK DENSITY UNITS: LBS/GAL

VISCOSITY CST @ 100 DEG. C: 8.8-65
VISCOSITY CST @ 40 DEG. C: 60-1100

PERCENT VOLATILE: NEGLIGIBLE

EVAPORATION RATE (nBuAc=1): <1

FLASH POINT: >399 DEG. F / 204 DEG. C

LEL%: NO DATA
UEL%: NO DATA

AUTOIGNITION TEMPERATURE: NO DATA

10. STABILITY AND REACTIVITY

STABILITY:
STABLE UNDER NORMAL AMBIENT AND ANTICIPATED STORAGE AND HANDLING CONDITIONS OF TEMPERATURE AND PRESSURE.

CONDITIONS TO AVOID:
EXTENDED EXPOSURE TO HIGH TEMPERATURES CAN CAUSE DECOMPOSITION.

MATERIALS TO AVOID (INCOMPATIBLE MATERIALS):
AVOID CONTACT WITH STRONG OXIDIZING AGENTS, STRONG ACIDS, STRONG BASES.

HAZARDOUS DECOMPOSITION PRODUCTS:
COMBUSTION CAN YIELD CARBON, NITROGEN AND SULFUR OXIDES.

HAZARDOUS POLYMERIZATION: WILL NOT OCCUR.

11. TOXICOLOGICAL INFORMATION

CHRONIC DATA:

LUBRICANT BASE OIL (PETROLEUM) - CAS: VARIOUS:

CARCINOGENICITY:
THE PETROLEUM BASE OILS CONTAINED IN THIS PRODUCT HAVE BEEN HIGHLY REFINED BY A VARIETY OF PROCESSES INCLUDING SOLVENT EXTRACTION, HYDROTREATING, AND DEWAXING TO REMOVE AROMATICS AND IMPROVE PERFORMANCE CHARACTERISTICS. ALL OF THE OILS MEET THE IP-346 CRITERIA OF LESS THAN 3 PERCENT PAH'S AND THEREFORE NONE ARE LISTED AS A CARCINOGEN BY NTP, IARC, OR OSHA.

ACUTE DATA:

LUBRICANT BASE OIL (PETROLEUM) - CAS: VARIOUS
DERMAL LD50: >2 G/KG
LC50: NO INFORMATION AVAILABLE
ORAL LD50: >5 G/KG

ADDITIVES - CAS: PROPRIETARY:
DERMAL LD50: NO INFORMATION AVAILABLE
LC50: NO INFORMATION AVAILABLE
ORAL LD50: NO INFORMATION AVAILABLE

12. ECOLOGICAL INFORMATION

NOT EVALUATED AT THIS TIME.

13. DISPOSAL CONSIDERATIONS

THIS MATERIAL UNDER MOST INTENDED USES WOULD BECOME USED OIL DUE TO CONTAMINATION BY PHYSICAL OR CHEMICAL IMPURITIES. RECYCLE ALL USED OIL. WHILE BEING RECYCLED, USED OIL IS REGULATED BY 40 CFR 279. USE RESULTING IN CHEMICAL OR PHYSICAL CHANGE OR CONTAMINATION MAY ALSO SUBJECT IT TO REGULATION AS HAZARDOUS WASTE. UNDER FEDERAL REGULATIONS, USED OIL IS A SOLID WASTE MANAGED UNDER 40 CFR 279. HOWEVER, IN CALIFORNIA, USED OIL IS MANAGED AS HAZARDOUS WASTE UNTIL TESTED TO SHOW IT IS NOT HAZARDOUS. CONSULT STATE AND LOCAL REGULATIONS REGARDING THE PROPER HANDLING OF USED OIL. IN THE CASE OF USED OIL, THE INTENT TO DISCARD IT MAY CAUSE THE USED OIL TO BE REGULATED AS HAZARDOUS WASTE.

CONTENTS SHOULD BE COMPLETELY USED AND CONTAINERS EMPTIED PRIOR TO DISCARD. RINSATE MAY BE CONSIDERED A RCRA HAZARDOUS WASTE AND MUST BE DISPOSED OF WITH CARE AND IN COMPLIANCE WITH FEDERAL, STATE AND LOCAL REGULATIONS. LARGE EMPTY CONTAINERS, SUCH AS DRUMS, SHOULD BE RETURNED TO THE DISTRIBUTOR OR A DRUM RECONDITIONER. TO ASSURE PROPER DISPOSAL OF SMALL EMPTY CONTAINERS, CONSULT WITH STATE AND LOCAL REGULATIONS AND DISPOSAL AUTHORITIES.

14. TRANSPORTATION INFORMATION

DOT PROPER SHIPPING NAME: NOT REGULATED

NOTE:
MATERIAL IS UNREGULATED UNLESS IN CONTAINER OF 3500 GALLONS OR MORE, THEN PROVISIONS OF 49 CFR PART 130 APPLY FOR LAND SHIPMENT.

IMDG SHIPPING DESCRIPTION: NOT REGULATED

ICAO/IATA SHIPPING DESCRIPTION: NOT REGULATED

15. REGULATORY INFORMATION

U.S. REGULATIONS:

EPA SARA 311/312 (TITLE III HAZARD CATEGORIES):
ACUTE HEALTH: NO
CHRONIC HEALTH: NO
FIRE HAZARD: NO
PRESSURE HAZARD: NO
REACTIVE HAZARD: NO

SARA - SECTION 313 AND 40 CFR 372:
THIS MATERIAL CONTAINS THE FOLLOWING CHEMICALS SUBJECT TO THE REPORTING REQUIREMENTS OF SARA 313 AND 40 CFR 372: NONE KNOWN

EPA (CERCLA) REPORTABLE QUANTITY (IN POUNDS): NONE KNOWN

CERCLA/SARA - SECTION 302 EXTREMELY HAZARDOUS SUBSTANCES AND TPQS (IN POUNDS):
THIS MATERIAL CONTAINS THE FOLLOWING CHEMICALS SUBJECT TO THE REPORTING REQUIREMENTS OF SARA 302 AND 40 CFR 372: NONE KNOWN

CALIFORNIA PROPOSITION 65:
WARNING:
THIS MATERIAL CONTAINS THE FOLLOWING CHEMICALS WHICH ARE KNOWN TO THE STATE OF CALIFORNIA TO CAUSE CANCER, BIRTH DEFECTS OR OTHER REPRODUCTIVE HARM, AND ARE SUBJECT TO THE REQUIREMENTS OF CALIFORNIA PROPOSITION 65 (CA HEALTH & SAFETY CODE SECTION 25249.5): NONE KNOWN

CARCINOGEN IDENTIFICATION:
THIS MATERIAL HAS NOT BEEN IDENTIFIED AS A CARCINOGEN BY NTP, IARC, OR OSHA. SEE SECTION 11 FOR CARCINOGENICITY INFORMATION OF INDIVIDUAL COMPONENTS, IF ANY.

TSCA: ALL COMPONENTS ARE LISTED ON THE TSCA INVENTORY.

INTERNATIONAL REGULATIONS:

CANADIAN REGULATIONS:
THIS PRODUCT HAS BEEN CLASSIFIED IN ACCORDANCE WITH THE HAZARD CRITERIA OF THE CONTROLLED PRODUCTS REGULATIONS (CPR) AND THE MSDS CONTAINS ALL THE INFORMATION REQUIRED BY THE CPR.

DOMESTIC SUBSTANCES LIST: LISTED

WHMIS CLASSIFICATION: NOT REGULATED

16. OTHER INFORMATION

ISSUE DATE: 22-FEB-2005

PREVIOUS ISSUE DATE: 01/01/2002

PRODUCT CODE: 47601, 47602, 47603, 47604, 47605, 47606, 47607, 47609

REASON FOR REVISION:
COMBINED ALL GRADES INTO SINGLE MSDS.
CHANGED RESPONSIBLE PARTY FROM PHILLIPS TO CONOCO PHILLIPS. OTHER FORMATTING CHANGES

PREVIOUS PRODUCT CODE:
5246020000, 5233030000, 5247040000, 5248050000, 5249060000, 5250070000, 5251080000, 5252090000

MSDS CODE: 720080

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ACME REFINING
PREMIUM AW HYDRAULIC OIL LIGHT **Revised: 03/01/2009**

MSDS Contents

MATERIAL SAFETY DATA SHEET

SECTION I PRODUCT IDENTIFICATION

MANUFACTURER'S NAME: ACME REFINING

TELEPHONE NO: (216) 961-6900

ADDRESS:
3591 WEST 56TH STREET
CLEVELAND, OHIO 44102

TRADE NAME: ACME PREMIUM AW HYDRAULIC OIL LIGHT

DATE: MARCH 1, 2009

SECTION II HAZARDOUS INGREDIENTS

COMPONENT NAME PERCENT (OPTIONAL) TLV (UNITS) C.A.S REG. NO.

SARA TITLE III SECTION 313

NO ITEM LISTED IN SECTION 313 IS PRESENT IN THIS PRODUCT IN A REPORTABLE QUANTITY.

IN EVENT OF OIL MISTING - 5 MG./CUBIC METER

SECTION III PHYSICAL DATA

PROX. BOILING POINT C: N/A

FREEZING POINT: N/A

VOLATILITY/VOL (%): N/A

VAPOR PRESSURE (MMHg) @ 20 C: N/A

VAPOR DENSITY (AIR = 1): N/A

SOLUBILITY IN H2O: INSOLUBLE

APPEARANCE: CLEAR AMBER LIQUID

SPECIFIC GRAVITY: 0.87

EVAPORATION RATE: N/A

NFPA HAZARD IDENTIFICATION:

DEGREE OF HAZARD:
HEALTH 1
FIRE 1
REACTIVITY 0

HAZARD RATING:
0-LEAST
1-SLIGHT
2-MODERATE
3-HIGH
4-EXTREME

SECTION IV FIRE AND EXPLOSION HAZARD DATA

FLASH POINT F: 400 F. COC

LOWER EXPLOSIVE LIMIT: N/A
UPPER EXPLOSIVE LIMIT: N/A

EXTINGUISH MEDIA: USE CARBON DIOXIDE, FOAM, FOG, OR DRY CHEMICAL

FIRE & EXPLOSION HAZARDS: NONE

FIRE FIGHTING PROCEDURES:
HANDLE AS A PETROLEUM FIRE, AVOID SMOKE INHALATION, WEAR SELF-CONTAINED BREATHING APPARATUS.

SECTION V HEALTH INFORMATION

CARCINOGENICITY:
NTP?: NO
IARC MONOGRAPHS?: NO
OSHA REGULATED?: NO

EFFECTS OF OVEREXPOSURE: MILD IRRITATION OF EYES AND SKIN.

INGESTION: MAY CAUSE NAUSEA AND VOMITING

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: ALLERGY, ECZEMA OR SKIN CONDITIONS

FIRST AID:
EYE CONTACT: FLUSH WITH WATER UNTIL IRRITATION SUBSIDES
SKIN CONTACT: WIPE OFF WITH DRY CLOTH, WASH THOROUGHLY WITH SOAP.
INHALATION: REMOVE INDIVIDUAL TO FRESH AIR.
INGESTION: DO NOT INDUCE VOMITING, DRINK WATER OR MILK.

SECTION VI REACTIVITY DATA

CHEMICAL STABILITY: STABLE

CONDITIONS TO AVOID: NONE

INCOMPATIBLE MATERIALS: STRONG OXIDANTS

DECOMPOSITION PRODUCTS: CO., AND OTHER ASPHYXIATES

HAZARDOUS POLYMERIZATION: WILL NOT OCCUR

SECTION VII SPILL, LEAK & DISPOSAL PROCEDURES

ACTION TO TAKE FOR SPILL:
SOAK UP WITH CHEMICAL ABSORBENT. SHOVEL INTO A CONTAINER FOR DISPOSAL.

DISPOSAL METHOD:
DISPOSE OF IN ACCORDANCE WITH ALL LOCAL, STATE, AND FEDERAL REGULATIONS.

SECTION VIII SPECIAL HANDLING INFORMATION

VENTILATION:
LOCAL EXHAUST: RECOMMENDED
RESPIRATORY PROTECTION: NONE REQUIRED FOR NORMAL CONDITIONS.

PROTECTIVE CLOTHING: CHEMICAL RESISTANT GLOVES, SAFETY GOGGLES

HANDLING AND STORAGE: KEEP CONTAINER CLOSED WHEN NOT IN USE.

OTHER PRECAUTIONS:
DO NOT REUSE EMPTY CONTAINERS. DO NOT PRESSURIZE OR EXPOSE CONTAINERS TO HEAT OR FLAME. KEEP CLOSED WHEN NOT IN USE.

THE INFORMATION SUPPLIED ABOVE IS PRESENTED IN GOOD FAITH AND HAS BEEN DERIVED FROM SOURCES BELIEVED TO BE RELIABLE. HOWEVER, NO WARRANTY, EXPRESSED OR IMPLIED IS EXTENDED REGARDING ITS ACCURACY OR THE RESULTS TO BE OBTAINED FROM ITS USE, SINCE CONDITIONS OF USE ARE BEYOND OUR CONTROL. ALL RISKS ARE ASSUMED BY THE USER.

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Material Safety Data Sheet Collection
Genium group inc.
1171 RiverFront Center, Amsterdam, NY 12010
(518) 842-4111

Issue Date: 2006-06

Hydrochloric Acid
HYD2200

Section 1 - Chemical Product and Company Identification 61

Material Name: Hydrochloric Acid
CAS Number: 7647-01-0
Chemical Formula: ClH
Structural Chemical Formula: HCl
EINECS Number: 231-595-7
ACX Number: X1002202-3
Synonyms: 4-D BOWL SANITIZER; ACIDE CHLORHYDRIQUE; ACIDO CLORHIDRICO; ACIDO CLORIDRICO; ANHYDROUS HYDROCHLORIC ACID; ANHYDROUS HYDROGEN CHLORIDE; AQUEOUS HYDROGEN CHLORIDE; BOWL CLEANER; CHLOORWATERSTOF; CHLOROHYDRIC ACID; CHLOROWODOR; CHLORURE D'HYDROGENE; CHLORURE D'HYDROGENE ANHYDRE; CHLORURO DE HIDROGENO; CHLORWASSERSTOFF; CLORURO DE HIDROGENO ANHIDRO; EMULSION BOWL CLEANER; EPA PESTICIDE CHEMICAL CODE 045901; HYDROCHLORIC ACID; HYDROCHLORIC ACID GAS; HYDROCHLORIDE; HYDROGEN CHLORIDE; HYDROGEN CHLORIDE (HCL); HYGEIA CREME MAGIC BOWL CLEANER; MURIATIC ACID; MURIATIC ACID); NOW SOUTH SAFTI-SOL BRAND CONCENTRATED BOWL CLEANSE WITHMAGIC ACTIO; PERCLEEN BOWL AND URINAL CLEANER; SPIRITS OF SALT; VARLEY'S OCEAN BLUE SCENTED TOILET BOWL CLEANER; VARLEY POLY-PAK BOWL CREME; WHITE EMULSION BOWL CLEANER; WUEST BOWL CLEANER SUPER CONCENTRATED
General Use: Hydrogen chloride is used to produce pharmaceutical hydrochlorides; vinyl chloride from acetylene; alkyl chlorides from olefins and arsenious chloride from arsenious oxide; electronic grade for etching semiconductor crystals. Used in the chlorination of rubber; in organic reactions involving isomerization, polymerization and alkylation; as a catalyst and condensing agent; for making chlorine where economical; in the separation of cotton from wool and cotton de-linting; as flux in the babbitt type of metal alloy; etching semi-conductor crystals.
Hydrochloric acid is used for pickling and heavy duty cleaning of metal parts; rust and scale removal. The production of chlorides; neutralizing bases; a laboratory reagent. For hydrolyzing starch and proteins in preparations for food. As a catalyst and solvent in organic synthesis. As "spirits of salts" for cleaning of lime and masonry from new brickwork. As flux or flux component for soldering; manufacture of "killed spirits".

Section 2 - Composition / Information on Ingredients

Name	CAS	%
hydrogen chloride	7647-01-0	> 99.0

OSHA PEL
Ceiling: 5 ppm, 7 mg/m^3.

NIOSH REL
Ceiling: 5 ppm (7 mg/m^3).

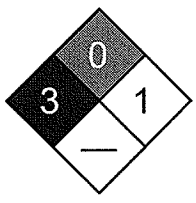
DFG (Germany) MAK
TWA: 5 ppm; PEAK: 5 ppm.

ACGIH TLV
Ceiling: 2 ppm.

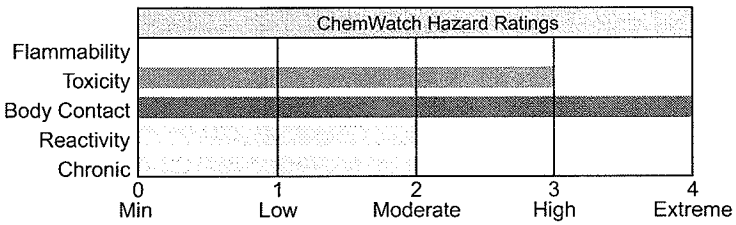
IDLH Level
50 ppm.

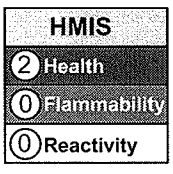
EU OEL
TWA: 5 ppm; STEL: 10 ppm.

Section 3 - Hazards Identification

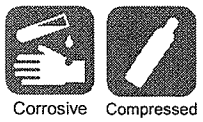


Fire Diamond





ANSI Signal Word
Danger!


Corrosive Compressed Gas

☆☆☆☆☆ Emergency Overview ☆☆☆☆☆

Colorless gas; characteristic suffocating, pungent odor. Corrosive. Stored as compressed gas which may cause frostbite. Chronic Effects: erosion of teeth.

Potential Health Effects

Target Organs: eyes, skin, respiratory system, liver (in animals)
Primary Entry Routes: inhalation, skin contact, eye contact
Acute Effects

Inhalation: The vapor is extremely discomforting to the upper respiratory tract, may cause severe mucous membrane damage and may be harmful if inhaled.
Inhalation of quantities of liquid mist may be extremely hazardous, even lethal due to spasm, extreme irritation of larynx and bronchi, chemical pneumonitis and pulmonary edema.
A single severe exposure may cause coughing and choking; bleeding of nose, inflammation and occasionally ulceration of the nose, throat and larynx. Fluid on the lungs followed by generalized lung damage may follow.
Breathing of vapor may aggravate asthma and inflammatory or fibrotic pulmonary disease.
High concentrations cause necrosis of the tracheal and bronchial epithelium, pulmonary edema, atelectasis and emphysema and damage to the pulmonary blood vessels and liver.
Inhalation hazard is increased at higher temperatures.
The vapor from heated material is extremely discomforting to the upper respiratory tract and lungs if inhaled.
Continued severe exposure can result in pulmonary edema and corrosion of tissues in the nose and throat.

Eye: Hydrogen Chloride: The vapor is extremely discomforting to the eyes and is capable of causing pain and severe conjunctivitis. Corneal injury may develop, with possible permanent impairment of vision, if not promptly and adequately treated.
The material may be irritating to the eye, with prolonged contact causing inflammation. Repeated or prolonged exposure to irritants may produce conjunctivitis.
Hydrochloric Acid: Eye contact is extremely painful and may cause rapid corneal damage. The liquid is extremely corrosive to the eyes and is capable of causing severe damage with loss of sight.
The vapor is highly discomforting and may be corrosive to the eyes. The vapor from heated material is extremely discomforting to the eyes.

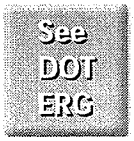
Skin: The material is corrosive to the skin and may cause chemical burns.
Toxic effects may result from skin absorption. Bare unprotected skin should not be exposed to this material. The material may accentuate any pre-existing skin condition.
The vapor is discomforting to the skin.

Ingestion: Considered an unlikely route of entry in commercial/industrial environments.
The liquid is extremely corrosive if swallowed and is capable of causing burns to mouth, throat, esophagus, with extreme discomfort, pain and may be fatal if swallowed in quantity. Ingestion may result in nausea, abdominal irritation, pain and vomiting.

Carcinogenicity: NTP - Not listed; IARC - Group 3, Not classifiable as to carcinogenicity to humans; OSHA - Not listed; NIOSH - Not listed; ACGIH - Not listed; EPA - Not listed; MAK - Not listed.

Chronic Effects: Chronic exposure may cause discoloration or erosion of the teeth, bleeding of the nose and gums; and ulceration of the nasal mucous membranes.
Repeated exposures of animals to concentrations of about 34 ppm produced no immediate toxic effects.
Workers exposed to hydrochloric acid suffered from gastritis and a number of cases of chronic bronchitis have also been reported.
Repeated or prolonged exposure to dilute solutions may cause dermatitis. Repeated exposure to low vapor concentrations can cause skin tenderness, bleeding of the nose and gums, chronic bronchitis, gastritis.

Section 4 - First Aid Measures



Inhalation: Remove to fresh air.
Lay patient down. Keep warm and rested.
If breathing is shallow or has stopped, ensure clear airway and apply resuscitation. Transport to hospital or doctor.

Eye Contact: Immediately hold the eyes open and flush continuously for at least 15 minutes with fresh running water. Ensure irrigation under eyelids by occasionally lifting the upper and lower lids.
Transport to hospital or doctor without delay. Removal of contact lenses after an eye injury should only be undertaken by skilled personnel.

Skin Contact: Immediately flush body and clothes with large amounts of water, using safety shower if available.
Quickly remove all contaminated clothing, including footwear.
Wash affected areas with water (and soap if available) for at least 15 minutes. Transport to hospital or doctor.

Ingestion: Contact a Poison Control Center. Rinse mouth out with plenty of water. Do NOT induce vomiting. Give a glass of water.

After first aid, get appropriate in-plant, paramedic, or community medical support.

Note to Physicians: For acute or short-term repeated exposures to strong acids:
1.Airway problems may arise from laryngeal edema and inhalation exposure.
Treat with 100% oxygen initially.
2.Respiratory distress may require cricothyroidotomy if endotracheal intubation is contraindicated by excessive swelling.

3. Intravenous lines should be established immediately in all cases where there is evidence of circulatory compromise.
4.Strong acids produce a coagulation necrosis characterized by formation of a coagulum (eschar) as a result of the desiccating action of the acid on proteins in specific tissues.

INGESTION:

1.Immediate dilution (milk or water) within 30 minutes post-ingestion is recommended.
2.Do not attempt to neutralize the acid since exothermic reaction may extend the corrosive injury.
3.Be careful to avoid further vomiting since re-exposure of the mucosa to the acid is harmful. Limit fluids to one or two glasses in an adult.
4.Charcoal has no place in acid management.
5.Some authors suggest the use of lavage within 1 hour of ingestion.

SKIN:

1.Skin lesions require copious saline irrigation. Treat chemical burns as thermal burns with non-adherent gauze and wrapping.
2.Deep second-degree burns may benefit from topical silver sulfadiazine.

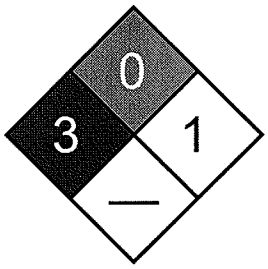
EYE:

1.Eye injuries require retraction of the eyelids to ensure thorough irrigation of the conjunctival cul-de-sacs. Irrigation should last at least 20-30 minutes. Do not use neutralizing agents or any other additives. Several liters of saline are required.
2.Cycloplegic drops (1% cyclopentolate for short-term use or 5% homatropine for longer term use), antibiotic drops, vasoconstrictive agents, or artificial tears may be indicated dependent on the severity of the injury.
3.Steroid eye drops should only be administered with the approval of a consulting ophthalmologist.

Section 5 - Fire-Fighting Measures

See DOT ERG

Flash Point: Nonflammable
Autoignition Temperature: Not applicable
LEL: Not applicable
UEL: Not applicable
Extinguishing Media: Water spray or fog; foam; Bromochlorodifluoromethane (BCF) (where regulations permit); Dry agent; Carbon dioxide.



Fire Diamond

General Fire Hazards/Hazardous Combustion Products: Noncombustible liquid. Will not burn, but heat produces highly toxic fumes/vapors.
Heating may cause expansion or decomposition leading to violent rupture of containers. Decomposes on heating and produces toxic fumes of hydrogen chloride. Decomposition may produce toxic fumes of chlorine.
Reacts with metals producing flammable/explosive hydrogen gas. Contact with moisture or water may generate heat causing ignition. Reacts vigorously with alkalis. Moderate fire hazard when in contact with reducing agents.

Fire Incompatibility: Reacts with metals producing flammable/explosive hydrogen gas.
Avoid reactions with metals, metal oxides, hydroxides, amines, carbonates, alkaline materials, acetic anhydride, cyanides, sulphides, sulphites, phosphides, acetylides, borides, carbides, silicides, vinyl acetate, formaldehyde and potassium permanganate, unsaturated organics, metal acetylides, sulphuric acid.
Note: Compatibility with plastics should be confirmed prior to use.

Fire-Fighting Instructions: Contact fire department and tell them location and nature of hazard.
Wear full body protective clothing with breathing apparatus. Prevent, by any means available, spillage from entering drains or waterways. Consider evacuation. Cool fire-exposed containers with water spray from a protected location. If safe to do so, remove containers from path of fire. Equipment should be thoroughly decontaminated after use. Water spray or fog may be used to disperse vapor. Do not approach cylinders suspected to be hot. If safe to do so, stop flow of gas.

Section 6 - Accidental Release Measures

See DOT ERG

Small Spills: DO NOT touch the spill material. Clean up all spills immediately. Wear fully protective PVC clothing and breathing apparatus. Contain and absorb spill with sand, earth, inert material or vermiculite. Use soda ash or slaked lime to neutralize. Collect residues and place in labeled plastic containers with vented lids. Clear area of personnel and move upwind. Avoid breathing vapors and contact with skin and eyes. Do not exert excessive pressure on valve; do not attempt to operate damaged valve. Water spray or fog may be used to disperse vapor.

Large Spills: Contact fire department and tell them location and nature of hazard. Clear area of personnel and move upwind. Wear full body protective clothing with breathing apparatus. Prevent, by any means available, spillage from entering drains or waterways. Consider evacuation. Stop leak if safe to do so. Remove leaking cylinders to a safe place if possible. Release pressure under safe, controlled conditions by opening the valve. Do not exert excessive pressure on valve; do not attempt to operate damaged valve. Shut off all possible sources of ignition and increase ventilation. Water spray or fog may be used to disperse vapor. Use soda ash or slaked lime to neutralize. Collect and seal in labeled drums for disposal. Wash spill area with large quantities of water. If contamination of

drains or waterways occurs, advise emergency services. After clean-up operations, decontaminate and launder all protective clothing and equipment before storing and reusing. DO NOT touch the spill material. Contain and absorb spill with sand, earth, inert material or vermiculite.
DO NOT USE WATER OR NEUTRALIZING AGENTS INDISCRIMINATELY ON LARGE SPILLS.
Regulatory Requirements: Follow applicable OSHA regulations (29 CFR 1910.120).

Section 7 - Handling and Storage

Handling Precautions: Avoid generating and breathing mist and vapor, breathing vapors and contact with skin and eyes.
Avoid physical damage to containers. Use in a well-ventilated area. Wear protective clothing and gloves when handling containers. Handle and open container with care.
WARNING: To avoid violent reaction, ALWAYS add material to water and NEVER water to material. When handling, DO NOT eat, drink or smoke. Always wash hands with soap and water after handling. Work clothes should be laundered separately. Use good occupational work practices. Observe manufacturer's storing and handling recommendations.
Atmosphere should be regularly checked against established exposure standards to ensure safe working conditions are maintained.
Local exhaust ventilation may be required for safe working, i.e. to keep exposures below required standards; otherwise, PPE is required.
Keep dry. Reacts violently with water.
Transport containers on a trolley. Avoid sources of heat. DO NOT transfer gas from one cylinder to another.
Recommended Storage Methods: Packaging as recommended by manufacturer. Check that containers are clearly labeled.
Cylinder. Ensure the use of equipment rated for cylinder pressure. Ensure the use of compatible materials of construction. Valve protection cap to be in place until cylinder is secured, connected. Cylinder must be properly secured either in use or in storage. Cylinder valve must be closed when not in use or when empty. Segregate full from empty cylinders. WARNING: Suckback into cylinder may result in rupture. Use back-flow preventive device in piping.
Hydrochloric acid: Packs of 2.5 litres or less require a child-resistant closure. Glass container or Plastic carboy or Polylined drum.
Regulatory Requirements: Follow applicable OSHA regulations.

Section 8 - Exposure Controls / Personal Protection

Engineering Controls: If risk of overexposure exists, wear air supplied breathing apparatus. Provide adequate ventilation in warehouse or closed storage areas. Use in a well-ventilated area. Local exhaust ventilation may be required for safe working, i. e. , to keep exposures below required standards; otherwise, PPE is required.
If risk of inhalation or overexposure exists, wear NIOSH-approved respirator or work in fume hood. Hydrogen chloride vapors will not be adequately absorbed by organic vapor respirators.
Personal Protective Clothing/Equipment:
Eyes: Chemical goggles. Full face shield.
DO NOT wear contact lenses. Contact lenses pose a special hazard; soft contact lenses may absorb irritants and all lenses concentrate them.
Hands/Feet: Neoprene gloves; rubber gloves. Nitrile gloves.
Safety footwear. Rubber boots.
Hydrochloric acid: Barrier cream and Neoprene gloves or Elbow length PVC gloves. Nitrile gloves.
PVC boots or PVC safety gumboots.
Respiratory Protection:
Exposure Range >5 to <50 ppm: Air Purifying, Negative Pressure, Half Mask
Exposure Range 50 to unlimited ppm: Self-contained Breathing Apparatus, Pressure Demand, Full Face
Cartridge Color: white
Other: Ensure there is ready access to a safety shower; Eyewash unit.
Acid-resistant overalls. Full protective suit. Operators should be trained in procedures for safe use of this material.
Glove Selection Index:

BUTYL	Best selection
BUTYL/NEOPRENE	Best selection
HYPALON	Best selection
NEOPRENE	Best selection
NEOPRENE/NATURAL	Best selection
NITRILE+PVC	Best selection
PE/EVAL/PE	Best selection
SARANEX-23	Best selection
VITON/NEOPRENE	Best selection
PVC	Best selection

NITRILE ..... Best selection
NATURAL RUBBER..... Satisfactory; may degrade after 4 hours continuous immersion
NATURAL+NEOPRENE..... Satisfactory; may degrade after 4 hours continuous immersion
NAT+NEOPR+NITRILE ..... Poor to dangerous choice for other than short-term immersion

Section 9 - Physical and Chemical Properties

Appearance/General Info: Hydrogen chloride: Colorless, corrosive gas. Pungent suffocating odor. White fumes in moist air. Soluble in methanol, ethanol, ether and benzene.
Hydrochloric acid: Clear to light yellow (orange tint for inhibited grades) fuming corrosive liquid with sharp, suffocating odor.

Physical State: Hydrogen chloride: Compressed gas; Hydrochloric acid: Liquid
Odor Threshold: 0.26 to 0.3 ppm
Vapor Pressure (kPa): < 24.8 at 25 °C
Vapor Density (Air=1): 1.268 at 20 °C
Formula Weight: 36.461
Specific Gravity (H_2O=1, at 4 °C): < 1.19 at 20 °C
Evaporation Rate: Slow

pH: Hydrochloric acid: < 1
Boiling Point: -85 °C (-121 °F)
Freezing/Melting Point: -114.44 °C (-173.992 °F)
Volatile Component (% Vol): 100
Decomposition Temperature (°C): Not applicable
Water Solubility: 56.1 g/100 cc hot water at 60 °C

Section 10 - Stability and Reactivity

Stability/Polymerization/Conditions to Avoid: Decomposes in the presence of moisture to produce corrosive acid. May generate sufficient heat to ignite combustible materials. Presence of heat source and direct sunlight (ultra-violet radiation). Product is considered stable under normal handling conditions. Hazardous polymerization will not occur.
Storage Incompatibilities: Hydrogen chloride: Segregate from most common metals and their alloys, alkalis, unsaturated organics, fluorine, metal carbides, metal acetylides, potassium permanganate and sulfuric acid. Compatibility with plastics should be confirmed prior to use.
Hydrochloric acid: Segregate from alkalies, oxidizing agents and chemicals readily decomposed by acids, i.e. cyanides, sulfides, carbonates. Avoid storage with metals, metal oxides, hydroxides, amines, carbonates, alkaline materials, acetic anhydride, cyanides, sulphides, sulphites, phosphides, acetylides, borides, carbides, silicides, vinyl acetate, formaldehyde and potassium permanganate. Reacts with zinc, brass, galvanized iron, aluminum, copper and copper alloys.

Section 11 - Toxicological Information

Toxicity
Inhalation (human) LC_{Lo}: 1300 ppm/30 m
Inhalation (human) LC_{Lo}: 3000 ppm/5 m
Inhalation (rat) LC_{50}: 3124 ppm/60 m
Inhalation (rat) LC_{50}: 4701 ppm/30 m
Oral (rat) LD_{50}: 900 mg/kg

Irritation
Eye (rabbit): 5 mg/30 s - mild

See *RTECS* MW 4025000, for additional data.

Section 12 - Ecological Information

Environmental Fate: No data found.
Ecotoxicity: TL_m Gambusia affinis (mosquito fish) 282 ppm/96 hr (fresh water) /Conditions of bioassay not specified; Lethal Lepomis macrochirus (bluegill sunfish) 3.6 mg/l/48 hr /Conditions of bioassay not specified; LC_{50} Cockle 330 to 1,000 mg/l/48 hr /Conditions of bioassay not specified; LC_{50} Carassius auratus (goldfish) 178 mg/l (1 to 2 hr survival time) /Conditions of bioassay not specified; LC_{50} Shore crab 240 mg/l/48 hr /Conditions of bioassay not specified; LC_{50} Shrimp 100 to 330 ppm/48 hr (salt water) /Conditions of bioassay not specified; LC_{100} Trout 10 mg/l 24 hr /Conditions of bioassay not specified
Biochemical Oxygen Demand (BOD): none

Section 13 - Disposal Considerations

Disposal: Recycle wherever possible. Consult manufacturer for recycling options. Treat and neutralize at an effluent treatment plant. Bury residue in an authorized landfill. Decontaminate empty containers with a lime slurry. Return empty containers to supplier or bury empty containers at an authorized landfill.
Return empty cylinders to supplier.

Section 14 - Transport Information

DOT Hazardous Materials Table Data (49 CFR 172.101):

Note: This material has multiple possible HMT entries. Choose the appropriate one based on state and condition of specific material when shipped.

Shipping Name and Description: Hydrogen chloride, anhydrous
ID: UN1050
Hazard Class: 2.3 - Poisonous gas
Packing Group:
Symbols:
Label Codes: 2.3 - Poison Gas, 8 - Corrosive
Special Provisions: 3
Packaging: **Exceptions:** None **Non-bulk:** 304 **Bulk:** None
Quantity Limitations: **Passenger aircraft/rail:** Forbidden **Cargo aircraft only:** Forbidden
Vessel Stowage: **Location:** D **Other:** 40

Shipping Name and Description: Hydrochloric acid
ID: UN1789
Hazard Class: 8 - Corrosive material
Packing Group: II - Medium Danger
Symbols:
Label Codes: 8 - Corrosive
Special Provisions: A3, A6, B3, B15, IB2, N41, T8, TP2, TP12
Packaging: **Exceptions:** 154 **Non-bulk:** 202 **Bulk:** 242
Quantity Limitations: **Passenger aircraft/rail:** 1 L **Cargo aircraft only:** 30 L
Vessel Stowage: **Location:** C **Other:**

Shipping Name and Description: Hydrochloric acid
ID: UN1789
Hazard Class: 8 - Corrosive material
Packing Group: III - Minor Danger
Symbols:
Label Codes: 8 - Corrosive
Special Provisions: IB3, T4, TP1, TP12
Packaging: **Exceptions:** 154 **Non-bulk:** 203 **Bulk:** 241
Quantity Limitations: **Passenger aircraft/rail:** 5 L **Cargo aircraft only:** 60 L
Vessel Stowage: **Location:** C **Other:**

Section 15 - Regulatory Information

EPA Regulations:
RCRA 40 CFR: Not listed
CERCLA 40 CFR 302.4: Listed per CWA Section 311(b)(4) 5000 lb (2268 kg)
SARA 40 CFR 372.65: Listed
SARA EHS 40 CFR 355: Listed
RQ: 5000 lb
TPQ: 500 lb
TSCA: Listed

Section 16 - Other Information

Disclaimer: Judgments as to the suitability of information herein for the purchaser's purposes are necessarily the purchaser's responsibility. Although reasonable care has been taken in the preparation of such information, Genium Group, Inc. extends no warranties, makes no representations, and assumes no responsibility as to the accuracy or suitability of such information for application to the purchaser's intended purpose or for consequences of its use.

Material Safety Data Sheet Collection
Genium group inc.
1171 RiverFront Center, Amsterdam, NY 12010
(518) 842-4111

Hydrogen Peroxide Solution 20-60%
HYD2600

Issue Date: 2006-06

Section 1 - Chemical Product and Company Identification 61

Material Name: Hydrogen Peroxide Solution 20-60% **CAS Number:** 7722-84-1
Chemical Formula: H_2O_2
Structural Chemical Formula: H_2O_2
EINECS Number: 231-765-0
ACX Number: X1002204-7
Synonyms: ALBONE; ALBONE 35; ALBONE 50; ALBONE 70; ALBONE 35CG; ALBONE 50CG; ALBONE 70CG; ALBONE DS; DIHYDROGEN DIOXIDE; HIGH-STRENGTH HYDROGEN PEROXIDE; HIOXYL; HYDROGEN DIOXIDE; HYDROGEN DIOXIDE SOLUTION; HYDROGEN PEROXIDE; HYDROGEN PEROXIDE (AQUEOUS); HYDROGEN PEROXIDE SOLUTION; HYDROGEN PEROXIDE SOLUTION (30%); HYDROGEN PEROXIDE SOLUTION 20-60%; HYDROPEROXIDE; INHIBINE; INTEROX; KASTONE; PERHYDROL; PERONE 30; PERONE 35; PERONE 50; PEROSSIDO DI IDROGENO; PEROXAAN; PEROXAN; PEROXIDE; PEROXYDE D'HYDROGENE; T-STUFF; SUPEROXOL; WASSERSTOFFPEROXID; WATERSTOFPEROXYDE
General Use: At varying concentrations used for bleaching and deodorizing of textiles, wood pulp, hair, fur etc.; source of organic and inorganic peroxides; pulp and paper industry; plasticizers; rocket fuel; foam rubber; manufacture of glycerol; antichlor; dyeing; electroplating; antiseptic, laboratory reagent, epoxidation, hydroxylation, oxidation and reduction; viscosity control for starch and cellulose derivatives; refining and cleaning metals; bleaching and oxidizing agent in food; neutralizing agent in wine distillation; seed disinfectant; substitute for chlorine water and sewage treatment.
Pharmaceutical grades : 200 Volume (50% H_2O_2) and 100 Volume (30% H_2O_2).

Section 2 - Composition / Information on Ingredients

Name	CAS	%
hydrogen peroxide	7722-84-1	20 - 60
water	7732-18-5	40 - 80

OSHA PEL
TWA: 1 ppm, 1.4 mg/m^3.

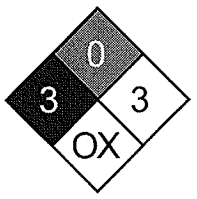
NIOSH REL
TWA: 1 ppm (1.4 mg/m^3).

DFG (Germany) MAK
TWA: 1 ppm; PEAK: 1 ppm.

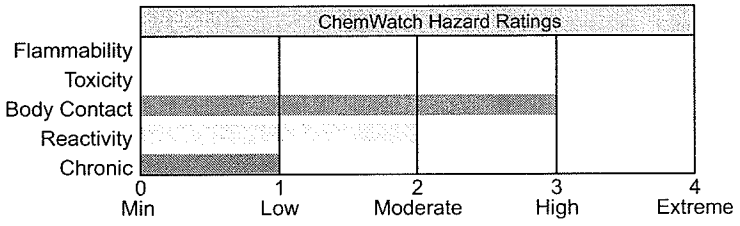
ACGIH TLV
TWA: 1 ppm.

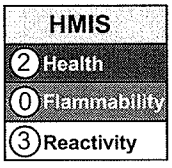
IDLH Level
75 ppm.

Section 3 - Hazards Identification



Fire Diamond





ANSI Signal Word
Danger!


Corrosive

☆☆☆☆☆ Emergency Overview ☆☆☆☆☆

Colorless liquid; slight acrid odor (high concentrations). Corrosive. Other Acute Effects: difficulty breathing, salivation, giddiness, muscle weakness, tremors/numbness of extremities, pulmonary edema, possible sight loss. Strong oxidizer.

Potential Health Effects

Target Organs: eyes, skin, respiratory system, central nervous system (CNS)
Primary Entry Routes: inhalation, skin contact, eye contact

Acute Effects

Inhalation: The vapor/mist is highly discomforting and corrosive to the upper respiratory tract.
Inhalation of excessive levels of mist may result in headache, dizziness, vomiting, diarrhea, irritability, insomnia and, in extreme cases, pulmonary edema.

Eye: The liquid is discomforting and is highly corrosive to the eyes and is capable of causing severe damage with loss of sight.
Reactions may not occur on exposure but response may be delayed with symptoms only appearing many hours later and may cause severe ulceration.

Skin: Skin contact will result in rapid drying and bleaching, leading to chemical burns on prolonged contact. Bare unprotected skin should not be exposed to this material. The material may accentuate any pre-existing skin condition.

Ingestion: The liquid is highly corrosive if swallowed and is capable of causing burns to mouth, throat, esophagus, with extreme discomfort, pain. Ingestion may result in nausea, abdominal irritation, pain, vomiting, and possible internal bleeding. Released oxygen gas may cause distension, pain, even severe organ damage.

Carcinogenicity: NTP - Not listed; IARC - Group 3, Not classifiable as to carcinogenicity to humans; OSHA - Not listed; NIOSH - Not listed; ACGIH - Class A3, Animal carcinogen; EPA - Not listed; MAK - Not listed.

Chronic Effects: Severe systemic poisoning can cause tremors and numbness of the extremities, shock, convulsions, and unconsciousness.

Section 4 - First Aid Measures

See DOT ERG

Inhalation: Remove to fresh air. Lay patient down. Keep warm and rested. If breathing is shallow or has stopped, ensure clear airway and apply resuscitation. Transport to hospital or doctor.

Eye Contact: Immediately hold the eyes open and wash continuously for at least 15 minutes with fresh running water. Ensure irrigation under eyelids by occasionally lifting the upper and lower lids. Transport to hospital or doctor without delay.
Removal of contact lenses after an eye injury should only be undertaken by skilled personnel.

Skin Contact: Immediately flush body and clothes with large amounts of water, using safety shower if available. Quickly remove all contaminated clothing, including footwear. Wash affected areas with water (and soap if available) for at least 15 minutes. Transport to hospital or doctor.

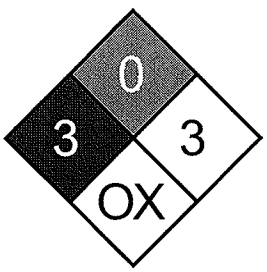
Ingestion: Rinse mouth out with plenty of water. Contact a Poison Control Center.
If swallowed, do NOT induce vomiting. Give a glass of water.

After first aid, get appropriate in-plant, paramedic, or community medical support.

Note to Physicians: Treat symptomatically.

Section 5 - Fire-Fighting Measures

See DOT ERG



Fire Diamond

Flash Point: Nonflammable

LEL: 40% v/v

UEL: 100% v/v

Extinguishing Media: Flooding quantities of water only in the early stages of a fire.
Water spray or fog. DO NOT use halogenated fire extinguishing agents.

General Fire Hazards/Hazardous Combustion Products: Non combustible liquid. Will not burn but increases intensity of fire. Contact with readily oxidizable organic material may cause ignition/fire. Heating may cause expansion or decomposition, leading to violent rupture of containers.

Fire Incompatibility: Avoid contact with organic materials/compounds, particularly finely divided combustible materials, as ignition may result. Violent catalytic decomposition will occur in contact with certain metals such as iron, copper, chromium, brass, bronze, lead, silver, manganese or their salts.

Fire-Fighting Instructions: Alert fire department and tell them location and nature of hazard..
May be violently or explosively reactive. Wear full body protective clothing with breathing apparatus. Prevent, by any means available, spillage from entering drains or water ways. Use fire fighting procedures suitable for surrounding area. Cool fire exposed containers with water spray from a protected location. Do not approach containers suspected to be hot. If safe to do so, remove containers from path of fire.

Section 6 - Accidental Release Measures

See DOT ERG

Small Spills: Clean up all spills immediately. Avoid contact with skin and eyes. Wear impervious gloves and safety glasses. Remove all ignition sources. Small quantities may be discharged to sewer with a large excess of water. Wipe up.

Large Spills: Clear area of personnel and move upwind. Alert fire department and tell them location and nature of hazard.
May be violently or explosively reactive. Wear full body protective clothing with breathing apparatus. Prevent, by any means available, spillage from entering drains or water ways. No smoking, bare lights or ignition sources.

Increase ventilation. Stop leak if safe to do so. Contain spill with sand, earth or vermiculite. Collect recoverable product into labeled containers for recycling. DO NOT return unused product to containers. Absorb remaining product with sand, earth or vermiculite. Collect residues and place in labeled plastic containers with vented lids. Wash spill area with large quantities of water.

After clean up operations, decontaminate and launder all protective clothing and equipment before storing and re-using. If contamination of drains or waterways occurs, advise emergency services.

Regulatory Requirements: Follow applicable OSHA regulations (29 CFR 1910.120).

Section 7 - Handling and Storage

Handling Precautions: Avoid generating and breathing mist. Handle and open container with care. Atmosphere should be regularly checked against established exposure standards to ensure safe working conditions are maintained. Use good occupational work practice. Observe manufacturer's storing and handling recommendations. Avoid all personal contact, including inhalation. Wear protective clothing when risk of exposure occurs. Avoid smoking, bare lights, heat or ignition sources. Use in a well-ventilated area. Avoid contact with incompatible materials. DO NOT return unused product to containers. Avoid sources of heat. Mild steel, brass, bronze and copper equipment should not be used. When handling, DO NOT eat, drink or smoke. Always wash hands with soap and water after handling. Work clothes should be laundered separately. Launder contaminated clothing before re-use.

Recommended Storage Methods: Packaging as recommended by manufacturer. Check that containers are clearly labelled. Glass container. Container to have vented cap. Properly passivated aluminium or stainless steel containers. Polyethylene containers or porcelain, vitreous stoneware.

Regulatory Requirements: Follow applicable OSHA regulations.

Section 8 - Exposure Controls / Personal Protection

Engineering Controls: Use in a well-ventilated area.

Personal Protective Clothing/Equipment:

Eyes: Chemical goggles. Full face shield.

Contact lenses pose a special hazard; soft lenses may absorb irritants and all lenses concentrate them.

Hands/Feet: Barrier cream and PVC gloves. Rubber boots.

Respiratory Protection:

Exposure Range >1 to 50 ppm: Supplied Air, Constant Flow/Pressure Demand, Half Mask

Exposure Range >50 to <75 ppm: Supplied Air, Constant Flow/Pressure Demand, Full Face

Exposure Range 75 to unlimited ppm: Self-contained Breathing Apparatus, Pressure Demand, Full Face

Note: odor threshold unknown

Other: Do not allow clothing wet with material to stay in contact with skin. Overalls, PVC apron and impervious apron. Eyewash unit. Ensure there is ready access to a safety shower.

Glove Selection Index:

NEOPRENE..... Best selection

NATURAL RUBBER..... Satisfactory; may degrade after 4 hours continuous immersion

Section 9 - Physical and Chemical Properties

Appearance/General Info: Clear, colorless, water-like liquid with a slightly sharp odor. Hydrogen peroxide readily decomposes and requires stabilization. Soluble in ether, insoluble in hydrocarbons and decomposed by many organic solvents.

Material hazard increases as concentration of peroxide increases.

Concentration (%w/w)	27.5	35	50	59.5
Boiling Pt.	106	107	114	119
Melting Pt.	-23	-33	-52	-56
Vap. Press. (mmHg)	15	13	10	8
Spec. grav.	1.10	1.13	1.20	1.24

Self accelerating decomposition temperature SADT (°C) >50 for all concentrations.

Physical State: Liquid

Vapor Density (Air=1): Not applicable.

Formula Weight: Not applicable.

Evaporation Rate: Not available

pH: Not available

pH (1% Solution): Not available.

Volatile Component (% Vol): Not available.

Decomposition Temperature (°C): Not applicable

Water Solubility: Miscible with water

Section 10 - Stability and Reactivity

Stability/Polymerization/Conditions to Avoid: Avoid any contamination of this material as it is very reactive and any contamination is potentially hazardous. Presence of heat source and direct sunlight. Solutions of hydrogen peroxide decompose slowly releasing oxygen. Heat or contaminants will accelerate decomposition. Containers may be pressurized. Hydrogen peroxide is decomposed by alkalis and even ordinary dust or rust.

Storage Incompatibilities: Rotate all stock to prevent aging. Use on FIFO (First In-First Out) basis. Segregate from combustible materials, particularly finely divided combustible materials and reducing agents.

Section 11 - Toxicological Information

Not available. Refer to individual constituents.

See *RTECS* MX 0899500, for additional data.

Section 12 - Ecological Information

Environmental Fate: No data found.
Ecotoxicity: Aquatic toxicity: more than 40 ppm/time period not specified/fingerling trout/toxic/salt water
Biochemical Oxygen Demand (BOD): none

Section 13 - Disposal Considerations

Disposal: Recycle wherever possible. Consult manufacturer for recycling options. Consult State Land Waste Management Authority for disposal. Decompose small amounts by slowly adding to warm caustic solution. Puncture containers to prevent re-use.

Section 14 - Transport Information

DOT Hazardous Materials Table Data (49 CFR 172.101):

Note: This material has multiple possible HMT entries. Choose the appropriate one based on state and condition of specific material when shipped.

Shipping Name and Description: Hydrogen peroxide, aqueous solutions *with more than 40 percent but not more than 60 percent hydrogen peroxide (stabilized as necessary)*
ID: UN2014
Hazard Class: 5.1 - Oxidizer
Packing Group: II - Medium Danger
Symbols:

Label Codes: 5.1 - Oxidizer, 8 - Corrosive
Special Provisions: 12, A3, A6, B53, B80, B81, B85, IB2, IP5, T7, TP2, TP6, TP24, TP37
Packaging: **Exceptions:** None **Non-bulk:** 202 **Bulk:** 243
Quantity Limitations: **Passenger aircraft/rail:** Forbidden **Cargo aircraft only:** Forbidden
Vessel Stowage: **Location:** D **Other:** 25, 66, 75, 106

Shipping Name and Description: Hydrogen peroxide, aqueous solutions *with not less than 20 percent but not more than 40 percent hydrogen peroxide (stabilized as necessary)*
ID: UN2014
Hazard Class: 5.1 - Oxidizer
Packing Group: II - Medium Danger
Symbols:

Label Codes: 5.1 - Oxidizer, 8 - Corrosive
Special Provisions: A2, A3, A6, B53, IB2, IP5, T7, TP2, TP6, TP24, TP37
Packaging: **Exceptions:** None **Non-bulk:** 202 **Bulk:** 243
Quantity Limitations: **Passenger aircraft/rail:** 1 L **Cargo aircraft only:** 5 L
Vessel Stowage: **Location:** D **Other:**

Section 15 - Regulatory Information

EPA Regulations:
RCRA 40 CFR: Not listed
CERCLA 40 CFR 302.4: Not listed
SARA 40 CFR 372.65: Not listed
SARA EHS 40 CFR 355: Listed
RQ: 1000 lb
TPQ: 1000 lb
TSCA: Listed

Section 16 - Other Information

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76 LUBRICANTS
SUPER MOTOR OIL **Revised: 10/15/2004**

MSDS Contents

76 LUBRICANTS

MSDS CODE: 721780

STATUS: FINAL

DATE OF ISSUE: 15-OCT-2004

MATERIAL SAFETY DATA SHEET

76 SUPER MOTOR OIL

1. PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME: 76 SUPER MOTOR OIL

PRODUCT CODE: 1043226, 1043286, 1043331, 1043376, 1043401

INTENDED USE: CRANKCASE OIL

SYNONYMS:
76 SUPER MOTOR OIL, SAE 10W-30
76 SUPER MOTOR OIL, SAE 10W-40
76 SUPER MOTOR OIL, SAE 20W-50
76 SUPER MOTOR OIL, SAE 30
76 SUPER MOTOR OIL, SAE 40

RESPONSIBLE PARTY:
76 LUBRICANTS
A DIVISION OF CONOCOPHILLIPS
600 N. DAIRY ASHFORD
HOUSTON, TEXAS 77079-1175

CUSTOMER SERVICE: 888-766-7676

TECHNICAL INFORMATION: 800-435-7761

THE INTENDED USE OF THIS PRODUCT IS INDICATED ABOVE. IF ANY ADDITIONAL USE IS KNOWN, PLEASE CONTACT US AT THE TECHNICAL INFORMATION NUMBER LISTED.

EMERGENCY OVERVIEW:

24 HOUR EMERGENCY TELEPHONE NUMBERS:
SPILL, LEAK, FIRE OR ACCIDENT CALL CHEMTREC:
NORTH AMERICA: (800) 424-9300
OTHERS: (703) 527-3887 (COLLECT)

CALIFORNIA POISON CONTROL SYSTEM: (800) 356-3219

HEALTH HAZARDS/PRECAUTIONARY MEASURES:
AVOID CONTACT WITH EYES, SKIN AND CLOTHING. WASH THOROUGHLY AFTER HANDLING.

PHYSICAL HAZARDS/PRECAUTIONARY MEASURES:
KEEP AWAY FROM ALL SOURCES OF IGNITION.

APPEARANCE: CLEAR, AMBER

PHYSICAL FORM: LIQUID

ODOR: CHARACTERISTIC PETROLEUM

NFPA 704 HAZARD CLASS:
HEALTH: 1 (SLIGHT)
FLAMMABILITY: 1 (SLIGHT)
INSTABILITY: 0 (LEAST)

HMIS HAZARD CLASS:
HEALTH: 1 (SLIGHT)
FLAMMABILITY: 1 (SLIGHT)
PHYSICAL HAZARDS: 0 (LEAST)

2. COMPOSITION/INFORMATION ON INGREDIENTS

HAZARDOUS COMPONENTS:

COMPONENT/CAS NO	PERCENT (%)	ACGIH	OSHA	NIOSH	OTHER
ZINC COMPOUND(S) PROPRIETARY	0.5-1.5	NE	NE	NE	NE

NON-HAZARDOUS COMPONENTS:

COMPONENT/CAS NO	PERCENT (%)	ACGIH	OSHA	NIOSH	OTHER
LUBRICANT BASE OIL (PETROLEUM) VARIOUS STEL 5 MG/M3 NOHSC TWA	77-91	5 MG/M3 TWA 10 MG/M3	5 MG/M3 TWA	2500 MG/M3 IDLH	AS OIL MIST, IF GENERATED
ADDITIVES PROPRIETARY	9-23	NE	NE	NE	NE

ALL COMPONENTS ARE LISTED ON THE TSCA INVENTORY.

THE BASE OIL FOR THIS PRODUCT CAN BE A MIXTURE OF ANY OF THE FOLLOWING HIGHLY REFINED PETROLEUM STREAMS:
CAS 64741-88-4; CAS 64741-89-5; CAS 64741-96-4; CAS 64741-97-5;
CAS 64742-01-4; CAS 64742-52-5; CAS 64742-53-6; CAS 64742-54-7;
CAS 64742-55-8; CAS 64742-56-9; CAS 64742-57-0; CAS 64742-62-7;
CAS 64742-63-8; CAS 64742-65-0; CAS 72623-83-7; CAS 72623-85-9;
CAS 72623-86-0; CAS 72623-87-1

NOTE:
STATE, LOCAL OR OTHER AGENCIES OR ADVISORY GROUPS MAY HAVE ESTABLISHED MORE STRINGENT LIMITS. CONSULT AN INDUSTRIAL HYGIENIST OR SIMILAR PROFESSIONAL, OR YOUR LOCAL AGENCIES, FOR FURTHER INFORMATION.

1%=10,000 PPM.
NE=NOT ESTABLISHED

3. HAZARDS IDENTIFICATION

POTENTIAL HEALTH EFFECTS:

EYE:
CONTACT MAY CAUSE MILD EYE IRRITATION INCLUDING STINGING, WATERING, AND REDNESS.

SKIN:
CONTACT MAY CAUSE MILD SKIN IRRITATION INCLUDING REDNESS, AND A BURNING SENSATION. PROLONGED OR REPEATED CONTACT CAN WORSEN IRRITATION BY CAUSING DRYING AND CRACKING OF THE SKIN LEADING TO DERMATITIS (INFLAMMATION). NO HARMFUL EFFECTS FROM SKIN ABSORPTION ARE EXPECTED.

INHALATION (BREATHING):
NO INFORMATION AVAILABLE. STUDIES BY OTHER EXPOSURE ROUTES SUGGEST A LOW DEGREE OF TOXICITY BY INHALATION.

INGESTION (SWALLOWING): NO HARMFUL EFFECTS EXPECTED FROM INGESTION.

SIGNS AND SYMPTOMS:
EFFECTS OF OVEREXPOSURE MAY INCLUDE IRRITATION OF THE NOSE AND THROAT, IRRITATION OF THE RESPIRATORY TRACT, NAUSEA, DIARRHEA.

CANCER:
INADEQUATE EVIDENCE AVAILABLE TO EVALUATE THE CANCER HAZARD OF THIS MATERIAL. SEE SECTION 11 FOR CARCINOGENICITY INFORMATION OF INDIVIDUAL COMPONENTS, IF ANY.

TARGET ORGANS: NO DATA AVAILABLE FOR THIS MATERIAL.

DEVELOPMENTAL: NO DATA AVAILABLE FOR THIS MATERIAL.

PRE-EXISTING MEDICAL CONDITIONS:
CONDITIONS AGGRAVATED BY EXPOSURE MAY INCLUDE SKIN DISORDERS.

4. FIRST AID MEASURES

EYE:
IF IRRITATION OR REDNESS DEVELOPS, MOVE VICTIM AWAY FROM EXPOSURE AND INTO FRESH AIR. FLUSH EYES WITH CLEAN WATER. IF SYMPTOMS PERSIST, SEEK MEDICAL ATTENTION.

SKIN:
WIPE MATERIAL FROM SKIN AND REMOVE CONTAMINATED SHOES AND CLOTHING. CLEANSE AFFECTED AREA(S) THOROUGHLY BY WASHING WITH MILD SOAP AND WATER AND, IF NECESSARY, A WATERLESS SKIN CLEANSER. IF IRRITATION OR REDNESS DEVELOPS AND PERSISTS, SEEK MEDICAL ATTENTION.

INHALATION (BREATHING):

IF RESPIRATORY SYMPTOMS DEVELOP, MOVE VICTIM AWAY FROM SOURCE OF EXPOSURE AND INTO FRESH AIR. IF SYMPTOMS PERSIST, SEEK MEDICAL ATTENTION. IF VICTIM IS NOT BREATHING, CLEAR AIRWAY AND IMMEDIATELY BEGIN ARTIFICIAL RESPIRATION. IF BREATHING DIFFICULTIES DEVELOP, OXYGEN SHOULD BE ADMINISTERED BY QUALIFIED PERSONNEL. SEEK IMMEDIATE MEDICAL ATTENTION.

INGESTION (SWALLOWING):
FIRST AID IS NOT NORMALLY REQUIRED; HOWEVER, IF SWALLOWED AND SYMPTOMS DEVELOP, SEEK MEDICAL ATTENTION.

NOTES TO PHYSICIAN:
HIGH-PRESSURE HYDROCARBON INJECTION INJURIES MAY PRODUCE SUBSTANTIAL NECROSIS OF UNDERLYING TISSUE DESPITE AN INNOCUOUS APPEARING EXTERNAL WOUND. OFTEN THESE INJURIES REQUIRE EXTENSIVE EMERGENCY SURGICAL DEBRIDEMENT AND ALL INJURIES SHOULD BE EVALUATED BY A SPECIALIST IN ORDER TO ASSESS THE EXTENT OF INJURY.

ACUTE ASPIRATIONS OF LARGE AMOUNTS OF OIL-LADEN MATERIAL MAY PRODUCE A SERIOUS ASPIRATION PNEUMONIA. PATIENTS WHO ASPIRATE THESE OILS SHOULD BE FOLLOWED FOR THE DEVELOPMENT OF LONG-TERM SEQUELAE. INHALATION EXPOSURE TO OIL MISTS BELOW CURRENT WORKPLACE EXPOSURE LIMITS IS UNLIKELY TO CAUSE PULMONARY ABNORMALITIES.

5. FIRE-FIGHTING MEASURES

FLAMMABLE PROPERTIES:

FLASH POINT: 365 DEG. F/185 DEG. C (PMCC) APPROXIMATELY

OSHA FLAMMABILITY CLASS: NOT REGULATED

NFPA FLAMMABILITY CLASS: NO DATA

LEL%: NO DATA
UEL%: NO DATA

AUTOIGNITION TEMPERATURE: NO DATA

UNUSUAL FIRE & EXPLOSION HAZARDS:
THIS MATERIAL MAY BURN, BUT WILL NOT IGNITE READILY. VAPORS ARE HEAVIER THAN AIR AND CAN ACCUMULATE IN LOW AREAS. IF CONTAINER IS NOT PROPERLY COOLED, IT CAN RUPTURE IN THE HEAT OF A FIRE.

EXTINGUISHING MEDIA:
DRY CHEMICAL, CARBON DIOXIDE, FOAM, OR WATER SPRAY IS RECOMMENDED. WATER OR FOAM MAY CAUSE FROTHING OF MATERIALS HEATED ABOVE 212 DEG. F. CARBON DIOXIDE CAN DISPLACE OXYGEN. USE CAUTION WHEN APPLYING CARBON DIOXIDE IN CONFINED SPACES.

FIRE FIGHTING INSTRUCTIONS:
FOR FIRES BEYOND THE INCIPIENT STAGE, EMERGENCY RESPONDERS IN THE IMMEDIATE HAZARD AREA SHOULD WEAR BUNKER GEAR. WHEN THE POTENTIAL CHEMICAL HAZARD IS UNKNOWN, IN ENCLOSED OR CONFINED SPACES, OR WHEN EXPLICITLY REQUIRED BY DOT, A SELF CONTAINED BREATHING APPARATUS SHOULD BE WORN. IN ADDITION, WEAR OTHER APPROPRIATE PROTECTIVE EQUIPMENT AS CONDITIONS WARRANT (SEE SECTION 8).

ISOLATE IMMEDIATE HAZARD AREA, KEEP UNAUTHORIZED PERSONNEL OUT. STOP SPILL/RELEASE IF IT CAN BE DONE WITH MINIMAL RISK. MOVE UNDAMAGED CONTAINERS FROM IMMEDIATE HAZARD AREA IF IT CAN BE DONE WITH MINIMAL RISK.

WATER SPRAY MAY BE USEFUL IN MINIMIZING OR DISPERSING VAPORS AND TO PROTECT PERSONNEL. COOL EQUIPMENT EXPOSED TO FIRE WITH WATER, IF IT CAN BE DONE WITH

MINIMAL RISK. AVOID SPREADING BURNING LIQUID WITH WATER USED FOR COOLING PURPOSES.

6. ACCIDENTAL RELEASE MEASURES

THIS MATERIAL MAY BURN, BUT WILL NOT IGNITE READILY. KEEP ALL SOURCES OF IGNITION AWAY FROM SPILL/RELEASE.

STAY UPWIND AND AWAY FROM SPILL/RELEASE. NOTIFY PERSONS DOWN WIND OF THE SPILL/RELEASE, ISOLATE IMMEDIATE HAZARD AREA AND KEEP UNAUTHORIZED PERSONNEL OUT. STOP SPILL/RELEASE IF IT CAN BE DONE WITH MINIMAL RISK. WEAR APPROPRIATE PROTECTIVE EQUIPMENT INCLUDING RESPIRATORY PROTECTION AS CONDITIONS WARRANT (SEE SECTION 8).

PREVENT SPILLED MATERIAL FROM ENTERING SEWERS, STORM DRAINS, OTHER UNAUTHORIZED DRAINAGE SYSTEMS, AND NATURAL WATERWAYS. DIKE FAR AHEAD OF SPILL FOR LATER RECOVERY OR DISPOSAL. SPILLED MATERIAL MAY BE ABSORBED INTO AN APPROPRIATE ABSORBENT MATERIAL.

NOTIFY FIRE AUTHORITIES AND APPROPRIATE FEDERAL, STATE, AND LOCAL AGENCIES. IMMEDIATE CLEANUP OF ANY SPILL IS RECOMMENDED. IF SPILL OF ANY AMOUNT IS MADE INTO OR UPON NAVIGABLE WATERS, THE CONTIGUOUS ZONE, OR ADJOINING SHORELINES, NOTIFY THE NATIONAL RESPONSE CENTER (PHONE NUMBER 800-424-8802).

7. HANDLING AND STORAGE

HANDLING:
DO NOT ENTER CONFINED SPACES SUCH AS TANKS OR PITS WITHOUT FOLLOWING PROPER ENTRY PROCEDURES SUCH AS ASTM D-4276 AND 29CFR 1910.146. THE USE OF APPROPRIATE RESPIRATORY PROTECTION IS ADVISED WHEN CONCENTRATIONS EXCEED ANY ESTABLISHED EXPOSURE LIMITS (SEE SECTIONS 2 AND 8).

DO NOT WEAR CONTAMINATED CLOTHING OR SHOES. WASH THOROUGHLY AFTER HANDLING. USE GOOD PERSONAL HYGIENE PRACTICES.

HIGH PRESSURE INJECTION OF HYDROCARBON FUELS, HYDRAULIC OILS OR GREASES UNDER THE SKIN MAY HAVE SERIOUS CONSEQUENCES EVEN THOUGH NO SYMPTOMS OR INJURY MAY BE APPARENT. THIS CAN HAPPEN ACCIDENTALLY WHEN USING HIGH PRESSURE EQUIPMENT SUCH AS HIGH PRESSURE GREASE GUNS, FUEL INJECTION APPARATUS OR FROM PINHOLE LEAKS IN TUBING OF HIGH PRESSURE HYDRAULIC OIL EQUIPMENT.

"EMPTY" CONTAINERS RETAIN RESIDUE AND MAY BE DANGEROUS. DO NOT PRESSURIZE, CUT, WELD, BRAZE, SOLDER, DRILL, GRIND, OR EXPOSE SUCH CONTAINERS TO HEAT, FLAME, SPARKS, OR OTHER SOURCES OF IGNITION. THEY MAY EXPLODE AND CAUSE INJURY OR DEATH. CONTAINERS SHOULD BE DISPOSED OF IN AN ENVIRONMENTALLY SAFE MANNER AND IN ACCORDANCE WITH GOVERNMENTAL REGULATIONS.

BEFORE WORKING ON OR IN TANKS WHICH CONTAIN OR HAVE CONTAINED THIS MATERIAL, REFER TO OSHA REGULATIONS, ANSI Z49.1 AND OTHER REFERENCES PERTAINING TO CLEANING, REPAIRING, WELDING, OR OTHER CONTEMPLATED OPERATIONS.

STORAGE:
KEEP CONTAINER(S) TIGHTLY CLOSED. USE AND STORE THIS MATERIAL IN COOL, DRY, WELL-VENTILATED AREAS AWAY FROM HEAT AND ALL SOURCES OF IGNITION. STORAGE TEMPERATURES ABOVE 113 DEG. F MAY LEAD TO THERMAL DECOMPOSITION, RESULTING IN THE GENERATION OF HYDROGEN SULFIDE AND OTHER SULFUR CONTAINING GASES. STORE ONLY IN APPROVED CONTAINERS. KEEP AWAY FROM ANY INCOMPATIBLE MATERIAL (SEE SECTION 10). PROTECT CONTAINER(S) AGAINST PHYSICAL DAMAGE.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

ENGINEERING CONTROLS:
IF CURRENT VENTILATION PRACTICES ARE NOT ADEQUATE TO MAINTAIN AIRBORNE CONCENTRATIONS BELOW THE ESTABLISHED EXPOSURE LIMITS (SEE SECTION 2), ADDITIONAL ENGINEERING CONTROLS MAY BE REQUIRED.

PERSONAL PROTECTIVE EQUIPMENT (PPE):

RESPIRATORY:
A NIOSH CERTIFIED AIR PURIFYING RESPIRATOR WITH A TYPE 95 (R OR P) PARTICULATE FILTER MAY BE USED UNDER CONDITIONS WHERE AIRBORNE CONCENTRATIONS ARE EXPECTED TO EXCEED EXPOSURE LIMITS (SEE SECTION 2).

PROTECTION PROVIDED BY AIR PURIFYING RESPIRATORS IS LIMITED (SEE MANUFACTURER'S RESPIRATOR SELECTION GUIDE). USE A NIOSH APPROVED SELF-CONTAINED BREATHING APPARATUS (SCBA) OR EQUIVALENT OPERATED IN A PRESSURE DEMAND OR OTHER POSITIVE PRESSURE MODE IF THERE IS POTENTIAL FOR AN UNCONTROLLED RELEASE, EXPOSURE LEVELS ARE NOT KNOWN, OR ANY OTHER CIRCUMSTANCES WHERE AIR PURIFYING RESPIRATORS MAY NOT PROVIDE ADEQUATE PROTECTION. A RESPIRATORY PROTECTION PROGRAM THAT MEETS OSHA'S 29 CFR 1910.134 AND ANSI Z88.2 REQUIREMENTS MUST BE FOLLOWED WHENEVER WORKPLACE CONDITIONS WARRANT A RESPIRATOR'S USE.

SKIN:
THE USE OF GLOVES IMPERVIOUS TO THE SPECIFIC MATERIAL HANDLED IS ADVISED TO PREVENT SKIN CONTACT AND POSSIBLE IRRITATION (SEE MANUFACTURERS LITERATURE FOR INFORMATION ON PERMEABILITY).

EYE/FACE:
APPROVED EYE PROTECTION TO SAFEGUARD AGAINST POTENTIAL EYE CONTACT, IRRITATION, OR INJURY IS RECOMMENDED. DEPENDING ON CONDITIONS OF USE, A FACE SHIELD MAY BE NECESSARY.

OTHER PROTECTIVE EQUIPMENT:
A SOURCE OF CLEAN WATER SHOULD BE AVAILABLE IN THE WORK AREA FOR FLUSHING EYES AND SKIN. IMPERVIOUS CLOTHING SHOULD BE WORN AS NEEDED.

SUGGESTIONS FOR THE USE OF SPECIFIC PROTECTIVE MATERIALS ARE BASED ON READILY AVAILABLE PUBLISHED DATA. USERS SHOULD CHECK WITH SPECIFIC MANUFACTURERS TO CONFIRM THE PERFORMANCE OF THEIR PRODUCTS.

9. PHYSICAL AND CHEMICAL PROPERTIES

NOTE:
UNLESS OTHERWISE STATED, VALUES ARE DETERMINED AT 20 DEG. C (68 DEG. F) AND 760 MM HG (1 ATM).

APPEARANCE: CLEAR AMBER

PHYSICAL FORM: LIQUID

ODOR: CHARACTERISTIC PETROLEUM

ODOR THRESHOLD: NO DATA

pH: NOT APPLICABLE

VAPOR PRESSURE (MM HG): <1

VAPOR DENSITY (AIR=1): >1

BOILING POINT: NO DATA

SOLUBILITY IN WATER: NEGLIGIBLE

PARTITION COEFFICIENT (N-OCTANOL/WATER): NO DATA

SPECIFIC GRAVITY: 0.86-0.89

BULK DENSITY: 7.16-7.41

BULK DENSITY UNITS: LBS/GAL

VISCOSITY CST @ 100 DEG. C: 10.0 - 21.0

VISCOSITY CST @ 40 DEG. C: 67 - 193

PERCENT VOLATILE: NEGLIGIBLE

EVAPORATION RATE (NBUAC=1): <1

FLASH POINT: 365 DEG. F/185 DEG. C
TEST METHOD: (PMCC) APPROXIMATELY

LEL%: NO DATA
UEL%: NO DATA

AUTOIGNITION TEMPERATURE: NO DATA

10. STABILITY AND REACTIVITY

STABILITY:
STABLE UNDER NORMAL AMBIENT AND ANTICIPATED STORAGE AND HANDLING CONDITIONS OF TEMPERATURE AND PRESSURE.

CONDITIONS TO AVOID:
EXTENDED EXPOSURE TO HIGH TEMPERATURES CAN CAUSE DECOMPOSITION.

MATERIALS TO AVOID (INCOMPATIBLE MATERIALS):
AVOID CONTACT WITH STRONG OXIDIZING AGENTS, REDUCING AGENTS.

HAZARDOUS DECOMPOSITION PRODUCTS:
COMBUSTION CAN YIELD CARBON, NITROGEN, SULFUR, PHOSPHORUS, AND ZINC OXIDES. HYDROGEN SULFIDE AND ALKYL MERCAPTANS MAY ALSO BE RELEASED. THERMAL DECOMPOSITION MAY PRODUCE HYDROGEN SULFIDE AND OTHER SULFUR-CONTAINING GASES AT TEMPERATURES GREATER THAN 113 DEG. F. METHACRYLATE MONOMERS MAY ALSO BE FORMED.

HAZARDOUS POLYMERIZATION: WILL NOT OCCUR.

11. TOXICOLOGICAL INFORMATION

CHRONIC DATA:

LUBRICANT BASE OIL (PETROLEUM) - CAS: VARIOUS
CARCINOGENICITY:
THE PETROLEUM BASE OILS CONTAINED IN THIS PRODUCT HAVE BEEN HIGHLY REFINED BY

A VARIETY OF PROCESSES INCLUDING SOLVENT EXTRACTION, HYDROTREATING, AND DEWAXING TO REMOVE AROMATICS AND IMPROVE PERFORMANCE CHARACTERISTICS. ALL OF THE OILS MEET THE IP-346 CRITERIA OF LESS THAN 3 PERCENT PAH'S AND THEREFORE NONE ARE LISTED AS A CARCINOGEN BY NTP, IARC, OR OSHA.

ACUTE DATA:

LUBRICANT BASE OIL (PETROLEUM) - CAS: VARIOUS
DERMAL:
LD50 = >2 G/KG
LC50 = NO INFORMATION AVAILABLE
ORAL:
LD50 = >5 G/KG

ADDITIVES - CAS: PROPRIETARY
DERMAL:
LD50 = NO INFORMATION AVAILABLE
LC50 = NO INFORMATION AVAILABLE
ORAL:
LD50 = NO INFORMATION AVAILABLE

ZINC COMPOUND(S) - CAS: PROPRIETARY
DERMAL:
LD50 = NO INFORMATION AVAILABLE
LC50 = NO INFORMATION AVAILABLE
ORAL:
LD50 = NO INFORMATION AVAILABLE

12. ECOLOGICAL INFORMATION

NOT EVALUATED AT THIS TIME.

13. DISPOSAL CONSIDERATIONS

THIS MATERIAL UNDER MOST INTENDED USES WOULD BECOME USED OIL DUE TO CONTAMINATION BY PHYSICAL OR CHEMICAL IMPURITIES. RECYCLE ALL USED OIL. WHILE BEING RECYCLED, USED OIL IS REGULATED BY 40 CFR 279. USE RESULTING IN CHEMICAL OR PHYSICAL CHANGE OR CONTAMINATION MAY ALSO SUBJECT IT TO REGULATION AS HAZARDOUS WASTE. UNDER FEDERAL REGULATIONS, USED OIL IS A SOLID WASTE MANAGED UNDER 40 CFR 279. HOWEVER, IN CALIFORNIA, USED OIL IS MANAGED AS HAZARDOUS WASTE UNTIL TESTED TO SHOW IT IS NOT HAZARDOUS. CONSULT STATE AND LOCAL REGULATIONS REGARDING THE PROPER HANDLING OF USED OIL. IN THE CASE OF USED OIL, THE INTENT TO DISCARD IT MAY CAUSE THE USED OIL TO BE REGULATED AS HAZARDOUS WASTE.

CONTENTS SHOULD BE COMPLETELY USED AND CONTAINERS EMPTIED PRIOR TO DISCARD. RINSATE MAY BE CONSIDERED A RCRA HAZARDOUS WASTE AND MUST BE DISPOSED OF WITH CARE AND IN COMPLIANCE WITH FEDERAL, STATE AND LOCAL REGULATIONS. LARGE EMPTY CONTAINERS, SUCH AS DRUMS, SHOULD BE RETURNED TO THE DISTRIBUTOR OR A DRUM RECONDITIONER. TO ASSURE PROPER DISPOSAL OF SMALL EMPTY CONTAINERS, CONSULT WITH STATE AND LOCAL REGULATIONS AND DISPOSAL AUTHORITIES.

14. TRANSPORTATION INFORMATION

DOT PROPER SHIPPING NAME: NOT REGULATED
NOTE:

MATERIAL IS UNREGULATED UNLESS IN CONTAINER OF 3500 GALLONS OR MORE, THEN PROVISIONS OF 49 CFR PART 130 APPLY FOR LAND SHIPMENT.

IMDG SHIPPING DESCRIPTION: NOT REGULATED

ICAO/IATA SHIPPING DESCRIPTION: NOT REGULATED

15. REGULATORY INFORMATION

U.S. REGULATIONS:

EPA SARA 311/312 (TITLE III HAZARD CATEGORIES):
ACUTE HEALTH: NO
CHRONIC HEALTH: NO
FIRE HAZARD: NO
PRESSURE HAZARD: NO
REACTIVE HAZARD: NO

SARA - SECTION 313 AND 40 CFR 372:
THIS MATERIAL CONTAINS THE FOLLOWING CHEMICALS SUBJECT TO THE REPORTING REQUIREMENTS OF SARA 313 AND 40 CFR 372:

ZINC COMPOUND(S) PROPRIETARY 0.5-1.5%

EPA (CERCLA) REPORTABLE QUANTITY (IN POUNDS): NONE KNOWN

CERCLA/SARA - SECTION 302 EXTREMELY HAZARDOUS SUBSTANCES AND TPQS (IN POUNDS):
THIS MATERIAL CONTAINS THE FOLLOWING CHEMICALS SUBJECT TO THE REPORTING REQUIREMENTS OF SARA 302 AND 40 CFR 372: NONE KNOWN

CALIFORNIA PROPOSITION 65:
WARNING:
THIS MATERIAL CONTAINS THE FOLLOWING CHEMICALS WHICH ARE KNOWN TO THE STATE OF CALIFORNIA TO CAUSE CANCER, BIRTH DEFECTS OR OTHER REPRODUCTIVE HARM, AND ARE SUBJECT TO THE REQUIREMENTS OF CALIFORNIA PROPOSITION 65 (CA HEALTH & SAFETY CODE SECTION 25249.5): NONE KNOWN

USED ENGINE OILS, WHILE NOT A COMPONENT OF THIS MATERIAL, IS ON THE PROPOSITION 65 LIST OF CHEMICALS KNOWN TO THE STATE OF CALIFORNIA TO CAUSE CANCER.

CARCINOGEN IDENTIFICATION:
THIS MATERIAL HAS NOT BEEN IDENTIFIED AS A CARCINOGEN BY NTP, IARC, OR OSHA. SEE SECTION 11 FOR CARCINOGENICITY INFORMATION OF INDIVIDUAL COMPONENTS, IF ANY.

USED MOTOR OIL HAS BEEN IDENTIFIED AS A POSSIBLE SKIN CARCINOGEN BY IARC.

TSCA: ALL COMPONENTS ARE LISTED ON THE TSCA INVENTORY.

INTERNATIONAL REGULATIONS:

CANADIAN REGULATIONS:
THIS PRODUCT HAS BEEN CLASSIFIED IN ACCORDANCE WITH THE HAZARD CRITERIA OF THE CONTROLLED PRODUCTS REGULATIONS (CPR) AND THE MSDS CONTAINS ALL THE INFORMATION REQUIRED BY THE CPR.

DOMESTIC SUBSTANCES LIST: LISTED

WHMIS CLASSIFICATION: NOT REGULATED

16. OTHER INFORMATION

ISSUE DATE: 15-OCT-2004

PREVIOUS ISSUE DATE: 3/27/2002

PRODUCT CODE: 1043226, 1043286, 1043331, 1043376, 1043401

REASON FOR REVISION:
COMPOSITION INFORMATION MODIFIED - SEE SECTION 2
COMBINED ALL GRADES INTO SINGLE MSDS.

PREVIOUS PRODUCT CODE: 3310052000

MSDS CODE: 721780

DISCLAIMER OF EXPRESSED AND IMPLIED WARRANTIES:
THE INFORMATION PRESENTED IN THIS MATERIAL SAFETY DATA SHEET IS BASED ON DATA BELIEVED TO BE ACCURATE AS OF THE DATE THIS MATERIAL SAFETY DATA SHEET WAS PREPARED. HOWEVER, NO WARRANTY OF MERCHANTABILITY, FITNESS FOR ANY PARTICULAR PURPOSE, OR ANY OTHER WARRANTY IS EXPRESSED OR IS TO BE IMPLIED REGARDING THE ACCURACY OR COMPLETENESS OF THE INFORMATION PROVIDED ABOVE, THE RESULTS TO BE OBTAINED FROM THE USE OF THIS INFORMATION OR THE PRODUCT, THE SAFETY OF THIS PRODUCT, OR THE HAZARDS RELATED TO ITS USE. NO RESPONSIBILITY IS ASSUMED FOR ANY DAMAGE OR INJURY RESULTING FROM ABNORMAL USE OR FROM ANY FAILURE TO ADHERE TO RECOMMENDED PRACTICES. THE INFORMATION PROVIDED ABOVE, AND THE PRODUCT, ARE FURNISHED ON THE CONDITION THAT THE PERSON RECEIVING THEM SHALL MAKE THEIR OWN DETERMINATION AS TO THE SUITABILITY OF THE PRODUCT FOR THEIR PARTICULAR PURPOSE AND ON THE CONDITION THAT THEY ASSUME THE RISK OF THEIR USE. IN ADDITION, NO AUTHORIZATION IS GIVEN NOR IMPLIED TO PRACTICE ANY PATENTED INVENTION WITHOUT A LICENSE.

ALCONOX
LIQUINOX **Revised: 07/14/2006**

MSDS Contents

MSDS_LIQUINOX_ENGLISH_ANSI

LIQUINOX

MSDS

SECTION 1: PRODUCT AND COMPANY IDENTIFICATION

CHEMICAL FAMILY: DETERGENT.

MANUFACTURER:
ALCONOX, INC.
30 GLENN ST.
SUITE 309
WHITE PLAINS, NY 10603.

MANUFACTURER EMERGENCY: 800-255-3924.

PHONE NUMBER: 813-248-0585 (OUTSIDE OF THE UNITED STATES).

SUPPLIER: SAME AS MANUFACTURER.

PRODUCT NAME: LIQUINOX

SECTION 2: INGREDIENT INFORMATION

C.A.S.	CONCENTRATION %	INGREDIENT NAME	T.L.V.	LD/50	LC/50
25155-30-0	10-30	SODIUM DODECYLBENZENE-SULFONATE	NOT AVAILABLE	438 MG/KG RAT ORAL 1330 MG/KG MOUSE ORAL	NOT AVAILABLE

SECTION 3: HAZARD IDENTIFICATION

ROUTE OF ENTRY: SKIN CONTACT, EYE CONTACT, INHALATION AND INGESTION.

EFFECTS OF ACUTE EXPOSURE:

EYE CONTACT: MAY CAUSE IRRITATION.

SKIN CONTACT: PROLONGED AND REPEATED CONTACT MAY CAUSE IRRITATION.

INHALATION: MAY CAUSE HEADACHE AND NAUSEA.

INGESTION:
MAY CAUSE VOMITING AND DIARRHEA.
MAY CAUSE GASTRIC DISTRESS.

EFFECTS OF CHRONIC EXPOSURE: SEE EFFECTS OF ACUTE EXPOSURE

SECTION 4: FIRST AID MEASURES

SKIN CONTACT:
REMOVE CONTAMINATED CLOTHING.
WASH THOROUGHLY WITH SOAP AND WATER.
SEEK MEDICAL ATTENTION IF IRRITATION PERSISTS.

EYE CONTACT:
CHECK FOR AND REMOVE CONTACT LENSES.

FLUSH EYES WITH CLEAR, RUNNING WATER FOR 15 MINUTES WHILE HOLDING EYELIDS
OPEN: IF IRRITATION PERSISTS, CONSULT A PHYSICIAN.

INHALATION:
REMOVE VICTIM TO FRESH AIR.
IF IRRITATION PERSISTS, SEEK MEDICAL ATTENTION.

INGESTION:
DO NOT INDUCE VOMITING, SEEK MEDICAL ATTENTION.
DILUTE WITH TWO GLASSES OF WATER.
NEVER GIVE ANYTHING BY MOUTH TO AN UNCONSCIOUS PERSON.

SECTION 5: FIRE FIGHTING MEASURES

FLAMMABILITY: NOT FLAMMABLE.

CONDITIONS OF FLAMMABILITY: SURROUNDING FIRE.

EXTINGUISHING MEDIA:
CARBON DIOXIDE, DRY CHEMICAL, FOAM.
WATER
WATER FOG.

SPECIAL PROCEDURES:
SELF-CONTAINED BREATHING APPARATUS REQUIRED.
FIREFIGHTERS SHOULD WEAR THE USUAL PROTECTIVE GEAR.
USE WATER SPRAY TO COOL FIRE EXPOSED CONTAINERS.

AUTO-IGNITION TEMPERATURE: NOT AVAILABLE.

FLASH POINT (DEG. C), METHOD: NONE

LOWER FLAMMABILITY LIMIT (% VOL): NOT APPLICABLE.
UPPER FLAMMABILITY LIMIT (% VOL): NOT APPLICABLE.

EXPLOSION DATA:
SENSITIVITY TO STATIC DISCHARGE: NOT AVAILABLE.
SENSITIVITY TO MECHANICAL IMPACT: NOT AVAILABLE.

HAZARDOUS COMBUSTION PRODUCTS:
OXIDES OF CARBON (COx).
HYDROCARBONS.

RATE OF BURNING: NOT AVAILABLE.

EXPLOSIVE POWER: CONTAINERS MAY RUPTURE IF EXPOSED TO HEAT OR FIRE.

SECTION 6: ACCIDENTAL RELEASE MEASURES

LEAK/SPILL:
CONTAIN THE SPILL.
PREVENT ENTRY INTO DRAINS, SEWERS, AND OTHER WATERWAYS.
WEAR APPROPRIATE PROTECTIVE EQUIPMENT.
SMALL AMOUNTS MAY BE FLUSHED TO SEWER WITH WATER.
SOAK UP WITH AN ABSORBENT MATERIAL.
PLACE IN APPROPRIATE CONTAINER FOR DISPOSAL.
NOTIFY THE APPROPRIATE AUTHORITIES AS REQUIRED.

SECTION 7: HANDLING AND STORAGE

HANDLING PROCEDURES AND EQUIPMENT:
PROTECT AGAINST PHYSICAL DAMAGE.
AVOID BREATHING VAPORS/MISTS.
WEAR PERSONAL PROTECTIVE EQUIPMENT APPROPRIATE TO TASK.
WASH THOROUGHLY AFTER HANDLING.
KEEP OUT OF REACH OF CHILDREN.
AVOID CONTACT WITH SKIN, EYES AND CLOTHING.
AVOID EXTREME TEMPERATURES.
LAUNDER CONTAMINATED CLOTHING PRIOR TO REUSE.

STORAGE REQUIREMENTS:
STORE AWAY FROM INCOMPATIBLE MATERIALS.
KEEP CONTAINERS CLOSED WHEN NOT IN USE.

SECTION 8: EXPOSURE CONTROLS / PERSONAL PROTECTION

PRECAUTIONARY MEASURES:

GLOVES/TYPE: WEAR APPROPRIATE GLOVES.

RESPIRATORY/TYPE: NONE REQUIRED UNDER NORMAL USE.

EYE/TYPE: SAFETY GLASSES RECOMMENDED.

FOOTWEAR/TYPE: SAFETY SHOES PER LOCAL REGULATIONS.

CLOTHING/TYPE: AS REQUIRED TO PREVENT SKIN CONTACT.

OTHER/TYPE:
EYE WASH FACILITY SHOULD BE IN CLOSE PROXIMITY.
EMERGENCY SHOWER SHOULD BE IN CLOSE PROXIMITY.

VENTILATION REQUIREMENTS: LOCAL EXHAUST AT POINTS OF EMISSION.

EXPOSURE LIMIT OF MATERIAL: NOT AVAILABLE.

SECTION 9: PHYSICAL AND CHEMICAL PROPERTIES

PHYSICAL STATE: LIQUID.

APPEARANCE & ODOR:
ODORLESS.
PALE YELLOW.

ODOR THRESHOLD (PPM): NOT AVAILABLE.

VAPOR PRESSURE (MMHg): @ 20 DEG. C (68 DEG. F). 17

VAPOR DENSITY (AIR=1): >1

VOLATILES (%) BY VOLUME: NOT AVAILABLE.

EVAPORATION RATE (BUTYL ACETATE = 1): <1.

BOILING POINT (DEG. C): 100 (212F)

FREEZING POINT (DEG. C): NOT AVAILABLE.

pH: 8.5

SPECIFIC GRAVITY @ 20 DEG. C (WATER = 1).: 1.083

SOLUBILITY IN WATER (%): COMPLETE.

COEFFICIENT OF WATER\OIL DIST.: NOT AVAILABLE

VOC: NONE

CHEMICAL FAMILY: DETERGENT.

SECTION 10: STABILITY AND REACTIVITY

CHEMICAL STABILITY:
PRODUCT IS STABLE UNDER NORMAL HANDLING AND STORAGE CONDITIONS.

CONDITIONS OF INSTABILITY: EXTREME TEMPERATURES.

HAZARDOUS POLYMERIZATION: WILL NOT OCCUR.

INCOMPATIBLE SUBSTANCES:
STRONG ACIDS.
STRONG OXIDIZING AGENTS.

HAZARDOUS DECOMPOSITION PRODUCTS: SEE HAZARDOUS COMBUSTION PRODUCTS.

SECTION 11: TOXICOLOGICAL INFORMATION

LD50 OF PRODUCT, SPECIES & ROUTE: >5000 MG/KG RAT ORAL.

LC50 OF PRODUCT, SPECIES & ROUTE: NOT AVAILABLE.

SENSITIZATION TO PRODUCT: NOT AVAILABLE.

CARCINOGENIC EFFECTS: NOT LISTED AS A CARCINOGEN.

REPRODUCTIVE EFFECTS: NOT AVAILABLE.

TERATOGENICITY: NOT AVAILABLE.

MUTAGENICITY: NOT AVAILABLE.

SYNERGISTIC MATERIALS: NOT AVAILABLE.

SECTION 12: ECOLOGICAL INFORMATION

ENVIRONMENTAL TOXICITY: NO DATA AT THIS TIME.

ENVIRONMENTAL FATE: NO DATA AT THIS TIME.

SECTION 13: DISPOSAL CONSIDERATIONS

WASTE DISPOSAL: IN ACCORDANCE WITH LOCAL AND FEDERAL REGULATIONS.

SECTION 14: TRANSPORT INFORMATION

D.O.T. CLASSIFICATION: NOT REGULATED.

SPECIAL SHIPPING INFORMATION: NOT REGULATED.

SECTION 15: REGULATORY INFORMATION

CANADIAN REGULATORY INFORMATION:

WHMIS CLASSIFICATION: NOT CONTROLLED.

DSL STATUS: NOT AVAILABLE.

USA REGULATORY INFORMATION:

SARA HAZARD CATEGORIES SECTIONS 311/312:
IMMEDIATE (ACUTE) HEALTH HAZARD: NO.
DELAYED (CHRONIC) HEALTH HAZARD: NO.
FIRE HAZARD: NO.

SUDDEN RELEASE OF PRESSURE: NO.
REACTIVE: NO.

SARA SECTION 313: NONE

TSCA INVENTORY:
ALL COMPONENTS OF THIS PRODUCT ARE LISTED ON THE TSCA INVENTORY.

NFPA:
HEALTH HAZARD 1
FLAMMABILITY 0
REACTIVITY 0

HMIS:
HEALTH HAZARD 1
FLAMMABILITY 0
PHYSICAL HAZARD 0
PPE A

SECTION 16: OTHER INFORMATION

SUPPLIER MSDS DATE: 2006/07/14

DATA PREPARED BY:
GLOBAL SAFETY MANAGEMENT
3340 PEACHTREE ROAD, #1800
ATLANTA, GA 30326

PHONE: 877-683-7460

FAX: (877) 683-7462

WEB: WWW.GLOBALSAFETYNET.COM

EMAIL: INFO@GLOBALSAFETYNET.COM.

GENERAL NOTE:
THIS MATERIAL SAFETY DATA SHEET WAS PREPARED FROM INFORMATION OBTAINED FROM VARIOUS SOURCES, INCLUDING PRODUCT SUPPLIERS AND THE CANADIAN CENTER FOR OCCUPATIONAL HEALTH AND SAFETY.

MS 01.40.01.01.06.1

AIR PRODUCTS AND CHEMICALS
ISOBUTYLENE Revised: 07/01/1999

MSDS Contents

MATERIAL SAFETY DATA SHEET

SECTION 1. PRODUCT IDENTIFICATION

PRODUCT NAME: ISOBUTYLENE

CHEMICAL NAME:
ISOBUTYLENE, UNSATURATED ALIPHATIC HYDROCARBON, ALKENE, LIQUEFIED PETROLEUM GAS (LPG), LP-GAS

FORMULA: (CH3)2C:CH3 OR C4H8

SYNONYMS: ISOBUTENE, 1,1-DIMETHYL ETHYLENE, 2-METHYL PROPYLENE

MANUFACTURER: AIR PRODUCTS AND CHEMICALS, INC.
7201 HAMILTON BOULEVARD
ALLENTOWN, PA 18195 - 1501

PRODUCT INFORMATION: (800) 752-1597

MSDS NUMBER: 1068

REVISION: 5

REVIEW DATE: JULY 1999

REVISION DATE: JULY 1999

SECTION 2. COMPOSITION / INFORMATION ON INGREDIENTS

ISOBUTYLENE IS PACKAGED AS PURE PRODUCT (>99%).

CAS NUMBER: 115-11-7

EXPOSURE LIMITS:
OSHA: NONE ESTABLISHED
ACGIH: SIMPLE ASPHYXIANT

NIOSH: NONE ESTABLISHED

ACGIH RECOMMENDS 1000 PPM TWA FOR LPG (LIQUEFIED PETROLEUM GAS).

SECTION 3. HAZARD IDENTIFICATION

EMERGENCY OVERVIEW:
ISOBUTYLENE IS A FLAMMABLE, COLORLESS LIQUEFIED COMPRESSED GAS PACKAGED IN CYLINDERS UNDER ITS OWN VAPOR PRESSURE OF 39.4 PSIA AT 70 DEG. F. IT POSES AN IMMEDIATE FIRE AND EXPLOSION HAZARD WHEN MIXED WITH AIR AT CONCENTRATIONS EXCEEDING 1.8%. HIGH CONCENTRATIONS THAT CAN CAUSE RAPID SUFFOCATION ARE ABOVE THE LOWER FLAMMABLE LIMIT AND MUST NOT BE ENTERED. ISOBUTYLENE IS HEAVIER THAN AIR AND MAY COLLECT IN LOW AREAS OR TRAVEL ALONG THE GROUND WHERE THERE MAY BE AN IGNITION SOURCE PRESENT. DIRECT CONTACT WITH LIQUID CAN CAUSE FROSTBITE.

EMERGENCY TELEPHONE NUMBERS:
(800) 523-9374 CONTINENTAL U.S., CANADA AND PUERTO RICO
(610) 481-7711 OTHER LOCATIONS

ACUTE POTENTIAL HEALTH EFFECTS:

ROUTES OF EXPOSURE:

EYE CONTACT:
CONTACT WITH LIQUID (OR RAPIDLY EXPANDING GAS) MAY CAUSE IRRITATION AND FROSTBITE.

INGESTION:
INGESTION IS NOT A LIKELY ROUTE OF EXPOSURE FOR ISOBUTYLENE. LIQUEFIED GAS MAY CAUSE FREEZE BURNS TO THE MUCOUS MEMBRANES AND POSSIBLE CENTRAL NERVOUS SYSTEM DEPRESSION.

INHALATION:
ISOBUTYLENE IS A CENTRAL NERVOUS SYSTEM (CNS) DEPRESSANT AND A MILD ANESTHETIC. IT CAN ALSO REDUCE THE AMOUNT OF OXYGEN IN THE AIR NECESSARY TO SUPPORT LIFE. EXPOSURE TO OXYGEN-DEFICIENT ATMOSPHERES (LESS THAN 19.5%) MAY PRODUCE DIZZINESS, NAUSEA, VOMITING, LOSS OF CONSCIOUSNESS, AND DEATH. AT VERY LOW OXYGEN CONCENTRATIONS (LESS THAN 12%) UNCONSCIOUSNESS AND DEATH MAY OCCUR WITHOUT WARNING. IT SHOULD BE NOTED THAT BEFORE SUFFOCATION COULD OCCUR, THE LOWER FLAMMABLE LIMIT FOR ISOBUTYLENE IN AIR WILL BE EXCEEDED; CAUSING BOTH AN OXYGEN DEFICIENT AND AN EXPLOSIVE ATMOSPHERE.

SKIN CONTACT:
CONTACT WITH LIQUID (OR RAPIDLY EXPANDING GAS) CAN CAUSE IRRITATION AND FROSTBITE.

POTENTIAL HEALTH EFFECTS OF REPEATED EXPOSURE:

ROUTE OF ENTRY: SKIN CONTACT

SYMPTOMS: REPEATED OR PROLONGED CONTACT MAY CAUSE DERMATITIS.

TARGET ORGANS: SKIN

MEDICAL CONDITIONS AGGRAVATED BY OVEREXPOSURE: MAY AGGRAVATE DERMATITIS.

CARCINOGENICITY:
ISOBUTYLENE IS NOT LISTED AS A CARCINOGEN OR POTENTIAL CARCINOGEN BY NTP, IARC, OR OSHA SUBPART Z.

SECTION 4. FIRST AID MEASURES

EYE CONTACT:
FLUSH EYES WITH PLENTY OF LUKEWARM WATER FOR SEVERAL MINUTES. SEEK MEDICAL ATTENTION IMMEDIATELY.

INGESTION:
WASH OUT MOUTH WITH LUKEWARM WATER PROVIDED PERSON IS CONSCIOUS. OBTAIN PROMPT MEDICAL ATTENTION.

INHALATION:
REMOVE PERSON TO FRESH AIR. IF NOT BREATHING, ADMINISTER ARTIFICIAL RESPIRATION. IF BREATHING IS DIFFICULT, ADMINISTER OXYGEN. OBTAIN PROMPT MEDICAL ATTENTION.

SKIN CONTACT:
IF LIQUID ISOBUTYLENE COMES IN CONTACT WITH SKIN, REMOVE CONTAMINATED CLOTHING AND FLUSH WITH PLENTY OF LUKEWARM WATER FOR SEVERAL MINUTES. SEEK MEDICAL ATTENTION IMMEDIATELY.

NOTES TO PHYSICIAN:
TREATMENT OF OVEREXPOSURE SHOULD BE DIRECTED AT THE CONTROL OF SYMPTOMS AND THE CLINICAL CONDITION.

SECTION 5. FIRE FIGHTING MEASURES

FLASH POINT: NOT APPLICABLE

AUTOIGNITION: 869 DEG. F (465 DEG. C)

FLAMMABLE RANGE: 1.8% - 9.6%

EXTINGUISHING MEDIA: CARBON DIOXIDE, DRY CHEMICAL, WATER.

SPECIAL FIRE FIGHTING INSTRUCTIONS:
EVACUATE ALL PERSONNEL FROM AREA. IF POSSIBLE, WITHOUT RISK, SHUT OFF SOURCE OF ISOBUTYLENE, THEN FIGHT FIRE ACCORDING TO TYPES OF MATERIALS BURNING. EXTINGUISH FIRE ONLY IF GAS FLOW CAN BE STOPPED. THIS WILL AVOID POSSIBLE ACCUMULATION AND RE-IGNITION OF A FLAMMABLE GAS MIXTURE. KEEP ADJACENT CYLINDERS COOL BY SPRAYING WITH LARGE AMOUNTS OF WATER UNTIL THE FIRE BURNS ITSELF OUT. SELF-CONTAINED BREATHING APPARATUS (SCBA) MAY BE REQUIRED.

UNUSUAL FIRE AND EXPLOSION HAZARDS:
MOST CYLINDERS ARE DESIGNED TO VENT CONTENTS WHEN EXPOSED TO ELEVATED TEMPERATURES. PRESSURE IN A CYLINDER CAN BUILD UP DUE TO HEAT AND IT MAY RUPTURE IF PRESSURE RELIEF DEVICES SHOULD FAIL TO FUNCTION. ISOBUTYLENE VAPORS ARE HEAVIER THAN AIR AND MAY TRAVEL TO A SOURCE OF IGNITION AND FLASH BACK.

HAZARDOUS COMBUSTION PRODUCTS: CARBON MONOXIDE

SECTION 6. ACCIDENTAL RELEASE MEASURES

STEPS TO BE TAKEN IF MATERIAL IS RELEASED OR SPILLED:
EVACUATE IMMEDIATE AREA. ELIMINATE ANY POSSIBLE SOURCES OF IGNITION, AND PROVIDE MAXIMUM EXPLOSION-PROOF VENTILATION. USE A FLAMMABLE GAS METER (EXPLOSIMETER) CALIBRATED FOR ISOBUTYLENE TO MONITOR CONCENTRATION. NEVER ENTER AN AREA WHERE THE ISOBUTYLENE CONCENTRATION IS GREATER THAN 0.36% (WHICH IS 20% OF THE LOWER

FLAMMABLE LIMIT). AN IMMEDIATE FIRE AND EXPLOSION HAZARD EXISTS WHEN ATMOSPHERIC ISOBUTYLENE CONCENTRATIONS EXCEED 1.8%. USE APPROPRIATE PROTECTIVE EQUIPMENT (SCBA AND FIRE RESISTANT SUIT). SHUT OFF SOURCE OF LEAK IF POSSIBLE. ISOLATE ANY LEAKING CYLINDER. IF LEAK IS FROM CONTAINER, PRESSURE RELIEF DEVICE OR ITS VALVE, CONTACT YOUR SUPPLIER. IF THE LEAK IS IN THE USER'S SYSTEM, CLOSE THE CYLINDER VALVE, SAFELY VENT THE PRESSURE, AND PURGE WITH AN INERT GAS BEFORE ATTEMPTING REPAIRS.

SECTION 7. STORAGE AND HANDLING

STORAGE:
STORE CYLINDERS IN A WELL-VENTILATED, SECURE AREA, PROTECTED FROM THE WEATHER. CYLINDERS SHOULD BE STORED UPRIGHT WITH VALVE OUTLET SEALS AND VALVE PROTECTION CAPS IN PLACE. THERE SHOULD BE NO SOURCES OF IGNITION. ALL ELECTRICAL EQUIPMENT SHOULD BE EXPLOSION-PROOF IN THE STORAGE AREAS. STORAGE AREAS MUST MEET NATIONAL ELECTRICAL CODES FOR CLASS 1 HAZARDOUS AREAS. FLAMMABLE STORAGE AREAS MUST BE SEPARATED FROM OXYGEN AND OTHER OXIDIZERS BY A MINIMUM DISTANCE OF 20 FT. OR BY A BARRIER OF NON-COMBUSTIBLE MATERIAL AT LEAST 5 FT. HIGH HAVING A FIRE RESISTANCE RATING OF AT LEAST 1/2 HOUR. POST "NO SMOKING OR OPEN FLAMES" SIGNS IN THE STORAGE OR USE AREAS. DO NOT ALLOW STORAGE TEMPERATURE TO EXCEED 125 DEG. F (52 DEG. C). STORAGE SHOULD BE AWAY FROM HEAVILY TRAVELED AREAS AND EMERGENCY EXITS. FULL AND EMPTY CYLINDERS SHOULD BE SEGREGATED. USE A FIRST-IN FIRST-OUT INVENTORY SYSTEM TO PREVENT FULL CONTAINERS FROM BEING STORED FOR LONG PERIODS OF TIME.

HANDLING:
DO NOT DRAG, ROLL, SLIDE OR DROP CYLINDER. USE A SUITABLE HAND TRUCK DESIGNED FOR CYLINDER MOVEMENT. NEVER ATTEMPT TO LIFT A CYLINDER BY ITS CAP. SECURE CYLINDERS AT ALL TIMES WHILE IN USE. USE A SEPARATE CONTROL VALVE TO SAFELY DISCHARGE GAS FROM CYLINDER. USE A CHECK VALVE TO PREVENT REVERSE FLOW INTO CYLINDER. NEVER APPLY FLAME OR LOCALIZED HEAT DIRECTLY TO ANY PART OF THE CYLINDER. DO NOT ALLOW ANY PART OF THE CYLINDER TO EXCEED 125 DEG. F (52 DEG. C). ONCE CYLINDER HAS BEEN CONNECTED TO PROPERLY PURGED AND INERTED PROCESS, OPEN CYLINDER VALVE SLOWLY AND CAREFULLY. IF USER EXPERIENCES ANY DIFFICULTY OPERATING CYLINDER VALVE, DISCONTINUE USE AND CONTACT SUPPLIER. NEVER INSERT AN OBJECT (E.G., WRENCH, SCREWDRIVER, ETC.) INTO VALVE CAP OPENINGS. DOING SO MAY DAMAGE VALVE CAUSING A LEAK TO OCCUR. USE AN ADJUSTABLE STRAP-WRENCH TO REMOVE OVER-TIGHT OR RUSTED CAPS. ALL PIPED SYSTEMS AND ASSOCIATED EQUIPMENT MUST BE GROUNDED. ELECTRICAL EQUIPMENT SHOULD BE NON-SPARKING OR EXPLOSION-PROOF.

SPECIAL PRECAUTIONS:
ALWAYS STORE AND HANDLE COMPRESSED GAS CYLINDERS IN ACCORDANCE WITH COMPRESSED GAS ASSOCIATION, INC. (TELEPHONE 703-412-0900) PAMPHLET CGA P-1, SAFE HANDLING OF COMPRESSED GASES IN CONTAINERS. LOCAL REGULATIONS MAY REQUIRE SPECIFIC EQUIPMENT FOR STORAGE OR USE.

SECTION 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

ENGINEERING CONTROLS:

VENTILATION:
PROVIDE ADEQUATE NATURAL OR EXPLOSION-PROOF VENTILATION TO PREVENT ACCUMULATION OF GAS CONCENTRATIONS ABOVE 0.36% (20% OF LEL).

RESPIRATORY PROTECTION:
EMERGENCY USE: DO NOT ENTER AREAS WHERE ISOBUTYLENE CONCENTRATION IS GREATER THAN 0.36% (20% OF LEL). EXPOSURE TO CONCENTRATIONS BELOW THIS CONCENTRATION DO NOT REQUIRE RESPIRATORY PROTECTION.

EYE PROTECTION:
SAFETY GLASSES FOR HANDLING CYLINDERS. CHEMICAL GOGGLES WITH FULL FACESHIELD FOR CONNECTING OR DISCONNECTING CYLINDERS.

SKIN PROTECTION:
LEATHER GLOVES FOR HANDLING CYLINDERS. NEOPRENE GLOVES DURING USE OF PRODUCT. FIRE RESISTANT SUIT AND GLOVES IN EMERGENCY SITUATIONS.

OTHER PROTECTIVE EQUIPMENT:
SAFETY SHOES ARE RECOMMENDED WHEN HANDLING CYLINDERS.

SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

APPEARANCE, ODOR AND STATE:
AT ROOM TEMPERATURE AND ATMOSPHERIC PRESSURE, ISOBUTYLENE IS A COLORLESS, FLAMMABLE GAS WITH A MILD ODOR. IT IS SHIPPED AS A LIQUEFIED GAS UNDER ITS OWN VAPOR PRESSURE.

MOLECULAR WEIGHT: 56.1

BOILING POINT (1 ATM): 20.1 DEG. F (-6.6 DEG. C)

SPECIFIC GRAVITY (AIR = 1): 2.0

FREEZING POINT / MELTING POINT: -220.1 DEG. F (-140.1 DEG. C)

VAPOR PRESSURE (AT 70 DEG. F (21.1 DEG. C)): 39.4 PSIA

GAS DENSITY (AT 70 DEG. F (21.1 DEG. C) AND 1 ATM): 0.15 LB/FT3

SOLUBILITY IN WATER: NEGLIGIBLE

LIQUID DENSITY (AT 70 DEG. F (21.1 DEG. C), SAT.): 37.56 LB/FT3

SECTION 10. STABILITY AND REACTIVITY

CHEMICAL STABILITY: STABLE

CONDITIONS TO AVOID:
CYLINDERS SHOULD NOT BE EXPOSED TO TEMPERATURES IN EXCESS OF 125 DEG. F (52 DEG, C).

INCOMPATIBILITY (MATERIALS TO AVOID): OXYGEN, HALOGENS AND OXIDIZERS

REACTIVITY:
A) HAZARDOUS DECOMPOSITION PRODUCTS: NONE
B) HAZARDOUS POLYMERIZATION: MAY OCCUR AT HIGH TEMPERATURES OR PRESSURES OR IN THE PRESENCE OF A CATALYST.

SECTION 11. TOXICOLOGICAL INFORMATION

LC50 (INHALATION): NOT APPLICABLE. SIMPLE ASPHYXIANT.

LD50 (ORAL): NOT APPLICABLE

LD50 (DERMAL): NOT APPLICABLE

SKIN CORROSIVITY: ISOBUTYLENE IS NOT CORROSIVE TO THE SKIN.

ADDITIONAL NOTES:
ISOBUTYLENE IS A CNS DEPRESSANT AND ACTS AS A SIMPLE ASPHYXIANT AND MILD ANESTHETIC.

SECTION 12. ECOLOGICAL INFORMATION

AQUATIC TOXICITY: NOT DETERMINED

MOBILITY: NOT DETERMINED

PERSISTENCE AND BIODEGRADABILITY: NOT DETERMINED

POTENTIAL TO BIOACCUMULATE: NOT DETERMINED

REMARKS:
THIS PRODUCT DOES NOT CONTAIN ANY CLASS I OR CLASS II OZONE DEPLETING CHEMICALS.

SECTION 13. DISPOSAL CONSIDERATIONS

UNUSED PRODUCT / EMPTY CYLINDER:
RETURN CYLINDER AND UNUSED PRODUCT TO SUPPLIER. DO NOT ATTEMPT TO DISPOSE OF UNUSED PRODUCT.

DISPOSAL:
RESIDUAL PRODUCT IN THE SYSTEM MAY BE BURNED IF A SUITABLE BURNING UNIT (FLAIR INCINERATOR) IS AVAILABLE ON SITE. THIS SHALL BE DONE IN ACCORDANCE WITH FEDERAL, STATE, AND LOCAL REGULATIONS. WASTES CONTAINING THIS MATERIAL MAY BE CLASSIFIED BY EPA AS HAZARDOUS WASTE BY CHARACTERISTIC (I.E., IGNITABILITY, CORROSIVITY, TOXICITY, REACTIVITY). WASTE STREAMS MUST BE CHARACTERIZED BY THE USER TO MEET FEDERAL, STATE, AND LOCAL REQUIREMENTS.

SECTION 14. TRANSPORT INFORMATION

DOT SHIPPING NAME: ISOBUTYLENE

HAZARD CLASS: 2.1

IDENTIFICATION NUMBER: UN1055

SHIPPING LABEL(S): FLAMMABLE GAS

PLACARD (WHEN REQUIRED): FLAMMABLE GAS

SPECIAL SHIPPING INFORMATION:
CYLINDERS SHOULD BE TRANSPORTED IN A SECURE UPRIGHT POSITION IN A WELL-VENTILATED TRUCK. NEVER TRANSPORT IN PASSENGER COMPARTMENT OF A VEHICLE. ENSURE CYLINDER VALVE IS PROPERLY CLOSED, VALVE OUTLET CAP HAS BEEN REINSTALLED, AND VALVE PROTECTION CAP IS SECURED BEFORE SHIPPING CYLINDER.

CAUTION:
COMPRESSED GAS CYLINDERS SHALL NOT BE REFILLED EXCEPT BY QUALIFIED PRODUCERS OF COMPRESSED GASES. SHIPMENT OF A COMPRESSED GAS CYLINDER WHICH HAS NOT BEEN FILLED BY THE OWNER OR WITH THE OWNER'S WRITTEN CONSENT IS A VIOLATION OF

FEDERAL LAW (49 CFR 173.301).

NORTH AMERICAN EMERGENCY RESPONSE GUIDEBOOK NUMBER (NAERG #): 115

SECTION 15. REGULATORY INFORMATION

U.S. FEDERAL REGULATIONS:

EPA - ENVIRONMENTAL PROTECTION AGENCY
CERCLA: COMPREHENSIVE ENVIRONMENTAL RESPONSE, COMPENSATION, AND LIABILITY ACT OF 1980 (40 CFR PARTS 117 AND 302)
 REPORTABLE QUANTITY (RQ): NONE

SARA TITLE III: SUPERFUND AMENDMENT AND REAUTHORIZATION ACT

SECTIONS 302/304: EMERGENCY PLANNING AND NOTIFICATION (40 CFR PART 355)
 EXTREMELY HAZARDOUS SUBSTANCES: ISOBUTYLENE IS NOT LISTED.
 THRESHOLD PLANNING QUANTITY (TPQ): NONE
 REPORTABLE QUANTITY (RQ): NONE

SECTIONS 311/312: HAZARDOUS CHEMICAL REPORTING (40 CFR PART 370)
 IMMEDIATE HEALTH: YES PRESSURE: YES
 DELAYED HEALTH: NO REACTIVITY: NO
 FIRE: YES

SECTION 313: TOXIC CHEMICAL RELEASE REPORTING (40 CFR PART 372)
ISOBUTYLENE DOES NOT REQUIRE REPORTING UNDER SECTION 313.

CLEAN AIR ACT:
SECTION 112 (R): RISK MANAGEMENT PROGRAMS FOR CHEMICAL ACCIDENTAL RELEASE (40 CFR PART 68)
 ISOBUTYLENE IS LISTED AS A REGULATED SUBSTANCE.
 THRESHOLD PLANNING QUANTITY (TPQ): 10,000 LBS

TSCA: TOXIC SUBSTANCE CONTROL ACT
ISOBUTYLENE IS LISTED ON THE TSCA INVENTORY.

OSHA - OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION:
29 CFR PART 1910.119: PROCESS SAFETY MANAGEMENT OF HIGHLY HAZARDOUS CHEMICALS
ISOBUTYLENE IS NOT LISTED IN APPENDIX A AS A HIGHLY HAZARDOUS CHEMICAL. HOWEVER, ANY PROCESS THAT INVOLVES A FLAMMABLE GAS ON SITE IN ONE LOCATION, IN QUANTITIES OF 10,000 POUNDS (4,553 KG) OR GREATER IS COVERED UNDER THIS REGULATION UNLESS IT IS USED AS FUEL.

STATE REGULATIONS:

CALIFORNIA:
PROPOSITION 65: THIS PRODUCT IS NOT A LISTED SUBSTANCE WHICH THE STATE OF CALIFORNIA REQUIRES WARNING UNDER THIS STATUTE.

SECTION 16. OTHER INFORMATION

NFPA RATINGS:
HEALTH: = 1
FLAMMABILITY: = 4
REACTIVITY: = 0
SPECIAL:

HMIS RATINGS:
HEALTH: = 0
FLAMMABILITY: = 4
REACTIVITY: = 0

ALAMO CEMENT
CEMENT, PORTLAND **Revised: 03/04/1991**

MSDS Contents

U.S. DEPARTMENT OF LABOR
OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION

OMB NO 1218-0074
EXPIRATION DATE 05/31/86

MATERIAL SAFETY DATA SHEET

REQUIRED UNDER USDL SAFETY AND HEALTH REGULATIONS FOR SHIPYARD EMPLOYMENT
(29 CFR 1915)

3/4/91

SECTION I

MANUFACTURER'S NAME: ALAMO CEMENT

ADDRESS (NUMBER, STREET, CITY, STATE AND ZIP CODE):
P.O. BOX 34807
SAN ANTONIO, TX 78233

EMERGENCY TELEPHONE NO.

CHEMICAL NAME AND SYNONYMS: CEMENT

TRADE NAME AND SYNONYMS: CEMENT, PORTLAND

CHEMICAL FAMILY: CEMENT, CALCIUM

FORMULA: SILICATES & ALUMINATES

SECTION II - HAZARDOUS INGREDIENTS

PAINTS, PRESERVATIVES AND SOLVENTS	%	TLV (UNITS)
PIGMENTS	N/A	
CATALYST	N/A	
VEHICLE	N/A	
SOLVENTS	N/A	
ADDITIVES	N/A	
OTHERS	N/A	

ALLOYS AND METALLIC COATINGS	%	TLV (UNITS)
BASE METAL	N/A	

ALLOYS	N/A
METALLIC COATINGS	N/A
FILLER METAL PLUS COATING OR CORE FLUX	N/A
OTHERS	N/A

HAZARDOUS MIXTURES OF OTHER LIQUIDS, SOLIDS, OR GASES

	%	TLV (UNITS)
N/A		

SECTION III - PHYSICAL DATA

BOILING POINT (DEG. F):	N/A
SPECIFIC GRAVITY (H2O = 1):	3.17
VAPOR PRESSURE (MM HG.):	N/A
PERCENT VOLATILE BY VOLUME (%):	0.0
VAPOR DENSITY (AIR = 1):	N/A
EVAPORATION RATE (= 1):	0.0
SOLUBILITY IN WATER:	50% - 80%
APPEARANCE AND ODOR:	GREY, NO ODOR

SECTION IV - FIRE AND EXPLOSION HAZARD DATA

FLASHPOINT (METHOD USED): N/A

FLAMMABLE LIMITS: LEL: UEL:

EXTINGUISHING MEDIA: N/A

SPECIAL FIRE FIGHTING PROCEDURES: N/A

UNUSUAL FIRE AND EXPLOSION HAZARDS: NONE

SECTION V - HEALTH HAZARD DATA

THRESHOLD LIMIT VALUE:

EFFECTS OF OVEREXPOSURE: MAY CAUSE SLIGHT SKIN IRRITATION OR DRYING OUT AS A RESULT OF PROLONGED OVEREXPOSURE.

EMERGENCY FIRST AID PROCEDURES: WASH WITH EYE WASH IF DUST GETS IN EYE, SEE PHYSICIAN. WASH HANDS AND SKIN WITH SOAP AND WATER, USE NORMAL HAND MOISTURIZING CREAM IF SKIN IS DRY OR CHAPPED.

SECTION VI - REACTIVITY DATA

STABILITY:
- UNSTABLE ( )
- STABLE (X)

CONDITIONS TO AVOID:

INCOMPATIBILITY (MATERIALS TO AVOID):

HAZARDOUS DECOMPOSITION PRODUCTS: NONE

HAZARDOUS POLYMERIZATION:
MAY OCCUR ( )
WILL NOT OCCUR (X)

CONDITIONS TO AVOID:

SECTION VII - SPILL OR LEAK PROCEDURES

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED: SHOVEL OR SWEEP UP AND RE-USE, IF POSSIBLE; OTHERWISE, DISPOSE OF AS AN AGGREGATE AND AVOID WATER DUE TO CEMENT'S NATURE OF HARDENING IN CONTACT WITH WATER.

WASTE DISPOSAL METHOD: SEE ABOVE

SECTION VIII - SPECIAL PROTECTION INFORMATION

RESPIRATORY PROTECTION (SPECIFY TYPE): OSHA-MSHA APPROVED SILICA DUST RESPIRATOR

VENTILATION: SUBJECT TO LOCAL CODES
LOCAL EXHAUST:
MECHANICAL (GENERAL):
SPECIAL:
OTHER:

PROTECTIVE GLOVES: COTTON OR NORMAL RUBBER GLOVES

EYE PROTECTION: STANDARD SAFETY GLASSES

OTHER PROTECTIVE EQUIPMENT: USE CLOTHING AS NECESSARY TO AVOID SKIN CONTACT

SECTION IX - SPECIAL PRECAUTIONS

PRECAUTIONS TO BE TAKEN IN HANDLING AND STORING: PROTECT FROM MOISTURE

OTHER PRECAUTIONS:

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Material Safety Data Sheet Collection
Genium group inc.
1171 RiverFront Center, Amsterdam, NY 12010
(518) 842-4111

Potassium Permanganate
POT7020

Issue Date: 2006-06

Section 1 - Chemical Product and Company Identification 61

Material Name: Potassium Permanganate **CAS Number:** 7722-64-7
Chemical Formula: $KMnO_4$
Structural Chemical Formula: $KMnO_4$
EINECS Number: 231-760-3
ACX Number: X1000083-0
Synonyms: Potassium Permanganate; POTASSIUM PERMANGANATE; ALGAE-K; ARGUCIDE; C.I. 77755; CAIROX; CHAMELEON MINERAL; CHLORISOL; CONDY'S CRYSTALS; DIVERSEY DIVERSOL CX WITH ARODYNE; DIVERSEY DIVERSOL CXU; EPA PESTICIDE CHEMICAL CODE 068501; HILCO #88; ICC 237 DISINFECTANT,SANITIZER,DESTAINER,AND DEODORIZER; KALIUMPERMANGANAAT; KALIUMPERMANGANAT; PERMANGANATE DE POTASSIUM; PERMANGANATE OF POTASH; PERMANGANATO POTASICO; PERMANGANIC ACID (HMNO4),POTASSIUM SALT; PERMANGANIC ACID POTASSIUM SALT; POTASSIO (PERMANGANATO DI); POTASSIUM (PERMANGANATE DE); PURPLE SALT; SOLO SAN SOO; WALKO TABLETS
General Use: Bleaching resins, waxes, fats, oils, straw, cotton, silk and other fibers and chamois skins; dyeing wood brown; printing fabrics; washing carbon dioxide in manufacture of mineral waters; photography; tanning leathers; purifying water; with formaldehyde solution to expel formaldehyde gas for disinfecting; as an important reagent in analytical and synthetic organic chemistry.

Section 2 - Composition / Information on Ingredients

Name	CAS	%
potassium permanganate	7722-64-7	>99

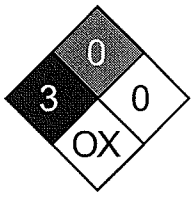
OSHA PEL
Ceiling: 5 mg/m^3; as Mn.

ACGIH TLV
TWA: 0.2 mg/m^3. *Manganese - Elemental & inorganic cmpds (as Mn)*

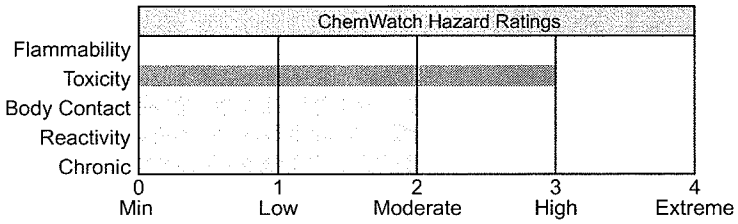
NIOSH REL
TWA: 1 mg/m^3; STEL: 3 mg/m^3; as Mn inorganic.

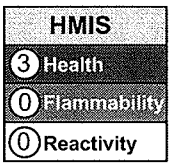
DFG (Germany) MAK
TWA: 0.5 mg/m^3; PEAK: 5 mg/m^3; as Mn inorganic, ceiling, measured as inhalable fraction of the aerosol, substances with systemic effects, onset of effect greater than 2 hours, half-life greater than shift length, strongly cumulative.

Section 3 - Hazards Identification



Fire Diamond





ANSI Signal Word
Danger!


Corrosive

☆☆☆☆☆ Emergency Overview ☆☆☆☆☆
Odorless, dark purple crystals. Corrosive. Other Acute Effects: respiratory tract irritation, blood/kidney damage. Strong oxidizer.

Potential Health Effects

Target Organs: respiratory system, eyes, skin, gastrointestinal (GI) tract
Primary Entry Routes: ingestion, inhalation

Acute Effects

Inhalation: The material is moderately discomforting to the upper respiratory tract and may be harmful if inhaled.
Manganese fume is toxic and produces nervous system effects characterized by tiredness. Acute poisoning is rare although acute inflammation of the lungs may occur. A chemical pneumonia may also result from frequent exposure.
Inhalation of freshly formed metal oxide particles sized below 1.5 microns and generally between 0.02 to 0.05 microns may result in "metal fume fever". Symptoms may be delayed for up to 12 hours and begin with the sudden onset of thirst, and a sweet, metallic or foul taste in the mouth.
Other symptoms include upper respiratory tract irritation accompanied by coughing and a dryness of the mucous membranes, lassitude and a generalized feeling of malaise. Mild to severe headache, nausea, occasional vomiting, fever or chills, exaggerated mental activity, profuse sweating, diarrhea, excessive urination and prostration may also occur. Tolerance to the fumes develops rapidly, but is quickly lost. All symptoms usually subside within 24-36 hours following removal from exposure.
Persons with impaired respiratory function, airway diseases, and conditions such as emphysema or chronic bronchitis, may incur further disability if excessive concentrations of particulate are inhaled.

Eye: The material is corrosive to the eyes and is capable of causing pain and severe conjunctivitis.
Corneal injury may develop, with possible permanent impairment of vision, if not promptly and adequately treated.

Skin: The material is highly discomforting to the skin and is capable of causing skin reactions which may lead to dermatitis.
Open cuts, abraded or irritated skin should not be exposed to this material.
The material may accentuate any pre-existing skin condition.

Ingestion: The material is corrosive to the gastrointestinal tract, may cause severe mucous membrane damage and may be harmful if swallowed.
Poisonings rarely occur after oral administration of manganese salts as they are generally poorly absorbed from the gut (generally less than 4%) and seems to be dependent, in part, on levels of dietary iron and may increase following the consumption of alcohol. A side-effect of oral manganese administration is an increase in losses of calcium in the feces and a subsequent lowering of calcium blood levels. Absorbed manganese tends to be slowly excreted in the bile.
Divalent manganese appears to be 2.5-3 times more toxic than the trivalent form.
Ingestion may cause brown discoloration and burns to the mouth with edema of the glottis, nausea, vomiting and diarrhea.
Over-exposure may result in anemia, swelling of the throat with possibility of suffocation and kidney damage.

Carcinogenicity: NTP - Not listed; IARC - Not listed; OSHA - Not listed; NIOSH - Not listed; ACGIH - Not listed; EPA - Class D, Not classifiable as to human carcinogenicity; MAK - Not listed.

Chronic Effects: Manganese is an essential trace element in all living organisms with the level of tissue manganese remaining remarkably constant throughout life.
Systemic poisoning may result from inhalation or chronic ingestion of manganese containing substances. Chronic exposure has been associated with two major effects; bronchitis/pneumonitis following inhalation of manganese dusts and "manganism", a neuropsychiatric disorder that may also arise from inhalation exposures.
Chronic exposure to low levels may result in the accumulation of toxic concentrations in critical organs. The brain in particular appears to sustain cellular damage to the ganglion. Symptoms appear before any pathology is evident and may include a mask-like facial expression, spastic gait, tremors, slurred speech, sometimes dystonia (disordered muscle tone), fatigue, anorexia, asthenia (loss of strength and energy), apathy and the inability to concentrate. Insomnia may be an early finding.
Rat studies indicate the gradual accumulation of brain manganese to produce lesions mimicking those found in Parkinsonism.
Long term exposures to manganese compounds may effect the central nervous system. Symptoms include muscular weakness and tremors similar to Parkinson's disease. Behavioral changes and handwriting differences may also appear. Other symptoms include sleepiness, weakness in the legs, muscle twitchings and tremors, nocturnal leg cramps, and a typical Parkinsonian slapping gait may appear. These systems may stimulate progressive bulbar paralysis, multiple sclerosis, amyotrophic lateral sclerosis and progressive lenticular degeneration. The blood may show increased erythrocyte formation and increased osmotic fragility.
No known cases of chronic manganese poisoning by potassium permanganate have been reported.

Section 4 - First Aid Measures

Inhalation: Remove to fresh air.
Lay patient down. Keep warm and rested.
If breathing is shallow or has stopped, ensure clear airway and apply resuscitation. Transport to hospital or doctor.

Eye Contact: Immediately hold the eyes open and flush continuously for at least 15 minutes with fresh running water. Ensure irrigation under eyelids by occasionally lifting the upper and lower lids.
Transport to hospital or doctor without delay. Removal of contact lenses after an eye injury should only be undertaken by skilled personnel.

Skin Contact: Immediately remove all contaminated clothing, including footwear (after rinsing with water).
Wash affected areas thoroughly with water (and soap if available).

Seek medical attention in event of irritation.

Ingestion: Contact a Poison Control Center.

Do NOT induce vomiting. Give a glass of water.

After first aid, get appropriate in-plant, paramedic, or community medical support.

Note to Physicians: Both dermal and oral toxicity of manganese salts is low because of limited solubility of manganese. No known permanent pulmonary sequelae develop after acute manganese exposure.

Treatment is supportive.

In clinical trials with miners exposed to manganese-containing dusts, L-dopa relieved extrapyramidal symptoms of both hypokinetic and dystonic patients.

For short periods of time symptoms could also be controlled with scopolamine and amphetamine. BAL and calcium EDTA prove ineffective.

For potassium intoxications:

1.Hyperkalemia, in patients with abnormal renal function, results from reduced renal excretion following intoxication.

2.The presence of electrocardiographic evidence of hyperkalemia or serum potassium levels exceeding 7.5 mE/L indicates a medical emergency requiring an intravenous line and constant cardiac monitoring.

3.The intravenous ingestion of 5-10 mL of 10% calcium gluconate in adults, over a 2 minute period, antagonizes the cardiac and neuromuscular effects.

The duration of action is approximately 1 hour.

Section 5 - Fire-Fighting Measures

Flash Point: Nonflammable

Autoignition Temperature: Not applicable

LEL: Not applicable

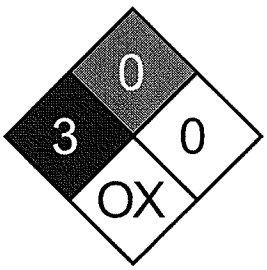
UEL: Not applicable

Extinguishing Media: Jets of water; water spray or fog; foam; dry chemical powder.

BCF (where regulations permit).

Carbon dioxide.

See DOT ERG



Fire Diamond

General Fire Hazards/Hazardous Combustion Products: Will not burn but increases intensity of fire.

Heating may cause expansion or decomposition leading to violent rupture of containers.

Heat affected containers remain hazardous.

Contact with combustibles such as wood, paper, oil or finely divided metal may cause ignition, combustion or violent decomposition.

May emit irritating, poisonous or corrosive fumes.

May cause spontaneous ignition if mixed with glycol, or anti-freeze compounds.

Reacts violently when exposed to sulfuric acid or hydrogens peroxide.

May form explosive compounds with ammonium compounds.

Decomposes on heating and produces oxygen, oxides of manganese and potassium. Reacts with concentrated acids to produce oxygen.

Reacts with hydrochloric acid to produce chlorine.

Fire Incompatibility: Oxidizing agents as a class are not necessarily combustible themselves, but can increase the risk and intensity of fire in many other substances.

Reacts vigorously with metallic powders, ammonium compounds, phosphorous, carbon, arsenates, ethylene glycol, sulfur, hydrazine, metal hydrides, peroxides, alcohol and other combustible materials.

Avoid reaction with acids.

Potassium permanganate is readily decomposed by many reducing substances such as ferrous or mercury salts, iodides, bromides, oxalates, etc., especially in the presence of an acid.

Fire-Fighting Instructions: Contact fire department and tell them location and nature of hazard.

Wear full body protective clothing with breathing apparatus. Prevent, by any means available, spillage from entering drains or waterways.

Fight fire from a safe distance, with adequate cover.

Extinguishers should be used only by trained personnel.

Use water delivered as a fine spray to control fire and cool adjacent area.

Avoid spraying water onto liquid pools.

Do not approach containers suspected to be hot.

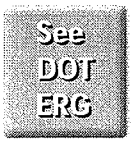
Cool fire-exposed containers with water spray from a protected location.

If safe to do so, remove containers from path of fire.

If fire gets out of control withdraw personnel and warn against entry.

Equipment should be thoroughly decontaminated after used.

Section 6 - Accidental Release Measures



Small Spills: Clean up all spills immediately. No smoking, bare lights, ignition sources.
Avoid all contact with any organic matter including fuel, solvents, sawdust, paper or cloth and other incompatible materials, as ignition may result.
Avoid breathing dust or vapors and all contact with skin and eyes.
Control personal contact by using protective equipment.
Contain and absorb spill with dry sand, earth, inert material or vermiculite. DO NOT use sawdust as fire may result.
Scoop up solid residues and seal in labeled drums for disposal.
Neutralize/decontaminate area.

Large Spills: Pollutant - Clear area of personnel and move upwind. Contact fire department and tell them location and nature of hazard.
May be violently or explosively reactive. Wear full body protective clothing with breathing apparatus. Prevent, by any means available, spillage from entering drains or waterways. Consider evacuation.
No smoking, flames or ignition sources. Increase ventilation.
Contain spill with sand, earth or other clean, inert materials. NEVER use organic absorbents such as sawdust, paper or cloth.
Use spark-free and explosion-proof equipment.
Collect residues and seal in labeled drums for disposal.
Wash area and prevent runoff into drains. Decontaminate equipment and launder all protective clothing before storage and reuse.
If contamination of drains or waterways occurs advise emergency services.
Cover residue with a reducer (hypo, a bisulfate or a ferrous salt, but not carbon, sulfur or a strong reducing agent) mix and spray with water.
To promote rapid reduction, add sulfuric acid with reducer above. Scoop into a metal container of water and neutralize with soda ash. Wash residue with soap solution containing some reducer.

Regulatory Requirements: Follow applicable OSHA regulations (29 CFR 1910.120).

Section 7 - Handling and Storage

Handling Precautions: Avoid personal contact and inhalation of dust, mist or vapors.
Provide adequate ventilation.
Always wear protective equipment and wash off any spillage from clothing.
Keep material away from light, heat, flammables or combustibles. Keep cool, dry and away from incompatible materials.
Avoid physical damage to containers.
Do not repack or return unused portions to original containers. Withdraw only sufficient amounts for immediate use.
Contamination can lead to decomposition leading to possible intense heat and fire. When handling NEVER smoke, eat or drink.
Always wash hands with soap and water after handling.
Use only good occupational work practices. Observe manufacturer's storing and handling directions.

Recommended Storage Methods: Check that containers are clearly labeled.
Packaging as recommended by manufacturer.
Glass container.
Plastic drum.
Polyethylene or polypropylene container.
Polylined drum.

Regulatory Requirements: Follow applicable OSHA regulations.

Section 8 - Exposure Controls / Personal Protection

Engineering Controls: General exhaust is adequate under normal operating conditions.
If risk of overexposure exists, wear NIOSH-approved respirator.
Correct fit is essential to obtain adequate protection.
Provide adequate ventilation in warehouse or closed storage areas.

Personal Protective Clothing/Equipment:

Eyes: Safety glasses with side shields; chemical goggles. Full face shield.
Contact lenses pose a special hazard; soft lenses may absorb irritants and all lenses concentrate them.

Hands/Feet: Impervious gloves; PVC gloves.
Rubber gloves.
Safety footwear.
Rubber boots.

Other: Overalls. Impervious protective clothing.
Eyewash unit.
Ensure there is ready access to a safety shower.

Equipment should be kept clean and in working-order.

Section 9 - Physical and Chemical Properties

Appearance/General Info: Purple-bronze (almost black) odorless, crystals or powder with a metallic luster. Sweet with an astringent after-taste. Decomposed by alcohol and many other organic solvents. Concentrated solutions are alkaline.

Physical State: Divided solid
Formula Weight: 158.04
Specific Gravity (H_2O=1, at 4 °C): 2.7
Evaporation Rate: Not applicable
pH: Not applicable
pH (1% Solution): >7

Boiling Point: Decomposes at 1 atm
Freezing/Melting Point: 240 °C (464 °F)
Volatile Component (% Vol): Not applicable
Decomposition Temperature (°C): <240
Water Solubility: 6.38 g/100 cc at 20 °C water

Section 10 - Stability and Reactivity

Stability/Polymerization/Conditions to Avoid: Presence of heat source and ignition source. Presence of elevated temperatures. Product is considered stable under normal handling conditions. Hazardous polymerization will not occur.

Storage Incompatibilities: Contact with acids produces toxic fumes.
Oxidizing agents as a class are not necessarily combustible themselves but can increase the risk and intensity of fire in many other substances.
Segregate from reducing agents, concentrated acids, tin, sulfur, alcohol, peroxides, bromides, iodides, arsenates, ethylene glycol, ammonium compounds, metallic powders, phosphorous, hydrazine, ferrous or mercury salts, oxalates and combustible materials and organic substances generally.

Section 11 - Toxicological Information

Toxicity
Oral (human) LD_{Lo}: 143 mg/kg
Oral (woman) TD_{Lo}: 2.4 mg/kg/d
Oral (rat) LD_{50}: 1090 mg/kg
Dyspnea, nausea, effects on spermatogenesis and the male fertility index recorded.

Irritation
Nil reported

See *RTECS* SD 6475000, for additional data.

Section 12 - Ecological Information

Environmental Fate: No data found.
Ecotoxicity: LC_{50} Ictalurus punctatus (channel catfish) 0.75 mg/l/96 hr /conditions of bioassay not specified
BCF: no food chain concentration potential
Biochemical Oxygen Demand (BOD): none

Section 13 - Disposal Considerations

Disposal: Recycle wherever possible. Special hazards may exist - specialist advice may be required.
Consult manufacturer for recycling options.
Follow applicable federal, state, and local regulations.
Treat and neutralize at an approved treatment plant.
Decontaminate empty containers. Observe all label safeguards until containers are cleaned and destroyed.
Puncture containers to prevent reuse and bury at an authorized landfill.
For small quantities: Dissolve solid residue in water. Add a reducer (hypo, a bisulfate, or a ferrous salt but not carbon, sulfur or strong reducing agent), and sulphuric acid to promote reduction.
Neutralize with soda ash.
Bury precipitate in an authorized landfill.
Decontaminate empty containers with reducer, acid and soda ash, as above.
Recycle containers wherever possible, otherwise dispose of in an authorized landfill.

Section 14 - Transport Information

DOT Hazardous Materials Table Data (49 CFR 172.101):

Shipping Name and Description: Potassium permanganate
ID: UN1490
Hazard Class: 5.1 - Oxidizer
Packing Group: II - Medium Danger
Symbols:
Label Codes: 5.1 - Oxidizer
Special Provisions: IB8, IP4
Packaging: **Exceptions:** 152 **Non-bulk:** 212 **Bulk:** 240
Quantity Limitations: **Passenger aircraft/rail:** 5 kg **Cargo aircraft only:** 25 kg
Vessel Stowage: **Location:** D **Other:** 56, 58, 69, 106, 107

Section 15 - Regulatory Information

EPA Regulations:
RCRA 40 CFR: Not listed
CERCLA 40 CFR 302.4: Listed per CWA Section 311(b)(4) 100 lb (45.35 kg)
SARA 40 CFR 372.65: Listed as Compound
SARA EHS 40 CFR 355: Not listed
TSCA: Listed

Section 16 - Other Information

Disclaimer: Judgments as to the suitability of information herein for the purchaser's purposes are necessarily the purchaser's responsibility. Although reasonable care has been taken in the preparation of such information, Genium Group, Inc. extends no warranties, makes no representations, and assumes no responsibility as to the accuracy or suitability of such information for application to the purchaser's intended purpose or for consequences of its use.

ANTHRATECH WESTERN CANADA
SILICA SAND Revised: 09/30/2001

MSDS Contents

MATERIAL SAFETY DATA SHEET

SECTION 1 - PRODUCT IDENTIFICATION AND USE

PRODUCT IDENTIFIER: SILICA SAND

VARIOUS SIZES, INCLUDING SILICA FLOUR, PLAY SAND, TRACTION SAND

DESCRIPTION: ODORLESS, GRANULAR SAND

PRODUCT USE: WATER TREATMENT FILTRATION, SAND BLASTING ABRASIVE

MANUFACTURER'S NAME:
AWI(ANTHRATECH WESTERN INC.)
4450-46 AVENUE, SE
CALGARY, ALBERTA T2B 3N7

EMERGENCY PHONE: (403) 255-7377

SUPPLIER'S NAME:
AWI (ANTHRATECH WESTERN INC.)
4450-46 AVENUE, SE
CALGARY, ALBERTA T2B 3N7

EMERGENCY PHONE: (403) 620-4505

SECTION 2 - HAZARDOUS INGREDIENTS

SILICA, CRYSTALLINE QUARTZ
C.A.S. NUMBER: 14808-60-7
LD50: N/A
LC50: N/A

SECTION 3 - PHYSICAL DATA

PHYSICAL STATE: SOLID

ODOR & APPEARANCE: ODORLESS, GRANULAR SAND

ODOR THRESHOLD: N/A

SPECIFIC GRAVITY: 2.6 (APPROXIMATE)

VAPOR PRESSURE: N/A

VAPOR DENSITY: N/A

EVAPORATION RATE: N/A

BOILING POINT: 4000 DEG. F

FREEZING POINT: N/A

pH: 7.3

COEFFICIENT OF WATER/OIL DISTRIBUTION: N/A

SECTION 4 - FIRE AND EXPLOSION DATA

CONDITIONS OF FLAMMABILITY: N/A

MEANS OF EXTINCTION: N/A

FLASH POINT: N/A

UPPER FLAMMABLE LIMIT: N/A
LOWER FLAMMABLE LIMIT: N/A

AUTO-IGNITION TEMPERATURE: N/A

EXPLOSION DATA (MECHANICAL IMPACT): N/A

EXPLOSION DATA (STATIC IMPACT): N/A

SECTION 5 - REACTIVITY DATA

CONDITIONS UNDER WHICH THE PRODUCT IS CHEMICALLY UNSTABLE: N/A

SUBSTANCE OR CLASS OF SUBSTANCE WITH WHICH THE PRODUCT IS INCOMPATIBLE: N/A

CONDITIONS OF REACTIVITY: N/A

HAZARDOUS DECOMPOSITION PRODUCTS: N/A

SECTION 6 - TOXICOLOGICAL PROPERTIES

SKIN CONTACT: NO EFFECT

SKIN ABSORPTION: NO EFFECT

EYE CONTACT: NO LONG-TERM EFFECT OTHER THAN DUST DISCOMFORT

INGESTION: NO EFFECT

INHALATION ACUTE EXPOSURE: NO IMMEDIATE EFFECT

CHRONIC EXPOSURE:
RESPIRATORY DISEASES MAY DEVELOP SUCH AS SILICOSIS, PNEUMOCONIOSIS AND PULMONARY FIBROSIS

EXPOSURE LIMITS:

ACGIH TLV:
CRYSTALLINE QUARTZ
TLV-TWA: 0.1 MG/CUBIC M (RESPIRABLE DUST)

SEE THRESHOLD LIMIT VALUE AND BIOLOGICAL EXPOSURE INDICES FOR 1987-1988 AMERICAN CONFERENCE OF GOVERNMENTAL INDUSTRIAL HYGIENISTS, BE CHANGED TO 50 MICROGRAMS RESPIRABLE FREE SILICA PER CUBIC METER OF AIR (50 (MICRO)G/CUBIC M) AVERAGED OVER A WORK SHIFT OF UP TO 10 HOURS PER DAY, 40 HOURS PER WEEK. THE NIOSH CRITERIA DOCUMENT OF CRYSTALLINE SILICA SHOULD BE CONSULTED FOR MORE DETAILED INFORMATION.

SECTION 7 - PREVENTIVE MEASURES

USE LOCAL EXHAUST TO CONTROL DUST DISPERSION. FOR RESPIRATORY PROTECTION, USE AN AIR-SUPPLIED RESPIRATOR OR OTHER CONVENTIONAL PARTICULATE RESPIRATORY PROTECTION BASED ON CONSIDERATIONS OF AIRBORNE CONCENTRATIONS AND DURATION OF EXPOSURE. FOR MORE INFORMATION CONTACT THE FOLLOWING STANDARDS:

1) AMERICAN NATIONAL STANDARD INSTITUTE (ANSI 2.88.2)
2) OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION (OSHA -29CFR PART 1910.134)
3) MINE SAFETY AND HEALTH ADMINISTRATION (MSHA - CFR PART 56)

SAFETY GLASSES SHOULD BE WORN TO PREVENT DUST IN EYES, IN CASE OF SPILL, VACUUM SPILLAGE AND DISPOSE OF WASTE IN CONTAINERS OF SLURRY TO AVOID REDISPERSION.

STORE IN SILOS OR BAGS.

SECTION 8 - FIRST AID MEASURES

EYE CONTACT:
A WATER WASH WILL REMOVE PARTICLES

INHALATION:
REMOVE FROM CONTAMINATED AREA. IF SHORTNESS OF BREATH OR OTHER BREATHING PROBLEMS PERSIST, CONSULT A PHYSICIAN.

SECTION 9 - PREPARATION OF DATE OF MSDS

PREPARED BY: PRODUCTION & QUALITY CONTROL

TELEPHONE NUMBER: (403) 255-7377

DATE PREPARED: SEPTEMBER 30, 2001

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Contract No. FA8903-09-D-8580, Task Order No. 0013 • Draft • Revision 0 • November 2011 • WERC-09-13-002-3

Appendix F
NFPA 70 E – Electrical Safety Tables

NFPA 70 (E) Table 130.7 (C) (9) (a) Hazard/Risk Category Classifications

Task (Assumes Equipment Is Energized, and Work Is Done Within the Flash Protection boundary	Hazard/Risk Category	V-rated Gloves	V-rated Tools
Panel boards Rated 240 V and Below --- Notes 1 and 3			
Circuit breaker (CB) or fused switch operation with covers on	0	N	N
CB or fused switch operation with covers off	0	N	N
Work on energized parts, including voltage testing	1	Y	Y
Remove/install CBs or fused switches	1	Y	Y
Removal of bolted covers (to expose bare, energized parts)	1	N	N
Opening hinged covers (to expose bare, energized parts)	0	N	N
Panel boards or Switchboards Rated >240 V and up to 600 V (with molded case or insulated case circuit breakers) --- Notes 1 and 3			
CB or fused switch operation with covers on	0	N	N
CB or fused switch operation with covers off	1	N	N
Work on energized parts, including voltage testing	2*	Y	Y
600 V Class Motor control Centers (MCCs) --- Notes 2 (except as indicated) and 3			
CB or fused switch or starter operation with enclosure doors closed	0	N	N
Reading a panel meter while operating a meter switch	0	N	N
CB or fused switch or starter operation with enclosure doors open	1	N	N
Work on energized parts, including voltage testing	2*	Y	Y
Work on control circuits with energized parts 120 V or below, exposed	0	Y	Y
Work on control circuits with energized parts > 120 V exposed	2*	Y	Y
Insertion or removal of individual starter "buckets" from MCC - Note 4	3	Y	N
Application of safety grounds, after voltage test	2*	Y	N
Removal of bolted covers (to expose bare, energized parts)	2*	N	N
Opening hinged covers (to expose bare, energized parts)	1	N	N
600 V Class Switchgear (with power circuit breakers or fused switches)-- Notes 5 and 6			
CB or fused switch operation with enclosure door closed	0	N	N
Reading a panel meter while operating a meter switch	0	N	N
CB or fused switch operation with enclosure door open	1	N	N
Work on energized parts, including voltage testing	2*	Y	Y
Work on control circuits with energized parts 120 V or below, exposed	0	Y	Y
Work on control circuits with energized parts > 120 V, exposed	2*	Y	Y
Insertion or removal (racking) of CBs from cubicles, doors open	3	N	N
Insertion or removal (racking) of CBs from cubicles, doors closed	2	N	N
Application of safety grounds, after voltage test	2*	Y	N
Removal of bolted covers (to expose bare, energized parts)	3	N	N
Opening hinged covers (to expose bare, energized parts)	2	N	N

NFPA 70 (E) Table 130.7 (C) (9) (a) Hazard/Risk Category Classifications (Continued)

Task (Assumes Equipment Is Energized, and Work Is Done Within the Flash Protection Boundary)	Hazard/Risk Category	V-rated Gloves	V-rated Tools
Other 600 V Class (277 V through 600 V, nominal) Equipment -- Note 3			
Lighting or small power transformers (600 V, maximum)	--	--	--
Removal of bolted covers (to expose bare, energized parts)	2*	N	N
Opening hinged covers (to expose bare energized parts)	1	N	N
Work on energized parts, including voltage testing	2*	Y	Y
Application of safety grounds, after voltage test	2*	Y	N
Revenue meters (kW-hour, at primary voltage and current)	--	--	--
Insertion or removal	2*	Y	N
Cable trough or tray cover removal or installation	1	N	N
Miscellaneous equipment cover removal or installation	1	N	N
Work on energized parts, including voltage testing	2*	Y	Y
Application of safety grounds, after voltage test	2*	Y	N
NEMA E2 (fused contactor) Motor Starters, 2.3 kV Through 7.2 kV			
Contactor operation with enclosure doors closed	0	N	N
Reading a panel meter while operating a meter switch	0	N	N
Contactor operation with enclosure doors open	2*	N	N
Work on energized parts, including voltage testing	3	Y	Y
Work on control circuits with energized parts 120 V or below, exposed	0	Y	Y
Work on control circuits with energized parts > 120 V, exposed	3	Y	Y
Insertion or removal (racking) of starters from cubicles, doors open	3	N	N
Insertion or removal (racking) of starters from cubicles, doors closed	2	N	N
Application of safety grounds, after voltage test	3	Y	N
Removal of bolted covers (to expose bare, energized parts)	4	N	N
Opening hinged covers (to exposed bare, energized parts)	3	N	N
Metal Clad Switchgear, 1 kV and Above			
CB or fused switch operation with enclosure doors closed	2	N	N
Reading a panel meter while operating a meter switch	0	N	N
CB or fused switch operation with enclosure doors open	4	N	N
Work on energized parts, including voltage testing	4	Y	Y
Work on control circuits with energized parts 120 V or below, exposed	2	Y	Y
Work on control circuits with energized parts > 120 V, exposed	4	Y	Y
Insertion or removal (racking) of CBs from cubicles, doors open	4	N	N
Insertion or removal (racking) of CBs from cubicles, doors closed	2	N	N
Application of safety grounds, after voltage test	4	Y	N
Removal of bolted covers (to expose bare, energized parts)	4	N	N
Opening hinged covers (to expose bare, energized parts)	3	N	N
Opening voltage transformer or control power transformer compartments	4	N	N

NFPA 70 (E) Table 130.7 (C) (9) (a) Hazard/Risk Category Classifications (Continued)

Task (Assumes Equipment Is Energized, and Work Is Done Within the Flash Protection Boundary)	Hazard/Risk Category	V-rated Gloves	V-rated Tools
Other Equipment 1 kV and Above			
Metal clad load interrupter switches, fused or unfused	--	--	--
Switch operation, doors closed	2	N	N
Work on energized parts, including voltage testing	4	Y	Y
Removal of bolted covers (to expose bare, energized parts)	4	N	N
Opening hinged covers (to expose bare, energized parts)	3	N	N
Outdoor disconnect switch operation (hook stick operated)	3	Y	Y
Outdoor disconnect switch operation (gang-operated, from grade)	2	N	N
Insulated cable examination, in manhole or other confined space	4	Y	N
Insulated cable examination, in open area	2	Y	N

Note:
V-rated Gloves are gloves rated and tested for the maximum line-to-line voltage upon which work will be done.
V-rated Tools are tools rated and tested for the maximum line-to-line voltage upon which work will be done.
2* means that a double-layer switching hood and hearing protection are required for this task in addition to the other Hazard/Risk Category 2 requirements of Table 130.7 (C) (10).

Y = yes (required)

N = no (not required)

Notes:
1. 25 kA short circuit current available, 0.03 second (2 cycle) fault clearing time.
2. 65 kA short circuit current available, 0.03 second (2 cycle) fault clearing time.
3. For < 10 kA short circuit current available, the hazard/risk category required may be reduced by one number
4. 65 kA short circuit current available, 0.33 second (20 cycle) fault clearing time.
5. 65k A short circuit current available, up to 1.0 second (60 cycle) fault clearing time.
6. for < 25 kA short circuit current available, the hazard/risk category required may be reduced by one number

NFPA 70 (E) Table 130.7 (C) (10) Protective Clothing and Personal Protective Equipment (PPE) Matrix

Protective Clothing and Equipment	Protective Systems for Hazard/Risk Category					
Hazard/Risk Category Number	**-1** (Note 3)	**0**	**1**	**2**	**3**	**4**
Non-melting (according to ASTM F 1506-00) or Untreated Natural Fiber						
a. T-shirt (short-sleeve)	X			X	X	X
b. Shirt (long-sleeve)		X				
c. Pants (long)	X	X	X (Note 4)	X (Note 6)	X	X
FR Clothing (Note 1)						
a. Long-sleeve shirt			X	X	X (Note 9)	X
b. Pants			X (Note 4)	X (Note 6)	X (Note 9)	X
c. overall			(Note 5)	(Note 7)	X (Note 9)	(Note 5)
d. Jacket, parka, or rainwear			AN	AN	AN	AN
FR Protective Equipment						
a. Flash suit jacket (multilayer)						X
b. Flash suit pants (multilayer)						X
c. Head protection						
1. Hard hat			X	X	X	X
2. FR hard hat liner					AR	AR
d. Eye protection		--	--	--	--	--
1. Safety glasses	X	X	X	AL	AL	AL
2. Safety goggles				AL	AL	AL
e. Face and head area protection		--	--	--	--	--
1. Arc-rated face shield, or flash suit hood				X (Note 8)		
2. Flash suit hood					X	X
3. Hearing protection (car canal inserts)				X (Note 8)	X	X
f. Hand protection			--	--	--	--
Leather gloves (Note 2)			AN	X	X	X
g. Foot protection						
Leather work shoes			AN	X	X	X

AN = As needed
AL = Select one in group
AR = As required
FR = Flame Resistant
X = Minimum required

Notes:
1. See Table 130.7(C) (11). Arc rating for a garment is expressed in cal/cm^2.
2. If voltage-rated gloves are required, the leather protectors worn external to the rubber gloves satisfy this requirement.
3. Hazard/Risk Category Number "-1" is only defined if determined by Notes 3 or 6 of Table 130.7(C) (9) (a).
4. Regular weight (minimum 12 oz/yd^2 fabric weight), untreated, denim cotton blue jeans are acceptable in lieu of FR pants. The FR pants used for Hazard/Risk Category 1 shall have a minimum arc rating of 4.
5. Alternate is to use FR coveralls (minimum arc rating of 4) instead of FR shirt and FR pants.
6. If the FR pants have a minimum arc rating of 8, long pants of non-melting or untreated natural fiber pants and t-shirt.
7. Alternate is to use FR coveralls (minimum arc rating of 4) over non-melting or untreated natural fiber pants and T-shirt.
8. A face shield with a minimum arc rating of 8, with wrap-around guarding to protect not only the face, but also the forehead, ears, and neck (or, alternatively, a flash suit hood), is required.
9. Alternate is to use two sets of FR coveralls (the inner with a minimum arc rating of 4 and outer coverall with a minimum arc rating of 5) over non-melting or untreated natural fiber clothing, instead of FR coveralls over FR shirt and FR pants over non-melting or untreated natural fiber clothing.

NFPA 70 (E) Table 130.7 (C) (11) Protective Clothing Characteristics

Hazard/Risk Category	Clothing Description (Typical number of clothing layers is given in parentheses)	Required Minimum Arc Rating of PPE [J/cm^2(cal/cm^2)]
0	Non-melting, flammable materials (i.e., untreated cotton, wool rayon, or silk, or blends of these materials) with a fabric weight at least 4.5 oz/yd^2 (1)	N/A
1	Flame Resistant (FR) shirt and FR pants or FR coverall (1)	16.74 (4)
2	Cotton underwear -- conventional short sleeve and brief/shorts plus FR shirt and FR pants (1 and 2)	33.47 (8)
3	Cotton underwear plus FR shirt and FR pants plus FR coverall, or cotton underwear plus two FR coveralls (2 or 3)	104.6 (25)
4	Cotton underwear plus FR shirt and FR pants plus multilayer flash suit (3 or more)	167.36 (40)

Note: Arc rating is defined in Article 100 and can be either ATPV or E_{BT}. ATPV is defined in ASTM F 1959-99 as the incident energy on a fabric or material that results in sufficient heat transfer through the fabric or material to cause the onset of a second-degree burn based on the Stoll curve. E_{BT} is defined in ASTM F 1959-99 as the average of the five highest incident energy exposure values below the Stoll curve where the specimens do not exhibit break-open. E_{BT} is reported when ATPV cannot be measured due to FR fabric break-open.

NFPA 70E Table 130.2(C)

Approach Boundaries to Live Parts for Shock Protection

(All dimensions are distance from live part to employee.)

(1)	(2)	(3)	(4)	(5)
	Limited Approach Boundary [1]		Restricted Approach Boundary [1], Includes Inadvertent Movement Adder	Prohibited Approach Boundary [1]
Nominal System Voltage Range, Phase to Phase	Exposed Moveable Conductor	Exposed Fixed Circuit Part		
Less than 50	Not specific	Not specific	Not specific	Not specific
50 to 300	3.05 m (10 ft 0 in.)	1.07 m (3 ft 6 in.)	Avoid contact	Avoid contact
301 to 750	3.05 m (10 ft 0 in.)	1.07 m 3 ft 6 in.)	304.8 mm (1 ft 0 in.)	25.4 mm (0 ft 1 in.)
751 to 15 kV	3.05 m (10 ft 0 in.)	1.53 m (5 ft 0 in.)	660.4 mm (2 ft 2 in.)	177.8 mm (0 ft 7 in.)
15.1 kV to 36 kV	3.05 m (10 ft 0 in.)	1.83 m (6 ft 0 in.)	787.4 mm (2 ft 7 in.)	254 mm (0 ft 10 in.)
36.1 kV to 46 kV	3.05 m (10 ft 0 in.)	2.44 m (8 ft 0 in.)	838.2 mm (2 ft 9 in.)	431.8 mm (1 ft 5 in.)
46.1 kV to 72.5 kV	3.05 m (10 ft 0 in.)	2.44 m (8 ft 0 in.)	965.2 mm (3 ft 2 in.)	635 mm (2 ft 1 in.)
72.6 kV to 121 kV	3.25 m (10 ft 8 in.)	2.44 m (8 ft 0 in.)	991 mm (3 ft 3 in.)	812.8 mm (2 ft 8 in.)
138 kV to 145 kV	3.36 m (11 ft 0 in.)	3.05 m (10 ft 0 in.)	1.093 m (3 ft 7 in.)	939.8 mm (3 ft 1 in.)
161 kV to 169 kV	3.56 m (11 ft 8 in.)	3.56 m (11 ft 8 in.)	1.22 m (4 ft 0 in.)	1.07 m (3 ft 6 in.)
230 kV to 242 kV	3.97 m (13 ft 0 in.)	3.97 m (13 ft 0 in.)	1.6 m (5 ft 3 in.)	1.45 m (4 ft 9 in.)
345 kV to 362 kV	4.68 m (15 ft 4 in.)	4.68 m (15 ft 4 in.)	2.59 m (8 ft 6 in.)	2.44 m (8 ft 0 in.)
500 kV to 550 kV	5.8 m (19 ft 0 in.)	5.8 m (19 ft 0 in.)	3.43 m (11 ft 3 in.)	3.28 m (10 ft 9 in.)
765 kV to 800 kV	7.24 m (23 ft 9 in.)	7.24 m (23 ft 9 in.)	4.55 m (14 ft 11 in.)	4.4 m (14 ft 5 in.)

Note: For Flash Protection Boundary, see NFPA 70E 130.3(A)

1: See definitions in Article 100 and text in NFPA 70E 130.2(D)(2) and Annex C for elaboration

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Draft • Revision 0 • November 2011 • WERC-09-13-002-3

Appendix G
Guidelines for Standard Safety Disciplinary Actions

Guidelines for Standard Safety Disciplinary Actions Acknowledgment Form

I have read and understand the Shaw Environmental and Infrastructure, Inc. *Guidelines for Standard Safety Disciplinary Actions*.

Printed Name	Signature	Representing	Date

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Draft • Revision 0 • November 2011 • WERC-09-13-002-3

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Draft • Revision 0 • November 2011 • WERC-09-13-002-3

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Contract No. FA8903-09-D-8580, Task Order No. 0013 • Draft • Revision 0 • November 2011 • WERC-09-13-002-3

Appendix H
Incident Notification, Reporting, and Management Procedure

Incident Notification, Reporting, and Management Procedure

Directions, Notes, and Reminders

- **Follow this procedure step-by-step for all incidents.**
- **This procedure has limited application to subcontractors. Assist subcontractors with medical emergencies (as applicable) and then immediately notify the Program H&S Manager for guidance.**
- **Periodically review this procedure in order to be familiar with the steps - prior to an incident occurring.**
- **For injuries and vehicle accidents, secure the scene to prevent additional injury/incident, administer on-site first aid, and arrange for emergency assistance prior to making any other notifications.**
- **The Site Supervisor is responsible for making all other notifications to:**
  - **CORE Health Networks (must be notified while employee is en route to medical care facility): 877-EHS-Shaw (or 877-347-7429)**
  - **Shaw Help Desk / Hot Line: 866-299-3445**
  - **Project Manager: Kathleen Romalia - (720) 554-8207 Cell**
  - **Marcia Musgrave: 419-425-6160.**
- **A Supervisor (or SSHO) is responsible for notifying the Program H&S Manager or Alternate H&S Manager by telephone prior to making any other notifications (other than calling 911 and CORE).**
- **A Supervisor or the SSHO shall accompany all injured personnel to the CORE clinic or to the hospital emergency room.**
- **The Project Manager shall notify the Program Manager in person or by telephone no later than two hours after the incident.**
- **All incident reports shall be completed by typing (when feasible and applicable).**
- **All incident reports shall be submitted (email or fax) to the Program H&S Manager or Alternate H&S Manager for review and distribution.**
- **Complete all the blanks on the INCIDENT NOTIFICATION AND COMMUNICATION CONTACT LIST (page 6) and post near all site telephones.**

Incident Notification, Reporting, and Management Procedure

Action	Who / When	Under what circumstances	How	Notes
1. Notify Site Superintendent for all incidents (no matter how minor)	Injured person, first person recognizing incident, driver/passenger, or employee causing damage *Immediately*	All incidents no matter how minor (including minor cuts, scratches, minor strains/sprains, and insect bites)	In person or by telephone	Site Superintendent to make note of very minor incidents (such as band-aid over scratch) in field logbook
2. For ***life-threatening injuries / illnesses*** - make scene safe, contact local emergency personnel For ***non life-threatening injuries / illnesses*** - make scene safe, transport injured person to doctor at an occupational medical facility For ***vehicle accidents*** – make scene safe, notify police, aid injured parties For ***equipment / property damage*** - make scene safe, prevent further damage or injuries	Site Superitendent *Immediately (concurrently with next step if injury or illness)* Site Superitendent *Immediately (concurrently with next step if injury or illness)* Driver/passenger *Immediately* Employee causing damage *Immediately*	In case of serious injury or illness requiring off-site medical care	Via ambulance Via vehicle	Site Superitendent or Site Safety Officer must immediately go to emergency care facility. Follow HS101 post accident alcohol and drug testing procedure. Site Superitendent or Site Safety and Health Officer must transport and stay with injured person until released from care. Make medical personnel aware of Shaw's "restricted work will be provided" and "no prescriptions if possible" policies. CORE clinics are the preferred urgent care facilities when possible, unless injury is severe and victim is transported by ambulance.
3. Notify CORE Health Networks (for injuries / illnesses to Shaw employees only)	Site Superitendent *Immediately, prior to transporting the injured employee, unless injuries are life threatening*	• Serious injury requiring off-site medical care • If employee states that he/she has been exposed to any chemical or biological substance • If illness is work related	CORE Medical 877-347-7429 Note: Outside Continental US call: **225-614-9561**	Not required for temporary agency and subcontractor labor Provide name of injured employee, name and phone # of treating medical facility, description of the incident CORE will help with medical facility coordination and follow-up care
4. Notify Program H&S Manager (if unsure, see contact list) Notify Alternate H&S Manager if Program H&S Manager cannot be contacted. (if unsure, see contact list)	Site Superitendent *Immediately (concurrently with providing transportation to occupational medical facility or EMS transport to hospital)*	All incidents except on-site first aid cases	See Incident Notification and Communication Contact List (attached)	Program H&S Manager will notify H&S Director

Incident Notification, Reporting, and Management Procedure

Action	Who / *When*	Under what circumstances	How	Notes
5. Notify Shaw Notification Hotline / Help Desk	Site Superintendent *As soon as possible. Prior to sending an individual for medical treatment*	• Illness and/or injury (doctors cases and above) • Any utility damage • Property damage (damage > $2,500.00) • Vehicle accidents (All) • Criminal activity (i.e. bomb threat, theft) • Natural disaster (all) • Explosion and/or fires (damage > $2,500.00 or result in injury) • Environmental spills/releases (incidents that requires regulatory notification or have an offsite impact) • Regulatory agency visit • Fatalities	Shaw Notification Hotline / Help Desk Phone Number: 866-299-3445 Note - Outside the Continental US call: 225-215-5056	Request name of Hotline / Help Desk operator for future reference and note date/time of notification
6. Complete forms: I*njuries and illnesses*: • Authorization for Release of Protected Medical Information • Authorization for Treatment of Occupational Injury/Illness • Return-To-Work Examination Form ***and*** fax to CORE ***and*** email or fax to Program H&S Manager	Injured employee and medical facility personnel (Site Superintendent or Site Safety and Health Officer is responsible for verifying forms are completed) *Prior to leaving medical facility*	• Serious injury requiring off-site medical care • If employee states that he/she has been exposed to any chemical or biological substance	Fax to CORE: 225.292.8986 Email or fax to Program H&S Manager	Site Superintendent or Site Safety and Health Officer must take these forms with him/her to occupational medical facility or hospital (Contained in HS 020) Contact Program H&S Manager for blank electronic forms or obtain forms from: http://shawnet3.shawgrp.com/sites/eihs/federal/Lists/Announcements/DispForm.aspx?ID=8
7. Call Project Manager and notify of incident (Remind Project Manager of notification responsibilities to Program Manager)	Site Superintendent *As soon as reasonably possible*	If Hot Line / Help Desk notification is required (see # 5 above)	See Incident Notification and Communication Contact List	Project Manager will verbally report incident to upper level of Operations/Business Line Management *As soon as reasonably possible*
8. Notify Marcia Musgrave	Site Superintendent	All incidents involving personnel (injuries, illnesses, vehicle accidents)	419-425-6160	

Incident Notification, Reporting, and Management Procedure

Action	Who / When	Under what circumstances	How	Notes
9. Call back Program H&S Manager to report on status of *injured / ill employee*	Site Superintendent *Prior to employee leaving medical facility*	All injuries and illnesses requiring off-site medical care	See Incident Notification and Communication Contact List (attached)	
10. Complete forms (typed electronically): *OSHA Recordable Cases* • Superintendent's Employee Injury/Illness Report Form • Injured Employee Statement • Witness Statement Form(s) *First Aid Cases (Doctor's)* • Superintendent's Employee Injury/Illness Report • Injured Employee Statement • Witness Statement Form(s) Email or Fax completed forms to Program H&S Manager and CORE	• Site Superintendent • Witnesses *As soon as possible – no later than 24 hours*	All injuries, illnesses, and first aide cases	Email or fax to Program H&S Manager See Incident Notification and Communication Contact List (attached) Fax to CORE 225.292.8986	Site Superintendent should have these forms with him/her at all times (Contained in HS 020) Contact Program H&S Manager for blank electronic forms or obtain forms from: http://shawnet3.shawgrp.com/sites/eihs/federal/Lists/Announcements/DispForm.aspx?ID=8
11. Complete forms (typed electronically): *Chargeable Vehicle Accidents* • Vehicle Accident Report • Witness Statement Form(s) • Driving Record Certification (Procedure HS800) *Non-Chargeable Vehicle Accidents* • Vehicle Accident Report • Witness Statement Form(s) *Equipment, Property Damage and General Liability Incidents* • Equipment, Property Damage and General Liability Loss Report • Witness Statement Form(s) Email or Fax completed forms to Program H&S Manager	• Site Superintendent • Witnesses *As soon as possible – no later than 24 hours*	All vehicle accidents and /or all property damage	Email or fax to Program H&S Manager Health See Incident Notification and Communication Contact List (attached)	Superintendent should have these forms with him/her at all times (Contained in HS 020) Contact Program H&S Manager for blank electronic forms or obtain forms from: http://shawnet3.shawgrp.com/sites/eihs/federal/Lists/Announcements/DispForm.aspx?ID=8

Incident Notification, Reporting, and Management Procedure

Action	Who / When	Under what circumstances	How	Notes
12. Complete these additional forms (typed electronically): *OSHA Recordable Cases* • Incident Investigation Report *First Aid Cases (Doctor's)* • Incident Investigation Report *Chargeable Vehicle Accidents* • Incident Investigation Report *Non-Chargeable Vehicle Accidents* • Incident Investigation Report *Equipment, Property Damage and General Liability Incidents* • Incident Investigation Report *Near Miss* • Incident Investigation Report	Site Superitendent *As soon as possible – no later than 72 hours of incident*	Near Misses as defined by HS020	Email or fax to Program H&S Manager See Incident Notification and Communication Contact List (attached)	Superitendent should have these forms with him/her at all times (Contained in HS 020) Contact Program H&S Manager for blank electronic forms or obtain forms from: http://shawnet3.shawgrp.com/sites/eihs/federal/Lists/Announcements/DispForm.aspx?ID=8
• SharePoint electronic Near Miss Report Email or Fax completed forms to Program H&S Manager	*As soon as possible – no later than 96 hours of incident*	All other Near Misses	Contact Program H&S Manager	Do not include any employee or project identification information – *these reports are anonymous*
13. Perform "Accident Review Board" (ARB) as required by HS020 - Coordinate through Program H&S Manager	Program H&S Manager *Within 10 days of incident*	OSHA Recordable Cases Chargeable Vehicle Accidents		
Perform "Incident Review Board" (IRB) to extract lessons learned - Coordinate through Program H&S Manager		Doctor's First Aid Cases Utility damage or significant property damage		An IRB is outside of the HS020 requirements for an ARB.

INCIDENT NOTIFICATION AND COMMUNICATION CONTACT LIST

Project Number: 143253 **Project/Office Name / Location: Kirtland AFB, Albuquerque, NM**

Name	Phone Number(s)	Fax Number	E-mail
Shaw Notification Hotline/Helpdesk	866-299-3445 225-215-5056	N/A	N/A
CORE (Must be notified prior to or during transport to medical treatment center)	877-EHS-Shaw-(877-347-7429)	225.292.8986	
Program H&S Manager: Dave Mummert	Office 419.425.6129 Cell 419.348.1544		david.mummert@shawgrp.com
Site Safety and Health Officer (SSHO) - James Vigerust	505-262-8736 Office 505-410-4995 (cell)		james.vigerust@shawgrp.com
Project Manager: Kathleen Romalia	Office (720)554-8207 Cell (720) 989-1154		kathleen.romalia@shawgrp.com
E&I H&S Director – Andrew Johnson	513-782-4972 (office) 859-393-4346 (cell)		andrew.johnson@shawgrp.ocm

Final
Site Safety and Health Plan
Holloman Air Force Base
Alamogordo, New Mexico

Prepared for U.S. Air Force Center for Engineering and the Environment
2261 Hughes Ave., Suite 155
Lackland Air Force Base, Texas 78236-9861

Prepared by Shaw Environmental & Infrastructure, Inc.
1401 Enclave Parkway, Suite 250
Houston, Texas 77077

Contract No. FA8903-09-D-8580, Task Order No. 0013
Project No. 144106
Revision 0
January 2012

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Final
Site Safety and Health Plan
Holloman Air Force Base
Alamogordo, New Mexico

Midwest Region Performance Based Remediation
Contract No. FA8903-09-D-8580
Task Order No. 0013

Revision 0
January 2012

Developed by:	David L Mummert, Certified Industrial Hygienist Shaw Program Health and Safety Manager	January 6, 2012 Date
Reviewed/ Concurred by:	Kathleen Romalia Shaw Project Manager	January 6, 2012 Date
Reviewed/ Concurred by:	Spencer Patterson, PE Shaw Program Manager	January 6, 2012 Date
Reviewed/ Concurred by:	Chris Long Shaw Installation Lead	January 6, 2012 Date
Reviewed/ Concurred by:	James Vigerust, Jr. Shaw Site Safety Officer	January 6, 2012 Date

Site Safety and Health Plan Disclaimer

This Base wide Site Safety and Health Plan (SSHP) has been designed for the methods presently contemplated by Shaw Environmental & Infrastructure, Inc. (Shaw) for execution of the proposed work. Therefore, the SSHP may not be appropriate if the work is not performed by or using the methods presently contemplated by Shaw.

In addition, as the work is performed, conditions different from those anticipated may be encountered and the SSHP may have to be modified through SSHP Amendments. Therefore, Shaw makes no representations of warranties as to the adequacy of the SSHP, except for warranties specifically stated in the SSHP itself.

Table of Contents

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-4

Table of Contents (continued)

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-4

Table of Contents (continued)

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-4

Table of Contents (continued)

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-4

Table of Contents (continued)

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-4

List of Figures

List of Tables

List of Appendices

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-4

Acronyms and Abbreviations

ACGIH	American Conference of Governmental Industrial Hygienists
ACM	Asbestos Containing Material
AFB	Air Force Base
AFCEE	Air Force Center for Engineering and the Environment
AHA	Activity Hazard Analysis
AIDS	acquired immunodeficiency syndrome
ANSI	American National Standards Institute
APR	air purifying respirator
ATSDR	Agency for Toxic Substances and Disease Registry
CIH	Certified Industrial Hygienist
CFR	Code of Federal Regulation
CNS	central nervous system
COR	Contracting Officer's Representative
CPR	cardiopulmonary resuscitation
CRZ	Contamination Reduction Zone
DEET	N,N-Diethyl-m-toluamide
DNAPL	dense nonaqueous phase liquid
EHS	environmental, health, and safety
EMS	Emergency Medical Service
EZ	Exclusion Zone
HARP	hazard assessment and resolution process
HAZWOPER	Hazardous Waste Operations and Emergency Response
HBV	hepatitis B virus
HIV	human immunodeficiency virus
HSM	Health and Safety Manager
HTRW	Hazardous, Toxic, and Radioactive Waste
IDLH	immediately dangerous to life and health
JSA	Job Safety Analysis
LEL	lower explosive limit
LNAPL	light non-aqueous phase liquid
MD	Medical Doctor
MEC	munitions and explosives of concern
mg/m^3	milligram(s) per cubic meter
MPH	Master of Public Health
MSA	Mine Safety Administration
MSDS	Material Safety Data Sheet
NFPA	National Fire Protection Association
NIOSH	National Institute for Occupational Safety and Health
No.	number
OSHA	Occupational Safety and Health Administration
PAH	polyaromatic hydrocarbon
PEL	permissible exposure limit
PFD	personal flotation device

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-4

Acronyms and Abbreviations (continued)

PPE	personal protective equipment
ppm	part(s) per million
PVC	polyvinyl chloride
QC	quality control
SAR	supplied air respirator
Shaw	Shaw Environmental & Infrastructure, Inc.
SSHO	Site Safety and Health Officer
SSHP	site safety health plan
STEL	short-term exposure limit
TLV	threshold limit value
TWA	time-weighted average
USACE	U.S. Army Corps of Engineers
USAF	U.S. Air Force
U.S.	United States
WERC09	Worldwide Environmental Restoration and Construction 2009

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-4

1.0 INTRODUCTION

This Base wide Site Safety and Health Plan (SSHP) describes the safety and health guidelines developed by Shaw Environmental & Infrastructure, Inc. (Shaw) to protect Shaw personnel, subcontractors, Government personnel, and members of the public involved in the Air Force Center for Engineering and the Environment (AFCEE) project for the Worldwide Environmental Restoration and Construction 2009 (WERC09), performed under Contract Number (No.) FA8903-09-D-8580, Task Order 0013, at the Holloman Air Force Base (AFB) Alamogordo, New Mexico. This SSHP is intended to encompass the general scope of authority, responsibilities for accident and incident prevention and provide basic guidelines for implementing, enforcing, and monitoring safe work practices and procedures.

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-4

This SSHP is prepared in accordance with the standards established by the United States Occupational Safety and Health Administration (OSHA) for regulated sites. Specifically, this SSHP complies with the appropriate standards contained in 29 Code of Federal Regulations (CFR) 1910.120; 29 CFR 1926.65; the *Safety and Health Requirements Manual EM 385-1-1* (U.S. Army Corps of Engineers [USACE], 2008); and *Safety and Occupational Health Requirements for Hazardous, Toxic, and Radioactive Waste (HTRW) Activities* (USACE, 2007). The safety and health measures presented are in effect for the duration of the project. This document is intended for use by Shaw personnel and subcontractors. All personnel working on the project sites are required to abide by these measures. Where not specifically mentioned, all personnel are required to comply with the applicable regulations contained in 29 CFR 1910, 29 CFR 1926, the *Safety and Health Requirements Manual*, and the health and safety rules of the Government installation that concern related activities. Each person working on this project must sign the SSHP Acknowledgment Form (Appendix A). The procedures and guidelines contained herein are based upon the best available information at the time of the plan's preparation. Any revisions to this plan will be made with the knowledge and concurrence of Shaw and AFCEE. Revisions to this SSHP will be included as a SSHP Amendment (Appendix B). This SSHP used in conjunction with the Activity Hazard Analyses (AHAs) (Appendix C) and SSHP Addenda, if applicable (Section 1.1) will also serve as the project's:

- Accident Prevention Plan;
- Emergency Response Plan;
- Emergency Action Plan; and
- Fire Prevention Plan.

1.1 Site Safety and Health Plan Addenda

A SSHP Addendum will be prepared for activities at each of the twenty-nine Performance-Based Remediation sites that are necessary to complete the project, but not covered by this SSHP. The SSHP Addenda will be specific to the work to be accomplished and will provide the following:

- Scope of work.
- Chemical hazards specific to the scope of work.
- AHA (described in Section 3.14 of this document), which identify the specific hazards associated with the scope of work and the measures required to control those hazards.
- Personal protective equipment (PPE) requirements for the specific activities.
- Monitoring requirements.

All SSHP Addenda will become a component of this SSHP. The SSHP Addenda will be attached to this SSHP as Appendix B.

1.2 Site Background

Holloman AFB is situated in south central New Mexico, in the northwest central part of Otero County, approximately 75 miles north-northeast of El Paso, Texas and occupies approximately 59,639 acres in the northeast quarter of Section 1, Township 17 South, Range 8 East. Private and public owned lands border the remainder of Holloman AFB. The major highway servicing the base is Highway 70, which runs southwest from the town of Alamogordo and separates Holloman AFB from publicly owned lands to the south. Alamogordo, with a population of 30,403 according to the 2010 U.S. Census, is located about 7 miles east of the base. Holloman AFB was first established in 1942 as Alamogordo Army Air Field and served as the training grounds for over 20 different flight groups, primarily B-17s, B-24s, and B-29s from 1942 through 1945. After World War II, most operations had ceased at the base. In 1947, Air Material Command announced the air field would be its primary site for the testing and development of unmanned aircraft, guided missiles, and other research programs. On January 13, 1948, the Alamogordo installation was renamed in honor of the late Colonel George V. Holloman; a pioneer in guided missile research. In 1968, the 49th Tactical Fighter Wing arrived at Holloman AFB and has remained since. Today, the base also serves as the German Air Force's Tactical Training Center. Environmental restoration activities, schedules, and necessary documentation for Holloman AFB are based on the corrective action requirements of Holloman AFB's

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-4

Resource Conservation and Recovery Act Part B Hazardous Waste Permit No. NM65721224422 dated February 24, 2004 administered by the NMED.

1.3 Safety and Health Policy Statement

This section presents Shaw's Safety and Health Policy Statement for all Shaw employees, clients and partners and Shaw's corporate-wide objective of zero accidents for all projects.

"Shaw Environmental & Infrastructure, Inc. expects all of our employees, clients, and partners to uphold the highest environmental, health, and safety (EHS) standards to promote a positive and proactive safety attitude and to exhibit a heightened awareness of their surroundings both on and off the job. We must identify risks and hazards and implement appropriate controls in order to provide an injury-free work environment where people, equipment, and the environment are not placed at unreasonable threat of injury or damage. We will continually strive to be good citizens in our own community, as well as in every community in which we operate.

The Environmental Health and Safety Program and the components of our Occupational Health & Safety Management System have been developed to guide us in our daily activities. We also commit ourselves to continual improvement in EHS management. Further, I ask that you include our EHS process in all aspects of your work, assist in the maintenance of our process, and communicate this policy to all persons working for or on behalf of Shaw with the intent that they are made aware of their individual EHS obligations.

Through compliance with this policy, we will all actively participate in this process and advocate this philosophy. Together, we can accomplish our goals and exceed the minimum requirements provided by applicable laws and regulations, thus resulting in all stakeholders being proud to be a part of a team that truly values the importance of health, safety, and respect for the environment. Accordingly, we will maintain the position as a recognized leader in all of our business endeavors through a stewardship-based approach for our fellow employees, the environment, and the communities in which we live and work.

We are committed to the spirit and intent of this EHS policy statement and the laws, rules, and regulations to which we subscribe at its foundation."

George Bevan
President Shaw Environmental & Infrastructure, Inc.

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-4

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-4

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2.0 ORGANIZATION, QUALIFICATIONS, AND RESPONSIBILITIES

There will be numerous personnel required to complete the tasks for this project. The necessary personnel will be on-site Shaw project personnel, various subcontractors, off-site project team members, and government employees. All project personnel share the responsibility for safely completing project activities.

2.1 On-Site Personnel

All on-site personnel are responsible for continuous adherence to safety and health procedures during the performance of assigned work. In no case may work be performed in a manner that conflicts with the inherent safety and environmental precautions outlined in this SSHP. After due warning personnel violating safety procedures will be dismissed from the site and possibly terminated from further work.

Any person who observes unsafe acts or conditions or other safety problems has "Stop Work Authority" and shall immediately report the deficiency to supervisory personnel. If there is any dispute with regard to safety and health, on-site staff will attempt to resolve the issue and if the issue cannot be resolved on-site, they will consult off-site technical staff and supervisors for assistance. The specific task or operation in question shall remain discontinued until the issue is resolved.

2.2 Project Manager

The Project Manager, Kathleen Romalia, shall be the point of contact for AFCEE for the Holloman AFB project. She has ultimate authority and responsibility for the establishment and maintenance of project administration control procedures. The Project Manager issues communications to AFCEE on the project status. The Project Manager, through the Installation Lead, oversees the activities of all Shaw personnel, ensures compliance with the scope of work environmental activities, and controls project consistency. Additionally, the Project Manager is ultimately responsible for the development, implementation, and enforcement of the comprehensive Safety and Health Program.

2.3 Installation Lead

The Installation Lead, Chris Long, shall be the point of contact for all field activities and shall report directly to the Project Manager. He will ensure that all activities are conducted in a safe manner and shall communicate all unsafe conditions to the Project Manager. The Installation Lead oversees the activities of all Shaw personnel, ensures compliance with the scope of work environmental activities, and controls project consistency.

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-4

2.4 Construction Manager

The Construction Manager, is responsible for the field implementation and enforcement of this SSHP. The Construction Manager is also responsible for working with the Site Safety and Health Officer (SSHO) on a daily basis and maintaining contact with the Project Manager and Program Health and Safety Manager (HSM) for matters regarding project health and safety. The Construction Manager reports to the Project Manager.

2.5 Program Health and Safety Manager

The Program HSM, David Mummert, Certified Industrial Hygienist, is responsible for the following actions:

- Develop, maintain, and oversee implementation of this SSHP
- Visit the project as needed to audit the effectiveness of the SSHP
- Remain available for project emergencies
- Develop modifications to this SSHP as needed
- Evaluate occupational exposure monitoring/air sampling data and adjust SSHP requirements as necessary
- Approve this SSHP by signature

2.6 Site Safety and Health Officer

The Site Safety and Health Officer (SSHO) James Vigerust is the primary safety official and emergency response coordinator at the project. On a daily basis will assure operations are conducted in accordance with the SSHP, AFCEE requirements, and OSHA regulations. The SSHO reports, project-wide, to the Project Manager during execution of project activities, but reports directly to the Program HSM with functional issues. The SSHO has the authority to suspend operations at the project due to non-compliance. An alternate SSHO will be assigned by the primary SSHO when is not available on-site.

The SSHO has the overall responsibility to conduct exposure monitoring and/or air sampling and to select and/or adjust PPE use. The SSHO shall have the authority and is responsible for the following actions:

- Be present during operations to implement the SSHP
- Inspect site activities to identify safety and occupational health deficiencies and correct them

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-4

- Coordinate changes/modifications to the SSHP with the HSM, Construction Manager, Project Manager, and Contracting Officer's Representative (COR)
- Conduct project-specific training

Inspections completed by the SSHO will also be used to determine if operations are being conducted in accordance with the SSHP, AFCEE requirements, and OSHA regulations. These inspections shall be documented – deficiencies to be corrected shall be noted as an action item list and provided to the HSM for follow-up. Daily safety inspections shall be documented on the Daily Safety Inspection Report (Appendix D). Copies of the inspections will be provided to AFCEE, if requested.

Other SSHO responsibilities include the following:

- General Safety and Health Program administration.
- On-site contact for regulatory agencies on matters of safety and health.
- Establish employee exposure monitoring notification programs.
- Investigate significant accidents and illnesses and implement corrective action plans.
- Implement all safety procedures and operations on site.
- Observe work party members for symptoms of on-site exposure or stress.
- Arrange for the availability of on-site emergency medical care and first aid, as necessary.
- Determine evacuation routes, verify that an effective means of emergency communication is always available while workers are on site, establish and post local emergency telephone numbers, and arrange emergency transportation.
- Establish work zones.
- Present tailgate safety meetings and maintain attendance logs and records.
- Verify that the respiratory protection program is implemented, when necessary.
- Verify that decontamination procedures meet established criteria, when necessary.
- Monitor employee work hours and limit those work hours that are excessive.

In addition to having the pre-requisite 40-hour OSHA Hazardous Waste Operations and Emergency Response (HAZWOPER) training and updated 8-hour HAZWOPER Refresher

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-4

certifications, 8 hour Site Supervisor Certification the SSHO must also have completed the 30-hour OSHA construction safety class.

2.7 Subcontractor Personnel

Both Shaw and subcontractors share the responsibility for the safety and health of their employees. Subcontractors are also responsible for complying with the standards established in this SSHP, the guidelines established in Shaw Procedure No. HS011, "Health & Safety Rules for Contractors"; *Safety and Health Requirements Manual EM 385-1-1* (USACE, 2008); and all other project safety requirements. Subcontractors shall be pre-qualified according to the requirements of Shaw Procedure No. SOP-T-PR-301, "Qualification of Sources." The following are some of the requirements that apply to subcontractors:

- All subcontractors under the direction of Shaw will report to the Construction Manager.
- An assigned safety representative for each subcontractor shall be present on any day that work is being performed. The name of the assigned safety representative shall be conveyed to the Construction Manager.
- Subcontractors shall submit all training and medical surveillance documents to Shaw prior to mobilization.
- Planned operations for the day shall be verbally conveyed to the Construction Manager at the beginning of each day.
- All subcontractor employees working on site shall sign the Site Entry Log (Appendix D) at the beginning and end of each workday.
- All subcontractor personnel shall attend a project safety orientation prior to beginning work on site.
- All subcontractor personnel shall attend the morning tailgate safety meeting and prepare Job Safety Analyses. If scheduling precludes attendance at the Shaw meeting, then subcontractors shall hold and document their own safety meeting. Safety meeting documentation, using the Safety Meeting/Training Log form (Appendix D), is to be submitted to the SSHO.
- All accidents, fires, injuries, illnesses, and spills shall be immediately reported to the SSHO.
- Heavy equipment is to be inspected prior to use at the project site by a competent mechanic using the USACE Safety Inspection Checklist for Construction Equipment (Appendix D). Heavy equipment shall be inspected daily by the

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-4

equipment operator using the Daily Equipment Inspection form (Appendix D). Inspection documentation is to be submitted to the SSHO.

- Vehicles, such as trucks and automobiles are to be inspected daily by the individual driving using the Vehicle Inspection form (Appendix D). Inspection documentation is to be submitted to the SSHO weekly.
- Subcontractors are required to frequently inspect work sites for safety deficiencies and correct all deficiencies. Documentation of these inspections, as well as the corrective actions implemented, is to be submitted to the SSHO. The Project Safety Inspection Report (Appendix D), Daily Safety Inspection Report (Appendix D), or equivalent shall be used.

2.8 Visitors and Other On-Site Personnel

Visitors and other on-site personnel shall check in with the SSHO in order to verify that all appropriate entry requirements are met. All visitors will be briefed by the SSHO on the hazards to be expected on the site(s) and the safety and health controls required (i.e., hardhat, foot protection, etc.). The SSHO will verify that all visitors entering the site are properly protected and are wearing or provided with the appropriate PPE. A stock of common PPE (i.e., hard hats, eye protection, hearing protection, reflective vests, etc.) shall be maintained at the project for use by visitors. Visitors are responsible for providing their own respiratory protection, if required, as Shaw cannot provide respiratory protection to visitors. The SSHO will provide an escort for all visitors while on site.

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-4

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-4

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3.0 ACCIDENT PREVENTION PLAN

This section addresses general safety areas specified in Appendix A of the *Safety and Health Requirements Manual EM 385-1-1* (USACE, 2008), as components of the Accident Prevention Plan.

3.1 Project Safety Goal

Safety is Shaw's highest priority. Shaw and project personnel have targeted a goal of zero injuries, illnesses, and environmental incidents for the duration of this project. Additionally, there is a goal in place for experiencing zero vehicle incidents. All activities shall be conducted in a manner that supports these goals.

3.2 Indoctrination of New Employees

Both Shaw and subcontractor personnel are required to attend a safety-orientation meeting prior to commencing work. Safety-orientation meetings shall be documented and kept on file. Refer to Section 9.4 for an outline of the information that is conveyed to all personnel.

3.3 Fire Prevention and Protection

This section details fire prevention and protection procedures/resources to be used at each project.

3.4 Workplace Fire Hazards

The primary fire hazards at each project consist of fueling operations, storage of fuels, other flammable liquids at the project sites, and welding and cutting activities.

3.5 Potential Ignition Sources

The potential ignition sources at the project include smoking materials, welding/cutting equipment, vehicle/equipment exhaust, catalytic converters, and engine block surfaces. Personnel shall also be alert for other ignition sources such as, static electricity, lightning, and electrical equipment.

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-4

3.5.1 Fire Control Systems, Equipment, and Procedures

Depending on the nature and extent of any fire, the following fire control systems and equipment shall be evaluated or provided at the project:

- The Holloman AFB Fire Department shall be contacted prior to beginning new operations at the project site. The Holloman AFB Fire Department shall also be contacted at the conclusion of operations.
- Fire extinguishers shall be provided at work areas. Project vehicles and heavy equipment shall also be equipped with fire extinguishers.
- A Holloman AFB Hot Work Permit is required before a flame or spark-producing activity is to commence with work on base property.(Section 4.2.3).
- The AHA for fueling operations shall be followed (Appendix C14, "*Fueling Operations*").
- Flammable and oxidizing materials shall be stored in marked (No Smoking, Matches, or Open Flame) flammable materials storage areas with fire extinguishers available.
- Smoking shall only be permitted in designated areas. Personnel shall never discard cigarette butts into the environment while working at the project.
- All fires, no matter how small, shall be reported to the Holloman AFB Fire Department, immediately.
- Project personnel are only permitted to extinguish small fires in their incipient stages.
- Fighting fires is prohibited by project personnel and shall only be performed by fire department personnel (Section 11.5).

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-4

3.5.2 Fire Control Equipment Maintenance Responsibilities

The SSHO is responsible for performing the monthly inspections (documented on the Emergency Eyewash Station/Fire Extinguisher Inspection Checklist [Appendix D]) and obtaining annual service for all Shaw fire extinguishers used at the project. Subcontractors are responsible for performing the monthly inspections and obtaining annual service for their fire extinguishers used at the project. Vehicle and heavy equipment operators are responsible for the inspection of fire extinguishers on vehicles/equipment.

3.6 Housekeeping

Housekeeping shall be a priority at each project site. The following provisions are specified to maintain a high standard of housekeeping:

- The importance of housekeeping and the expectations that good housekeeping shall be maintained will be regular topics of the morning safety meetings.
- Job sites and work areas shall be cleaned up on a daily basis.
- Subcontractors are required to maintain good housekeeping practices.
- Dumpsters and adequate waste/trash receptacles shall be provided as necessary in sufficient quantities in active work areas and are to be emptied regularly. Potentially contaminated waste shall be segregated from sanitary waste for proper characterization and/or disposal. Hazardous waste containers shall be labeled according to applicable regulations.
- Housekeeping is an operational/safety item, which shall be regularly considered during routine inspections.
- Nails shall be bent-over or removed from scrap lumber immediately.

3.7 Mechanical Equipment Inspections

Before any machinery or mechanized equipment is placed in use, it shall be inspected and tested in accordance with the manufacturer's recommendations and requirements of the *Safety and Health Requirements Manual EM 385-1-1* (USACE, 2008) and shall be certified in writing by a competent person to meet the manufacturer's recommendations and requirements of the manual. Subsequent re-inspections will be conducted at least annually thereafter. These inspections shall be documented on the USACE Safety Inspection Checklist for Construction Equipment (Appendix D). All safety deficiencies noted during the inspection shall be corrected prior to the equipment being placed in service at the project. If at any time the machinery or mechanized equipment is removed and subsequently returned to the project (other than equipment removed for routine off-site operations as part of the project), it shall be re-inspected and recertified prior to use. All heavy equipment shall be inspected by each operator prior to use on the project and shall then be inspected on a daily basis. Daily inspections shall be documented on the Daily Equipment Inspection form (Appendix D). Deficiencies in the equipment shall be noted on the form. All inspection documentation shall be submitted to the SSHO prior to using the equipment if safety deficiencies are observed and at the end of the day if no safety deficiencies are observed.

The SSHO shall immediately evaluate the inspection forms and determine if the equipment is in need of immediate repairs and if it should be "red tagged" and taken out of service. If the

equipment is taken out of service, then the equipment shall not be used until the SSHO is satisfied that the necessary repairs have been made. For minor deficiencies that do not compromise the safe operation of the equipment, repairs shall be made at the discretion of the equipment owner. All inspection records are to be kept on file in the Shaw field office.

3.8 First Aid and Medical Facilities

The following addresses first aid and medical facilities:

- Effective emergency communication devices must always be available while personnel are present at the site.
- Employees working alone in a remote location or away from other workers shall be provided an effective means of emergency communications. This means of communication could include a cellular phone, two-way radios, hard-line telephones or other acceptable means. The selected communication must be readily available (easily within the immediate reach) of the employee and must be tested prior to the start of work to verify that it effectively operates in the area/environment. An employee check-in/check-out communication procedure shall be developed to assure employee safety (see Section 4.5.1, Lone Worker Procedure).
- Emergency telephone numbers shall be posted at all Shaw-controlled telephones (Section 11.2).
- A large first aid kit shall be provided and maintained at the project. The first aid kit shall be inspected weekly by the SSHO. A seal may be placed on first aid kits to allow for less frequent inspections, such as, if the seal is not broken, then an inspection is not required. There shall be a small first aid kit available in all project vehicles. First aid kits in project vehicles do not need to be inspected if the factory plastic wrapping is intact. First aid kits shall be inspected using the First Aid Kit Inspection Log (Appendix D).
- The nearest hospital for the project is:

  Gerald Champion Regional Medical Center
  2669 Scenic Dr # 105A
  Alamogordo, NM 88310
  (575) 439-6100

  The distance to the hospital is approximately 14.6 miles from the Holloman AFB, with a travel time of approximately 22 minutes. The route map to the hospital is depicted in Figure 2.

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-4

- The nearest CORE Health Networks medical clinic for the project is:

  Concentra Medical Center
  2170 East Lohman Ave., Suite A, B, C
  Las Cruces, NM 88001
  (575) 524-8888

  The distance to the clinic is approximately 59.8 miles from Holloman AFB, with a travel time of approximately 59 minutes. The route map to the clinic is depicted in Figure 3.

  Shaw employees shall utilize the CORE clinic for injuries that do not require assistance or transport by Emergency Medical Service (EMS).

The route maps to the clinic and hospital shall be available in all project vehicles; however, the facility to care for serious medical emergencies shall be determined by the EMS responding to the incident. At a minimum, the SSHO and at least one other on-site employee, including subcontractors, shall be certified in first aid and cardiopulmonary resuscitation (CPR) during intrusive activities. First aid and CPR training/certification must be made by a reputable provider, such as, the American Red Cross or American Heart Association.

3.9 Sanitation

The following provisions shall be made to address sanitation:

- Portable toilets shall be provided, as necessary, at convenient locations at the project site. Arrangements shall be made for the routine servicing and cleaning of these units.
- Safe drinking water is to be provided at each project site and provisions shall be made as necessary to provide safe drinking water at individual field locations. One-serving size individual bottle of water or disposable sanitary cups shall be provided along with receptacles for their disposal. All outlets dispensing non-potable water (under Shaw or subcontractor control) shall be posted with appropriate warning signs. Systems furnishing non-potable water and systems furnishing potable water shall be constructed to remain completely independent of each other.
- Portable washing facilities shall be provided as necessary at project sites and in Contamination Reduction Zones (CRZ). Portable washing facilities shall consist of, at a minimum, soap, water, and paper towels.

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-4

3.10 Illumination

Adequate lighting shall be provided to perform all activities in a safe manner. Work shall be scheduled, when possible, during daylight hours. When work is performed before sunrise, after sunset, inside buildings, or within other structures, the minimum lighting requirements specified in Table 7-1 of the *Safety and Health Requirements Manual EM 385-1-1* (USACE, 2008) shall be provided.

3.11 Engineering and Administrative Controls

The use of engineering and administrative controls shall be the preferred method of controlling or eliminating hazards. Only in cases where the use or application of engineering and administrative controls is deemed to be not feasible, then PPE may be used.

3.12 Signs, Labels, and Tags

Hazard warning signs shall be used to define specific hazards of a nature, such that failure to designate them may lead to accidental injury to workers or the public, or both, or to property damage. All new and replacement signs shall be in accordance with the requirements contained in 29 CFR 1910.145.

All containers of hazardous materials shall be labeled as to contents and the associated hazards. Hazard warning labels, whether on containers or equipment, shall not be removed by employees without the permission of the SSHO.

Tags shall be used as a means to prevent accidental injury or illness to employees who are exposed to hazardous or potentially hazardous conditions, equipment, or operations, which are out of the ordinary, unexpected, or not readily apparent. Tags shall be used until the identified hazard is eliminated or the hazardous operation is completed. Tags need not be used where signs, guarding, or other positive means of protection are being used. All equipment that is in need of repair for safety-related reasons shall be tagged as “Out of Service” until the equipment has been satisfactorily repaired.

3.13 Safety Promotions

The following methods for promoting accident prevention will be enacted:

- Accident prevention will be a regular topic discussed at safety meetings.
- All personnel will be encouraged to sign a Zero Accident Pledge poster (Appendix D) that is to be posted at the project.
- A Safety Incentive Award Program shall be implemented to reward safe employee behavior.

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-4

3.14 Accident Reporting

All accidents, regardless of their severity, shall be reported to the Construction Manager, SSHO, Project Manager, HSM, and COR. Other provisions for accident reporting and investigation are addressed later in this SSHP (Section 13.4).

3.15 Scope of Work

Shaw is responsible for all efforts needed to support the selected remediation efforts at the Holloman AFB. Activities include, but are not limited to the following:

- Mobilization & Demobilization.
- General Site Activities.
- Collect Surface Soil Samples.
- Collect Subsurface Soil Samples.
- Collect Surface Water and Ground Water Samples.
- Well Drilling and Well Installation.
- Surface Soil Removal.
- Backfill Excavations.
- Surveying.
- Site Restoration.
- Soil Borrow Material Import (Loading, Transportation, & Dumping).
- Equipment Decontamination.

Scopes of work for the individual project sites will be verified prior to fieldwork initiation. If a specific activity is not covered by this SSHP an SSHP Addendum shall be completed, reviewed and approved as stated in Section 1.1, Site Safety and Health Plan Addenda.

3.16 Activity Hazard Analysis

AHAs identify potential safety, health, and environmental hazards associated with specific tasks and provide protective measures for personnel, the community, and the environment. The AHAs have been developed for all major tasks performed for the project and included in this SSHP as Appendix C. An AHA shall also be prepared when new tasks are added, the job situation changes, or when it becomes necessary to alter safety requirements. Work will not proceed on a particular task/phase until the AHA has been reviewed with the work crews. The AHAs shall be reviewed and modified by the Construction Manager and SSHO (with

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-4

input from field employees and subcontractors). The AHAs shall be reviewed and modified throughout the workday, as necessary, to address changing site conditions, operations, or changes of competent/qualified person(s). The AHAs shall also be reviewed and modified during the daily tailgate safety meetings and Job Safety Analysis (JSA) meetings. Modifications will be handwritten in ink on the specific AHA. Additions or modifications to the AHAs, which are less conservative or allow for a downgrade in PPE requirements, must have written approval from the HSM.

The names of the competent/qualified person(s) required for a particular activity, (*i.e.*, excavations, scaffolding, fall protection, and other activities) as specified by OSHA shall be identified and included in the AHA. If more than one competent/qualified person will be used on the AHA, a list of names will be included as an attachment to the AHA. Those listed shall be competent and qualified for the type of work involved and familiar with current site safety issues. If a new competent/qualified person (not on the original list) is added, the list shall be updated (this is an administrative action not requiring an updated AHA). The new person shall acknowledge in writing that he/she has reviewed the AHA and is familiar with current site safety issues. Additions or changes to this SSHP must be attached as an SSHP Amendment (Appendix B). Any amendment to this SSHP must have written approval from the HSM.

3.17 Job Safety Analysis

Job Safety Analyses are an effective management technique for identifying hazardous conditions and unsafe acts in the workplace. A JSA is intended to analyze the individual steps or activities, which together create a job or specific work duty, and to detect any actual or potential hazards that may be present. Each crew must complete a JSA for each task that will be accomplished for that day, as required by Shaw Procedure No. HS045, “Job Safety Analysis”. The JSA shall be revised, as necessary, when unforeseen circumstances arise or work site conditions change. Any revisions shall be immediately communicated with the affected site workers. If the need to complete an unplanned task becomes necessary at any point throughout the day, a new JSA shall be prepared to cover that task. The JSAs shall be completed using the JSA Checklist Form and JSA Worksheet Form, both of which can be found in Appendix D.

3.18 Hazard Assessment Resolution Process

Hazard Assessment Resolution Process (HARP) is brief, paperless, general risk assessment made by employees in each work area. The objective of HARP is to identify and eliminate or control potential real-time workplace hazards, which could lead to an accident.

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-4

HARP requires workers to continuously be aware of the immediate work environment so as to detect conditions unanticipated by our work planning. This involves a three-step process:

1. Assess the hazard(s) and risk(s) to identify what could go wrong and what is the worst thing that could happen.
2. Analyze the situation to determine how to reduce the risks. Evaluate each identified risk and implement the appropriate safeguards to control the hazards.
3. Act to ensure safe operations:
   - Take the necessary steps to complete the job safely.
   - Follow written standards and procedures (SSHP, AHAs, JSAs, etc.).
   - Don't proceed until it's safe.

In performing the HARP, focus attention on surroundings, equipment, tools, PPE, and critical steps prior to focusing on the task; consider the chemical, physical, and environmental hazards associated with the task.

Risk reduction is a critical component of HARP. The following risks shall be avoided:

- Hurrying.
- Presume the job is routine or simple.
- Belief that nothing bad can happen.
- Not talking about precautions with co-workers.
- Not raising a "gut feel."

The appropriate hazard resolution and corrective actions must take place before proceeding with the task:

- Communicate hazards and precautions to take with co-workers and supervisor.
- Eliminate or control the hazards. The implementation of administrative controls is sometimes effective, i.e., marking the hazard with warning tape, signs, or tags.
- If the risk is unacceptable or if a hazard cannot be satisfactorily controlled, then stop work and contact the SSHO or HSM.

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-4

3.19 Safety Observation Program

Safety observations are behavior-based and provide a systematic feedback process between line personnel and supervision to proactively identify opportunities for safety improvement in work areas.

Employees engaged in work activities are often the most knowledgeable about the hazards of their work and can provide valuable feedback on unsafe conditions and unsafe practices, which may require corrective action.

The Safety Observation Program is a tool for employees to provide information on actual or potential safety hazards that they observe in their workplace, which if left unreported may result in an accident and or injury. This program also provides a mechanism for recommending corrective actions.

The Shaw Safety Observation Program:

- Identifies practices that could cause accidents, injuries, or damage.
- Identifies specific needs for coaching and training.
- Checks the adequacy of the SSHP, AHAs, JSAs, and compliance with general site rules and other procedures.
- Monitors the effectiveness of training.

The SSHO must develop a schedule for conducting safety observations. A general guideline for the number of observations in a week is one observation per 100 work hours on the project. The schedule for observation(s) shall be communicated to site personnel.

The volunteer conducting the safety observation shall record their findings on the Safety Observation Reporting Card, as required by Shaw Procedure No. HS026, “Safety Observation Procedure” (2011). Tasks or items that require follow-up because of serious risk potential must be addressed immediately by the SSHO. Items with lesser risk should be discussed in the next tailgate safety meeting. The action items and corrective actions, including dates and responsible person(s) shall be documented on the Safety and Occupational Health Deficiency Tracking Log (Appendix D), maintained, and available for inspection.

3.20 Safety and Health Bulletin Board

A safety and health bulletin board shall be maintained in an area commonly accessed by workers at the Field Office. The bulletin board shall be maintained current, in clear view of on-site workers, and protected against the elements and unauthorized removals. The SSHO

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-4

shall evaluate the content of the bulletin board each week, at a minimum, and update if necessary. It shall contain at least the following safety and health information:

- Map denoting the route to the nearest emergency care facility.
- Emergency telephone numbers.
- Copy of the most up-to-date SSHP shall be mounted on or adjacent to the bulletin board or state the location, which will be accessible on the site by all workers.
- Copy of current SSHP Addenda shall be mounted on or adjacent to the bulletin board or state the location, which will be accessible on the site by all workers.
- Copy of current AHA(s) shall be mounted on or adjacent to the bulletin board or state the location, which will be accessible on the site by all workers.
- OSHA Form 300A shall be posted in accordance with OSHA requirements and mounted on or adjacent to the bulletin board or state the location, which will be accessible on the site by all workers.
- Copy of Safety and Occupational Health Deficiency Tracking Log (Appendix D) shall be mounted on or adjacent to the bulletin board or state the location where it will be accessible by all workers upon request.
- Safety and health promotional posters (includes Environmental, Health, and Safety Mission Vision Poster [Appendix D]).
- Date of last lost workday injury.
- OSHA Safety and Health Poster.

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-4

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-4

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4.0 PROJECT HAZARDS AND HAZARD CONTROL MEASURES

There are potential chemical, physical, and environmental hazards present at the project sites. The anticipated hazards at the project sites and the recommended control measures are presented in this section. A site-specific hazard assessment of each remedial area will be performed by the SSHO to assess exposure potential to site workers from contaminants, physical hazards, remedial activities and environmental stressors. Additional information on specific hazards and control measures are outlined in the AHAs and SSHP Addenda when developed.

4.1 Chemical Hazards

Potential exposure exists to personnel through all routes (i.e., dermal contact, inhalation of dust and vapors, and ingestion). The exposure potential will be clearly identified in the SSHP Addendum hazard assessment. The use of engineering and administrative controls, where practical, along with PPE and proper decontamination procedures are required when performing work with contaminated media.

These various hazardous inorganic and inorganic chemicals have been identified as potentially being present as contaminants in soils and waters at the Holloman AFB sites. The majority of these chemicals are related to past fuel releases, leaking underground storage tanks, and maintenance operations which occurred at the site i.e. solvents. These chemicals are considered toxic and some are identified as being carcinogenic. The chemicals potentially present are summarized below:

- ***Particulates not otherwise regulated/Particulates not otherwise specified.*** Particulates not otherwise regulated target the eyes, skin, and upper respiratory system. Symptoms of exposure include irritation to the eyes, skin, throat and upper respiratory system. (permissible exposure limit [PEL]-time-weighted average [TWA]: 15 milligrams per cubic meter [mg/m^3] [total]; 5 mg/m^3 – [respirable fraction]; immediately dangerous to life and health [IDLH]: not determined; threshold limit value [TLV]-TWA: 10 mg/m^3 [inhalable particles]; 3 mg/m^3 – [respirable particles]).
- ***BTEX.*** The term BTEX refers to a combination of benzene, toluene, ethylbenzene and xylene. The presence of this material is usually indicative of petroleum hydrocarbon contamination. The individual compounds are discussed in this section.

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-4

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-4

- ***Benzene.*** Benzene targets the eyes, skin, respiratory system, blood, central nervous system (CNS), and bone marrow. Symptoms of exposure include irritation eyes, skin, nose, respiratory system; dizziness; headache, nausea, staggered gait; anorexia, lassitude (weakness, exhaustion); dermatitis; bone marrow depression; (potential occupational carcinogen). Benzene is a confirmed human carcinogen (ACGIH, 2011). (PEL-TWA: 1 part per million [ppm], short-term exposure limit [STEL]: 5 ppm; IDLH: Carcinogen [500 ppm]; TLV-TWA: 0.5 ppm, 2.5 ppm TLV-STEL with a skin notation.) TLV Basis: Leukemia (ACGIH, 2011).
- ***Toluene.*** Toluene targets the CNS, skin, eyes, liver, kidneys, and respiratory system. Symptoms of exposure include irritated eyes and nose, headaches, dizziness, lassitude, confusion, euphoria, muscle fatigue, insomnia, anxiety, liver and kidney damage, lacrimation, paresthesia, dermatitis, and dilated pupils (NIOSH, 2007). Toluene is not classifiable as a human carcinogen (ACGIH, 2011). (PEL-TWA: 200 ppm, PEL-Ceiling: 300 ppm, PEL-10-minute maximum peak in any 3 hours: 500 ppm, IDLH: 500 ppm; TLV-TWA: 20 ppm) TLV Basis: visual impairment; female reproductive; pregnancy loss (ACGIH, 2011).
- ***Ethylbenzene.*** Ethylbenzene targets the central nervous system, skin, eyes, and respiratory system. Symptoms of exposure include irritated eyes, skin, and mucous membranes; headaches, narcosis, dermatitis, and coma. Ethylbenzene is a confirmed animal carcinogen with unknown relevance to humans (ACGIH, 2011). (PEL-TWA: 100 ppm; IDLH: 800 ppm [10 percent lower explosive limit {LEL}]; TLV-TWA: 100 ppm, TLV-STEL: 125 ppm.) TLV Basis - Critical Effect(s): upper respiratory tract and eye irritation; CNS impairment (ACGIH, 2011).
- ***Xylenes.*** Xylenes target the eyes, skin, respiratory system, central nervous system, gastrointestinal tract, blood, liver, and kidneys. Symptoms of exposure include irritation to the eyes, skin, nose, throat; dizziness, excitement, drowsiness, in-coordination, staggering gait; corneal vacuolization; anorexia, nausea, vomiting, abdominal pain; dermatitis. Xylenes are not classifiable as human carcinogens (ACGIH, 2011). (PEL-TWA: 100 ppm; IDLH: 900 ppm; TLV-TWA: 100 ppm, TLV-STEL: 150 ppm.) TLV Basis: upper respiratory tract and eye irritation; CNS impairment (ACGIH, 2011).
- ***Polyaromatic Hydrocarbons (PAHs)*** PAHs, also known as coal tar pitch volatiles, are a collection of polycyclic aromatic hydrocarbons associated with burning of organic material, and coal and petroleum refining. PAHs can cause eye, nose and throat irritation. Skin exposure with concurrent sunlight exposure can cause severe sunburn. Some of the individual constituents are human carcinogens. (PEL-

TWA: 0.2 mg/m^3, IDLH: Carcinogen [80 mg/m^3]; TLV-TWA: 20.2 mg/m^{3}5 ppm.) TLV Basis: Cancer (ACGIH, 2011).

4.1.1 Hydrogen Sulfide and Methane

There is potential for hydrogen sulfide gas and methane to be present in the landfills or identified remedial areas due to the decomposition of various materials. The hazards of hydrogen sulfide and methane gas are summarized in the following:

- ***Hydrogen sulfide.*** Hydrogen sulfide is a colorless gas with a strong odor of rotten eggs. Note: The sense of smell becomes rapidly fatigued and cannot be relied upon to warn of the continuous presence of hydrogen sulfide. Hydrogen sulfide targets the eyes, respiratory system, and central nervous system. Symptoms of exposure include irritation of the eyes and respiratory system; apnea; coma; convulsions; eye disturbances and damage; dizziness; headache; lassitude; irritability; insomnia; and gastrointestinal disturbances (NIOSH, 2007). (PEL-Ceiling: 20 ppm; IDLH: 100 ppm; TLV-TWA: 1 ppm, TLV-STEL: 5 ppm) TLV Basis: upper respiratory tract irritation; CNS impairment (ACGIH, 2011).
- ***Methane.*** Methane is a colorless, odorless gas. The material is highly flammable. It has very low degree of toxicity however is recognized as a simple asphyxiant (i.e., excludes oxygen from the air). No exposure indices have been developed for this material.

4.1.2 Unknown Chemical Containers

If reactive chemicals, chemical containers, gas cylinders, drums, or barrels are encountered, the field crew shall immediately stop work, exit the area, and contact the Construction Manager or SSHO and the HSM. Operations will be resumed only after the appropriate controls have been implemented.

4.1.3 Asbestos

While there is no mention of asbestos containing materials (ACM), there is potential for ACM to be encountered during project activities. If suspected ACM is identified (brake shoes, insulation, floor tiles, ceiling tiles, siding, shingles, pipes, etc.), the field crew shall immediately stop work, exit the area, and contact the Construction Manager or SSHO and the HSM. Operations will be resumed only after the appropriate controls have been implemented. Normal dust control measures will limit low concentrations of asbestos fibers from becoming an inhalation hazard.

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-4

4.1.4 Raw Sewage

The potential for contacting raw sewage during project activities has not been determined. Potential work around or near sewage lines will be evaluated by the Construction Manager and SSHO prior to work beginning in that specific area.

4.1.5 Munitions and Explosives of Concern

The presence of Munitions and Explosives of Concern (MEC) has not been identified in project documents. If suspected or known MEC is encountered, the field crew shall immediately stop work, leave the exclusion zone (EZ), and contact the Construction Manager or SSHO and the HSM (Section 6.1). The MEC shall not be probed, touched, or handled by unauthorized personnel under any circumstance. The basic guidelines for MEC safety are listed below:

- Do not continue to move towards suspected MEC.
- Once you recognize a MEC hazard, do not move any closer.
- Stop all work.
- Make all radio transmissions at least 100 meters away from a MEC hazard.
- Do not try to remove anything that is on or near MEC.
- Do not touch, move, or disturb the MEC.
- Stay away from MEC.
- Mark a MEC hazard area properly so that other personnel will stay away from it.
- Evacuate all non-essential personnel from a MEC hazard area.
- Report through your chain of command all MEC hazards that affect operations.

Specific emergency procedures for MEC encounters are included in Section 11.7.

4.1.6 Radiological Hazards

No radiological hazards have been identified with anticipated project activities. If a suspected radiological hazard is identified (radium painted dials, vacuum tubes, trefoil symbols, etc.), the field crew shall immediately stop work, exit the area, and contact the Construction Manager or SSHO and the HSM.

4.1.7 Operational Chemicals/Hazard Communication Program

Hazardous chemicals will be brought to project sites for use in activities supporting the planned work. These chemicals are used as fuels, construction materials, solvents, cements, cleaning solutions, paints, etc. The use of operational chemicals is regulated by OSHA under

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-4

the Hazard Communication Standard (29 CFR 1910.1200). A written hazard communication program has been established as Shaw Procedure No. HS060, "Hazard Communication Program," which includes the following elements:

- ***Container Labeling***—Project personnel will ensure that all containers are labeled according to their contents. This requirement will apply to containers from manufacturers and those produced on site by operations. The labels on all incoming and outgoing containers will be checked for identity, hazard warning, and the name and address of the responsible party.
- ***Material Data Safety Sheets (MSDS)***—MSDSs will be provided on site for each hazardous chemical used or known to be present at the site.
- ***Employee Information and Training***—Employees will receive annual chemical hazard safety training, supplemented by informal daily safety meetings. Project-specific chemical hazards will be communicated to employees through an initial site orientation meeting and daily safety meetings. Employees may request copies of specific MSDSs by completing the "Employee Request for Material Safety Data Sheet (MSDS)" form provided in Appendix D.

The written hazard communication program will be available at the project site for personnel review and provides requirements for the safe use of operational chemicals. Proper ventilation and PPE shall be used when working with operational chemicals. Air monitoring may be performed as needed to assess and control exposures resulting from the use of operational chemicals. An inventory list of the operational chemicals (Hazardous Chemical Inventory List) used and an MSDS for operational chemicals shall be completed by the SSHO, placed in Appendix E or a stand-alone document, and made available at the project site. A copy of the Inventory and MSDSs shall be provided to Holloman AFB Fire Department upon request.

4.2 Physical Hazards

There will be numerous physical hazards associated with site operations that require consideration. Some of these physical hazards are as follows:

- Noise and hearing conservation;
- Slips, trips, and falls;
- Fires, explosions, and hot work;
- Use of ladders and scaffolding;
- Use of small tools;

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-4

- Use of cutting tools;
- Use of heavy and mechanized equipment;
- Operation of motor vehicles;
- Material handling;
- Hazardous energies (i.e., electrical, mechanical, and pressure);
- Air compressor use;
- Portable generator use;
- Intrusive activities;
- Excavation;
- Confined space entry;
- Dust;
- Use of pressure washers and steam washers;
- Excessive work hours;
- Working over or near water; and
- Workplace reproductive hazards.

4.2.1 Noise and Hearing Conservation

There will be many sources of noise at each project site. Noise may be generated from the use of equipment and tools. Hearing loss, resulting from occupational exposure to noise, can be prevented. Shaw Procedure No. HS402, "Hearing Conservation Program," shall be implemented at each project site whenever there is employee noise exposures equal to or exceeds an eight-hour TWA of 85 decibels, A-scale. As part of the criteria for a hearing conservation program, audiometric testing of personnel must be conducted annually. The SSHO shall conduct noise surveys as necessary to determine if engineering controls should be implemented and/or if hearing protection is adequate. Personnel shall wear hearing protection when working with or around heavy equipment, power tools, as noise monitoring indicates, or in areas posted as such. Warning signs shall be posted in areas where noise (greater than 85 decibels) necessitates the use of hearing protection.

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-4

4.2.2 Slips, Trips, and Falls

The following details procedures to prevent slips, trips, and falls:

- Personnel shall keep work areas clean and orderly. Tools, equipment, and materials shall be used and stored in a fashion to minimize tripping hazards.
- Debris shall not be left lying around in any place, particularly in areas where personnel walk.
- Spills shall be cleaned up immediately.
- Personnel are prohibited from walking or working on surfaces or equipment that is not intended as walking or working surfaces.
- Personnel shall take extra precautions, such as establishing firm handholds, wearing suitable footwear, and walking slowly when walking on surfaces during wet, snowy, or icy weather.
- Walking and working surfaces shall be properly maintained during inclement winter weather, as feasible.
- Personnel shall not jump from elevated places or equipment.
- Personnel using hand and mechanical tools shall position themselves properly and consider the events if a tool slips or suddenly moves.
- Electrical extension cords and electrical wiring shall be kept clear of walking and working areas and/or covered, buried, or otherwise secured.
- Running is prohibited on job sites unless under emergency conditions.
- Employees exposed to fall hazards shall be protected by standard guardrail, catch platforms, temporary floors, safety nets, personal fall protection devices, or the equivalent. No employee may be exposed to a fall of over 6 feet without being adequately protected.
- Shaw Procedure No. HS301, “Fall Protection,” shall be followed when there is a fall hazard of 6 feet or greater.

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-4

4.2.3 Hot Work

Hot work (e.g., welding, burning, and cutting) conducted on site shall comply with the following requirements: Holloman AFB has a Hot Work Program that is independent of Shaw. All hot work done on base shall comply with the base program. Kirtland AFB follows the Chapter 9 and 10 requirements of the *Safety and Health Requirements Manual EM 385-1-1* (USACE, 2008). The SSHO is the contact with the fire department for hot work permits..

- Shaw Procedure No. HS314, "Hot Work in Hazardous Locations," shall be followed whenever there is spark/ignition producing activities in progress at the project site.
- The SSHO shall establish areas approved for welding, cutting, and other hot work.
- The SSHO is responsible for authorizing welding, cutting, and other hot work in areas not specifically designed or approved for such operations (Hot Work Permit).
- All personnel shall be protected from welding radiation, flashes, sparks, molten metal, and slag.
- All welding, burning, and cutting equipment shall be inspected daily by the operator. Defective equipment shall be tagged and removed from service, replaced or repaired, and re-inspected before again being placed in service.
- All welders, cutters, and their supervisors shall be properly trained in the safe operation of their equipment, safe welding/cutting practices, and welding/cutting respiratory and fire protection.
- The handling of compressed gas cylinders shall comply with the requirements established in Shaw Procedure No. HS304, "Compressed Gas Cylinders."
- Cutting, welding, or other hot work shall be permitted only in areas that are or have been made fire safe.
- Cutting or welding shall not be permitted in the following situations:
  - In areas not authorized by the SSHO.
  - In the presence of explosive atmospheres (i.e., mixtures of flammable gases, vapors, liquids, or dusts with air), or explosive atmospheres that may develop inside un-cleaned or improperly prepared drums, tanks, or other containers, and equipment that has previously contained such materials.

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-4

  - In any area where combustible gas indicator readings are in excess of 10 percent of the lower explosive limit.
  - On storage or process vessels or lines in service that contain flammable or combustible liquids, gases, vapors, or solids.

- Before any welding, cutting, or other hot work is permitted, the area shall be inspected by the SSHO to verify that the following requirements have been met:
  - Cutting and welding equipment to be used shall be in safe operating condition and in good repair.
  - Where practical, all combustible material shall be relocated at least 35 feet away from the hot work site. Where relocation is impractical, combustibles shall be protected with flameproof covers or otherwise shielded.
  - At a minimum, two fully charged and operable fire extinguishers, appropriate for the type of possible fire (4-A:60-B:C), shall be available at each work area.
  - A fire watch shall be required whenever hot work is performed in hazardous locations.
  - Combustible gas indicator readings shall be taken to verify the work area is free of combustible gases and vapors.
  - The work area is free of toxic contaminants at concentrations in excess of established TLVs or all personnel who will work in the area have been provided respiratory protection and protective apparel appropriate for the degree of exposure.
  - When hot work is to be performed on tanks or other vessels that contain or have contained flammable or combustible liquids, the vessel shall be properly isolated, purged, cleaned, or inerted as appropriate, to reduce the concentrations of flammable/combustible vapors to safe levels.
  - A Hot Work Permit (Appendix D) shall be completed by the SSHO, reviewed with personnel who will perform the hot work, and posted near the job site.
  - A Hot Work Permit is good only for the date issued and valid only for the 8-hour shift for which it is issued. If the work area is completely vacated by personnel, such as, during lunch, a new permit may need to be issued.

- If at any time during the hot work operation a change in conditions at the work site is suspected, such as a release of flammable gases or vapors in the work area, work shall be stopped immediately and the SSHO shall be notified. Such work stoppage invalidates the Hot Work Permit, and a new permit shall be completed after inspections and tests have been performed by the SSHO.
- No erasures or changes of dates on Hot Work Permits shall be permitted.

4.2.4 Use of Ladders and Scaffolds

Ladders and scaffolding shall only be used at each project under the following conditions:

- Ladder use shall comply with Shaw Procedure No. HS302, "Ladder Safety."
- Scaffold erection and use shall comply with all applicable OSHA regulations. A trained competent person shall supervise all scaffold erection and use.

4.2.5 Use of Small Tools

Hand and power tools shall be used, inspected, and maintained in accordance with the manufacturer's instructions and recommendations and will be used only for the purpose for which designed. A copy of the manufacturer's instructions and recommendations shall be maintained at the project site. The following requirements shall be adhered to:

- Tools designed to accommodate guards will be equipped with such guards when in use.
- Tools shall be inspected to ascertain safe operating conditions and are to be kept clean and free of accumulated dirt.
- Electric power tools and extension cords shall be used with ground fault circuit interrupter.
- Portable power cords will be designated as hard usage or extra hard usage and shall not be used if damaged, patched, oil-soaked, worn, or frayed.
- Connections on pneumatic lines shall be secured with a safety lashing.
- Explosive-actuated tools will meet the design requirements of American National Standards Institute (ANSI) A10.3 and only be operated by a qualified operator.
- Explosive-actuated tools and charges shall be secured at all times to prevent unauthorized possession or use.

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-4

- Explosive-actuated tools shall not be loaded until just prior to the intended firing time; neither loaded nor empty tools are to be pointed at any employees; hands shall be kept clear of the open barrel end.
- Hand tools, such as hammers and chisels, shall be inspected and dressed if necessary to remove mushroomed heads, which may separate and become projectile hazards.

4.2.6 Use of Cutting Tools

Proper cutting tools, such as scissors, snips, side cutters, etc., are to be used when possible in lieu of box cutters or knives. Furthermore, if box cutters are determined to be the appropriate tool for the job, the only type that should be used is the design that has a self-retracting blade capability. Employees must utilize appropriate PPE (leather gloves) to allow for further protection. There are many cutting tool manufacturers that offer a variety of safety knives, which are available for all types of cutting. The SSHO shall evaluate each cutting task in order to determine that the safest and most appropriate cutting tool is used. The SSHO shall also provide training in the proper use of the selected cutting tool. The following evaluation shall be made for each cutting task:

- Determine that hand knives are actually the most practical tool for the task. Where possible, use the safest cutting tool for the job (e.g., scissors, snips, or wire strippers).
- If a knife happens to be the correct tool, keep the knife sharp and clean. A dull blade can cause accidents because more force is needed to cut an object. However, a knife or any other unprotected blade tool must be the last resort when choosing a cutting tool.
- Maintain a supply of either replacement knives and/or blades and make them readily available.
- Cut away from yourself, ending the knife stroke away from your body. Hold the item you are cutting firmly, and do not cut downwards and towards your body. Cut into the air or onto hard surface.
- Confirm that appropriate PPE (e.g., gloves) specific to the task is available to employees and used when the possibility of injury exists.

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-4

- Personal knives (e.g., pocketknives) shall not be considered as a tool for any type of work-related cutting. Employees are required to ask for a cutting tool from their supervisor, thereby resulting in an additional review of using the right cutting tool for the job.
- The SSHO is to inspect material cutting activities to verify that leather gloves are being used to protect hands.

4.2.7 Use of Heavy and Mechanized Equipment

Excavators, front-end loaders, drill rigs, direct-push rigs, and other types of specialized equipment may be used to accomplish the work at the project. The use of this equipment can be dangerous. Extra care shall be exercised in its use and while working in the vicinity of this equipment.

4.2.7.1 Heavy Construction Equipment

Various types of heavy construction equipment will be used for project activities. All operators of this equipment shall be familiar with the requirements for inspection and operation of the equipment that they will be using. Before equipment is placed into use and on a daily basis, the operator is to inspect and verify that it is in safe operating condition, as described in Section 3.5. The following guidelines shall be adhered to while operating heavy construction equipment:

- Equipment shall not be operated in a manner that will endanger persons or property nor will the safe operating speeds or loads be exceeded.
- Getting on or off of equipment while it is in motion is prohibited.
- Equipment shall be operated in accordance with the manufacturer's instructions and recommendations.
- Determinations of road conditions and structures shall be made in advance to verify that clearances and load capacities are safe for the passage of equipment.
- All machinery or equipment shall be shut down and positive means taken to prevent its operation while repairs or manual lubrications are being done. Equipment designed to be serviced while running is exempt from this requirement.
- Buckets, blades, dump bodies, and similar equipment will be either fully lowered or blocked when being repaired or when not in use. All controls shall be in a neutral position, with the engines stopped and brakes set, unless work being performed on the machine requires otherwise, per manufacturer recommendations.

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-4

- No guard, safety appliance, or device shall be removed from machinery or equipment, or made ineffective except for making immediate repairs, lubrications, or adjustments, and then only after the power has been shut off. All guards and devices will be replaced immediately after completion of repairs and adjustments and before power is turned on.
- Mechanized equipment shall be shut down prior to and during fueling operations. Closed systems, with automatic shut-off, which prevent spillage if connections are broken, may be used to fuel diesel powered equipment left running.
- Each piece of heavy equipment and other similar equipment shall be equipped with at least one dry chemical or carbon dioxide fire extinguisher with a minimum rating of 10-B:C.
- Personnel shall not work, pass under, or ride in the buckets or booms of loaders in operation.
- All self-propelled construction equipment, whether moving alone or in combination, shall be equipped with a reverse signal alarm.
- Seat belt use is required while operating equipment.

Spotters for the operator shall be the only personnel allowed in the vicinity of the heavy equipment. Spotters shall stay out of the boom radius area. Personnel needing to approach heavy equipment while operating shall observe the following protocols:

- Wear Class 2 high visibility vests meeting ANSI specifications
- Make eye contact with the operator (and spotter)
- Signal the operator to cease heavy equipment activity
- Approach the equipment only after the operator has given signal to do so.

4.2.7.2 Mechanized Equipment – Use of Quick Connect/Disconnect Systems

The manufacturer's specifications and operating manuals for hydraulic equipment and attachments utilizing quick connect/disconnect systems shall be followed. After completing a switch in attachments, the equipment operator shall take the actions necessary to verify the quick connect/disconnect system is positively engaged.

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-4

4.2.7.3 Hydraulic Excavators, Wheel Loaders, Track Loaders, and Backhoe/Loaders Used to Transport or Hoist Loads with Rigging

When hydraulic excavating equipment is to be used to transport or hoist loads utilizing hooks, eyes, slings, chains, or other rigging, the following requirements shall apply:

- A Lift Plan Worksheet (Hydraulic Equipment) (Appendix D) shall be completed.
- Operations involving the use of hydraulic excavating equipment and rigging to transport or hoist loads require different operator skills and considerations than the standard excavating operations routinely performed with hydraulic excavating equipment. An AHA specific to the transporting or hoisting operation shall be prepared (Appendix C15, "*Rigging and Lifting with Hydraulic Equipment*"). The AHA shall include, but not be limited to the following:
  - Written proof of qualifications of equipment operators, riggers, and others involved in the transporting and hoisting operations.
  - Performance of the operational test described in section 16.N.01 (b) of the *Safety and Health Requirements Manual EM 385-1-1* (USACE, 2008).
  - Proper operating procedures in accordance with the equipment manufacturers operating manual.
  - Proper use and on site availability of manufacturer's load rating capacities or charts.
  - Proper use of rigging, including positive latching devices to secure the load and rigging.
  - Inspection of rigging (complete a "Rigging Inspection Checklist. (Appendix D)
  - Use of tag lines to control the load.
  - Communications.
  - Establishment of a sufficient swing radius (equipment, rigging, and load).
  - Stability of surfaces beneath the hydraulic excavating equipment.
- An operational test with the selected hydraulic excavating equipment will be performed in the presence of the Government Designated Authority, if available. The operational test shall consist of a demonstration that the test load and selected rigging can be safely lifted, maneuvered, controlled, stopped, and landed. The operational test shall be representative of the complete cycle of the proposed transporting or hoisting operation, including configuration, orientation, and positioning of the excavating equipment and the use of identical rigging. The test

load shall be equivalent to the maximum anticipated load, but shall not exceed 100 percent of the manufacturer's load rating capacity for the excavating equipment as configured. Written documentation of the performance of the operational test outlining test procedures and results shall be maintained at the on-site project office.

- All rigging and rigging operations shall comply with the requirements of Section 15 of the *Safety and Health Requirements Manual EM 385-1-1* (USACE, 2008). Hooks, eyes, slings, chains, or other rigging shall not be attached to or hung from the teeth of a bucket during the transporting or hoisting of a load by hydraulic excavating equipment.
- After the completion and acceptance of an operational test described in 16.S.01 (b) (USACE, 2008), if repairs, major maintenance, or reconfiguration are required to be performed on the hydraulic excavating equipment or attachments, another operational test as described in 16.S.01 (b) shall be performed to demonstrate that the completed repairs are satisfactory and that the test load and selected rigging can be safely lifted, maneuvered, controlled, stopped, and landed.
- Loads shall be lifted the minimum height necessary to clear the ground or other obstacles and carried as low as possible when the equipment is traveling.
- Loads shall not be lifted over personnel.
- Adequate clearances shall be maintained from electrical sources.
- Hydraulic excavating equipment shall not be used to hoist personnel. The riding of personnel on loads, hooks, hammers, buckets, or any other hydraulic excavating equipment attachment is prohibited.

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-4

4.2.7.4 Drill Rig /Direct-Push Safety

All drilling operations are to comply with Shaw Procedure No. HS316, "Drill Rig Operations." All members of the drill/direct-push crew(s) shall receive site-specific training prior to beginning work. The Shaw Field Team Leader must have successfully completed Shaw's in-house training pertinent to competent person drilling oversight training. The Field Team Leader is required not only to have successfully completed competent person drilling oversight training, but to have an appropriate educational background, coupled with field experience and the authority to make changes to correct deficiencies, or to stop the job if need be. The driller is responsible for the safe operation of the drill/direct-push rig, as well as the crew's adherence to the requirements of this SSHP. The driller is to verify that all safety equipment is in proper condition and is properly used. The members of the crew shall follow all instructions provided by the manufacturer of the drill/direct-push rig, wear the required

PPE, and be aware of all hazards and control procedures. The drill/direct-push crews shall participate in the daily tailgate safety meeting and be aware of all emergency procedures.

All drilling/direct-push activities must comply with Shaw Procedure No. HS308, "Underground/Overhead Utility Contact Prevention." After all mark-outs have been completed and documented on the Utility Mark-Out Documentation form (Appendix D), each bore or probe-hole location must be advanced by hand digging, probing, posthole digging, and/or air knifed to 5 feet below ground surface. Should the local geology be prone to refusal or should there be any other reason the above methods cannot be used to ensure the 5 feet clearance, ground-penetrating radar or other methods would then be required to ensure the boring or probe hole is cleared (5 feet minimum). Besides utilization of ground penetrating radar or other methods mentioned above, anytime the 5 feet clearance cannot be obtained, the SSHO must obtain a written variance from the Regional Vice President (or equivalent level such as Operations Director for Federal Business Line) or designee. This would include a telephone call to both the Regional Vice President and Regional Health and Safety Manager and signed approval by all parties involved. The Pre-drilling/Boring/Geoprobe Checklist and the Direct-Push Rig Inspection Checklist and/or Drill Rig Inspection Checklist (Appendix D) must be completed prior to drilling, boring, or direct-push activity.

4.2.8 Operation of Motor Vehicles

All Shaw owned, leased, or rented vehicle operations shall comply with the requirements of Shaw Procedure No. HS800, "Motor Vehicle Operation: General Requirements" and Shaw Procedure No. HS810, "Commercial Motor Vehicle Operation and Maintenance." Shaw vehicles shall be inspected on a daily basis. Additionally, all Shaw vehicles shall be inspected prior to any trip, which is 50 miles or greater. Vehicle inspections shall be documented on the Vehicle Inspection form (Appendix D).

Subcontractors operating motor vehicles at projects shall comply with all federal, state, and local traffic regulations. Subcontractors shall only use vehicles that are in good condition and safe to operate. Subcontractors shall inspect their vehicles on a daily basis and submit the inspection documentation to the SSHO. Vehicle inspections shall be documented on the Vehicle Inspection form (Appendix D).

All personnel shall drive defensively and wear seat belts while vehicles are in motion. All personnel must observe the maximum-posted speed limits on the base roadways and parking lots. Vehicles must not be parked closer than 15 feet from fire hydrants. Vehicle must pull over to the right side of the road when approached by emergency vehicles – remain stopped until the emergency vehicles have safely passed. All Shaw employees are required to attend a defensive driving training course.

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-4

Operators of vehicles may only use cellular telephones with hands-free devices while the vehicle is in motion. Operators of vehicles are not permitted to send text messages while the vehicle is in motion. Prior to using a hand-held cellular telephone, drivers shall find a safe place to bring their vehicle to a stop. This requirement does not preclude passenger(s) from using cellular telephones while the vehicle is in motion. The use of headphones and earphones for music or radio is prohibited while operating a motor vehicle.

Since backing accidents at these types of projects are frequent, the following guidelines shall be observed:

- Backing of vehicles shall be avoided when possible.
- Extra care shall be taken to back vehicles when unavoidable.
- Back-up slowly and back-up the shortest distance necessary to accomplish the maneuver.
- When parking vehicles, vehicles shall be backed into the space whenever possible.
- Before entering a vehicle, which has been parked, the driver should first physically perform a 360 degree walk around the vehicle to observe all areas and especially the area behind the vehicle.
- Spotters shall be used to back vehicles whenever possible or necessary.

4.2.9 Material Handling

Various materials and equipment may be handled manually during project operations. Care should be taken when lifting and handling heavy or bulky items to avoid back injuries. The following fundamentals address the proper lifting techniques that are essential in preventing back injuries:

- Size, shape, and weight of the object to be lifted shall first be considered. No individual employee is permitted to lift any object that weighs over 60-pounds. Multiple employees or the use of mechanical lifting devices is required for objects over the 60-pound limit.
- Anticipated path to be taken by the lifter should be inspected for the presence of slip, trip, and fall hazards.
- Feet shall be placed far enough apart for good balance and stability (typically shoulder width).
- Worker shall get as close to the load as possible. Legs shall be bent at the knees.

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-4

- Back shall be kept as straight as possible and abdominal muscles should be tightened.
- Twisting motions should be avoided when performing manual lifts.
- To lift the object, the legs are straightened from their bending position.
- Take small turning steps without twisting the knees or the back if it is necessary to turn with the load.
- A worker shall never carry a load that cannot be seen over or around.
- When placing an object down, the stance and position are identical to that for lifting. The legs are bent at the knees and the object lowered.

When two or more workers are required to handle the same object, coordination is essential for sharing the weight between the individuals carrying the load and to make a uniform lift. When carrying the object, each worker, if possible, shall face the direction in which the object is being carried. In handling bulky or heavy items, the following guidelines shall be followed to avoid injury to the hands and fingers:

- A firm grip on the object is essential; leather gloves shall be used as necessary.
- Hands and the object shall be free of oil, grease, and water, which might prevent a firm grip. Fingers shall be kept away from any points that could cause them to be pinched or crushed, especially when setting the object down.
- Item shall be inspected for metal slivers, sharp or jagged edges, burrs, and rough or slippery surfaces prior to being lifted.

4.2.10 Hazardous Energies (Electrical, Mechanical, and Pressurized Systems)

All portable electrical equipment and extension cords shall be protected with a ground fault circuit interrupter as part of the circuit. Applicable OSHA standards for electrical power, 29 CFR 1926 Subpart K and Section 11 of the *Safety and Health Requirements Manual EM 385-1-1* (USACE, 2008) apply.

Only qualified electricians may work on electrical circuits. Qualified personnel shall be trained with the proper use of the special precautionary techniques, PPE, including arc-flash, insulating and shielding materials, and insulated tools and test equipment.

Live parts to which an employee might be exposed shall be put into an electrically safe work condition (de-energized) before an employee works on or near them, unless it can be demonstrated that de-energizing introduces additional or increased hazards or is infeasible

due to equipment design or operational limitations. This rule applies to all electrical work, including changing a light bulb.

Where work is performed in locations containing un-insulated energized overhead lines that are not guarded or isolated, precautions shall be taken to prevent employees from contacting such lines directly with any unguarded parts of their body or indirectly through conductive materials, tools, or equipment. Refer to Table 2 when working near overhead power lines. Where the work to be performed is such that contact with un-insulated energized overhead lines is possible, the lines shall be de-energized and visibly grounded at the point of work, or suitably guarded.

Employees working in areas where electrical hazards are present shall be provided with, and shall use PPE that is designed and constructed for the specific part of the body to be protected and for the work to be performed, as required by Section 130.7 of National Fire Protection Association (NFPA) 70 E (2011), *Standard for Electrical Safety in the Workplace*. Refer to Appendix G.

Employees shall use insulated tools and/or handling equipment when working inside the Limited Approach Boundary of exposed live parts where tools or handling equipment might make accidental contact. Insulated tools shall be protected from damage to the insulating material.

Before starting each electrical job, the qualified employee in charge shall conduct a job briefing with the employees involved. The briefing shall cover such subjects as hazards associated with the job, work procedures involved, special precautions, energy source controls, and PPE requirements.

Only hard or extra-hard usage extension cords shall be used. Extension cords, power tools, and lighting equipment shall be inspected before each use, protected from damage, and kept out of wet areas.

The handling of compressed gas cylinders shall comply with the requirements established in Shaw Procedure No. HS304. All pressure vessels shall be designed, inspected, and tested in accordance with ASTM International standards.

Lockout/tagout procedures are to be implemented during servicing or maintenance of machines and equipment to preclude the unexpected release of stored energy or inadvertent energizing. These procedures are contained in Shaw Procedure No. HS315, “Control of Hazardous Energy Sources,” and comply with the requirements established in 29 CFR 1926.417. The appropriate logs and forms found in Appendix D and listed below shall be completed for all lockout/tagout:

- Lockout Log;
- Lockout/Tagout for Compressed Air and Gases;
- Lockout/Tagout for Electrical Equipment;
- Lockout/Tagout for Hydraulic Equipment;
- Lockout/Tagout for Steam, Water, and Fluid Lines; and
- Lockout/Tagout Procedure for Specific Equipment.

Subcontractors may implement their own lockout/tagout procedure if the SSHO has approved its use and verifies that it is no less protective than the Shaw Procedure.

4.2.11 Air Compressor Use

Refer to the air compressor manufacturer's instructions for safe operation. Prior to use, the Checklist – Portable Air Compressor (Appendix D) shall be completed. Never use an air compressor in enclosed or partially enclosed spaces due to the quick build-up of high levels of carbon monoxide. The concentration of carbon monoxide shall be monitored when using air compressors in areas of poor ventilation. The concentration of carbon monoxide in the work area shall not be allowed to exceed 25 ppm.

All air compressors and hoses shall be inspected before use, operated, and maintained by designated, qualified personnel. All air compressors shall be equipped with a pressure gauge and relief-valve, and only be operated at design pressures. Chicago fittings shall be secured together with tie-wire or equivalent and secured with safety lashings.

Before refueling the air compressor, shut it off and let it cool down. Gasoline spilled on hot engine parts could ignite. A 20-B:C fire extinguisher shall be readily available in locations where an air compressor is being used.

Use hearing protection when working near an air compressor.

4.2.12 Portable Generator Use

Refer to the generator manufacturer's instructions for safe operation. Never use a generator in enclosed or partially enclosed spaces due to the quick build-up of high levels of carbon monoxide. The concentration of carbon monoxide shall be monitored when using generators in areas of poor ventilation. The concentration of carbon monoxide in the work area shall not be allowed to exceed 25 ppm.

Keep the generator dry and do not use in rain or wet conditions. To protect from moisture, operate it on a dry surface under an open, canopy-like structure. Dry your hands, if wet,

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-4

before touching the generator. Use a heavy duty, outdoor-rated extension cord that is rated (in watts or amps) at least equal to the sum of the connected appliance loads. Check that the entire cord is free of cuts or tears and that the plug has all three prongs, especially a grounding pin. Ground generators by using a hand-inserted ground-rod, if recommended by the manufacturer.

Before refueling the generator, turn it off and let it cool down. Gasoline spilled on hot engine parts could ignite. A 20-B:C fire extinguisher shall be readily available in locations where a generator is being used.

Use hearing protection when working near a generator.

4.2.13 Intrusive Activities

Intrusive activities are defined as any activity that produces a man-made cut, cavity, trench, or depression into the earth's surface formed by earth removal or any activity that results in an object placed into the earth below the surface. These activities include excavating, drilling, augering, boring, shoveling, fence post driving, driving stakes, etc. Intrusive activities can be dangerous and can result in severe personal injury or death. Intrusive activities can also cause significant property damage to utilities, structures, and operational equipment. Breaching underground utilities can result in electrocution from damaged electrical lines, fires from broken fuel/gas lines, and disruption of telephone service. All intrusive activities must comply with Shaw Procedure No. HS308.

Before any intrusive activity begins, positive steps shall be taken to determine if the area contains underground utilities or overhead hazards. It is important to understand that underground utilities may be found in areas that have been properly investigated and thought not to have utilities present. Personnel shall always be alert for marking tape, wires, pipes, previously disturbed soils, crushed stone or sand bedding/backfill, containers, discolored soil, MEC, or anything else unusual.

The Intrusive Activities Clearance Procedure shall be followed. The procedure is designed to identify and protect underground installations or indicate that none exists. Intrusive activity shall not begin until the SSHO has signed off on the Intrusive Activities Permit form (Appendix D).

The SSHO will:

- Prepare a map indicating the area(s) where intrusive activity is planned to occur.
- Perform the necessary reviews.

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-4

- Contact Cugach, the base utility locating service, at least 3 business days prior to intrusive activities.
- Verify that all underground installations have been located, physically marked, and then noted on the map.
- Mark all overhead utilities with kilovolts rating on the map. Refer to Table 2 and Section 4.2.10 when working near overhead power lines.
- Notify the appropriate agencies, such as the COR and property owners (when applicable)
- Complete the Utility Mark-Out Documentation form (Appendix D)
- Issue the Intrusive Activities Permit.

A safety meeting shall be held and a JSA completed by all personnel involved in the intrusive activities prior to initiating work.

4.2.14 Excavation

When performing excavation activities, Shaw Procedure No. HS307, "Excavation and Trenching" and Shaw Procedure No. HS308, "Underground/Overhead Utility Contact Prevention" shall be followed. Any excavation 5 feet deep or greater, into which persons will enter and perform work, shall be shored, sloped, or otherwise made safe for entry. Excavations less than 5 feet in depth in which a competent person, as defined in 29 CFR 1926.650, examines and determines there to be no potential for cave-in, do not require protective systems. Certain excavations and trenches are considered confined spaces that require a confined space entry permit (Section 4.2.15).

Daily inspections of the excavation shall be made using an Excavation Inspection form (Appendix D) and a Soils Classification Worksheet (Appendix D) completed by a competent person as defined in 29 CFR 1926.650. All excavated materials shall be placed at least 2 feet from the edge of the excavation. Perimeter protection shall be provided for unattended excavations as specified in Section 25.B of the *Safety and Health Requirements Manual EM 385-1-1* (USACE, 2008). Open excavations shall be lighted at night, although, Shaw will attempt to minimize the need to perform intrusive activities at night. The SSHO shall evaluate the exposure of the excavation to employees, the public, vehicles, and equipment. This evaluation shall be used in determining the class of perimeter protection.

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-4

All project personnel shall participate in the site-specific training session and be instructed on the following requirements:

- Before commencing intrusive activities such as excavating, etc., the existence and location of underground pipes, electrical equipment, communication lines, gas lines, etc. shall be determined and documented. Only hand digging is permitted within 3 feet of underground high voltage, product, or gas lines. Once the line is exposed, heavy equipment can be used but must remain at least 3 feet from the exposed line.
- Operations shall be suspended, ignition sources eliminated, and the area shall be ventilated if the concentration of flammable/combustible vapors reach or exceed 10 percent of the lower explosive limit. A combustible gas indicator shall be used to make this determination.
- If excavating equipment is being operated in the vicinity of overhead power lines, Table 2 will be used to determine safe working distances.
- Personnel entry into any excavation 5 feet deep or greater is only permitted if the necessary protective systems are in place. Employees shall wear a harness with a lifeline securely attached to it when entering excavations classified as confined spaces or that otherwise present the potential for emergency rescue.
- Employees shall not work in excavations in which there is accumulated water, or in excavations in which water is accumulating, unless adequate precautions have been taken to protect employees against the hazards posed by water accumulation. If water is controlled or prevented from accumulating by the use of water removal equipment, the process shall be monitored by a competent person to ensure proper operation.
- Excavations greater than 4 feet in depth, which require personnel to enter, shall have sufficient means of entry and egress (e.g., stairs, ladders, and ramps). Ladders will be provided and secured as necessary. Ladders shall extend at least 3 feet above grade. Means of entry/egress shall not require personnel to travel laterally more than 25 feet.

4.2.15 Confined Space Entry

A confined space is defined as a space large enough and so configured that an employee can bodily enter and perform assigned work, has limited means for entry or exit, and is not designed for continuous employee occupancy. Confined space work may pose additional hazards such as chemical exposures, flammable/explosive atmospheres, electrocution, oxygen deficiency, etc. Shaw Environmental, Inc. has detailed training for confined space

entry: only properly trained personnel shall supervise and participate in confined space entry procedures or serve as standby attendants.

Entering a trench greater than 5 feet deep, entering a sewer, or entering a tank may be potential confined space entries. Personnel shall never enter a confined space without a permit issued by the SSHO. If personnel are uncertain about whether their activity involves a confined space entry, they shall stop work and notify their supervisor or the SSHO. Shaw Procedure No. HS300, "Confined Spaces," shall be followed for all confined space entries, if such an activity is needed.

All confined spaces are initially considered permit required. Under certain conditions, a space may be re-classified as a non-permit, confined space provided the SSHO approves the reclassification and the space meets the criteria outlined in Shaw Procedure No. HS300.

Shaw Procedure No. HS300 identifies the tug signals that may be used during entry as referenced on the Entry Permit for Permit-Required Confined Space (Appendix D).

4.2.15.1 Rescue and Emergency Services

Shaw recommends the use of non-company rescue services whenever possible. In certain instances, such as unavailability of a qualified outside provider, Shaw employees can participate in rescues if they have been provided the required equipment and training.

4.2.15.2 Outside Rescue Services

Prior to designating a non-company rescue service, an evaluation of their capabilities must be conducted. This documented evaluation can be conducted by an entry supervisor or a health and safety representative. The Rescue Service Evaluation form (Appendix D) can be used to document this evaluation. The rescue service must be certified by the evaluator as capable of performing rescues prior to being identified as the rescue service provider.

Each selected rescue service will be informed of the hazards they may encounter at the location. They will also be provided access to all Permit-Required Confined Spaces from which a rescue may be necessary.

4.2.15.3 Shaw Rescue Services

Shaw personnel assigned to provide emergency entry and rescue services will be trained annually in the proper use of personal protective and rescue equipment. Such training will include a simulated rescue exercise. Shaw rescue services will be evaluated using the Rescue Service Evaluation form (Appendix D) and must be certified by the evaluator as capable of performing rescues prior to being identified as the rescue service provider.

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-4

4.2.16 Dust

The generation of dust and fugitive emissions shall be prevented when possible and controlled when necessary. Work practices shall be adjusted in a manner to minimize dust generation, such as lowering excavation rates, not letting soils free-fall from equipment buckets, and traveling slow on dirt roads. Personnel shall avoid working in dust by positioning themselves upwind of dust generating activities. Excessive dust shall be controlled by suppression with water from an AFCEE-approved source. Dust that is not controlled may necessitate the use of respiratory protection.

4.2.17 Use of Pressure Washers or Steam Washers

The use of steam/pressure washers shall comply with Shaw Procedure No. HS303, "Pressurized Water Cleaning and Cutting Equipment." All personnel using steam/pressure washers shall wear Level D – Modified PPE, at a minimum. Eye, face, and shin/metatarsal protection is mandatory.

The pressure/steam washer shall be inspected before each use. The manufacturer's instruction manual shall be used to guide the inspection process.

Personnel shall be trained in the use of the washing equipment. All personnel working in the equipment decontamination area shall be trained in the emergency shut-off procedures for the equipment being used. The minimum amount of steam/pressure that will complete the job should be used. Pressure washers exceeding 3,000 pounds per square inch shall not be used without the approval of the HSM.

The spray from such equipment shall only be directed at surfaces to be cleaned and never at body parts or other personnel; high-pressure water can easily cut through skin and flesh! Personnel working in the immediate area shall also use eye, face, and shin/metatarsal protection.

Personnel shall keep a firm grip on the wand and not point it at anything that is not being washed. Pressure washer operators must maintain good footing. The trigger on the wand shall never be wired/fixed open. Operators are to take adequate breaks to avoid fatigue.

Hot surfaces shall be avoided. Pressure or steam washing equipment shall be shut off and allowed to cool prior to re-fueling.

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-4

4.2.18 Excessive Work Hours

The following workday duration limitations for hours worked on the projects are in effect:

- Personnel working on projects, including those who are operating hoisting equipment or mobile construction equipment, may work up to 12 hours at the site, which includes travel time to housing, but excludes non-compensated time. This workday duration is subject to reduction by the other requirements and factors described below. The 12-hour limit is primarily due to motor vehicle driving restrictions.
- Personnel shall not operate motor vehicles after being in a duty status (regardless of their role or function) for more than 12 hours during any 24-hour period without at least eight consecutive hours of rest. A minimum of eight consecutive hours shall be provided for rest in each 24-hour period.
- No employee may drive continuously for more than 10 hours in any single on-duty period. (Continuous period of more than 10 hours in any 24-hour period without at least eight consecutive hours of rest.)

For each project effort, the SSHO is responsible for adjusting the workday duration within the limits set above.

The following factors will be considered by the SSHO for adjusting the workday duration:

- Time of year (e.g., reduce workday duration because there is less daylight in winter).
- Temperature/weather (e.g., reduce workday duration when the temperature is very cold, very hot, or very windy).
- Type of work (e.g., reduce workday duration for personnel involved in physically demanding phases of work).
- Individual personnel limitations (e.g., reduce workday duration for personnel with minor head colds or suffering from temporary effects of allergies).

For any questions regarding the implementation of this policy, contact the HSM.

4.2.19 Transportation

Many of the individual sites are located in areas of high vehicle, equipment, and pedestrian traffic. When working in these areas extra caution should be used because of the unpredictable nature of vehicular traffic. Barriers should be placed around work areas, shielding workers from vehicular traffic and blocking pedestrian traffic from entering the

work area. Flaggers should always be used if any portion of the roadway is blocked or if barriers are inadequate or unfeasible. Flaggers are required to be trained on proper hand signals, signage, state regulations, and U.S. Department of Transportation regulations as applicable.

4.2.20 Working Over or Near Water

Working over or near water is not anticipated for proposed activities under the WERC09 contract.

4.3 General Work Rules

While all the procedures outlined in this SSHP are required, the following list presents general work rules that must be strictly enforced by the Construction Manager and Subcontractor Supervisors:

- Loose jewelry, clothing, or long hair is not permitted on or near equipment with moving parts.
- Personnel shall not enter a restricted area unless authorized.
- All work zones, as established on the site, shall be observed. All required PPE shall be worn prior to entering these zones.
- Legible and understandable labels shall be affixed prominently to the containers of waste materials.
- An emergency eyewash unit shall be located immediately adjacent to employees who handle hazardous or corrosive materials, such as battery acid, etc. All operations involving the potential for eye injury, splash, etc. shall have eyewash units locally available and capable of delivering at least 0.4 gallons per minute for at least 15 minutes. The eyewash unit maintenance shall be documented on the Emergency Eyewash Station/Fire Extinguisher Inspection Checklist (Appendix D)
- If on-site activities continue later than dusk, adequate lighting shall be provided.
- Field activities shall be suspended during severe weather such as thunderstorms, lightning, and winter storm warnings.
- Damaged PPE shall be immediately repaired or replaced, as appropriate.
- Personnel shall thoroughly wash their hands and face before eating, smoking, or drinking.
- Unauthorized removal of materials from the project is prohibited.

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-4

- Possession of controlled substances and prohibited items, such as alcohol, illicit drugs, firearms, and weapons while working on site is strictly prohibited.
- Operations involving the potential for fire hazards shall be conducted in a manner as to minimize the risk of fire.
- Overhead and underground utility hazards shall be identified and/or located prior to conducting operations.

4.3.1 Disciplinary Actions

A successful safety program is achieved by assigning qualified personnel, providing the necessary training and orientation, adequately planning for the work and following the plans, adhering to the policies and procedures, reinforcing positive behavior, and rewarding safe performance. A mechanism is also necessary to consistently apply disciplinary action to employees who jeopardize the safety of themselves and their coworkers by not following the established plans, policies, and procedures. Therefore, Shaw Guide – 004, "Guidelines for Standard Safety Disciplinary Actions", is applicable and in effect for this project (Appendix G).

4.4 Buddy System

The "buddy system" will be used at all times while working on-site – this requires that personnel maintain visual, voice, cellular telephone, or radio communication.

4.5 Lone Worker Procedure

Occasionally, only one worker may be present at the project to perform routine operations such as performing paperwork in the office. During these routine operations, there will be no "buddy" present on site. Even though there will be no buddy present on site at these times, communications must still be maintained. The lone field worker shall carry a cellular telephone or two-way radio on their person, at all times, while working at the project site (a landline telephone will suffice if the worker is in an office). Arrangements shall be made by the lone field workers, with at least one other person (monitor),and the SSHO to affect hourly communications. This hourly communication shall convey the following information:

- Present location.
- Present status.
- Anticipated activities and location of anticipated activities (include routes of expected travel).

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-4

- Estimated duration of anticipated activities.
- Identify other anticipated activities, projected travel routes, and activity locations if the lone field worker will complete the initial task prior to making the next scheduled contact with the other employee.

The lone field worker should initiate the hourly communication to the monitor at a pre-designated time (e.g., the top of the hour). If the monitor does not receive the status call at the pre-designated time, then the monitor shall try to establish communications with the lone employee. If the lone field employee answers, then the update shall be made and the schedule of calls shall continue. If the lone field employee does not answer, the monitor shall try again in five minutes. If contact is not made on the second try, then the monitor shall notify the local emergency services, such as police. All information provided from the last communication (see above) shall be provided to the emergency services. Additionally, the telephone number of the monitor (or other means of contact) shall be provided to the emergency services.

Upon mobilization to the project, the SSHO shall verify that emergency communications are established for all activities.

Important: This procedure applies to routine tasks only. Non-routine tasks require the buddy system to be in effect.

4.6 Environmental Hazards

In addition to chemical and physical hazards, there are environmental hazards that may be present. For the purposes of this SSHP, the environmental hazards are comprised of extreme ambient temperatures, insects, spiders, rodents, poisonous plants, and sunburn. Since some people are more sensitive or allergic to various biological hazards, the Allergy/Sensitivity Questionnaire (Appendix D) may be voluntarily completed by personnel during site orientation training. This form is used to alert the SSHO of these sensitivities so that additional precautions may be made.

4.7 Heat Stress

Heat stress is of concern for worker safety during the summer months or when working in areas containing steam lines or other heat generating equipment. Heat stress is caused by a number of interacting factors, including environmental conditions, clothing, PPE, workload, and individual characteristics. Heat stress can cause physical discomfort, loss of efficiency, or personal illness/injury.

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-4

Individuals vary in their susceptibility to heat stress. Factors that may predispose individuals to heat stress include the following:

- Lack of physical fitness and/or obesity.
- Insufficient acclimation.
- Age.
- Dehydration.
- Alcohol and/or drug use.
- Infection.
- Sunburn.
- Diarrhea.
- Chronic disease.
- Medical conditions and/or the use of some medications, such as beta-blockers for high blood pressure.

The amount and type of PPE worn, directly influences reduced work tolerance and the increased risk of heat stress. Personal protective equipment adds weight, bulk, reduces the body's capability for physiological thermoregulation (i.e., evaporation, convection, and radiation), and increases energy expenditure.

4.7.1.1 Signs and Symptoms of Heat Stress

If the body's physiological processes fail to maintain a normal body temperature because of excessive heat, a number of physical reactions can occur – ranging from mild to fatal.

These physical reactions to excessive heat include the following:

- Heat rash is caused by continuous exposure to heat and humidity and aggravated by chafing clothes. Heat rash decreases the body's ability to tolerate heat in addition to being a nuisance.
- Heat cramps are caused by profuse perspiration with inadequate electrolytic fluid replacement. Heat cramps cause painful muscle spasms and pain in the extremities and abdomen.
- Heat exhaustion is caused by increased stress on various organs to meet increased demand to cool the body. Heat exhaustion causes shallow breathing; pale, cool, moist skin; profuse sweating; and dizziness.

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-4

- Heat stroke is the most severe form of heat stress. Heat stroke symptoms include hot, dry skin; no perspiration; nausea; dizziness; confusion; strong, rapid pulse; coma; and sometimes death. Heat stroke is a serious medical emergency. The affected person shall be cooled down rapidly and medical attention must be given immediately (Section 4.5.1.4 for heat stroke first aid treatment).

The ACGIH states that excessive heat stress may be marked by one or more of the following symptoms, and an individual's exposure to heat stress should be discontinued when any of the following occur (2011):

- Sustained (several minutes) heart rate is in excess of 180 beats per minute minus the individual's age in years (180 minus age) for individuals with assessed normal cardiac performance; or
- Body core temperature is greater than 101.3 degrees Fahrenheit (°F) for medically selected and acclimatized personnel; or greater than 100.4°F in unselected, un-acclimatized workers; or
- Recovery heart rate at 1 minute after a peak work effort is greater than 120 beats per minute; or
- There are symptoms of sudden and severe fatigue, nausea, dizziness, or lightheadedness.

An individual may be at greater risk of heat stress if the following symptoms occur:

- Profuse sweating is sustained over several hours.
- Weight loss over a shift is greater than 1.5 percent of body weight.
- 24-hour urinary sodium excretion is less than 50 millimoles (ACGIH, 2011).

4.7.1.2 Heat Stress Prevention

The following practices will help prevent heat stress:

- Acclimatize workers to hot working conditions.
- Provide plenty of liquids to replace the body fluids lost by perspiration. Fluid intake should be forced because, under conditions of heat stress, the normal thirst mechanism is not adequate to bring about a voluntary replacement of lost fluids.
- Provide personal cooling devices.
- Conduct strenuous field operations in the early morning and provide shade when possible.

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-4

- Train personnel to recognize the signs and symptoms of heat stress, its prevention, and treatment.
- Rotate personnel to various job duties and establish adequate work/rest cycles.
- Provide shade or shelter during rest periods.

4.7.1.3 Heat Stress Treatment

Workers expressing the symptoms of heat stress shall notify the SSHO immediately. At the onset of heat related illness, activities must be halted and treatment initiated. Early detection and treatment of heat stress helps to prevent further serious illness or injury. Individuals that have experienced heat related illness could become more sensitive and predisposed to additional future heat stress related problems.

Heat exhaustion can be alleviated by having the affected person rest in a cool, shaded location and have them drink cool water. To cool down the affected person's body:

- Remove impermeable PPE.
- Remove worker from direct sunshine.
- Apply copious amounts of cool, not cold, water on them.
- Have them drink cool water, not cold, if conscious.

4.7.1.4 Heat Stroke Treatment

Heat stroke is a true medical emergency. In a heat stroke situation, the body must be cooled immediately to prevent severe injury or death – medical attention must be immediately obtained. The following shall be performed if heat stroke is suspected:

- Transportation of the victim to a medical facility must not be delayed – seek immediate medical attention.
- Apply cold packs, if available; place under the arms, around the neck, or any other place where they can cool large surface blood vessels.
- If transportation to a medical facility is delayed, reduce body temperature by immersing victim in a cool water bath (however, be careful not to over-chill the victim once body temperature is reduced below 102°F). If this is not possible, continuously douse victim with cool water and fan for evaporative cooling.

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-4

4.7.1.5 Acclimatization

Physiologically adjusting or acclimatizing personnel to hot conditions is extremely important. Supervisors shall provide the necessary time for adequate worker acclimatization, due to each individual's physical condition and his or her ability to work in hot and humid environments.

4.7.1.6 Physiological Monitoring

Adequate work/rest periods shall be implemented as necessary to prevent heat stress on personnel. However, since individuals vary in their susceptibility to heat stress, Shaw will also utilize physiological monitoring to aid in measuring each individual's response to heat stress. The initiation of physiological monitoring will be required when employees are working in environments exceeding 90°F ambient air temperatures. Physiological monitoring is also required when ambient temperatures exceed 70°F and impermeable garments are worn. Ambient air temperatures shall be recorded on the Ambient Air Temperature Log (Appendix D) when ambient temperatures exceed 70°F. The two physiological parameters that each individual will monitor are as follows:

- Heart Rate—Each individual will count his/her radial (wrist) pulse as early as possible during each rest period. If the heart rate of any individual exceeds 75 percent of their calculated maximum heart rate (maximum heart rate equals 200 minus age) at the beginning of the rest period, then the work cycle will be decreased by one-third. The rest period will remain the same. An individual is not permitted to return to work until his/her sustained heart rate is below 75 percent of their calculated maximum heart rate.
- Body Temperature—Each individual will measure his/her body temperature with an intra-aural (ear) thermometer, as directed by the thermometer manufacturer's instructions, as early as possible in the first rest period. If the temperature exceeds 99.6°F at the beginning of the rest period, then the work cycle shall be decreased by one-third. The rest period will remain the same.

An individual is not permitted to return to work if his/her temperature exceeds 100.4°F. Physiological monitoring data will be recorded on the Employee Physiological Monitoring Record for Heat Stress (Appendix D).

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-4

4.7.1.7 Training

Personnel, including subcontractor employees, who may be exposed to hot working environments shall be trained on the following:

- Employees:
  - Sources of heat stress, influence of protective clothing, and importance of acclimatization.
  - How the body handles heat.
  - Heat-related illnesses and their recognition (signs and symptoms).
  - Preventive/corrective measures.
  - Individual factors, such as age, weight, gender, level of acclimatization, etc. that may predispose some workers to heat stress.
  - Medical conditions and use of prescription drugs, such as beta blockers, that may modify a worker's ability to adapt physiologically to heat stress.
  - Physiological monitoring, record keeping of oral temperature/pulse, and establishment of work-rest regimes.
  - First aid procedures.
- Supervisors:
  - Physiological monitoring, record keeping of oral temperature/pulse, and establishment of work-rest regimes.
  - First aid procedures.

4.7.2 Ticks and Tick-Borne Diseases

Working in tall grass, especially in or at the edge of wooded areas, increases the potential for ticks to bite workers. Ticks can be particularly numerous in the spring and fall. Ticks are vectors of many different diseases including Rocky Mountain spotted fever, Q fever, ehrlichiosis, tularemia, Colorado tick fever, Lyme, and Lyme like disease. Ticks attach to the skin and intravenously feed on blood, creating an opportunity for disease transmission.

The symptoms of tick-borne diseases are high fever, head and joint aches, nausea, and vomiting. Additionally, persons infected with Rocky Mountain spotted fever may develop a red, spotty rash. Symptoms of tularemia may also include occasional cough, chest pain, swollen lymph glands, and severe pneumonia. Lyme disease usually (60 to 80 percent of the cases) presents a distinctive bull's eye rash at the site of the bite in addition to flu-like

symptoms and swollen lymph nodes. If tick-borne diseases are not properly treated with the appropriate antibiotic(s), then arthritis, heart disease, brain/nerve disorders, liver damage, and kidney damage are possible.

Wearing long-sleeved, light-colored shirts, light-colored trousers tucked into the socks, and the use of insect repellent containing N,N-Diethyl-m-toluamide (DEET) help prevent tick bites.

Periodically during the workday, employees should inspect themselves for the presence of ticks. If a tick is discovered, the following procedure should be used to remove it:

- Do not try to detach a tick with your bare fingers; bacteria from a crushed tick may be able to penetrate even unbroken skin. Fine-tipped tweezers should be used.
- Grip the tick as close to your skin as possible and gently pull it straight away from you until it releases its hold.
- Do not twist the tick as you pull and do not squeeze its body. That may actually inject bacteria into your skin.
- Thoroughly wash your hands and the bite area with soap and water, and then apply an antiseptic to the bite area.
- Save the tick in a small container noting the date and the location on the body of the bite.
- Notify the SSHO and HSM of any tick bites as soon as possible.

All personnel sustaining a tick bite should consult a physician. Consult http://www.osha.gov for more information concerning ticks and tick-borne illnesses.

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-4

4.7.3 Chiggers

Chiggers may be a problem while working at some project locations. Chiggers, also known as “red-bugs” or “harvest mites,” are the immature stages of a tiny red mite. They inhabit areas of tall grass, associated with low, wet spots, ponds and stream banks, wild berry patches, and forest underbrush. The larvae attach themselves to the clothing of people or to the fur of passing animals. Before settling down to feed, chiggers move to a constriction, such as sock tops, waistbands, or armpits. Feeding chiggers inject a salivary fluid, which dissolves the host’s cells, and then they suck up the liquefied tissue. Within a few hours, small, reddish, intensely itching welts appear. These bites may continue to itch for several days up to two weeks after the chigger is dislodged. Following are suggestions that should provide some protection from chiggers:

- Stay out of areas where chiggers are likely to be present including wood lots, pastures, roadside ditches, or other areas with tall grasses and weeds. Chiggers are especially common in moist low-lying areas.
- Wear loose-fitting clothing (if possible) when working outdoors. Vehicles should be frequently vacuumed to reduce the number of chiggers that may have been deposited.
- Apply a repellent containing DEET to shoes, socks, and trousers before entering chigger-infested areas. Caution: some individuals may be sensitive to DEET – always read and follow label directions.
- Immediately after possible exposure to chiggers, take a bath, thoroughly scrubbing the body with hot soapy water. This will kill or dislodge many of the chiggers. The clothes that were worn when the bite(s) occurred should be placed in a plastic bag for temporary storage until they can be laundered.
- When bites begin to itch, one course of treatment is to apply rubbing alcohol, followed by one of the nonprescription local anesthetics. A baking soda paste, calamine lotion, or product such as "After-Bite" or "Chigarid" also will help reduce discomfort. Avoid scratching bites since this only increases irritation and may lead to a secondary infection of the bite.

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-4

4.7.4 Rodents

Potential exists for exposure to microbiological hazards such as viruses that may be present in rodent feces. Hantavirus pulmonary syndrome is a deadly disease transmitted by infected rodents through urine, droppings, or saliva. Humans can contract the disease when they breathe in the aerosolized virus. Hantavirus pulmonary syndrome was first recognized in 1993, and has since been identified throughout the United States. The Hantavirus is known to be present in New Mexico. The HSM shall be contacted prior to working in areas where rodent droppings have been observed and may be disturbed. No work shall be performed in areas where rodent droppings are observed until the appropriate precautions have been taken.

4.7.5 Poisonous Plants

Three or five leaves radiating from a stem identify poison ivy, poison oak, and poison sumac. Poison ivy is in the form of a vine (and sometimes low-lying) while oak and sumac are bush-like. All of these plants can produce a delayed allergic reaction. The plant tissues have an oleoresin, urushiol, which is active in live, dead, and dried parts. The urushiol may be carried through smoke, dust, contaminated articles, and the hair of animals. Additionally, when operating a chain saw to clear brush in the winter or early spring, saw dust may be contaminated with enough urushiol to cause a severe rash. Symptoms usually occur 24 to

48 hours after exposure resulting in rashes that itch and blister. Should exposure to any of these plants occur, perform the following:

- First, cleanse exposed skin with generous amounts of isopropyl (rubbing) alcohol. (Avoid returning to the area of the poison ivy on the same day. Alcohol removes your skin's protection along with the urushiol and any new contact will cause the urushiol to penetrate twice as fast.)
- Second, wash skin with water. (Water temperature does not matter; if you're outside, it's likely only cold water will be available.)
- Third, take a regular shower with soap and warm water. Do not use soap before this point because "soap will tend to pick up some of the urushiol from the surface of the skin and move it around."
- Clothes, shoes, tools, and anything else that may have been in contact with the urushiol should be wiped off with alcohol and water. Be sure to wear gloves or otherwise cover your hands while doing this and then discard the hand covering.

The Food and Drug Administration considers over-the-counter topical corticosteroids (commonly called hydrocortisones under brand names such as Cortaid and Lanacort) safe and effective for temporary relief of itching associated with poison ivy. The best preventative measure for poisonous plants is recognition and avoidance. The use of disposable gloves and Tyvek® coveralls is recommended to help prevent skin contact with these plants.

4.7.6 Flying Insects

Flying insects such as mosquitoes, wasps, hornets, and bees may be encountered while working at project sites. Personnel who are allergic to bee stings should notify their supervisor and the SSHO. A voluntary Allergy/Sensitivity Questionnaire (Appendix D) may be completed by employees to help identify personnel who are allergic or sensitive to insect bites or stings. Mosquito bites can be effectively prevented by the use of insect repellants containing DEET. Insect repellant containing DEET shall be available to personnel while working on site. Additionally, special insecticide preparations, such as Repel Permanone, shall be available for treating worker's clothing. Commercially prepared ointments for treatment of insect bites and bee stings shall be available on site. All personnel shall immediately report any bee stings to their supervisor and the SSHO.

4.7.7 Spiders

Personnel shall be alert to the potential for spider bites. Spiders sometimes establish residence in dark places, stored clothing, and PPE. It is advisable for personnel to inspect

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-4

clothing and PPE for spiders prior to donning. If a spider bite is sustained, personnel shall report it to the SSHO.

4.7.8 Snakes

In North America the venomous snakes are rattlesnakes, copperheads, water moccasins and coral snakes. In Texas, rattlesnakes and copperheads are the most prevalent venomous snakes. Snakes typically are found in underbrush and tall grassy areas. Do not attempt to catch a snake.

If a person is bitten by a snake, wash and immobilize the injured area, keeping it lower than the heart if possible. Seek medical attention immediately and notify the SSHO.

4.7.9 Sunburn

Personnel working in direct sunlight, are encouraged to wear wide-brim hats (where hard hats are not a requirement) and apply sunscreen to all unprotected skin surfaces. The benefits of preventing sunburn and skin cancer are self-evident. Sunscreen will be provided for use by project personnel while working on site.

4.7.10 Inclement Weather

Inclement weather can pose hazards to project personnel. The Construction Manger or SSHO will evaluate weather conditions each day and take the appropriate precautions to minimize the hazards associated with the weather. Additional information on severe weather is provided in Section 11.9.

4.7.11 High Winds

If high winds are anticipated or underway, the following precautions shall be taken:

- Secure lightweight or loose items.
- Avoid handling items with large surface areas, such as plywood and polyethylene sheeting.
- Use caution and keep a firm grip when opening doors.
- Wear dust proof goggles if dust and soil particles are airborne.
- If cranes are being used, follow manufacturer recommendations for operating in wind.

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-4

4.7.12 Heavy Rain

Most outdoor activities will be suspended during heavy rain. Personnel shall not work outdoors if heavy rain is accompanied by lightning (Section 11.9.2). Personnel shall exit all excavations until inspected by a competent person; excavations shall be inspected with a higher frequency during periods of heavy rain. Electric tools and equipment shall not be used outdoors while raining, unless designed for use under wet conditions.

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-4

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-4

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5.0 PERSONAL PROTECTIVE EQUIPMENT

When engineering and administrative controls are not feasible or adequate to protect personnel from the hazards associated with project activities, PPE use will be required.

5.1 Levels of Protection

The following are general and typical descriptions of the PPE that will be required during project activities. The U.S. Environmental Protection Agency terminology for levels of PPE is used: Levels A, B, C, and D.

5.1.1 Level A Protection

Level A protection use is not anticipated during this project.

5.1.2 Level B Protection

Level B protection use is not anticipated during this project; however, Level B protection use may be required during activities when engineering controls are necessary but ineffective at maintaining the concentration of hazardous substances to below action levels in the work area and/or breathing zone of personnel. Level B protection use may also be required for Confined Space Entries. The HSM shall be contacted prior to all Confined Space Entries.

Level B PPE, in general, consists of the following:

- Supplied air respirator (SAR): airline respirators with 5-minute egress bottles or self-contained breathing apparatus.
- Work clothing as prescribed by weather.
- Hard hats meeting ANSI Z89.1 specifications.
- Safety-toed work boots meeting ANSI Z41 specifications.
- Nitrile surgical gloves (inner or double layer).
- Chemical gloves (outer, as necessary).
- Disposable Tyvek® coveralls with hoods, elastic wrists, and ankles (as necessary).
- Tychem® SL coveralls with hoods, elastic wrists, and ankles (if contact with light non-aqueous phase liquid [LNAPL] or dense nonaqueous phase liquid [DNAPL] is possible).
- Tychem® QC coveralls with hoods, elastic wrists, and ankles (if contact with slightly contaminated groundwater or slightly contaminated wet soil is possible).

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-4

- Chemical resistant boot covers and/or outer boots (polyvinyl chloride [PVC]/latex/neoprene when there is potential for shoe/boot contact with contaminated soil or water).
- Hearing protection (if necessary or required).
- High visibility vests (when working near vehicular traffic).
- Splash shield (if necessary).
- Type III or Type V personal flotation device (PFD) (when working next to or over water and a drowning hazard exists).
- Work gloves, such as leather, cotton, or other material that provides cut/abrasion resistance (as necessary).

5.1.3 Level C Personal Protective Equipment

Level C PPE shall be worn by personnel if air monitoring action levels are exceeded, or as directed by the SSHO. Level C protection generally consists of the following PPE:

- Full-face air purifying respirator (APR) with NIOSH-approved combination high efficiency particulate air/organic vapor cartridges.
- Work clothing as prescribed by weather.
- Hard hats meeting ANSI Z89.1 specifications.
- Safety-toed work boots meeting ANSI Z41 specifications.
- Nitrile surgical gloves (inner or double layer).
- Chemical gloves (outer, as necessary).
- Disposable Tyvek® coveralls with hoods, elastic wrists, and ankles (as necessary).
- Tychem® SL coveralls with hoods, elastic wrists, and ankles (if contact with LNAPL or DNAPL is possible).
- Tychem® QC coveralls with hoods, elastic wrists, and ankles (if contact with slightly contaminated groundwater or slightly contaminated wet soil is possible).
- Chemical resistant boot covers and/or outer boots (PVC/latex/neoprene when there is potential for shoe/boot contact with contaminated soil or water).
- Hearing protection (if necessary or required).
- High visibility vests (when working near vehicular traffic).
- Splash shield (if necessary).

- Type III or Type V PFD (when working next to or over water and a drowning hazard exists).
- Work gloves, such as leather, cotton, or other material that provides cut/abrasion resistance (as necessary).

5.1.4 Level D – Modified Protection

Level D – modified PPE shall be worn by personnel for certain tasks or as directed by the SSHO. Level D – modified protection generally consists of the following PPE:

- Work clothing as prescribed by weather.
- Hard hats meeting ANSI Z89.1 specifications.
- Safety-toed work boots meeting ANSI Z41 specifications.
- Safety glasses with side shields meeting ANSI Z87.1 specifications.
- Nitrile surgical gloves (inner or double layer).
- Chemical gloves (outer, as necessary).
- Disposable Tyvek® coveralls with hoods, elastic wrists, and ankles (as necessary).
- Tychem® SL coveralls with hoods, elastic wrists, and ankles (if contact with LNAPL or DNAPL is possible).
- Tychem® QC coveralls with hoods, elastic wrists, and ankles (if contact with slightly contaminated groundwater or slightly contaminated wet soil is possible).
- Chemical resistant boot covers and/or outer boots (PVC/latex/neoprene when there is potential for shoe/boot contact with contaminated soil or water).
- Hearing protection (if necessary or required).
- High visibility vests (when working near vehicular traffic).
- Splash shield (if necessary).
- Type III or Type V PFD (when working next to or over water and a drowning hazard exists).
- Work gloves, such as leather, cotton, or other material that provides cut/abrasion resistance (as necessary).

Employees working in areas where electrical hazards are present shall be provided with, and shall use, protective equipment as required by Section 130.7 of NFPA 70 E (2004) that is

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-4

designed and constructed for the specific part of the body to be protected and for the work to be performed.

5.1.5 Level D Protection

Level D protection is the minimum level of protection that will be used for activities at the project. Level D PPE shall, at a minimum, consist of:

- Safety-toed work boots meeting ANSI Z41 specifications.
- Safety glasses with side shields meeting ANSI Z87.1 specifications.
- Hard hats meeting ANSI Z89.1 specifications.
- Hearing protection (if necessary or required).
- High visibility vests (when working near vehicular traffic).
- Type III or Type V PFD (when working next to or over water and a drowning hazard exists).
- Work gloves, such as leather, cotton, or other material that provides cut/abrasion resistance (as necessary).

5.2 Respiratory Protection

Respiratory protection equipment shall be NIOSH-approved and respirator use will conform to ANSI Z88.2 and OSHA 29 CFR 1910.134 requirements. Shaw Procedure No. HS601, "Respiratory Protection Program," details the medical qualification and training requirements, as well as the selection, use, inspection, cleaning, maintenance, storage, and fit testing of respiratory protection equipment. This procedure complies with the requirements contained within 29 CFR 1910.134.

All personnel (including visitors) using respiratory protection, shall possess a written opinion by the medical examiner of the person's ability to use the necessary respiratory protective equipment and shall have successfully passed a respirator fit test (Section 5.2.3) in accordance with Shaw Procedure No. HS601 within the last 12 months. Fit testing and any training related to respiratory protection for site personnel will be documented on the Training Acknowledgment Form (Appendix D).

5.2.1 Respirator Cartridge Change-out Schedule

The cartridge change-out schedule is largely based on the concentrations of the site contaminants. The cartridge change-out schedule shall be determined for each task by the HSM or SSHO and documented on the Job Safety Analysis. In general, workers will change

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-4

the filter cartridges when breathing resistance is noted or when workers notice any odor, irritation, or discomfort. Cartridges shall be changed at a minimum of once per day.

5.2.2 Respirator Inspection and Cleaning

Respirators shall be checked periodically by a qualified individual and inspected before each use by the wearer. All respirators and associated equipment will be decontaminated and hygienically cleaned after each use.

5.2.3 Respirator Fit Testing

Annual respirator fit tests are required of all personnel wearing negative-pressure respirators. The test will use isoamyl acetate or irritant smoke. The fit test must be for the style and size of the respirator to be used. Quantitative fit-testing is required for use of respirators in chemical environments where the respirator effective use limit exceeds 10 (exposure of 1 ppm inside the respirator for 10 ppm outside the respirator). Therefore, quantitative fit-testing is dependent on the PEL/TLV of the chemical substance involved. Quantitative fit-testing is required for potential exposure to airborne particulate levels that exceed 10 times the established PEL/TLV.

5.2.4 Facial Hair

No personnel who have facial hair, which interferes with the respirator's sealing surface, will be permitted to wear a respirator and will not be permitted to work in areas requiring respirator use.

5.2.5 Corrective Lenses

Normal eyeglasses cannot be worn under full-face respirators because the temple bars interfere with the respirator's sealing surfaces. For workers requiring corrective lenses, special spectacles designed for use with respirators will be provided.

5.2.6 Medical Certification

Only workers who have been certified by a physician as being physically capable of respirator usage will be issued a respirator. Personnel unable to pass a respiratory fit test or without medical clearance for respirator use will not be permitted to enter or work in areas on site that require respiratory protection. Employees will receive a written physicians opinion that they are fit for general hazardous waste operations as per 29 CFR 1910.120(f)(7).

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-4

5.3 Activity-Specific Levels of Protection

The required level of personal protection is specific to the activity being conducted and are outlined in Table 3. Levels of PPE are subject to change or to modification. Upgrading of PPE may occur when air monitoring action levels are exceeded or when specified by the SSHO. Levels of PPE shall not be downgraded without prior approval from the HSM.

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-4

6.0 SITE CONTROL AND WORK ZONES

The purpose of site control is to minimize chemical exposures to workers, protect the public from hazards due to site activities, and prevent vandalism. The work areas that pose chemical and physical hazards to personnel may be regarded as regulated or restricted. To prevent both exposures to unprotected personnel and migration of contamination due to tracking by personnel or equipment, work areas known to contain contamination will be clearly identified.

Shaw Environmental, Inc. will designate work zones at the project as suggested in *Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities* (NIOSH et al., 1985). Regulated work areas are divided into the following three zones:

- EZ;
- CRZ; and
- Support Zone

6.1 Exclusion Zone

The EZ is, in general, the area where chemical, physical, or other hazards occur/exist during project work. All employees are required to follow the established procedures when working in these areas. Fencing, banner tape, signs, or other appropriate means will identify the location of each EZ. An Exclusion Zone Entry log shall be maintained by the SSHO.

6.2 Contamination Reduction Zone

Personnel and equipment decontamination will be performed in the CRZ. All personnel and equipment entering or leaving an EZ will pass through the CRZ in order to prevent cross contamination and for the purpose of accountability. Personal protective equipment will be removed in the CRZ, cleaned, and properly stored or disposed of. All water generated from equipment and personal decontamination will be contained on site and disposed of in an appropriate manner.

6.3 Support Zone

The Support Zone, or clean zone, will be the area outside the EZ and CRZ and within the geographic perimeters of the site. The Support Zone is used for staging of materials, parking of vehicles, office facilities, sanitation facilities, and receipt of deliveries. Eating, drinking, and smoking will only be allowed in this area.

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-4

6.4 Project Site Security

All equipment shall be locked when project personnel are not present.

6.5 Site Entry Requirements

In order to allow an individual into regulated areas of the site (i.e., EZ and CRZ) he/she must meet the following requirements:

- Documentation of completing training requirements as described in Section 9.0 (including review of this SSHP and signing off as such).
- Documentation of completing medical surveillance requirements as described in Section 10.0.
- Respiratory fit testing, as necessary (Section 5.2.3).
- Attend the site-specific safety orientation training session (Section 9.4).
- Review the specific AHA(s) (Appendix C).
- Obtain authorization from SSHO.
- Don the appropriate PPE.
- Sign the site entry log.

6.6 Posting Site

Appropriate warning signs shall be strategically placed to give adequate warning and caution of hazards, instructions, and directions to workers and non-project personnel.

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-4

7.0 PERSONAL HYGIENE AND DECONTAMINATION

Decontamination of equipment and personnel will be performed to limit the migration of contaminants off site and between work zones. Decontamination will generally occur at the edge of an EZ. This section describes the necessary procedures for personnel and equipment decontamination. In general, everything that enters the EZ at the site shall either be decontaminated or properly discarded upon exit from the EZ. All personnel shall enter and exit an EZ through a CRZ.

7.1 Personnel Decontamination

Personnel decontamination consists of discarding disposable PPE, cleaning reusable PPE, and washing the hands and face. All personnel shall wash hand and face prior to eating, drinking, or using tobacco products.

7.1.1 Decontamination Procedures for Level D – Modified Personal Protective Equipment

In general, the personnel decontamination procedure for activities conducted in Level D – modified consists of personnel discarding disposable PPE, washing reusable PPE, then washing hands and face. In some circumstances, disposable wet napkins may be used in the field to wash hands and face until personnel have access to potable water.

7.1.2 Decontamination Procedures for Level C Personal Protective Equipment

The general decontamination sequence for activities conducted at Level C is as follows:

- Wash and rinse outer gloves and boots;
- Remove and rinse hard hat;
- Remove tape at wrist, boot, and hood interface;
- Remove outer gloves and boot covers;
- Remove APR, discard cartridges (if necessary), clean APR;
- Remove coveralls;
- Remove inner gloves; and
- Wash hands and face.

Disposable gloves and coveralls will be removed by turning inside out. Ground cloths, gloves, boot covers, coveralls, and APR cartridges will be placed into plastic trash bags and

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-4

stored at the CRZ for disposal. Respirators shall be cleaned with potable water in the field after each use and shall be washed at the end of the day using a soap and water wash followed by disinfecting. Respirators shall be inspected before each use for damage, missing parts, and proper function. Other reusable protective equipment worn by personnel performing field activities will be rinsed with potable water after each use and will be cleaned at the end of each day in the manner described by the manufacturer. Reusable PPE items will be air dried and properly stored. Air purifying respirators shall be thoroughly dried and placed in plastic bags for storage.

7.1.3 Decontamination Procedures for Level B Personal Protective Equipment

The general decontamination sequence for activities conducted at Level B is as follows:

- Remove SAR;
- Stage mask and/or harness and bottle for cleaning;
- Wash outer gloves and boots;
- Rinse outer gloves and boots;
- Remove tape at wrist, boot, and hood interface;
- Remove outer gloves and boot covers;
- Remove and rinse hard hat;
- Remove coveralls;
- Move to respirator wash area; wash mask and other respirator components;
- Remove inner surgical gloves and discard; and
- Wash hands and face.

Disposable gloves and coveralls will be removed by turning inside out. Ground cloths, gloves, coveralls, and gloves will be placed into plastic trash bags and stored at the CRZ for disposal. Respirators shall be cleaned with potable water in the field after each use and shall be washed at the end of the day using a soap and water wash followed by disinfecting and rinsing. Respirators shall be inspected before each use for damage, missing parts, and proper function. Other reusable PPE worn by personnel performing field activities will be rinsed with potable water after each use and will be cleaned at the end of each day in the manner described by the manufacturer. Reusable PPE items will be air dried and properly stored. All SAR masks shall be thoroughly dried and placed in plastic bags for storage.

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-4

7.2 Suspected Contamination

Any employee suspected of experiencing skin or clothing contact with a hazardous chemical is to remove affected clothing (as modesty permits and exposure warrants), thoroughly wash the affected area(s), and don clean clothes. Following this, he/she shall report to the SSHO.

7.3 Procedures for Equipment Decontamination

Equipment contacting contaminated soil or water will be pressure washed, dry brushed, wet-wiped, or washed with detergent and water. All wash waters will be collected for treatment or disposal, as required. Equipment decontamination will be conducted prior to removing equipment from the work area. The SSHO (or designee) will inspect all equipment leaving the site for adequacy of decontamination (visually clean unless otherwise specified).

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-4

7.4 Decontamination Equipment and Supplies

Decontamination equipment and supplies may consist of, but are not limited to, the following:

- Potable water;
- Washtubs;
- Non-phosphate detergent, such as Alconox;
- Brushes, hand sprayers;
- Pressure or steam washer;
- Paper towels;
- Plastic sheeting;
- 5-gallon buckets with lids;
- Garbage bags;
- 55-gallon drums or similar container for collection of decontamination fluids; and
- Labels or paint sticks for marking contents of containers.

7.5 Procedures for Emergency Decontamination

In the event of an accident and if immediate medical treatment is required to save a life, decontamination should be delayed until the victim is stabilized. Proceed with decontamination if it can be performed without interfering with essential life-saving techniques or first aid. If a worker has been exposed to corrosive materials such as sample preservative or battery acid, decontamination must be performed immediately. If an

emergency due to a heat related illness develops, protective clothing should be removed from the victim as soon as possible to reduce further stress.

If decontamination can be done:

- Wash, rinse, and/or remove protective clothing and equipment.

  Note: In the event that corrosive materials get in the eyes, first aid personnel should begin to administer a 15-minute eye irrigation with water while EMS personnel are responding to the incident. Similarly, if a corrosive material is on an injured employee's skin, first aid personnel should flush the material off of the skin in conjunction with other first aid procedures being administered. EMS personnel should always be summoned as quickly as possible so as not to delay professional medical treatment.

If decontamination cannot be done:

- Alert medical personnel to potential contamination and instruct them about specific decontamination procedures, if necessary.
- Provide site personnel familiar with the incident at the medical facility.

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-4

8.0 ENVIRONMENTAL AND AMBIENT AIR MONITORING PROGRAM

Environmental and ambient air monitoring shall be conducted to determine the concentrations of toxic/flammable/combustible vapors and gases, oxygen, noise levels, and meteorological conditions. Ambient air monitoring is primarily used to verify that administrative controls, engineering controls, and PPE are effectively preventing harmful exposures to project personnel. Meteorological data shall be obtained as necessary for determining if physiological monitoring should be activated. The results of monitoring shall be conveyed to project personnel.

8.1 Types of Monitoring

The following monitoring will be performed as necessary:

- Real-time air monitoring
- Time-integrated personal air sampling
- Noise surveys/noise dosimetry

Refer to Table 4, “Direct Reading Air Monitoring Requirements.”.

8.1.1 Real-Time Air Monitoring

Real-time air monitoring will be conducted during intrusive work (drilling and excavation) in areas that are known or suspected to have chemical contamination or in areas where dust is generated. This type of monitoring will also be performed for soil and waste handling, and in special circumstances such as confined space entry, hot work (permitting), or during spills. The SSHO may use the following real-time instrumentation during the project:

- Photoionization detector for volatile organic compounds monitoring.
- Oxygen meter to measure for oxygen deficient/enriched atmospheres.
- Combustible gas indicator for flammable/combustible atmospheres.
- Hydrogen sulfide meter for measuring hydrogen sulfide concentrations.
- Carbon monoxide meter when internal combustion engines are operated near confined spaces while personnel are working in those spaces and in or near other poorly ventilated areas.
- Colorimetric tubes when working in areas that may potentially contain vinyl chloride and/or benzene.

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-4

- Aerosol monitor for measuring dust concentrations from dust generating activities.
- HazmatCAD with Chemical Agent detectors for site with possible CWM

8.1.1.1 Photoionization Detector

A Photovac 2020 photoionization detector, or equivalent, shall be used to determine the concentration of volatile organic compounds in the breathing zone of personnel. Lamp strength will be determined based on the primary contaminants of concern at each remedial site. Monitoring using this instrument will be conducted in the breathing zone of personnel who are performing intrusive work or in some instances, prior to and during confined space entry, during hot work or cleanup of chemical or fuel spills.

8.1.1.2 Combustible Gas Indicator/Oxygen Meter/Hydrogen Sulfide Meter/Carbon Monoxide Meter

An MSA Model FiveStar, or equivalent, shall be used to determine the concentration of flammable gases, oxygen, hydrogen sulfide, and carbon monoxide in the breathing zone of personnel prior to and during activities that include confined space entry, hot work and or cleanup of chemicals or fuel spills.

8.1.1.3 Colorimetric Detector Tubes

Colorimetric tubes may be used to characterize acid/base exposure potentials primarily to benzene and vinyl chloride. As appropriate, the HSM will designate the use of these measurement devices. Based on the chemical of concern identified for the Holloman AFB, monitoring for vinyl chloride and benzene may be required at sites where chlorinated and fuel-related volatile organic compounds are known to exist.

The proposed type of colorimetric tubes will be the Drager Multi Glass Detector Model 21/31or Accuro. Colorimetric indicator tubes (detector tubes) that consist of a glass tube impregnated with an indicating chemical. The tube is connected to a piston or bellow pump to draw a know volume of air through the tube. Contaminant reacts with the indicator chemical in the tube, producing a change in color whose length is proportional to the contaminant concentration. The glass tube has degradations in ppm to match the length of stain. A preconditioning filter may precede the detector tube to remove interfering contaminants.

8.1.1.4 Real-Time Aerosol Monitor

Real-time aerosol monitors (MIE pDR-1000 or equivalent) shall be used to monitor dust emissions during and excavation and soil handling activities or other dust generating activities. The real-time aerosol monitors will be placed in the work area (near areas where ground personnel are working) and at the downwind site perimeter. The selected placement

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-4

of these instruments may need to be adjusted throughout the workday to compensate for changes of wind direction.

8.1.2 Real-Time Air Monitoring Action Levels

This section discusses the establishment of action levels of potential vapor and/or gas readings and dust concentrations which are measurable by real-time air monitoring instruments identified above. These action levels are presented in further detail in Table 4, "Direct Reading Air Monitoring Requirements".

Unexpected instrument readings at or above action levels generally warrant the following:

- All personnel will stop work in the area, exit the work area, and assemble upwind.
- Additional monitoring shall be performed to substantiate previous readings
- Implement engineering controls, as feasible.
- Upgrade level of PPE as specified or contact the HSM.

If previous readings are substantiated, engineering controls, such as increasing ventilation, shall be implemented to maintain air quality within specified levels or personnel shall upgrade to the specified level of protection (Table 3, "Task Protection Levels"). If engineering controls, such as increased ventilation, cannot maintain atmospheres to within acceptable qualities, then the HSM shall be contacted prior to continuing work activities.

8.1.2.1 Photoionization Detector Real-Time Action Levels

In general, site-specific volatile organic compound action levels will be established in addendums to this SSHP as the work plans are prepared. The action levels will be based on the most current data available for the media(s) of concern and will be protective of the personnel working at the sites. In the absence of a site-specific addendum for a particular location, the following action levels and response actions for volatile organic compounds will apply:

- Volatile organic chemical concentration greater than 2 ppm but less than 10 ppm sustained for one minute, in the breathing zone. Stop work and evaluate the hazard. Increase the monitoring frequency, provide engineering controls and upgrade PPE.
- Volatile organic chemicals concentration greater than 10 ppm but less than 50 ppm sustained for five seconds, in the breathing zone. Stop work, evaluate the hazard, and contact the HSM.

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-4

- Volatile organic chemicals concentration greater than 50 ppm sustained for one second, in the breathing zone. Stop work, evaluate the hazard, and contact the HSM.

8.1.2.2 Combustible Gas Indicator/Oxygen Meter/Hydrogen Sulfide Meter/Carbon Monoxide Meter

The following action levels are established for the collected air monitoring data:

- ***Combustible Gas.*** Greater than 10 percent of LEL, confirmed instantaneous reading requires personnel to evacuate work area, eliminate ignitions sources, and provide engineering controls such as increasing ventilation.
- ***Carbon Monoxide (work area).*** Sustained carbon monoxide readings exceeding 15 ppm requires personnel to evacuate work area and provide engineering controls such as increasing ventilation or re-positioning internal combustion engine exhausts downwind from work area.
- ***Hydrogen Sulfide (work area).*** Sustained hydrogen sulfide instrument readings exceeding 1 ppm requires personnel to evacuate work area and provide engineering controls such as increasing ventilation.
- ***Carbon Monoxide (work area):*** greater than 15 ppm, confirmed instantaneous reading requires personnel to evacuate work area and provide engineering controls such as increasing ventilation.

8.1.2.3 Colorimetric Detector Tubes

The following action levels are established for the collected air monitoring data:

- ***Vinyl Chloride (work area).*** Greater than 1 ppm, confirmed instantaneous reading requires personnel to evacuate work area and provide engineering controls such as increasing ventilation.
- ***Benzene (work area).*** Greater than 0.25 ppm, confirmed instantaneous reading requires personnel to evacuate work area and provide engineering controls such as increasing ventilation.

8.1.2.4 Real-Time Aerosol Monitor

The real-time aerosol monitors will be set to alarm when the instantaneous aerosol concentration reaches 1 mg/m^3. The alarm will be used to indicate that additional dust control is necessary.

The real-time aerosol monitors are capable of collecting and integrating the aerosol concentrations throughout the workday into a TWA. Aerosol monitors shall be visually

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-4

checked on an hourly basis during soil excavation, soil handling, and other dust generating activities to verify that the TWA remains below 1 mg/m^3. Aerosol monitors registering TWA aerosol concentrations at or above 2.5 mg/m^3 require that workers upgrade to Level C PPE and indicate that additional dust control measures are necessary. Failure to control workday TWA dust concentrations to below 2.5 mg/m^3 shall necessitate ceasing dust generating activities and contacting the Project Manager and HSM for implementing alternate work practices.

The full work shift time-integrated concentrations will be evaluated at the conclusion of each workday to verify aerosol concentrations are maintained below action levels.

8.1.3 Personal Air Sampling (Time-Integrated)

Time-integrated air sampling may be performed at the discretion of the HSM, if air-monitoring action levels are exceeded (Section 8.1.2). Air samples will be collected and analyzed following OSHA or NIOSH methods. An American Industrial Hygiene Association accredited laboratory shall be used to analyze all personal air samples. The analytical results shall be reported as a TWA concentration for comparison against the OSHA PEL and ACGIH TLV.

8.1.4 Noise Surveys/Noise Dosimetry

The SSHO shall conduct noise monitoring with a Sound Level Meter when it is suspected that equipment is producing noise at sound pressure levels greater than 80 decibels. Areas that are surveyed at sound pressure levels greater than 85 decibels shall be posted as a noise hazard area. Actual employee exposures for personnel working in noise hazard areas shall then be determined with a noise dosimeter. The equipment/area shall then be evaluated to determine if it is feasible to implement engineering controls.

8.2 Calibration, Handling, and Maintenance

All monitoring equipment will be maintained and calibrated by according to the manufacturer's recommendations. Care shall be given by the operator to the handling of instruments so that the accuracy and fitness for use are maintained. Calibration checks on real-time monitoring instruments shall be performed using standards, which are National Institute of Standards and Testing traceable. Calibration for all instruments will be performed and documented before and after each use. Only properly functioning instrumentation shall be used. Instrument maintenance shall be tracked on the Master List of Measuring and Test Equipment form (Appendix D).

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-4

8.3 Record Keeping

The SSHO is responsible for maintaining all air and noise monitoring records. The SSHO shall also obtain copies of air and noise monitoring records generated by subcontractors for inclusion into project files. The following records shall be maintained:

- Date, time, location, and operations performed.
- Meteorological data.
- Equipment identification, calibration data.
- Monitoring/sampling data.
- Engineering controls used to reduce exposure.
- Description of PPE worn.

Specifically, the following air and noise monitoring data and calibration records (Appendix D) shall be maintained, controlled, and retrievable at all times by the SSHO:

- Air Monitoring Data Record.
- Air Sampling Data Record.
- Colorimetric Detector Tube Log.
- Employee Notification of Industrial Hygiene Monitoring Results.
- Real Time Aerosol Monitoring Log.
- Noise Dosimeter Field Data Log.
- Noise Survey Field Data Log.
- Sound Level Meter/Noise Dosimeter Calibration Log.

These records shall be maintained in the field office files by the SSHO and stored in the permanent project files. Any Employee Notification of Industrial Hygiene Monitoring Results records for Shaw personnel will be forwarded to the Shaw HSM for inclusion in personnel files when appropriate. Any Employee Notification of Industrial Hygiene Monitoring Results records for subcontractor personnel will be forwarded to the Subcontractor Human Resources Department (or equivalent safety records personnel) for inclusion in personnel files when appropriate.

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-4

8.4 Quality Assurance/Quality Control

Monitoring instruments shall be properly maintained and calibrated before and after use. The calibration and field maintenance of monitoring instruments shall be performed against known standards and manufacturer specifications. Instruments shall be calibrated to plus or minus 5 percent against the known standards. If instruments cannot be calibrated within this tolerance or if operation becomes erratic, then the instruments shall not be used and dispatched for maintenance by qualified and authorized technicians.

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-4

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-4

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9.0 TRAINING REQUIREMENTS

This section describes general training, safety meetings, site-specific training, hazard communication, first aid and CPR, and other additional training, certification, and licenses needed to work on the project sites.

9.1 General Training

The SSHO is responsible for informing all site personnel and all visitors of the contents of this SSHP and ensuring that each person signs off on the Site Safety and Health Plan Acknowledgment Form (Appendix A). Documentation of certification of training requirements will be reviewed by the SSHO, placed in the project files, and submitted to AFCEE (as required).

9.2 Hazardous Waste Operations Training

All site personnel working in regulated areas at this project will meet the minimum training requirements as specified in 29 CFR 1926.65 and 29 CFR 1910.120. The following criteria are used to determine the level of training required:

- Personnel engaged in hazardous substance removal or other activities, which expose or potentially expose them to hazardous substances and health hazards shall receive a minimum of 40 hours of instruction off site and three days of supervised field experience.
- Personnel who perform limited activities at the site and are not potentially exposed to contaminant levels above the PEL shall receive a minimum of 24 hours of instruction off site, and one day of supervised field experience.

9.3 40-Hour Training

The following is a general list of topics covered in the 40-hour course:

- General site safety.
- Chemical, physical, and environmental hazards.
- Key management positions responsible for site safety and health.
- Safety, health, and other hazards (including noise).
- PPE.
- Work practices by which employees can minimize risks from hazards.
- Safe use of engineering controls and equipment on site.

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-4

- Medical surveillance requirements including recognition of signs and symptoms of exposure.
- Hazard communication (Worker Right-to-Know).
- Engineering controls and safe work practices.
- Components of the site Safety and Health Program.
- Decontamination practices for personnel and equipment.
- Confined space entry procedures.
- Emergency response procedures.

9.3.1 24-Hour Training

The same topics presented in the 40-hour course are reviewed in the 24-hour course but with less time and detail spent on each topic.

9.3.2 Supervisory Training

Field supervisory personnel including the SSHO will receive eight additional hours of specialized training. The following topics are discussed:

- Overall safety and health program.
- PPE program.
- Spill containment program.
- Health hazard monitoring procedures and techniques.

9.3.3 Refresher Training

Personnel covered by Sections 9.2.1 and 9.2.2 are required to complete 8 hours of refresher training annually on the following topics:

- Safe work practices.
- Chemical hazard awareness.
- Hearing conservation.
- Hazard communication.
- Respirator refresher.
- Confined space entry refresher.

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-4

9.3.4 Supervised Field Experience

Personnel covered by Section 9.2.1 will receive a minimum of 3 days actual field experience under the direct supervision of a trained, experienced supervisor. A minimum of 1 day is required for personnel who fall under the requirements of Section 9.2.2.

9.3.5 Visitor Training

Site access by personnel making deliveries or performing repairs to utilities, public or government officials, visitors, or local residents will be limited to support areas only. These persons will not be required to comply with the medical and training requirements as defined in this SSHP. Support Zone access will be limited to designated work, delivery, or observation areas to minimize any potential exposure to site contaminants. Site observation areas will be located upwind from the EZ. Weather conditions or other site activities may restrict access to these areas. Authorization for limited site access will be determined on a case-by-case basis by the SSHO in consultation with the HSM, Project Manager, the PDA, and the AFCEE. These personnel will be escorted on-site and will be strictly prohibited from entering the EZ or CRZ.

9.4 Safety Meetings

Employees shall be provided continuing safety and health training to enable them to perform their work in a safe manner.

9.4.1 Morning Safety Meetings

The SSHO shall conduct a safety meeting at the beginning of each shift. The topics discussed at this daily “tailgate” safety meeting shall include safety and health considerations for the day’s activities, pertinent aspects of JSAs, necessary PPE, problems encountered, and new operations. Attendance records and meeting notes shall be documented on the Safety Meeting/Training Log form (Appendix D) and are maintained with the project files. At the conclusion of each shift, a debriefing for site employees will be held, if necessary.

9.5 Site-Specific Training

All personnel, including subcontractors, working at the project sites and falling within the scope and application of 29 CFR 1926.65 and 29 CFR 1910.120 shall attend a site-specific orientation covering the following topics:

- Purpose and review of this SSHP including emergency response procedures as outlined in Section 11.0.
- The pertinent provisions for safety and health contained in *Safety and Health Requirements Manual EM 385-1-1* (USACE, 2008).

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-4

- Review of applicable AHAs (Appendix C).
- MEC awareness as appropriate.
- Names of personnel responsible for site safety.
- The provisions for medical care and facilities and the names of CPR and first aid trained personnel assigned to the project.
- Morning safety and preparatory meeting procedures.
- Safety and health hazards on site and the means to control/eliminate those hazards.
- Responsibilities for accident prevention and maintaining safe and healthful work environments.
- Stop Work authority.
- Procedures for reporting and correcting unsafe conditions or practices.
- Responsibilities for reporting all accidents and illnesses.
- PPE (use and care).
- Location of safety equipment (i.e., fire extinguishers, first aid kits, eyewash stations, etc.).
- Standard operating procedures, safety rules, and safe work practices for the project.
- Work zones and site control measures.
- Hazard Communication Program (includes discussion of MSDSs on site).
- Lead or asbestos awareness training (as appropriate).
- Hot work procedures.
- Lockout/tagout procedures.
- Fall protection.
- Fire prevention.
- Housekeeping.

The content of the training will be derived from information contained within this SSHP.

9.6 Hazard Communication

All personnel performing field activities involving hazardous operational chemicals shall receive basic hazard communication training, which involves a review of the Shaw written

hazard communication program, MSDSs, container labeling, chemical health hazards, and chemical hazard control procedures. Personnel shall be notified of the hazards of chemical contamination on site (if present) by a review of Section 4.1 of this SSHP. Material Safety Data Sheets for additional materials brought on site shall be reviewed with personnel prior to the use.

9.7 First Aid and Cardiopulmonary Resuscitation

There shall be at least two persons trained and certified in both American Red Cross first aid techniques and CPR on site whenever there are two or more employees working at the project. Those Shaw employees who are trained in first aid techniques and CPR will meet both the training and vaccination requirements of Shaw Procedure No. HS512, "Handling of Blood or Other Potentially Infectious Material."

9.8 Additional Training, Certification, and Licenses

In addition to the training, certification, and licensing previously detailed, the following shall also be required:

- All personnel operating motor vehicles shall hold a valid operator's license.
- All crane operators shall be designated as qualified meeting the specifications in the *Safety and Health Requirements Manual EM 385-1-1* (USACE, 2008). Qualification is to be renewed every 3 years.
- Personnel operating powered industrial trucks (forklifts) shall have a certificate designating them as a qualified operator.
- Any employee operating a power-actuated tool shall be qualified as an operator of that tool as specified by the manufacturer. Recertification, if any, shall be obtained as specified by the manufacturer.
- Confined space entry, attendant, and supervisory personnel shall be trained and certified as specified in 29 CFR 1910.146. Confined space rescue personnel shall be trained and certified as specified in 29 CFR 1910.146 and shall practice rescues (from similar types of confined spaces) on an annual basis.
- The certification and recertification requirements for first aid (3 years) and CPR (1 year) are applicable. First aid and CPR training/certification must be made by a reputable provider.
- Personnel working from ladders shall be initially trained as specified in Shaw Procedure No. HS302, "Portable Ladder Safety".

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-4

- Personnel inspecting cranes shall have a certificate designating them as a competent person.
- Personnel inspecting excavations shall have a certificate designating them as a competent person.
- Personnel supervising scaffold erection shall have a certificate designating them as a competent person.
- Personnel operating arc-welding equipment shall have a certificate designating them as a qualified operator.
- Personnel operating gas welding and cutting equipment shall have a certificate designating them as a qualified operator.
- Personnel may only use portable fire extinguishers to extinguish small fires, if the employee has been trained and the employee is confident that the small fire can be safely extinguished.

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-4

10.0 MEDICAL SURVEILLANCE

Shaw utilizes the services of an Occupational Medicine physician for the medical surveillance requirements of all projects. Dr. William Nassetta (below) reviews all Shaw medical examinations and is available for medical consultation on an "as needed" basis.

Dr. William Nassetta, MD, MPH
CORE Health Networks
12091 Bricksome Avenue
Suite B
Baton Rouge, Louisiana 70816
1-(877) EHS-SHAW (1-877-347-7429)
(225) 614-9561 (office)
(225) 295-4846 (fax)

Subcontractors should also utilize the services of an occupational medicine physician of their choice to meet any medical surveillance requirements.

10.1 Medical Examination

As required by Shaw Procedure No. HS100, "Medical Policies and Procedures," all personnel on site with the potential for exposure to contamination will have successfully completed a pre-placement or periodic/updated physical examination, as required by OSHA regulations.

10.1.1 Pre-Placement Examination

On-site personnel with the potential for exposure to contamination shall undergo a pre-placement examination that complies with 29 CFR 1926.65, 29 CFR 1910.120, and *Safety and Health Requirements Manual EM 385-1-1* (USACE, 2008) requirements for hazardous waste site operations and hazardous, toxic, and radioactive waste activities. Specifically, the following on-site personnel shall be required to participate in this medical surveillance program:

- All employees who are or may be exposed to hazardous substances or health hazards at or above the established PEL, above the published exposure levels for these substances, without regard to the use of respirators, for 30 days or more than a year.
- All employees who wear a respirator for 30 days or more a year or as required by 29 CFR 1910.134.

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-4

- All employees who are injured, become ill, or develop signs or symptoms due to possible overexposure involving hazardous substances or health hazards from an emergency response or hazardous waste operation.
- Members of HAZMAT teams.

Pre-placement medical examinations consist of the following:

- Medical and occupational history questionnaire, which includes information on past gastrointestinal, hematological, renal, cardiovascular, reproductive, immunological, and neurological problems.
- Physical examination.
- Chest X-ray (no more frequently than every 4 years).
- Blood pressure.
- Complete blood count and differential to include hemoglobin and hematocrit determinations, red cell indices, and smear of peripheral morphology.
- Blood urea nitrogen and serum creatinine.
- Sequential Multiple Analyzer Computer Profile (SMAC 24).
- Pulmonary function test.
- Audiogram.
- Electrocardiogram for employees over 35 years old or when other complications indicate the necessity.
- Stress test (as directed by the occupational physician based on electrocardiogram/pulmonary function testing).
- Visual acuity.
- Urinalysis, as necessary, for metals.

The medical surveillance provided to the employee includes a written opinion by the medical examiner of the employee's ability to use the necessary respiratory protective equipment. Any employee found to have a medical condition, which could directly or indirectly be aggravated by exposure to any chemical substance present, or by the use of respiratory equipment will not be employed for the project. A copy of the medical examination shall be provided at the employee's request.

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-4

The employee will be informed of any medical conditions that would result in work restriction or that would prevent them from working at hazardous waste sites.

10.1.2 Annual Exam

Site personnel may be required to receive an annual, updated exam meeting the requirements of 29 CFR 1926.65 and 29 CFR 1910.120. The results of these exams are compared to previous results and the baseline physical to determine if any medical effects due to exposure have occurred. Appropriate actions shall be taken as recommended by the physician should the results indicate an exposure; otherwise, employees are cleared for continued work.

In general, an annual exam is required when the employee meets at least one of the following criteria:

- All employees who are or may be exposed to hazardous substances or health hazards at or above the established PEL, above the published exposure levels for these substances, without regard to the use of respirators, for 30 days or more than a year.
- All employees who wear a respirator for 30 days or more than a year or as required by 29 CFR 1910.134.
- All employees who are injured, become ill or develop signs or symptoms due to possible overexposure involving hazardous substances or health hazards from an emergency response or hazardous waste operation.
- Members of HAZMAT teams.

When an annual examination is required, the frequency shall be at least once every 12 months unless the attending physician believes a longer interval (not greater than biennially) is appropriate.

10.1.3 Exit Exam

Shaw offers exit physical exams (optional) for all employees involved in the medical surveillance program who are leaving the company for any reason.

10.1.4 Other Exams

Periodically, the need arises to conduct medical examinations at times other than those previously discussed. These include reassignment in accordance with 29 CFR 1910.120 (f)(3)(i)(C) and 29 CFR 1926.65 (f)(3)(i)(C), if an employee develops signs or symptoms of illnesses relating to work place exposure, if the physician determines examinations needing to be conducted more often than once a year, and whenever an employee sustains a lost time injury or develops a lost time illness.

10.1.5 Hearing Conservation Program

Personnel, including subcontractors, shall participate in a continuing, effective hearing conservation program, as described in 29 CFR 1910.95 (c), whenever employee noise exposures equal or exceed an 8-hour TWA sound level of 85 decibels measured on the A scale (slow response) or, equivalently, a dose of 50 percent.

10.2 Subcontractor Requirements

Subcontractors shall certify that their employees have successfully completed a physical examination by a qualified physician on the Training Acknowledgment Form (Appendix D), when applicable. The physical examinations shall meet the requirements of 29 CFR 1926.65 and 29 CFR 1926.103. The subcontractor requirements for physical examination are the same as for Shaw employees (Section 10.1).

10.3 Medical Records

Medical and personal exposure monitoring records will be maintained according to the requirements of 29 CFR 1926.65 and 29 CFR 1910.120 and will be kept for a minimum of 30 years. The confidentiality of employee medical records shall be maintained. The written medical opinion from the occupational physician is kept in site files.

10.4 Medical Restrictions

When a medical care provider identifies a need to restrict work activity, the employee's home office will communicate the restriction to the employee SSHO and HSM. The terms of the restriction will be discussed with the employee and the SSHO. Every attempt will be made to keep the employee working, while not violating the terms of the medical restriction.

10.5 Drug and Alcohol Testing

Shaw is firmly committed to providing employees a safe and healthful workplace, and to providing clients and the public safe and efficient services. Employee involvement with the use, possession, or sale of alcohol, illegal drugs, or any substance represented as a controlled substance creates an impediment toward meeting these commitments and is prohibited.

At no time while on duty may employees use or be under the influence of alcohol, narcotics, intoxicants, or similar mind-altering substances. Employees found under the influence of or consuming such substances will be immediately removed from the job site, as specified in the *Safety and Health Requirements Manual EM 385-1-1* (Section 01.C.02) (USACE, 2008).

All employees of Shaw and its subcontractors are subject to drug and alcohol testing as described in Shaw Procedure No. HS101, "Drug and Alcohol Testing."

11.0 EMERGENCY RESPONSE PLAN AND CONTINGENCY PROCEDURES

An emergency is defined as a sudden, generally unexpected occurrence demanding immediate action. Emergencies at project sites include accidents, injuries requiring medical care, fires, explosions, spills and significant releases of hazardous substances to the environment, and extreme weather events. Upon mobilization to the project, the Construction Manager shall provide a means for effective emergency communications (landline telephone, cellular phone) prior to commencing site activities.

In the event that an emergency arises, the appropriate immediate response must be taken by the first person to recognize the situation. The field crew shall immediately notify the Construction Manager or SSHO of the incident, and the appropriate emergency service organization shall be contacted. A list of emergency contacts is provided in Table 5. A copy of the emergency telephone numbers and directions to the nearest selected CORE Health Networks network clinic and hospital shall be posted at the project site.

The Project Manager, HSM, and the COR shall be notified of any accident, injury, or illness.

In the case of injury or illness, a trained person will render the proper emergency first aid care. First aid equipment shall be available at the area of fieldwork. Personnel will be notified as to the locations of first aid equipment during the initial safety briefing session.

If the injury or illness is from exposure to a hazardous substance, the MSDS shall be provided to the medical personnel. Material Safety Data Sheets are provided for operational chemicals. The MSDS details first aid procedures to follow in the event an exposure occurs.

Unless the emergency event is extreme and obvious, the decision to cease all field activities and evacuate the site shall be made by the Construction Manager or SSHO. Field personnel will report to the pre-designated area, if possible.

11.1 Personnel Roles/Lines of Authority

The responsibilities of specific project individuals and the coordination of emergency service personnel are defined in the following subsections.

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-4

11.1.1 Construction Manager

At all times during scheduled work activities, a Construction Manager or SSHO will be present on site. This individual will be responsible for implementing these procedures and determining appropriate response actions. Specific responsibilities for the Construction Manager include the following:

- Evaluating and assessing emergency incidents or situations.
- Coordinating response activities on site.
- Informing field personnel of the potential hazards associated with the site.
- Summoning emergency response personnel.
- Notifying the Project Manager and HSM of an emergency situation.
- Verifying that all emergency equipment is routinely inspected and functional.
- Informing the appropriate emergency response agencies of the provisions made herein.
- Evaluating the safety of site personnel in the event of an emergency and providing evacuation coordination if necessary.

The Construction Manager or SSHO will direct all emergency response activities conducted or managed by Shaw.

11.2 List of Emergency Contacts and Notification

Emergency and non-emergency numbers are listed in Table 5. The Holloman AFB Fire Department shall be contacted prior to initiating site activities. They shall be frequently advised and notified about upcoming site activities and potential emergencies. This shall be done to ascertain response capabilities and to obtain a response commitment.

The Construction Manager and SSHO will be notified immediately in the event of an emergency. The Construction Manager or SSHO will immediately evaluate the incident and, if necessary, notify emergency response personnel. If not previously notified, the COR will be advised of the situation. Telephone numbers for emergency contact personnel are listed in Table 5 of this SSHP. The list will be maintained with current contacts and telephone numbers, and provided in all project vehicles.

The information provided to the emergency contact should include the nature of the incident and the exact location. Specifically, the information should include the following:

- Name and telephone number of the individual reporting the incident.
- Location and type of incident.
- Nature of the incident.
- Number and nature of medical injuries.
- Potential for additional risks or dangers.
- Potential off-site risks or dangers.
- Movement or direction of spill/vapor/smoke.
- Response actions currently in progress.
- Estimate of quantity of any released materials.
- Status of incident.
- Other pertinent information.

When reporting spills only (Holloman AFB Fire Department), the following information is to be provided:

- Name and telephone number of person making notification.
- Exact location, cause and time of spill or emergency.
- Type and description of emergency.
- Estimate of amount and type of material spilled.
- Extent of actual or potential environmental damage.
- Injuries or property damage, if any.
- Possible hazards to off-post human health and environment.
- Immediate response actions taken.

11.3 Medical Emergency Response

Minor injuries will be treated on site by qualified first aid/CPR providers. Injuries and illnesses that do not require immediate medical care shall be treated at the selected medical care facilities. The EMS shall be summoned in the event of moderate to severe physical injury, which requires immediate emergency care. In all cases, the Construction Manager or

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-4

SSHO shall accompany the injured worker to the appropriate medical care facility. Figure 2 indicates the location of the nearest hospital. Figure 3 indicates the location of the nearest CORE Health Networks network clinic. The route to the selected CORE Health Networks network clinic and the hospital shall be available in all project vehicles.

11.4 Personal Exposure or Injury

The following procedures will be implemented in the event of a personal injury (other than first aid only).

11.4.1 Serious Injuries Requiring Transport by Ambulance

The Construction Manager or SSHO will provide any necessary support to emergency responders.

Upon the realization that an individual(s) needs medical care with transport by ambulance, the following procedure will be used when applicable:

- Administer first aid and contact the Construction Manager or SSHO to arrange for dispatch of the EMS.
- Notify the HSM.
- Provide an individual to meet the EMS at the project site entrance, to minimize time in locating the injured worker(s).
- Wait for emergency care, document the event, and maintain communication with the Construction Manager or SSHO.

In the event of a chemical exposure, the following procedures shall be followed after summoning the EMS:

- **Skin Contact:**
  - Flush with water
  - Remove clothing, flush skin
  - Obtain prompt medical attention, as necessary
- **Inhalation:**
  - Remove the person from the area
  - Administer first aid/CPR, as needed
  - Obtain immediate medical attention

- **Ingestion:**
  - Contact the Poison Center for immediate treatment, then obtain immediate medical attention
  - Inducing vomiting may cause further injury to the victim; follow instructions from the MSDS and/or Poison Center
- **Eye Contact:**
  - Flush eyes immediately with water for a minimum of 15 minutes
  - Obtain immediate medical attention

11.5 Fire Control

In the event of a fire or explosion at the site, the following actions shall be implemented:

- Evacuate all personnel to a safe location upwind or crosswind of the incident. Contact the Construction Manager or SSHO.
- Concurrently with the above, contact the Holloman AFB Fire Department.
- If personnel are present who have had training in the use of fire extinguishers, use available fire extinguishers to extinguish small fires, if the fire can be safely extinguished.
- Alert EMS about the possibility of fire victims, as appropriate.
- Document the incident in the field logbook and follow the procedures for incident reporting in Section 13.4.

11.6 Spill Prevention and Control

This spill prevention and control section sets forth the procedures for the coordination of and response to potential spills/discharges of hazardous materials or wastes.

11.6.1 Preemptive Measures

The following measures shall be taken to minimize the possibility of spills/discharges:

- Site controls are to be maintained so that only authorized personnel have access to work areas.
- Site personnel will be advised of appropriate spill/discharge control measures.

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-4

- Appropriate secondary containment structures will be used for storage of hazardous materials and wastes on site.
- Storage containment shall be examined daily.

11.6.2 Spill Response

If a hazardous material or waste release is observed at the site, the Construction Manager or SSHO will be immediately notified. The Holloman AFB Fire Department shall then be notified by the Construction Manager or SSHO. An assessment will be made of the magnitude and potential impact of the release. If it is safe to do so, trained site personnel will attempt to locate the source of the release, prevent further release, and contain the spilled and/or affected materials as follows:

- The spill or release area will be approached from upwind.
- Hazards will be identified based on available information from witnesses or material identification documents. The potential hazards will be evaluated to determine the proper personal protection levels, methods, and equipment necessary for response.
- Eliminate possible ignition sources for flammable material spills (e.g., turn power off, no smoking).
- As necessary, the release area will be evacuated, isolated, and secured.
- Eliminate routes to water by closing/blocking floor drains and storm drains.
- Work zones, including a decontamination station, shall be set up.
- If possible, spill containment will initially be made without entering the immediate hazard area.
- Entry to the release area will be made by personnel with the PPE, training, methods, and equipment necessary to perform the work. Hazardous spill containment and collection will be performed as follows:
    a. Contain the spill with absorbent socks, booms, granules, or construction of temporary dikes.
    b. Control the spill at the source by closing valves, plugging leaks, up righting containers, over packing containers, or transferring contents of a leaking container.
    c. Collect the spilled material with shovels, pumps, or heavy equipment as necessary.

d. Contaminated soil or gravel shall be cleaned up as directed by AFCEE. If the determination is made to drum the contaminated media, the spill will be dug out until no further contamination is visible and placed in 55-gallon open head steel drums. The drum then must be marked for proper disposal.

- The decontamination procedures established in Section 7.0 shall be used after the response is complete. Refer to Section 7.5 for information on procedures for emergency decontamination.

If site personnel cannot safely respond to an environmental release, evacuation of the area may be warranted. Upon their arrival at the site, the Construction Manager or SSHO will brief emergency responders of the status and any potential hazards.

11.7 Munitions and Explosives of Concern Discovery

In the event known or suspected MEC is encountered, the following procedures shall be implemented:

- Workers shall flag visibly, for example, up in a tree, next to where the MEC find is located by means of a rag or surveyors flagging. This will enable a MEC Specialist to locate the ordnance/explosive find later.
- Evacuate all personnel to a safe location upwind of the MEC. Contact the Construction Manager or SSHO.
- Secure area against trespassers.
- The Construction Manager or SSHO will notify the Project Manager and HSM.
- The Project Manager will notify the COR to determine the appropriate course of action.
- The work area will remain evacuated until clearance has been given from the Project Manager and COR.

11.8 Site Evacuation Procedures

Voice, radio, or cellular telephone communication may be used to alert site workers and provide special instructions on site evacuation. Personnel shall evacuate to a designated safe, upwind location and perform a “head count.” The Construction Manager or SSHO is to remain in frequent contact for proper execution of the evacuation procedures.

Situations requiring evacuation may include unusually severe weather conditions or fires. In the event of project evacuation, other than weather related, the Holloman AFB Fire Department will be notified immediately. A site emergency map that delineates evacuation

routes, emergency air horn locations, first aid kit locations, and rally point(s) shall be included in each site-specific addendum once the or SSHO has physically evaluated the site.

11.9 Adverse Weather Conditions

Personnel should be aware of the possibility for the occurrence of severe weather such as lightning, thunderstorms, high winds, or winter storms/blizzards. Necessary precautions or response, directed by the Construction Manager or SSHO, will be taken in the event of severe weather. Personnel may be advised to leave the project site and take refuge at home or a motel when high winds, heavy rain, or snowstorms are predicted and imminent. Outdoor operations will be suspended when the potential for lightning occurs.

Local weather broadcasts will be monitored by the Construction Manager or SSHO, when the likelihood for severe weather exists. Generally, cellular telephone communication will be utilized to alert crews to threatening weather. A severe weather shelter shall be identified and the location communicated with the crew(s) upon project mobilization.

11.9.1 Tornado Safety

In the event of a tornado, personnel should take cover in a basement, ditch, culvert, or interior room of a strong building. Personnel shall identify the nearest tornado shelter at each active remote work location prior to beginning operations. When a tornado has been sighted, go to your shelter immediately. Stay away from windows, doors, and outside walls.

- In a small building, go to the basement or storm cellar. If there is no basement, go to an interior room on the lower level (bathrooms, closets, interior hallways).
- Interior hallways on the lowest floor are usually safest. Stay away from open spaces and windows.
- Get under a piece of sturdy furniture such as a workbench or heavy table or desk and hold on to it.
- Use arms to protect head and neck.
- If in a trailer or vehicle, get out immediately and go to a more substantial structure.
- If there is no shelter nearby, lie flat in the nearest ditch, ravine, or culvert with your hands shielding your head.
- If in a car, get out and take shelter in a nearby building. Do not attempt to out-drive a tornado since they are erratic and move swiftly.
- Personnel should be aware that ditches and culverts may fill up with water quickly and should only use these as shelters as a last resort.

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-4

11.9.2 Lightning Safety

Outdoor activities will be suspended when the potential for lightning occurs. The following measures, offered by the National Lightning Safety Institute of Louisville, Colorado shall be taken to minimize the possibility of injury to personnel by lightning:

- The Construction Manager or SSHO is responsible to monitor weather conditions.
- Upon seeing lightning or hearing thunder, outdoor activities shall be suspended and personnel shall be evacuated to safe areas (i.e., inside vehicles or buildings). When clouds with dark bases and wind speeds pick up, anticipate thunderstorms. Those who have been struck by lightning did not seek cover in a timely fashion.
- The Construction Manager or SSHO will continue to monitor weather conditions.
- Outdoor activities may resume 30-minutes after the last bolt of lightning was observed and the last clap of thunder was heard.

People who have been struck by lightning do not carry an electrical charge and are safe to handle. Apply first aid immediately, if you are qualified to do so. Get emergency help promptly.

SAFE AREAS INCLUDE:

- Fully enclosed metal-topped vehicles with windows up.
- Substantial and permanent buildings.

UNSAFE AREAS INCLUDE:

- Small structures including huts and rain shelters.
- Nearby metallic objects like fences, gates, instrumentation and electrical equipment, wires, and power poles.

The following shall be avoided when lightning is in the area:

- Trees.
- Water.
- Open fields.
- Using hard-wired telephones and headsets.

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-4

If hopelessly isolated from shelter during close-in lightning, adopt a low crouching position with feet together (up on toes, if possible) and hands on ears. If hair stands on end or rises on back of neck, a lightning strike is imminent.

Remember the warning phrase from the National Lightning Safety Institute: "If you can see it (lightning), flee it; if you can hear it (thunder), clear it."

11.10 Emergency Equipment

At a minimum, the following emergency equipment shall be maintained at the project site(s):

- Fire extinguishers.
- First aid kits.
- Blood-borne pathogen control supplies or kit.
- Emergency eyewash, if corrosive materials are being used.
- Spill control.
- Communication devices.

This equipment is to be inspected by the SSHO on a monthly basis to verify that they are in good condition, ready to use, and easily accessible. Note: a seal may be maintained on first aid kits to indicate if the kit has been accessed within the preceding week. The weekly inspection of the first aid kit will only be necessary if the seal has been broken.

11.11 Critique and Follow-up of Emergency Procedures

The COR shall be verbally notified immediately and receive a written notification within 24 hours of all accidents or incidents including releases, fires, or explosions. The report shall include the following items:

- Name, organization, telephone number, and location of the contractor.
- Name and title of the person(s) reporting.
- Date and time of accident/incident.
- Location of accident/incident.
- Brief summary of accident/incident including pertinent details, such as, type of operation ongoing at time of accident.
- Cause of accident/incident, if known.
- Casualties.

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-4

- Details of any contamination.
- Estimated property damage, if applicable.
- Nature of damage, effect on contract schedule.
- Action taken by Shaw to maximize safety and security.
- Other damage or injuries sustained (public or private).

The Construction Manager and/or SSHO will investigate the cause of the incident to prevent its re-occurrence. The investigation should begin as soon as practical after the incident is under control but not later than the first workday after the incident. Investigations will follow the procedures described below:

- Interview witnesses and participants as soon as possible or practical.
- Determine the chronological sequence of events (opinions as to cause should not be solicited at this time).
- Note any movement, sounds, noises, or other sensory perceptions experienced by the participants or witnesses.
- Obtain weather data.
- Ascertain the location and position of all switches, controls, etc.
- Verify the condition of all safeguards.
- Determine if a revision to emergency procedures is warranted.

After the facts have been collected, causal factors should be identified and controlled/eliminated.

11.12 Hospital Information

The nearest local hospital for the project is:

Gerald Champion Regional Medical Center
2669 Scenic Dr # 105A
Alamogordo, NM 88310
(575) 439-6100

The distance to the hospital is approximately 14.6 miles from the Holloman AFB, with a travel time of approximately 22 minutes. The route map to the hospital is depicted in Figure 2.

11.13 Medical Services Clinic Information

The CORE Health Networks network clinic for the project is:

Concentra Medical Center
2170 East Lohman Ave., Suite A, B, C
Las Cruces, NM 88001
(575) 524-8888

The distance to the clinic is approximately 59.8 miles from Holloman AFB, with a travel time of approximately 59 minutes. The route map to the clinic is depicted in Figure 3

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-4

12.0 BLOOD-BORNE PATHOGEN EXPOSURE CONTROL PLAN

Blood-borne pathogens are microorganisms (i.e., bacteria, virus) sometimes present in blood and certain body fluids, which are capable of causing human disease or death. These pathogens can also be present on objects and surfaces that have had contact with infected blood or certain body fluids. Blood-borne pathogens are also capable of causing human disease or death to unprotected people who are exposed to infected blood or body fluids. Diseases caused by blood-borne pathogens include, but are not limited to, hepatitis A, hepatitis B, hepatitis C, malaria, acquired immunodeficiency syndrome (AIDS), and other sexually transmitted diseases. The most significant of these and of greatest concern are hepatitis B and AIDS.

Hepatitis B is a serious disease caused by the hepatitis B virus (HBV), which attacks the liver. The virus can cause lifelong infection, cirrhosis (scarring) of the liver, liver cancer, liver failure, and death. Exposure symptoms include fever, fatigue, nausea, vomiting, muscle aches, loss of appetite, and jaundice (yellowing of the eyes or skin). Hepatitis diagnosis is difficult because some symptoms are similar to the flu and may remain mild for an extended period. The HBV can remain infectious for up to 10 days, even in dried blood. Hepatitis B vaccine is available for all age groups to prevent HBV infection.

Human immunodeficiency virus (HIV) is the virus that causes AIDS. People with HIV have what is called HIV infection. Some of these people will develop AIDS because of their HIV infection. Humans may be infected with HIV for many years without experiencing any symptoms. Upon development of AIDS, symptoms may include weight loss, skin lesions, dry cough, fever, fatigue, diarrhea, swelling of the lymph glands, and death. Presently, no cure exists for HIV or AIDS, and no vaccination is currently available.

A hazard exists for blood and other bodily fluids to be infected with dangerous, infectious pathogens. Employees could become infected if they are exposed to these blood-borne pathogens.

The purpose of this Blood-borne Pathogen Exposure Control Plan is to provide the information, procedures, and requirements necessary to prevent employee exposure to blood-borne pathogens.

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-4

12.1 Regulatory, Requirement, and Policy Compliance

This Blood-borne Pathogen Exposure Control Plan has been prepared in compliance with:

- 29 CFR 1910.1030, Blood-borne Pathogens.
- *Safety and Health Requirements Manual EM 385-1-1,* Section A.03.06 (USACE, 2008).
- Shaw Procedure No. HS512, "Handling of Blood or other Infectious Material".

12.2 Exposure Determination

The OSHA requires employers to perform an exposure determination, identifying employees who may incur occupational exposure to blood or other potentially infectious materials. The exposure determination is made without regard to the use of PPE. For exposure determination purposes, employees are considered to be exposed, even if they wear PPE.

In general, it is anticipated that project activities will not present a high risk of employee exposure to blood or other body fluids. An exception to this would be under circumstances when personnel administer first aid care or CPR to injured workers and when personnel clean-up areas and equipment that may have been exposed to blood because of the incident. In these cases, there is reasonable potential for employee skin, eye, mucous membrane, or potential contact with blood or other bodily fluids.

The OSHA requires a listing of job classifications with identification of tasks performed in which some employees may have potential for occupational exposure. This requirement is for employees to clearly understand the tasks that they may perform have a potential for occupational exposure to infectious materials. The job classifications and associated tasks with an exposure potential are as follows:

- Construction Manager—Administer first aid or CPR; decontaminate or disinfect surfaces and articles that have contacted infectious materials, and prepare biohazard waste for temporary storage and subsequent disposal.
- Site Safety and Health Officer—Administer first aid or CPR; decontaminate or disinfect surfaces and articles that have contacted infectious materials, and prepare biohazard waste for temporary storage and subsequent disposal.

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-4

- Subcontractor Supervisors—Administer first aid or CPR; decontaminate or disinfect surfaces and articles that have contacted infectious materials, and prepare biohazard waste for temporary storage and subsequent disposal.
- Laborer—Administer first aid or CPR; decontaminate or disinfect surfaces and articles that have contacted infectious materials, and prepare biohazard waste for temporary storage and subsequent disposal.

These employees have potential for exposure to blood-borne pathogens when administering first aid or CPR and when performing post-accident clean-up operations due to the following:

- Contact or absorption of blood or blood-contaminated objects through open or broken skin (i.e., cuts, scratches, and rashes).
- Blood splashes to their eyes, nose, or mouth, or other mucous membranes.
- Punctures through the skin with a contaminated sharp object (i.e., scissors).

Workers can reduce their risk of contacting blood-borne pathogens by implementing the recommended work practices (outlined in this plan) before, during, and after responding to emergency medical incidents primarily involving personal injuries.

12.3 Schedule of Implementation

The procedures in this Blood-borne Pathogen Exposure Control Plan are to be implemented immediately.

Implementation includes:

- Verifying personnel who are available to voluntarily provide first aid care and CPR hold a valid training certificate from a reputable training provider (American Red Cross or American Heart Association).

  The Construction Manager or SSHO is responsible for verifying that an appropriate number of personnel have been trained in and hold valid certification to perform first aid and CPR.

- Verifying that personnel voluntarily providing first aid care, CPR, post-accident clean-up operations, and biohazard waste handling have received the specialized training meeting the requirements of 29 CFR 1910.1030; *Safety and Health Requirements Manual EM 385-1-1*, Section A.03.06 (USACE, 2008); and Shaw Procedure No. HS512, “Handling of Blood or other Infectious Material”. This

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-4

training is required for applicable personnel prior to the commencement of work and at least annually thereafter. This training shall cover the following elements:

- Copy of 29 CFR 1910.1030 and this procedure including an explanation of the contents.
- General explanation of the epidemiology and symptoms of blood-borne diseases.
- Explanation of the modes of transmission of blood-borne pathogens.
- Explanation of the appropriate methods for recognizing tasks and other activities that may involve exposure to blood and other potentially infectious materials.
- Explanation of the use and limitations of practices that will prevent or reduce exposure including appropriate engineering controls, work practices, and PPE.
- Information of the types, proper use, location, removal, handling, decontamination, and/or disposal of PPE.
- Explanation of the basis for selection of PPE.
- Information on the hepatitis B vaccine, including information on its efficacy, safety, and the benefits of being vaccinated.
- Information on the appropriate actions to take and persons to contact in an emergency
- Explanation of the procedure to follow if an exposure incident occurs including the method of reporting the incident and the medical follow-up that will be made available
- Information on the medical counseling that is provided for exposed individuals
- Explanation of required signs and labels

The Construction Manager or SSHO is responsible for verifying that this blood-borne pathogen training has occurred.

- Verifying that engineering controls are readily available at the project for use in an emergency. Engineering controls for this project include the following:
  - Red-bags for temporary storage of contaminated PPE and cleaning materials.
  - Appropriately labeled, 30-gallon hard-plastic container for the temporary storage of red-bagged waste.

- Whisk-broom and dust pan for cleaning up contaminated broken glass.
- Gallon container of Clorox® household bleach.
- Large utility sponge.
- Rolls of paper towels.
- Container of liquid disinfectant hand soap.
- "Biohazard" warning labels.
- Individually packaged disinfectant towelettes.
- CPR barriers.

The Construction Manager or SSHO is responsible for verifying that this inventory of engineering controls is readily available at the project site for emergency use.

Personal protective equipment is necessary to prevent employee exposures to infectious materials. The necessary PPE, which shall be maintained separately for use in an emergency include the following:

- P-100 Particulate filtering face-piece respirator (3-M 8293 or equivalent).
- Face-shields with ratcheting head-suspension.
- Safety glasses with clear lens.
- Disposable nitrile examination gloves.
- PVC Monkey Grip work gloves.
- Poly-coated or Saran-coated disposable Tyvek® coveralls with attached hood.
- Vinyl or latex disposable boot covers.
- Fluid-resistant surgical hoods.

The Construction Manager or SSHO is responsible for verifying that the above inventory of PPE is readily available at the project site for emergency use.

12.4 Work Practice Controls

Work practice controls reduce the likelihood of exposure by altering the manner in which a task is performed. The work practice controls outlined in this section are applicable to the administration of first aid and the subsequent clean-up operations.

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-4

Work practice controls shall be instituted whenever there is potential for employee contact with blood and bodily fluid. Situational examples where these controls are to be implemented include, but are not limited to:

- The voluntary administration of first aid care, such as application of bandages to minor or major cuts and abrasions of another person. This care may allow for contact with sores, wounds, broken skin, blood, or other bodily fluids.
- The voluntary administration of first aid care, such as providing CPR.
- Clean-up activities involving handling soiled articles (e.g., gauze, bandages, compresses, etc.) and the decontamination or disinfecting of surfaces and articles that have contacted potentially infectious materials, such as blood or other bodily fluids.
- Prepare biohazard waste for temporary storage and subsequent disposal.

Based upon professional judgment, an employee may choose to temporarily forego the use of PPE if the employee determines that the use of the PPE will further jeopardize his well-being or that of the injured worker. This limited application must be carefully evaluated and considered by the employee. If this situation does occur, Shaw will investigate and document the circumstances in an effort to provide alternative means to avoid further occurrence.

The following are specific work practice controls that shall be implemented in the above noted situations or whenever an employee determines that the implementation of these work practices is prudent or necessary:

- The appropriate PPE shall be donned prior to engaging in any activities that have the potential for employee contact with potentially infectious materials, such as blood or other bodily fluids.
- Hands and face will be washed as soon as possible after engaging in any activities that have the potential for employee contact with potentially infectious materials, such as blood or other bodily fluids. If wash facilities are not readily available, individually packaged disinfectant towelettes may be used in the interim.
- Eating, drinking, or smoking is not allowed in any work area where a potential exists for occupational exposure to blood-borne pathogens.
- Open wounds or cuts shall be promptly bandaged.
- Work surfaces and areas shall be cleaned and disinfected immediately after being contacted by potentially infectious materials. A 10 percent bleach solution (one part bleach added to nine parts water) shall be applied and allowed to have a

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-4

contact time of 15 minutes. Non-disposable articles, equipment, or materials contaminated with potentially infectious materials shall be similarly cleaned/disinfected prior to reuse.

- All bins, pails, cans, and similar receptacles intended for reuse, which have become contaminated with blood or other potentially infectious materials shall be cleaned and disinfected immediately after use.
- Broken glassware, which may be contaminated, shall not be picked up directly by hand. Broken glass shall be picked-up using mechanical means, such as by using a whiskbroom and dustpan.
- All PPE shall be immediately removed upon leaving the potentially contaminated work area, or as soon as possible if visibly contaminated. The contaminated PPE shall be placed in a labeled "red-bag" and then placed in the 30-gallon container for temporary storage and subsequent disposal.
- Any clothing that has contacted blood or other potentially infectious fluids shall be removed as soon as possible.
- Any clothing that has contacted blood or infectious fluids shall be placed in a labeled "red-bag" and then placed in the 30-gallon container for temporary storage and subsequent disposal.

12.4.1 Universal Precautions

Universal precautions is a method of infection control, which operates on the assumption that all human blood and bodily fluids are to be treated as if they are known to be infectious for HIV, HBV, or other blood-borne pathogens. Universal precautions shall be observed to prevent contact with blood or other potentially infectious materials. Universal precautions consist of the following practices:

- All workers shall routinely use appropriate barrier precautions to prevent skin and mucous-membrane exposure when contact with blood or other bodily fluids is anticipated. Gloves should be worn for touching blood and bodily fluids, mucous membranes, or non-intact skin and for handling items or surfaces contaminated with blood or body fluids. Masks and protective eyewear or face shields shall be worn during procedures that are likely to generate droplets of blood or other body fluids to prevent exposure of mucous membranes of the mouth, nose, and eyes. Protective suits shall be worn during procedures that are likely to generate splashes of blood or other bodily fluids.

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-4

- Hands and other skin surfaces shall be washed immediately and thoroughly if contaminated with blood or other bodily fluids. Hands shall be washed immediately after gloves are removed, using a disinfectant soap.
- Cardiopulmonary resuscitation barriers or other ventilation devices should be available for use in areas in which the need for resuscitation is foreseeable.
- Workers who have exudative lesions or weeping dermatitis shall be excluded from handling potentially infectious materials until the condition resolves.
- Pregnant workers should be especially familiar with and strictly adhere to precautions to minimize the risk of transmission.

12.4.2 Personal Protective Equipment

The proper use of PPE is an effective work practice control. The following requirements for PPE are mandatory whenever there is potential for employee contact with blood and bodily fluid:

- Inspect PPE prior to use to verify it is in good working order and without defects.
- Blood or other potentially infectious materials.
- Disposable (single use) gloves, such as surgical or examination gloves shall be replaced when visibly soiled, torn, punctured, or when their ability to function as a barrier is compromised. Gloves should be changed as soon as possible after contact with blood or bodily fluids. After use, remove gloves from top to bottom inside out, not allowing unprotected skin to contact the exterior of the gloves. Hands and other skin surfaces shall be washed with disinfectant soap immediately after care has been rendered or clean up has been completed. Gloves reduce the incidence of blood contamination of hands, but they cannot prevent penetrating injuries caused by sharp objects. Do not reuse gloves once removed. A CPR barrier shall be used when administering CPR.
- Protection for the eyes, face, hands, body, feet, and against inhalation hazards shall be provided as appropriate for each job.
- Gloves shall be worn when employees have the potential for direct skin contact with or when handling items or surfaces soiled with blood, other potentially infectious materials, mucous membranes, and non-intact skin.
- Polyvinyl chloride work gloves may be disinfected for immediate reuse if the integrity of the glove is not compromised; however, gloves must be discarded if they are cracked, peeling, discolored, torn, punctured, or exhibit other signs of

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-4

deterioration. All gloves shall be discarded at the conclusion of the activity or at the end of the shift – whichever comes first.

- Masks and eye protection or chin-length face shields shall be worn whenever splashes, spray, splatter, droplets, or aerosols of blood or other potentially infectious materials may be generated and there is a potential for eye, nose, or mouth contamination.
- Fluid-resistant clothing (e.g., coated Tyvek® suits) shall be worn if there is a potential for splashing or spraying of blood or potentially infectious materials. Coated Tyvek® coveralls shall also be worn during clean-up activities involving decontamination or disinfecting of surfaces and articles that have contacted potentially infectious materials, and when preparing biohazard waste for temporary storage and subsequent disposal.
- Fluid-resistant clothing (e.g., coated Tyvek® suits) shall be worn if there is a potential for clothing becoming soaked with blood or other potentially infectious materials.
- Surgical caps or hoods shall be worn if there is a potential for splashing or splattering of blood or potentially infectious materials on the head.
- Fluid-proof coverings shall be worn if there is a potential for shoes or boots to contact blood or other potentially infectious materials.
- Disposable nitrile or vinyl gloves shall be worn for touching blood and bodily fluids requiring universal precautions, mucous membranes, or non-intact skin and for handling items or surfaces soiled with blood or bodily fluids to which universal precautions apply.

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-4

12.4.3 Waste Handling

All wastes generated because of administering emergency first aid care and the subsequent clean-up activities shall be placed in red-bags, labeled as a biohazard, and kept separately from other trash. Wastes used in medical emergency treatment (i.e., gloves, towels, and gauze) shall also be bagged and stored in an identical manner. Red-bagged, biohazard waste shall be placed in the 30-gallon collection container, labeled, and secured for temporary storage and disposal. Additional containers shall be obtained as needed and containers shall not be overfilled.

12.5 Biohazard Waste Disposal

A Shaw Transportation and Disposal Coordinator shall be contacted to arrange for proper disposal of biohazard wastes. The waste shall remain secured on site in labeled container(s)

until disposal arrangements have been made at an approved disposal facility. Disposal of the infectious waste container(s) shall be in accordance with applicable local, state, and federal regulations.

12.6 Medical Requirements

Employees receive medical evaluations in accordance with Shaw Procedure No. HS100, "Medical Policies and Procedures". The medical requirements of this exposure control plan include provisions for vaccinations to all exposed employees as well as for post-exposure procedures and evaluations. All employees with potential for occupational exposure to blood-borne pathogens shall receive the hepatitis B vaccination and tetanus vaccination prior to workplace exposure, unless they read and sign the Hepatitis B and Tetanus Vaccination Declination form (Appendix D).

12.6.1 Hepatitis B Vaccination

All potentially exposed employees will have made available to them, at no cost, a hepatitis B vaccination. Recombivax or Accelerated Recombivax vaccines shall be utilized. If the employee has previously received the hepatitis B vaccination and/or antibody testing reveals that the employee is immune, a new vaccination is not required. Employees may be subjected to occupational exposure immediately after receiving the first shot in the hepatitis B vaccination series. Antibody testing shall be performed 30-days after completing the hepatitis B vaccination series. Employees unable to develop immunity shall be precluded from further occupational exposure. If a physician recommends a booster dose(s), the doses shall be provided according to standard recommendations for medical practice. The employee will also receive training as to the vaccine's efficacy, safety, benefits, and consequences prior to administration. The vaccination series may also be initiated within 24-hours of an incident with exposure potential.

12.6.2 Tetanus Vaccination

All employees subject to this policy shall maintain current status documentation of their tetanus vaccination (current status for tetanus vaccination is within 5 years). All potentially exposed employees shall be offered a tetanus vaccination at no cost.

12.6.3 Post-Exposure Procedures and Evaluation

All exposure incidents shall be reported as required by Shaw Procedure No. HS020, "Accident Prevention Program: Reporting, Investigation and Review." The occupational medicine physician shall be advised in addition to standard notification procedures.

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-4

Following a report of an exposure incident, each involved employee shall be offered a confidential medical evaluation and follow-up, which includes at least the following elements:

- Documentation of the route(s) of exposure.
- Hepatitis B virus and HIV antibody status of the source patient(s) (if known), and how the exposure occurred.
- The medical confidentiality rights of the source patient shall be preserved at all times.
- If the source patient can be determined and permission is obtained, collection of and testing of the source patient's blood to determine the presence of HIV or HBV infection shall be conducted under the direction of the attending physician.
- Collection of blood from the exposed employee as soon as possible after the exposure incident for the determination of HIV and/or HBV status. Actual core antibody and surface antigen testing of the blood or serum sample may be done at that time or later if the employee so requests. If the test is deferred, arrangements shall be made through the attending physician to properly archive the specimen.
- Follow-up of the exposed employee including antibody and antigen testing, counseling, illness reporting, and safe and effective post-exposure prophylaxis, according to standard recommendations for medical practice as defined by the occupational medicine physician.

Where applicable laws require employee consent, documented consent shall be obtained prior to testing. If an employee refuses the blood test, documentation of the refusal will be made. Documentation of the test results shall be made available to the exposed employee(s). All test results shall be kept confidential.

12.6.4 Physician Information

The following information shall be provided to the evaluating physician:

- Copy of 29 CFR 1910.1030 and its appendices.
- Description of the affected employee's duties as they relate to the employee's occupational exposure.

12.6.5 Physician Opinion

For each potentially exposed employee evaluation, the employee shall receive a copy of the evaluating physician's written opinion within 15 working days of the completion of the evaluation. The written opinion shall be limited to the following information:

- The physician's recommended limitations upon the employee's ability to receive the hepatitis B vaccination.
- A statement that the employee has been informed of the results of the medical evaluation and that the employee has been told about any medical conditions resulting from exposure to blood or other potentially infectious materials, which require further evaluation or treatment.
- Specific findings or diagnoses, which are related to the employee's ability to receive the HBV vaccination. Any other findings and diagnoses shall remain confidential.

12.6.6 Hazard Communication

There are regulatory requirements for labels, signs, and training. The provisions and exceptions for these are contained in the subsections below.

12.6.7 Warning Labels

Containers used for disposal of blood-contaminated supplies and waste will be labeled in accordance with the word "biohazard." The following symbol shall be an integral part of the label:

12.6.8 Warning Signs

There will be no designated areas for medical treatment on project sites, because first aid is provided on an emergency basis only; therefore, warning signs are not applicable. In cases of potential exposure, observers and nonessential personnel should be verbally warned to keep a safe distance from injured personnel.

12.6.9 Employee Training Program

All employees who are first aid/CPR trained and may provide assistance shall be trained in the requirements for voluntary providers as described in Shaw Procedure No. HS512,

"Handling of Blood or other Infectious Material", this SSHP, and the general provisions of this procedure.

12.7 Recordkeeping

There are federal record-keeping requirements for training, medical, and incident reporting documentation. The provisions for keeping these records are contained in the subsections below.

12.7.1 Training Records

All employees covered under this exposure plan shall be trained as required. A record of the training shall be appropriately generated. The training record will contain the date of the training session(s), the contents or a summary of the training session(s), the names of persons conducting the training, and the names of all persons attending the training sessions. The training records will be maintained by the Shaw Training Department for at least 5 years from the training date.

12.7.2 Medical Records

Medical records necessary for Shaw employees will include documentation of HBV vaccination status, medical follow-up, post-exposure testing, and a medical professional's written evaluation. The employee medical records will be forwarded to and maintained by CORE Health Networks, 12091 Bricksome Avenue, Suite B, Baton Rouge, Louisiana 70816 for inclusion in the employee's medical file. Confidentiality of all medical records shall be maintained.

Shaw maintains employee medical records for the duration of the employee's employment plus 30 years thereafter. If, for whatever reason, Shaw no longer does business and no successor exists, Shaw will notify the director of NIOSH in writing 3 months prior to the disposal of records. If so directed, the records shall be transferred to the director of NIOSH.

12.7.3 Incident Recording

An incident that occurs because of rendering emergency medical care will be recorded on the OSHA 300 log as OSHA defines work-related injuries and illnesses. All injuries involving the release of blood or bodily fluids must be immediately reported to the HSM for proper reporting and follow-up.

12.8 Plan Review and Update

This Blood-borne Pathogen Exposure Control Plan shall be reviewed and updated on an annual basis.

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-4

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-4

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13.0 LOGS, REPORTS, AND RECORD KEEPING

Proper record keeping and data management are essential in the implementation of this SSHP. The forms associated with the record keeping and data management requirements shall be completed in an accurate, timely fashion and appropriately filed. The proper completion of forms is the responsibility of the Construction Manager or SSHO. Completed forms will be kept and maintained by Shaw for a 5-year period. Subcontractors will also be responsible for keeping a copy of the forms pertaining to their activities.

Copies of all pertinent site safety and health forms and logs are provided in Appendix D.

13.1 Employee Training and Medical Certification Records

Before personnel are allowed to work in regulated areas on site, the Construction Manager or SSHO shall verify that the following training documentation is current and available in the project Health and Safety file:

- Respiratory protection training certificate (all personnel required to wear respiratory protection).
- Portable fire extinguisher training (two workers per crew).
- First aid/CPR training (at least two workers on site).
- Site Safety Orientation documentation indicating that employees have received the following training:
  - Review of SSHP (Site Safety and Health Plan Acknowledgment Form [Appendix A]).
  - Site-specific Hazard Communication training (Hazard Communication and Right-To-Know Standards Employee Training Record [Appendix D]).
  - Other training as applicable, such as base procedures and rules.

The SSHO shall also verify that the following medical surveillance documentation is current and available in the project Health and Safety file:

- Annual audiogram evidence for workers who may be exposed to noise greater than 85 decibels.
- Positive physician's medical determination regarding the employee's ability to use respiratory protection for personnel required to wear respiratory protection.

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-4

All personnel (including visitors) using respiratory protection, shall have successfully passed a respirator fit test in accordance with Shaw Procedure No. HS601, "Respiratory Protection Program", within the last 12 months. A document providing proof of a fit test for the specific respirator used shall be available in the project Health and Safety file.

13.2 Daily Safety Log

The SSHO will maintain and complete a daily log for each day's work. The daily log will document each day's safety and health activities in sufficient detail for future reference as needed.

The following items will be developed as applicable and maintained on site by the SSHO as part of the daily safety log:

- Daily safety meeting logs.
- Noise survey data.
- Personnel training and medical certificates.
- Hot Work Permits.
- Air monitoring/sampling data forms.
- Project safety inspections (daily and monthly).
- Subcontractor safety inspections.
- Hazard Communication Program audits.
- Warnings given related to safety infractions.
- AHAs.
- JSAs.
- Accident investigation reports.
- First aid log.
- Confined space entry permits.

13.3 Safety Inspections/Audits

Shaw's accident prevention program is centered on the following key procedures:

- Investigating, reporting, and reviewing of all near misses, incidents, and accidents.
- Managing reviews of all incident/accident reports, corrective action, and project safety concerns.

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-4

- Reviewing of project, operations, and construction activities by safety and health professionals and supervisory personnel.

Safety reviews and inspections are conducted by all tiers of the management structure and are documented. A list of all corrective action items shall be maintained showing the corrective action, responsible person, and the date the action is to be completed. Follow-up inspections are conducted by safety and health personnel to verify that corrective actions or measures have been implemented.

The Construction Manager will inspect the site daily and identify areas of safety concerns or ideas for safety improvement. Crew leaders will also inspect site conditions and activities daily to identify changing conditions or potential hazards. Daily safety inspections shall be documented on the Daily Safety Inspection Report (Appendix D). Identified safety and occupational health deficiencies and suggested corrective measures will be brought to the attention of the Project Manager and HSM.

Safety and occupational health deficiencies shall be tracked on the Safety and Occupational Health Deficiency Tracking Log (Appendix D), which provides the following information:

- Date deficiency identified.
- Description of deficiency.
- Name of person responsible for correcting deficiency.
- Projected resolution date.
- Date actually resolved.

The Construction Manager will immediately notify the HSM of any OSHA or other regulatory agency inspections. (The inspection will not be delayed due to the Government Designated Authority being unavailable.) The Construction Manager shall provide the HSM a copy of any citations or reports issued by the inspector and any corrective action responses to the citation(s) or report(s).

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-4

13.4 Accident Investigation and Reporting

Project personnel are required to report all near misses, injuries, illnesses, and accidents to their immediate supervisor. The Construction Manager or SSHO shall immediately arrange appropriate medical care as required. Once immediate medical care for the injured personnel or other critical emergency procedures has been accomplished, the Construction Manager shall follow the Incident Notification, Reporting, and Management Procedure (Appendix H). The appropriate form(s) to be completed are in Appendix D and include the following:

- Supervisor's Employee Injury/Illness Report Form.
- Authorization for Release of Protected Medical Information.
- Authorization for Treatment for Occupational Injury/Illness.
- Vehicle Accident Report.
- Equipment, Property Damage and General Liability Loss Report.
- Underground Utility Hits Tip Sheet for Incident Investigations.
- Incident Investigation Report.
- Injured Employee Statement.
- Employee Witness Statement.
- Accident Review Board.

All incidents shall be immediately reported to the Project Manager and HSM.

The Construction Manager shall immediately investigate all near misses, injuries, illnesses, and accidents. Corrective actions will be determined and implemented to prevent the recurrence of the accident, and responsibility for implementation of corrective actions will be assigned. The final report and required forms will be submitted within five days of the incident to the HSM.

In the event that an accident results in an employee being sent to a doctor, the Return-to-Work Examination Form (Appendix D) shall be completed by the attending physician, on the date of treatment stating that either:

- Employee may return to full duty work.
- Employee may return to limited duty (with type of limitations).
- Employee is unable to return to work.

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-4

A copy of this release shall accompany the accident report. In addition to the requirement for maintaining a log of OSHA recordable injuries/illnesses, a separate log will be maintained for all first aid treatments not otherwise recordable/reportable.

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-4

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-4

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14.0 REFERENCES

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U.S. Army Corps of Engineers (USACE), 2008, *Safety and Health Requirements, EM 385-1-1*, Department of the Army, U.S. Army Corps of Engineers, CESO-ZA Safety, Washington, D.C, November 15, 2008.

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-4

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Figures

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Figure 1
Site Location Map

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-4

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-4

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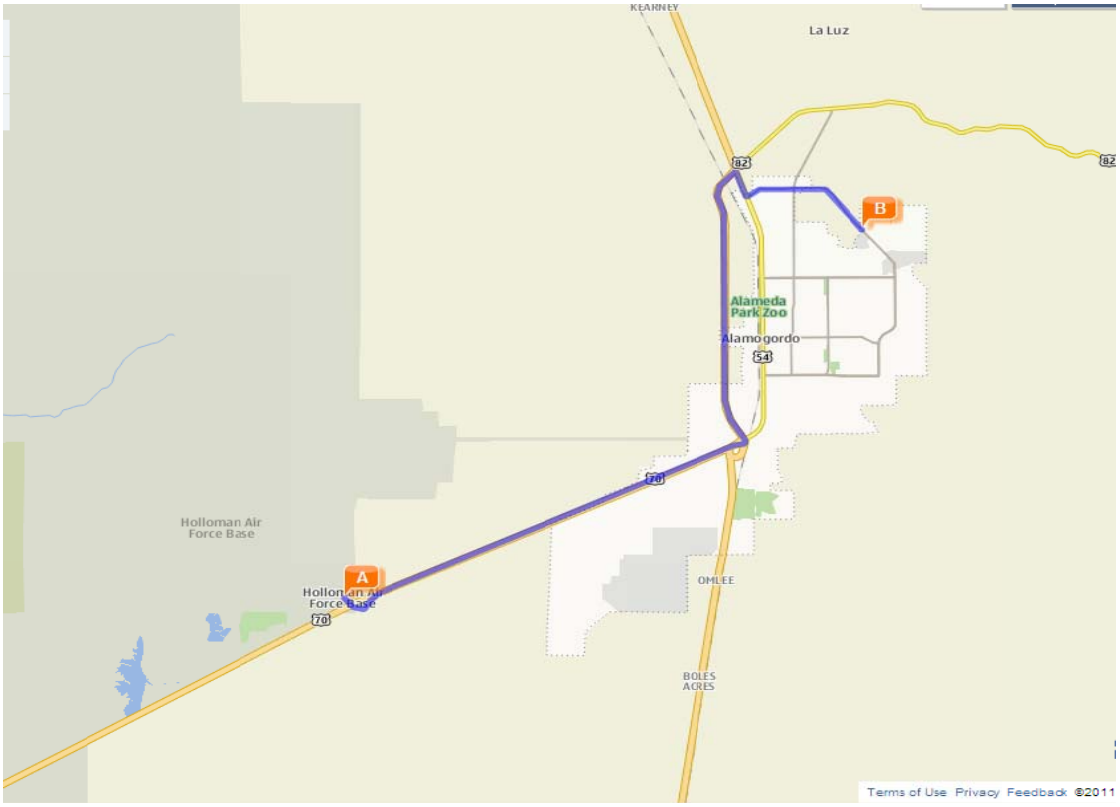
Figure 2
Hospital Route Map



Hospital Route Map from Holloman AFB (A) to
Gerald Champion Regional Medical Center (B)

2669 Scenic Dr # 105A
Alamogordo, NM 88310
(575) 439-6100

From Holloman AFB, go:

1. 75 ft Head toward Mesquite Rd on 1st St.
2. 209 ft Make a U-turn at Mesquite Rd onto 1st St.
3. 0.7 mi Continue on 1st St.
4. 6.0 mi Continue on US-70 E.
5. 0.2 mi Take ramp toward US-54 N/US-70 E/Tularosa/Relief Route.
6. 5.0 mi Turn left onto US-54 N, US-70 E.
7. 0.5 mi Turn right onto US-54 S, US-70 W, US-82 W.
8. 2.2 mi Turn left onto N Scenic Dr.
9. Your destination on 2669 N Scenic Dr, CR-A095 is on the right.

The distance to the hospital is approximately 14.6 miles from the Holloman AFB, with a travel time of approximately 22 minutes. (Note: Map will be revised when site trailers are established.)

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-4

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-4

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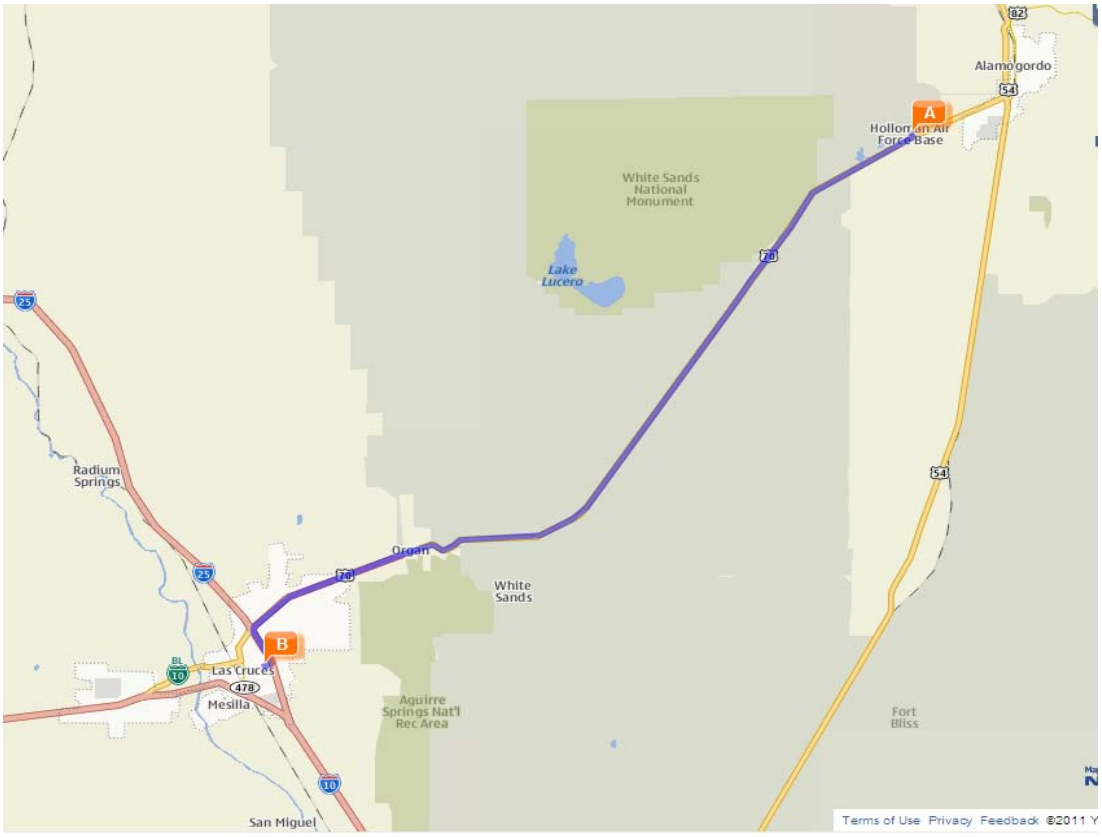
Figure 3
CORE Health Networks Medical Facility Route Map



CORE Health Networks Medical Facility Route Map from Holloman AFB (A) to Concentra Medical Center (B)

2170 East Lohman Ave., Suite A, B, C
Las Cruces, NM 88001
(575) 524-8888

From Holloman AFB, go:

1. Head toward Mesquite Rd on 1st St.
2. 209 ft Make a U-turn at Mesquite Rd onto 1st St.
3. 0.2 mi Bear right.
4. 55.8 mi Bear right onto US-70 W.
5. 2.8 mi Take the I-25 N/El Paso/Albuquerque exit onto I-25 S toward El Paso.
6. 0.3 mi Take exit #3/Lohman Avenue.
7. 0.6 mi Turn right onto E Lohman Ave (NM-342 W).
8. 0.1 mi Make a U-turn at Baca Rd onto E Lohman Ave (NM-342 E).
9. Your destination on 2170 E Lohman Ave (NM-342 E) is on the right.

The trip takes 59.8 mi and 59 mins. (Note: Map will be revised went site trailers are established.)

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-4

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-4

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Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-4

Tables

Table 1
Summary Table of Sites, Technical Approach, Performance Objectives, and Site Closure Dates

Compliance Clean-up Site Number	Site Name	Proposed Performance Objective	Brief Description of the Technical Approach	Projected Closure
OT-C530	Building 308	Site Closure	Prepare a VCM Request, Close septic tanks in place in accordance with 20.7.3.307 NMAC; Prepare a VCM Report; Prepare CACP; Prepare Class III permit modification request to document NMED approval of CAC without controls	3rd Quarter 2013
OT-C531	Buildings 920, 921, 922	Site Closure	Prepare a VCM Request, Close septic tanks in place in accordance with 20.7.3.307 NMAC, Prepare VCM Report and CACP; Prepare Class III permit modification request to document NMED approval of CAC without controls	3rd Quarter 2013
OT-C532	Building 924	Site Closure	Prepare a VCM Request, Close septic tanks in place in accordance with 20.7.3.307 NMAC, Prepare a VCM Report; Prepare CACP; Prepare Class III permit modification request to document NMED approval of CAC without controls	3rd Quarter 2013
OT-C533	Building 1190	Site Closure	Prepare a VCM Request, Close septic tanks in place in accordance with 20.7.3.307 NMAC, Prepare a VCM Report; Prepare CACP; Prepare Class III permit modification request to document NMED approval of CAC without controls	3rd Quarter 2013
OT-C534	Building 1194	Site Closure	Prepare a VCM Request, Close septic tanks in place in accordance with 20.7.3.307 NMAC, Prepare a VCM Report; Prepare CACP; Prepare Class III permit modification request to document NMED approval of CAC without controls	3rd Quarter 2013
OT-C535	Building 1196	Site Closure	Prepare a VCM Request, Close septic tanks in place in accordance with 20.7.3.307 NMAC, Prepare a VCM Report; Prepare CACP; Prepare Class III permit modification request to document NMED approval of CAC without controls	3rd Quarter 2013
OT-C536	Building 1199	Site Closure	Prepare a VCM Request, Close septic tanks in place in accordance with 20.7.3.307 NMAC, Prepare a VCM Report; Prepare CACP; Prepare Class III permit modification request to document NMED approval of CAC without controls	3rd Quarter 2013
OT-C537	Building 1200	Site Closure	Prepare a VCM Request, Close septic tanks in place in accordance with 20.7.3.307 NMAC, Prepare a VCM Report; Prepare CACP; Prepare Class III permit modification request to document NMED approval of CAC without controls	3rd Quarter 2013

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-4

Table 1 (continued)
Summary Table of Sites, Technical Approach, Performance Objectives, and Site Closure Dates

Compliance Clean-up Site Number	Site Name	Proposed Performance Objective	Brief Description of the Technical Approach	Projected Closure
OT-C538	Building 1201	Site Closure	Prepare a VCM Request, Close septic tanks in place in accordance with 20.7.3.307 NMAC, Prepare a VCM Report; Prepare CACP; Prepare Class III permit modification request to document NMED approval of CAC without controls	3rd Quarter 2013
OT-C539	Building 1221	Site Closure	Prepare a VCM Request, Close septic tanks in place in accordance with 20.7.3.307 NMAC, Prepare a VCM Report; Prepare CACP; Prepare Class III permit modification request to document NMED approval of CAC without controls	3rd Quarter 2013
OT-C540	Building 1251	Site Closure	Prepare a VCM Request, Close septic tanks in place in accordance with 20.7.3.307 NMAC, Prepare a VCM Report; Prepare CACP; Prepare Class III permit modification request to document NMED approval of CAC without controls	3rd Quarter 2013
OT-C541	Building 1269	Site Closure	Prepare a VCM Request, Close septic tanks in place in accordance with 20.7.3.307 NMAC, Prepare a VCM Report; Prepare CACP; Prepare Class III permit modification request to document NMED approval of CAC without controls	3rd Quarter 2013
OT-C542	Building 1166	Site Closure	Prepare a VCM Request, Close septic tanks in place in accordance with 20.7.3.307 NMAC, Prepare a VCM Report; Prepare CACP; Prepare Class III permit modification request to document NMED approval of CAC without controls	3rd Quarter 2013
OT-C543	Building 1175	Site Closure	Prepare a VCM Request, Close septic tanks in place in accordance with 20.7.3.307 NMAC, Prepare a VCM Report; Prepare CACP; Prepare Class III permit modification request to document NMED approval of CAC without controls	3rd Quarter 2013
OT-C544	Building 1176	Site Closure	Prepare a VCM Request, Close septic tanks in place in accordance with 20.7.3.307 NMAC, Prepare a VCM Report; Prepare CACP; Prepare Class III permit modification request to document NMED approval of CAC without controls	3rd Quarter 2013

Table 1 (continued)
Summary Table of Sites, Technical Approach, Performance Objectives, and Site Closure Dates

Compliance Clean-up Site Number	Site Name	Proposed Performance Objective	Brief Description of the Technical Approach	Projected Closure
TU/US-C500	Building 300	ISM and Draft RFI	Perform records search to obtain former UST location and removal information, Prepare an RFI Work Plan and VCM Work Plan, Perform investigation and soil removal, and collect confirmation samples, Prepare an RFI Report	Indefinite, depends on USAF funding and future remedial actions
TU/US-C501	Building 1113	ISM and Draft RFI	Perform records search to obtain former UST location and removal information, Prepare an RFI Work Plan and VCM Work Plan, Perform investigation and soil removal, and collect confirmation samples, Prepare an RFI Report	Indefinite, depends on USAF funding and future remedial actions
TU/US-C502	Building 2395	Site Closure	Perform records search for former UST location and removal information, Prepare VCM Request and RFI Work Plan, Perform investigation and soil removal, Prepare VCM/RFI Report; Prepare CACP; Prepare Class III permit modification request to document NMED approval of CAC without controls	Indefinite, depends on USAF funding and future remedial actions
TU/US-C503	Building 221	ISM and Draft RFI	Perform records search to obtain former UST location and removal information, Prepare an RFI Work Plan and VCM Work Plan, Perform investigation and soil removal, and collect confirmation samples, Prepare an RFI Report	Indefinite, depends on USAF funding and future remedial actions
TU/US-C504	Building 301	ISM and Draft RFI	Perform records search to obtain former UST location and removal information, Prepare an RFI Work Plan and VCM Work Plan, Perform investigation and soil removal, and collect confirmation samples, Prepare an RFI Report	Indefinite, depends on USAF funding and future remedial actions
TU/US-C505	Building 1097	ISM and Draft RFI	Perform records search to obtain former UST location and removal information, Prepare an RFI Work Plan and VCM Work Plan, Perform investigation and soil removal, and collect confirmation samples, Prepare an RFI Report	Indefinite, depends on USAF funding and future remedial actions
TU/US-C506	Building 901	ISM and Draft RFI	Perform records search to obtain former UST location and removal information, Prepare an RFI Work Plan and VCM Work Plan, Perform investigation and soil removal, and collect confirmation samples, Prepare an RFI Report	Indefinite, depends on USAF funding and future remedial actions

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-4

Table 1 (continued)
Summary Table of Sites, Technical Approach, Performance Objectives, and Site Closure Dates

Compliance Clean-up Site Number	Site Name	Proposed Performance Objective	Brief Description of the Technical Approach	Projected Closure
TU/US-C507	Building 1272	Site Closure	Perform records search to obtain former UST location and removal information, Prepare VCM Request and RFI Work Plan, Perform investigation and soil removal, Prepare VCM/RFI Report; Prepare CACP; Prepare Class III permit modification request to document NMED approval of CAC without controls	3rd Quarter 2013
TU/US-C508	Building 298	ISM and Draft RFI	Perform records search to obtain former UST location and removal information, Prepare an RFI Work Plan and VCM Work Plan, Perform investigation and soil removal, and collect confirmation samples, Prepare an RFI Report	Indefinite, depends on USAF funding and future remedial actions
TU/US-C513	Building 898	ISM and Draft RFI	Perform records search to obtain former UST location and removal information, Prepare an RFI Work Plan and VCM Work Plan, Perform investigation and soil removal, and collect confirmation samples, Prepare an RFI Report	Indefinite, depends on USAF funding and future remedial actions
TU/US-C514	Building 882	Site Closure	Perform records search to obtain former UST location and removal information, Prepare VCM Request and RFI Work Plan, Perform investigation and soil removal, Prepare VCM/RFI Report; Prepare CACP; Prepare Class III permit modification request to document NMED approval of CAC without controls	3rd Quarter 2013
TU/US-C515	Building 889	Site Closure	Perform records search to obtain former UST location and removal information, Prepare VCM Request and RFI Work Plan, Perform investigation and soil removal, Prepare VCM/RFI Report; Prepare CACP; Prepare Class III permit modification request to document NMED approval of CAC without controls	3rd Quarter 2013
TU/US-C516	Building 684	Site Closure	Perform records search to obtain former UST location and removal information, Prepare VCM Request and RFI Work Plan, Perform investigation and soil removal, Prepare VCM/RFI Report; Prepare CACP; Prepare Class III permit modification request to document NMED approval of CAC without controls	3rd Quarter 2013

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-4

Table 1 (continued)
Summary Table of Sites, Technical Approach, Performance Objectives, and Site Closure Dates

Compliance Clean-up Site Number	Site Name	Proposed Performance Objective	Brief Description of the Technical Approach	Projected Closure
TU/US-C518	UST 7003	ISM and Draft RFI	Perform records search for former UST location and removal information, Prepare an RFI Work Plan and VCM Work Plan, Perform investigation and soil removal, and collect confirmation samples, Prepare an RFI Report	Indefinite, depends on USAF funding and future remedial actions

CAC denotes Corrective Action Complete.

CACP denotes Corrective Action Complete Petition.

CY denotes cubic yards.

ISM denotes interim stabilization measures.

NMAC denotes New Mexico Administrative Code.

NMED denotes New Mexico Environment Department.

PBR denotes performance based remediation.

RCRA denotes Resource Conservation and Recovery Act.

RFI denotes RCRA Facility Investigation.

SWMU denotes Solid Waste Management Unit.

USAF denotes U.S. Air Force.

UST denotes Underground Storage Tank.

VCM denotes Voluntary Collective Measure.

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-4

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-4

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Table 2
Minimum Clearance from Energized Overhead Electric Lines

Nominal System Voltage	Minimum Required Clearance
0 to 50 kilovolts	3 meters (10 feet)
51 to 200 kilovolts	4.5 meters (15 feet)
201 to 300 kilovolts	6 meters (20 feet)
301 to 500 kilovolts	7.5 meters (25 feet)
501 to 750 kilovolts	10.5 meters (35 feet)
751 to 1,000 kilovolts	13.5 meters (45 feet)

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-4

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-4

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Table 3
Task Protection Levels

Task	Initial PPE Level	Upgrade PPE Level	Skin Protection	Respiratory Protection	Other PPE
Mobilization and general site activities	Level D	Level D – Modified	Generally none: some activities may require Tyvek® coveralls to prevent insect bites / contact with poisonous plants	Initial - None	Hearing protection >85 dBA, leather work-gloves.
Collect surface soil samples	Level D	Level D – Modified	Sample gloves; disposable boot covers if walking in areas with potential contamination; some activities may require Tyvek® coveralls to prevent insect bites / contact with poisonous plants	Initial - None	Hearing protection >85 dBA, leather work-gloves.
Collect subsurface soil samples	Level D	Level D – Modified	Sample gloves; disposable boot covers if walking in areas with potential contamination; some activities may require Tyvek® coveralls to prevent insect bites / contact with poisonous plants	Initial - None	Hearing protection >85 dBA, leather work-gloves.
Collect surface water and ground water samples	Level D	Level D – Modified	Sample gloves; disposable boot covers if walking in areas with potential contamination; some activities may require Tyvek® coveralls to prevent insect bites / contact with poisonous plants	Initial - None	Hearing protection >85 dBA, leather work-gloves.
Well drilling and well installation	Level D – Modified	Level B	See Section 5.1.4 and Section 5.1.2	Initial - None Upgrade - Level B: if VOCs exceeds action level	Hearing protection >85 dBA, leather work-gloves. 100% fall protection when working at height greater than 6 feet
Surface soil removal	Level D – Modified	Level B Level C	See Section 5.1.4, Section 5.1.2, and Section 5.1.3	Initial – None Upgrade - Level B: if VOCs exceeds action level Upgrade – Level C if dusts exceed action level	Hearing protection >85 dBA, leather work-gloves.

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-4

Table 3 (continued)
Task Protection Levels

Task	Initial PPE Level	Upgrade PPE Level	Skin Protection	Respiratory Protection	Other PPE
Backfill excavations	Level D	NA	See Section 5.1.5	Initial - None	Hearing protection >85 dBA, leather work-gloves.
Surveying	Level D	NA	See Section 5.1.5	Initial - None	Hearing protection >85 dBA, leather work-gloves.
Site restoration	Level D	NA	See Section 5.1.5	Initial - None	Hearing protection >85 dBA, leather work-gloves.
Soil borrow material import (loading, transportation, and dumping	Level D	NA	See Section 5.1.5	Initial - None	Hearing protection >85 dBA, leather work-gloves.
Equipment decontamination	Level D – Modified	Level C	See Section 5.1.4 and Section 5.1.3	Initial – None Upgrade – Level C: Full-face air-purifying respirator.	Hearing protection >85 dBA, face-shield, shin/metatarsal protection.

dBA denotes decibels, A-scale.

NA denotes not applicable.

PPE denotes personal protective equipment.

VOC denotes volatile organic compound.

Table 4
Direct Reading Air Monitoring Requirements

Monitoring Device / Contaminant	Monitoring Location / Personnel	Monitoring Frequency	Action Level	Action
Combustible Gas Indicator/Oxygen Meter (Lower Explosive Limit [LEL]/ oxygen [O_2])	In the work area and near the breathing zone of personnel. In the work area and breathing zone of personnel during well drilling activities. In the work area prior to hot work activities. In the confined space prior to entry. In the work area during fuel spill clean-up activities.	A minimum of twice per hour (LEL) at each well installation location when free-phase LNAPL is expected or observed until activity at that location has been completed. A minimum of once per sampling event (LEL) at each sampling location when free-phase LNAPL is expected or observed (groundwater and subsurface soil/sediment). At any time in any work location where personnel observe odors. Prior to issuing a hot work permit or confined space entry permit. Continuous during fuel spill clean-up activities. At the discretion of the SSHO.	<10% LEL 20 - 22% O_2	Continue work with caution.
			>10% LEL <20% O_2 or >22% O_2	Stop work, evacuate area, and contact HSM.
Carbon Monoxide (CO)	In the work area near the breathing zone of personnel.	A minimum of once per hour when internal combustion engines are being operated in poorly ventilated areas. At the discretion of the SSHO.	<15 ppm CO	Continue work with caution.
			>15 ppm CO	Stop work, evacuate area, and contact HSM.
Hydrogen Sulfide (H_2S)	In the work area near the breathing zone of personnel.	Continuous at each well installation location within 500 feet of a landfill until activity at that location has been completed. At any time in any work locations where personnel observe rotten egg odors. At the discretion of the SSHO.	<1 ppm H_2S	Continue work with caution.
			>1 ppm H_2S	Stop work, evacuate area, and contact HSM.
Vinyl Chloride (VC) Colorimetric Detector Tube	In the work area near the breathing zone of personnel.	Collected at each well if PID Action Level is exceeded	<1 ppm VC	Continue Work With Caution
			>1 ppm VC	Stop work, evacuate area, and contact HSM.

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-4

Table 4 (continued)
Direct Reading Air Monitoring Requirements

Monitoring Device / Contaminant	Monitoring Location / Personnel	Monitoring Frequency	Action Level	Action
Benzene Colorimetric Detector Tube	In the work area near the breathing zone of personnel.	Collected at each well if PID Action Level is exceeded	<0.25 ppm	Continue Work With Caution
			>0.25 ppm	Stop work, evacuate area, and contact HSM.
Photoionization Detector (volatile organic compounds)	In the breathing zone of personnel during well drilling, well installation, well abandonment, and soil excavation activities. In the breathing zone of personnel during groundwater and subsurface soil/sediment sampling. In the breathing zone of personnel during fuel spill clean-up activities.	A minimum of twice per hour at each well drilling/installation location or soil excavation area where VOC are known or suspected until activity at that location has been completed (continuous when free-phase LNAPL or DNAPL is expected or observed). Hourly at each well abandonment location A minimum of once per sampling event at each sampling location (groundwater and subsurface soil/sediment)/continuous when free-phase LNAPL or DNAPL is expected or observed. A minimum of twice per hour at each soil removal location until activity at that location has been completed (continuous when free-phase LNAPL or DNAPL is expected or observed). Continuous during fuel spill clean-up activities. At any time in any work location where personnel observe odors. At the discretion of the SSHO.	> 2 ppm but < 10 ppm above background, sustained for one minute in the breathing zone	Stop work: evaluate hazard, increase monitoring frequency, provide engineering controls, and upgrade PPE.
			> 10 ppm but < 50 ppm above background, sustained for five seconds in the breathing zone	Stop work, evacuate area, and contact HSM.
			> 50 ppm above background, sustained for one second in the breathing zone	Stop work, evacuate area, and contact HSM.
Real-time Aerosol Monitor (dust)	In the work zone approximating worker breathing zone area during soil excavation, soil removal, soil loading, and other dust generating activities.	Continuous during soil excavation, soil removal, soil loading, and other dust generating activities. At the discretion of the SSHO.	> 1 mg/m^3 instantaneous	Continue work, apply more engineering controls.
			> 2.5 mg/m^3 time-weighted average	Evacuate area, apply engineering controls, upgrade level of PPE, and contact HSM.

DNAPL denotes dense nonaqueous phase liquid.

HSM denotes Health and Safety Manager. HSM may indicate more prescriptive Action Levels in the SSHP Addenda

LNAPL denotes light nonaqueous phase liquid.
mg/m^3 denotes milligram(s) per cubic meter.
PPE denotes personal protective equipment.
ppm denotes part(s) per million.
SSHO denotes Site Safety and Health Officer.

Table 5
Emergency Telephone Numbers

Name/Organization	Telephone Numbers
Ambulance Emergency/EMS	911
Base Security Forces	(575) 572-7171
Base Air Force Office of Special Investigations	(575) 572-7143
Base AT Officer	(575) 572-7748
Holloman AFB Fire Department	Emergency –575-572-9111 (575) 572-7228.
Holloman AFB Security Force	Emergency 575-572-9111 (575) 572-7171
Alamogordo Police Department	Emergency 911 Non Emergency 575-439-4300
Otero County Sheriff's Department	Emergency 911 Non emergency (575) 437-2210
Holloman AFB Hospital	(575) 572-2778
Concentra Medical Center (Occupational Health Clinic)	(575) 524-8888
Gerald Champion Regional Medical Center (Hospital)	(575) 439-6100
CORE HEALTH	1-877-347-7429
Agency for Toxic Substances and Disease Registry	(404) 639-0615 (24-hour)
Chemtrec	(888) 344-7233
Poison Control Center	(800) 562-8236
National Response Center	(800) 424-8802
Daniel Cevallos, Jr. AFCEE Contracting Officer (KO)	(210)395-8722
Stephanie Ramon AFCEE/EXW COR	(210)395-8628
Kathleen Romalia (Shaw Project Manager)	(720) 554-8207
Spencer Patterson (Shaw Program Manager)	(720) 377-8806
Dave Mummert, CIH (Shaw CIH)	(419) 425-6129 (office) (419) 348-1544 (cell)
James Vigerust (SSHO Lead)	(505) 262-8736(office) (505) 410-4995 (cell)

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-4

Table 5 (continued)
Emergency Telephone Numbers

Name/Organization	Telephone Numbers
Chris Long (Installation Lead)	(281) 531-3179 (office) (281) 414-1546 (cell)
Shaw Notification Hotline	(866) 299-3445

AFCEE denotes Air Force Center for Engineering and the Environment.

CIH denotes Certified Industrial Hygienist.

COR denotes Contracting Officer's Representative.

EMS denotes Emergency Medical Service.

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-4

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-4

Appendix A
Site Safety and Health Plan Acknowledgement

Holloman AFB Project
Site-Specific Health & Safety Acknowledgment Form

I understand and agree to follow the Site-Specific Health & Safety Plan (SSHP) for the Holloman AFB Project. I understand that there may be additional safety and health requirements, which may be presented in task-specific Activity Hazard Analyses and Tailgate Safety Meetings. I agree to abide by the requirements of the SSHP and Activity Hazard Analyses for the work that I will perform.

Printed Name	Signature	Representing	Date

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Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-4

Appendix B
Site Safety and Health Plan Amendments and Addenda

Site Specific Health & Safety Plan Amendment Documentation

Project Name: Holloman AFB **Project No. 144106**

Amendment No. __ Date: _____

Amendment Address: _____

Reason For Amendment: _____

Amendment: _____

Scope of Work: _____

Chemical Hazards Specific To The Scope of Work:
_____

Specific AHA Identified: _____

PPE Required: _____

Monitoring Requirements: _____

_____
Completed by:

_____
Approved by:

_____
Approved by:

_____
Approved by:

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Appendix C
Activity Hazard Analyses

APPENDIX C1 ACTIVITY HAZARD ANALYSIS FOR MOBILIZATION/SITE SETUP				
Task Breakdown	**Potential Hazards**	**Critical Safety Practices**	**Personal Protective Clothing and Equipment**	**Monitoring Devices**
Mobilization/ Site Setup	Slips, Trips, Falls	• Clear walkways work areas of equipment, tools, vegetation, excavated material and debris • Mark, identify, or barricade other obstructions		
	Spills	• Clean up spills before initiating maintenance • Review maintenance procedures for safety practices		
	Electrical Shock	• De-energize or shut off utility lines at their source before work begins • Use double insulated or properly grounded electric power-operated tools • Provide an equipment-grounding conductor program or employ ground-fault circuit interrupters • Use qualified electricians to hook up electrical circuits • Inspect all extension cords daily for structural integrity, ground continuity, and damaged insulation • Cover or elevate electric wire or flexible cord passing through work areas to protect from damage • Keep all plugs and receptacles out of water • Use approved water-proof, weather-proof type if exposure to moisture is likely • Inspect all electrical power circuits prior to commencing work • Follow Lockout/Tagout procedure HS315 – Control of Hazardous Energy Sources	Lockout/Tagout Devices	Voltage Meter or Tic Tracer

APPENDIX C1 ACTIVITY HAZARD ANALYSIS FOR MOBILIZATION/SITE SETUP				
Task Breakdown	**Potential Hazards**	**Critical Safety Practices**	**Personal Protective Clothing and Equipment**	**Monitoring Devices**
Mobilization/ Site Setup (continued)	Handling Heavy Objects	• Observe proper lifting techniques • Obey sensible lifting limits (60 lb. Maximum per person manual lifting) • Use mechanical lifting equipment (hand carts, trucks) to move large, awkward loads • Avoid carrying heavy objects above shoulder level • Warm up muscles before engaging in manual lifting		
	Sharp Objects	• Wear cut resistant work gloves when the possibility of lacerations or other injury may be caused by sharp edges or objects • Maintain all hand and power tools in a safe condition	Leather gloves	
	High Noise Levels	• Use hearing protection when exposed to excessive noise levels (greater than 85 dBA over an 8-hour work period) • Do not attempt verbal communication in high noise backgrounds	Ear plugs	
	Struck By/ Against Heavy Equipment	• Wear reflective warning vests when exposed to vehicular traffic • Isolate equipment swing areas • Make eye contact with operators before approaching equipment • Understand and review hand signals • Follow hand signals of ground workers for equipment manipulation when placing/loading equipment into bucket. • Step away from equipment when bucket adjustments are made • Do not attempt verbal communication in high noise backgrounds.	Warning vests, Hard hat, Safety glasses, and Steel toe work boots	

APPENDIX C1 ACTIVITY HAZARD ANALYSIS FOR MOBILIZATION/SITE SETUP				
Task Breakdown	**Potential Hazards**	**Critical Safety Practices**	**Personal Protective Clothing and Equipment**	**Monitoring Devices**
Mobilization/ Site Setup (continued)	Struck-by/Against (Vehicle-traffic)	• Wear reflective warning vests when exposed to vehicular traffic • Barricade or enclose the work areas • Restrict entry to the work areas to authorized personnel during work activities • Wear hard hats, safety glasses with side shields, and steel-toe safety boots at all times • Follow FDOT roadway and traffic design standards manual • Personnel will perform all work tasks and remain inside barriered work zones • Spotters to be utilized as necessary	Warning vests, Hard hat, Safety glasses, and steel toe work boots	
	Pinch Points	• Review equipment adjustment procedures, identify pinch points • Isolate/block pinch points to limit motion when inserting pins, fasteners, closing tackles	Leather gloves	
	Burns associated with loading/unloading equipment on trucks	• Identify heavy objects for loading that may have hot surfaces • Allow objects to cool or cover hot surfaces with non-combustible material to protect workers from burns		
	Ladders	• Inspect ladders before use for mud buildup on treads • Clean mud from boots before climbing on ladders • Follow the three point of contact rule		
	High/Low Ambient Temperature	• Monitor for Heat Stress in accordance with Health and Safety Procedures HS400, HS401 • Provide fluids to prevent worker dehydration		
EQUIPMENT REQUIRED		**INSPECTION REQUIREMENTS**	**TRAINING REQUIREMENTS**	
• Vehicles • Hand tools • Ladders • Forklift/Hand carts		• Daily equipment inspections as per manufacturers requirements • Inspection of all emergency equipment (i.e. first aid kits, fire extinguishers)	• Review AHA with all task personnel • Review Site Specific Safety and Occupational Health Program • Review operations/safety manuals for all equipment utilized	

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APPENDIX C2 ACTIVITY HAZARD ANALYSIS FOR GENERAL SITE ACTIVITIES				
Task Breakdown	**Potential Hazards**	**Critical Safety Practices**	**Personal Protective Clothing and Equipment**	**Monitoring Devices**
Travel to/at project site	Operation of motor vehicles and trucks	All company owned, leased, or rented vehicle operations shall comply with the requirements of Shaw Procedure HS800, *Motor Vehicle Operation: General Requirements*. All company owned, leased, or rented commercial vehicle operations shall comply with the requirements of Shaw Procedure HS810, *Commercial Motor Vehicle Operation And Maintenance*. Subcontractors operating motor vehicles at the site shall comply with all federal, state, and local traffic regulations. Subcontractors shall only use vehicles that are in good condition and safe to operate. Subcontractors shall inspect vehicles routinely used at the site on a weekly basis and submit the inspection documentation to the SSHO. All personnel shall drive defensively and wear seat belts while vehicles are in motion. Backing of vehicles shall be avoided when possible. Extra care shall be taken to back vehicles when unavoidable. When parking vehicles into head in parking spaces, vehicles shall be backed into the space whenever possible. Before backing a vehicle that has been parked, the driver shall physically walk to the back of the vehicle to observe the area before entering the vehicle. Spotters shall be used to back vehicles whenever possible.	Seatbelts	

APPENDIX C2 ACTIVITY HAZARD ANALYSIS FOR GENERAL SITE ACTIVITIES				
Task Breakdown	**Potential Hazards**	**Critical Safety Practices**	**Personal Protective Clothing and Equipment**	**Monitoring Devices**
Unload equipment	Unfamiliarity with: site, general site hazards, project safety rules, chain of command, emergency procedures. Heavy lifting/strains, sprains; Use of mechanical equipment;	All personnel shall attend the site orientation training. No individual employee is permitted to lift any object that weighs over 60 pounds. Proper lifting techniques shall be used. Multiple employees or the use of mechanical lifting devices are required for lifting objects over the 60-pound limit. Only qualified personnel shall be permitted to operate equipment. Forklifts and mechanical equipment shall be inspected daily. Deficiencies in equipment shall be noted on the inspection form. Equipment found to be unsafe shall not be used. All equipment shall be operated at safe speeds and in a safe manner. Equipment operators shall wear safety belts and hearing protection. Ground personnel shall not position themselves between equipment and stationary objects and only approach equipment after a signal from the operator. Personnel are prohibited from entering the swing radius of booms. Equipment load capacities shall not be exceeded. Personnel shall ensure all mechanical guards are in place and functioning properly. All equipment shall be shut down with energies dissipated prior to performing maintenance activities - lock out/tag out procedures may apply. Only qualified mechanics shall work on or repair heavy equipment.		

APPENDIX C2 ACTIVITY HAZARD ANALYSIS FOR GENERAL SITE ACTIVITIES				
Task Breakdown	**Potential Hazards**	**Critical Safety Practices**	**Personal Protective Clothing and Equipment**	**Monitoring Devices**
Mobilization/ Site Setup	Slips, Trips, Falls	• Clear walkways work areas of equipment, tools, vegetation, excavated material and debris • Mark, identify, or barricade other obstructions		
	Spills	• Clean up spills before initiating maintenance • Review maintenance procedures for safety practices		
	Electrical Shock	• De-energize or shut off utility lines at their source before work begins • Use double insulated or properly grounded electric power-operated tools • Provide an equipment-grounding conductor program or employ ground-fault circuit interrupters • Use qualified electricians to hook up electrical circuits • Inspect all extension cords daily for structural integrity, ground continuity, and damaged insulation • Cover or elevate electric wire or flexible cord passing through work areas to protect from damage • Keep all plugs and receptacles out of water • Use approved water-proof, weather-proof type if exposure to moisture is likely • Inspect all electrical power circuits prior to commencing work • Follow Lockout/Tagout procedure HS315 – Control of Hazardous Energy Sources	Lockout/Tagout Devices	Voltage Meter or Tic Tracer

APPENDIX C2 ACTIVITY HAZARD ANALYSIS FOR GENERAL SITE ACTIVITIES				
Task Breakdown	**Potential Hazards**	**Critical Safety Practices**	**Personal Protective Clothing and Equipment**	**Monitoring Devices**
Mobilization/ Site Setup (continued)	Handling Heavy Objects	• Observe proper lifting techniques • Obey sensible lifting limits (60 lb. Maximum per person manual lifting) • Use mechanical lifting equipment (hand carts, trucks) to move large, awkward loads • Avoid carrying heavy objects above shoulder level • Warm up muscles before engaging in manual lifting		
	Sharp Objects	• Wear cut resistant work gloves when the possibility of lacerations or other injury may be caused by sharp edges or objects • Maintain all hand and power tools in a safe condition	Leather gloves	
	High Noise Levels	• Use hearing protection when exposed to excessive noise levels (greater than 85 dBA over an 8-hour work period) • Do not attempt verbal communication in high noise backgrounds	Ear plugs	
	Struck By/ Against Heavy Equipment	• Wear reflective warning vests when exposed to vehicular traffic • Isolate equipment swing areas • Make eye contact with operators before approaching equipment • Understand and review hand signals • Follow hand signals of ground workers for equipment manipulation when placing/loading equipment into bucket. • Step away from equipment when bucket adjustments are made • Do not attempt verbal communication in high noise backgrounds.	Warning vests, Hard hat, Safety glasses, and Steel toe work boots	

APPENDIX C2 ACTIVITY HAZARD ANALYSIS FOR GENERAL SITE ACTIVITIES				
Task Breakdown	**Potential Hazards**	**Critical Safety Practices**	**Personal Protective Clothing and Equipment**	**Monitoring Devices**
Mobilization/ Site Setup (continued)	Struck-by/Against (Vehicle-traffic)	• Wear reflective warning vests when exposed to vehicular traffic • Barricade or enclose the work areas • Restrict entry to the work areas to authorized personnel during work activities • Wear hard hats, safety glasses with side shields, and steel-toe safety boots at all times • Follow FDOT roadway and traffic design standards manual • Personnel will perform all work tasks and remain inside barriered work zones • Spotters to be utilized as necessary	Warning vests, Hard hat, Safety glasses, and steel toe work boots	
	Pinch Points	• Review equipment adjustment procedures, identify pinch points • Isolate/block pinch points to limit motion when inserting pins, fasteners, closing tackles	Leather gloves	
	Burns associated with loading/unloading equipment on trucks	• Identify heavy objects for loading that may have hot surfaces • Allow objects to cool or cover hot surfaces with non-combustible material to protect workers from burns		
	Ladders	• Inspect ladders before use for mud buildup on treads • Clean mud from boots before climbing on ladders • Follow the three point of contact rule		
	High/Low Ambient Temperature	• Monitor for Heat Stress in accordance with Health and Safety Procedures HS400, HS401 • Provide fluids to prevent worker dehydration		

EQUIPMENT REQUIRED	**INSPECTION REQUIREMENTS**	**TRAINING REQUIREMENTS**
• Vehicles • Hand tools • Ladders • Forklift/Hand carts	• Daily equipment inspections as per manufacturers requirements • Inspection of all emergency equipment (i.e. first aid kits, fire extinguishers)	• Review AHA with all task personnel • Review Site Specific Safety and Occupational Health Program • Review operations/safety manuals for all equipment utilized

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APPENDIX C3 ACTIVITY HAZARD ANALYSIS FOR COLLECT SURFACE SOIL SAMPLES				
Task Breakdown	**Potential Hazards**	**Critical Safety Practices**	**Personal Protective Clothing and Equipment**	**Monitoring Devices**
Arrival of new personnel at site.	Unfamiliarity with site, general site hazards, project safety rules, chain of command, and emergency procedures.	All personnel shall attend the site orientation training.		
Unload equipment.	Heavy lifting, strains, and sprains.	No individual employee is permitted to lift any object that weighs over 60 pounds. Proper lifting techniques shall be used. Multiple employees or the use of mechanical lifting devices are required for lifting objects over the 60-pound limit.		
	Intrusive activities.	Follow procedure for Intrusive Activities Permit in the SSHP. Underground utilities shall be located and marked prior to commencing sampling activity.		
	Munitions and Explosives of Concern (MEC).	Personnel shall attend MEC Awareness training.		

APPENDIX C3
ACTIVITY HAZARD ANALYSIS FOR COLLECT SURFACE SOIL SAMPLES

Task Breakdown	Potential Hazards	Critical Safety Practices	Personal Protective Clothing and Equipment	Monitoring Devices
Surface Soil Sampling. (Continued)	Use of sampling tools.	Tools shall be inspected daily and before each use. Damaged tools shall be removed from service.		
	Hazardous atmospheres.	Air monitoring, as described in the SSHP shall be performed in areas where there is the possibility of elevated concentrations of toxic chemicals, flammable vapors, or oxygen-deficient atmospheres. Personnel shall immediately notify the Site Safety and Health Officer (SSHO) if odors are detected.		
	Contaminated air, water, soil, or hazardous chemicals	Physical contact with contaminated media or hazardous chemicals shall be avoided. Personal protective equipment use is required when contact is possible. Personnel who sustain skin contact shall immediately wash the affected area with soap and water (eyes should be irrigated for 15 minutes with potable water) and report the incident to the SSHO.		
	Fire	Smoking shall not be permitted in regulated areas. Vehicles shall not be parked in tall dry grass		
	Miscellaneous site activity.	When possible, personnel shall avoid areas that have hazardous activities in progress. When access must be gained in busy areas, the foremen of the activities in the area shall be notified prior to sampling in the area.	High visibility vests shall be worn when working in areas with high vehicular or heavy equipment traffic.	

EQUIPMENT REQUIRED	INSPECTION REQUIREMENTS	TRAINING REQUIREMENTS
• Vehicles • Hand tools	• Daily equipment inspections as per manufacturers requirements • Inspection of all emergency equipment (i.e. first aid kits, fire extinguishers)	• Review AHA with all task personnel • Review Site Specific Safety and Occupational Health Program • Review operations/safety manuals for all equipment utilized

APPENDIX C4 ACTIVITY HAZARD ANALYSIS FOR COLLECT SUBSURFACE SOIL SAMPLES				
Task Breakdown	**Potential Hazards**	**Critical Safety Practices**	**Personal Protective Clothing and Equipment**	**Monitoring Devices**
Arrival of new personnel at site.	Unfamiliarity with: site, general site hazards, project safety rules, chain of command, and emergency procedures.	All personnel shall attend the site orientation training.		
Location surveys.	Use of hand tools.	Hand tools shall be inspected daily and before each use. Tools, which are damaged, shall be removed from service.		
Materials Handling.	Overexertion	Personnel shall work in a manner and pace to reduce strains and overexertion.		
Soil sampling.	Hazardous atmospheres.	Air monitoring shall be performed in areas where there is the possibility of elevated concentrations of toxic chemicals, flammable vapors, or oxygen deficient atmospheres. Personnel shall immediately notify the SSHO if odors are detected. Engineering controls shall be implemented, when feasible, to control hazardous atmospheres to within acceptable limits. When engineering controls are not adequate, administrative controls or the use of PPE is required.		
	Fire.	Smoking shall not be permitted in regulated areas. Vehicles shall not be parked in tall dry grass.		
	Slips, trips, and falls.	Keep work areas clear and maintain housekeeping. Personnel shall not jump from equipment or elevated surfaces. Personnel shall avoid walking on rough or slippery terrain.		

APPENDIX C4 ACTIVITY HAZARD ANALYSIS FOR COLLECT SUBSURFACE SOIL SAMPLES				
Task Breakdown	**Potential Hazards**	**Critical Safety Practices**	**Personal Protective Clothing and Equipment**	**Monitoring Devices**
Soil sampling (continued).	Contaminated air, water, soil, or hazardous chemicals.	Physical contact with contaminated media or hazardous chemicals shall be avoided. Personal protective equipment use is required when contact is possible/probable. Personnel who sustain skin contact shall immediately wash the affected area with soap and water (eyes should be irrigated for 15 minutes with potable water) and report the incident to the SSHO.		
	Use of acidic preservatives (if required).	Personal protective equipment use, including chemical splash goggles, shall be required. A portable eye wash station shall be readily available in the area where acids are being used. Acids will be used in areas with adequate ventilation. All containers shall be properly labeled.		
	Miscellaneous site activity.	Personnel shall avoid areas, when possible, that have hazardous activities in progress. When access must be gained in busy areas, the foremen of the activities in the area shall be notified - prior to sampling in the area. High visibility vests shall be worn when working in areas with high vehicular or heavy equipment traffic.		
	Heat/cold/severe weather.	Follow procedures outlined in SSHP. Follow procedures outlined in SSHP.		
	Biological.			

EQUIPMENT REQUIRED	**INSPECTION REQUIREMENTS**	**TRAINING REQUIREMENTS**
• Vehicles • Hand tools • Ladders • Forklift/Hand carts	• Daily equipment inspections as per manufacturers requirements • Inspection of all emergency equipment (i.e. first aid kits, fire extinguishers)	• Review AHA with all task personnel • Review SSHP • Review operations/safety manuals for all equipment utilized

APPENDIX C5 ACTIVITY HAZARD ANALYSIS FOR COLLECT SURFACE WATER AND GROUNDWATER SAMPLES				
Task Breakdown	**Potential Hazards**	**Critical Safety Practices**	**Personal Protective Clothing and Equipment**	**Monitoring Devices**
Arrival of new personnel at site.	Unfamiliarity with: site, general site hazards, project safety rules, chain of command, and emergency procedures.	All personnel shall attend the site orientation training.		
Location surveys.	Use of hand tools.	Hand tools shall be inspected daily and before each use. Tools, which are damaged, shall be removed from service.		
Materials Handling.	Overexertion	Personnel shall work in a manner and pace to reduce strains and overexertion.		
Water sampling.	Hazardous atmospheres.	Air monitoring shall be performed in areas where there is the possibility of elevated concentrations of toxic chemicals, flammable vapors, or oxygen deficient atmospheres. Personnel shall immediately notify the SSHO if odors are detected. Engineering controls shall be implemented, when feasible, to control hazardous atmospheres to within acceptable limits. When engineering controls are not adequate, administrative controls or the use of PPE is required.		
	Fire.	Smoking shall not be permitted in regulated areas. Vehicles shall not be parked in tall dry grass.		
	Slips, trips, and falls.	Keep work areas clear and maintain housekeeping. Personnel shall not jump from equipment or elevated surfaces. Personnel shall avoid walking on rough or slippery terrain.		

APPENDIX C5 ACTIVITY HAZARD ANALYSIS FOR COLLECT SURFACE WATER AND GROUNDWATER SAMPLES				
Task Breakdown	**Potential Hazards**	**Critical Safety Practices**	**Personal Protective Clothing and Equipment**	**Monitoring Devices**
Water sampling (continued).	Contaminated air, water, soil, or hazardous chemicals.	Physical contact with contaminated media or hazardous chemicals shall be avoided. Personal protective equipment use is required when contact is possible/probable. Personnel who sustain skin contact shall immediately wash the affected area with soap and water (eyes should be irrigated for 15 minutes with potable water) and report the incident to the SSHO.		
	Use of acidic preservatives (if required).	Personal protective equipment use, including chemical splash goggles, shall be required. A portable eye wash station shall be readily available in the area where acids are being used. Acids will be used in areas with adequate ventilation. All containers shall be properly labeled.		
	Miscellaneous site activity.	Personnel shall avoid areas, when possible, that have hazardous activities in progress. When access must be gained in busy areas, the foremen of the activities in the area shall be notified - prior to sampling in the area. High visibility vests shall be worn when working in areas with high vehicular or heavy equipment traffic.		
	Heat/cold/severe weather.	Follow procedures outlined in SSHP.		
	Biological.	Follow procedures outlined in SSHP.		

EQUIPMENT REQUIRED	**INSPECTION REQUIREMENTS**	**TRAINING REQUIREMENTS**
• Vehicles • Hand tools • Ladders • Forklift/Hand carts	• Daily equipment inspections as per manufacturers requirements • Inspection of all emergency equipment (i.e. first aid kits, fire extinguishers)	• Review AHA with all task personnel • Review SSHP • Review operations/safety manuals for all equipment utilized

APPENDIX C6 ACTIVITY HAZARD ANALYSIS FOR WELL DRILLING				
Task Breakdown	**Potential Hazards**	**Critical Safety Practices**	**Personal Protective Clothing and Equipment**	**Monitoring Devices**
Well Installation	Struck by/ Against Heavy Equipment, Flying Debris, Protruding Objects	• Wear reflective warning vests when exposed to vehicular traffic • Isolate equipment swing areas • Make eye contact with operators before approaching equipment • Barricade or enclose the drilling area • Restrict entry to the work area to authorized personnel during drilling activities • Wear hard hats, safety glasses with side shields, or splash/face shields and goggles, and steel-toe safety boots at all times • Understand and review hand signals	Warning vests, Hard hat, Safety glasses, steel toe work boots	
	Sharp Objects	• Wear cut resistant work gloves when the possibility of lacerations or other injury may be caused by sharp edges or objects • Maintain all hand and power tools in a safe condition • Keep guards in place during use • Observe work area and location of other personnel before lifting or moving objects with sharp edges	Leather gloves	
	Underground/ Overhead Utilities	• Identify all utilities around the site before work commences and cease work immediately if unknown utility markers are uncovered • Use manual excavation within 3 feet of known utilities • Utility clearance shall conform with 29 CFR 1926.955 (high voltage >700 kv) 15 feet phase to ground clearance; 31 feet phase to phase clearance		
	High Noise Levels	• Use hearing protection when exposed to excessive noise levels (greater than 85 dBA over an 8-hour work period) and Assess noise level with sound level meter if possibility exists that level may exceed 85dBA TWA	Ear plugs	Sound Level Meter

APPENDIX C6 ACTIVITY HAZARD ANALYSIS FOR WELL DRILLING				
Task Breakdown	**Potential Hazards**	**Critical Safety Practices**	**Personal Protective Clothing and Equipment**	**Monitoring Devices**
Well Installation (continued)	Handling Heavy Objects	• Observe proper lifting techniques • Obey sensible lifting limits (60 lb. Maximum per person manual lifting) • Use mechanical lifting equipment (hand carts, trucks) to move large, awkward loads • Warm up muscles before engaging in manual lifting activities • Review lifting posture/techniques regularly at safety meetings		
	Caught In/ Between Moving Parts	• Identify and understand parts of equipment which may cause crushing, pinching, rotating or similar injuries • Assure guards are in place to protect from these parts of equipment during operation • Provide and wear proper work gloves when the possibility of crush, pinch, or other injury may be caused by moving/stationary edges or objects • Maintain all equipment in a safe condition • Keep all guards in place during use • De-energize and lock-out machinery before maintenance or service		
	Horseplay	• Prohibit horseplay on all project sites • Review rules about horseplay with subcontract supervisors and workers • Remind workers not to respond/participate in horseplay started by others		

APPENDIX C6 ACTIVITY HAZARD ANALYSIS FOR WELL DRILLING				
Task Breakdown	**Potential Hazards**	**Critical Safety Practices**	**Personal Protective Clothing and Equipment**	**Monitoring Devices**
	Slips, Trips, Falls	• Clear walkways, work areas of equipment, drilling overburden, debris and other materials • Mark, identify, or barricade other obstructions		
	Inhalation and Contact with Hazardous Substances	• Provide workers proper skin, eye and respiratory protection based on the exposure hazards present • Review hazardous properties of site contaminants with workers before operations begin	Tyvek coveralls, nitrile gloves, latex or neoprene boots	
Well Installation (continued)	Fire/ Explosion	• Test well-head atmosphere with combustible gas meter • Eliminate sources of ignition from the work area • Prohibit smoking • Provide ABC (or equivalent) fire extinguishers in all work areas, flammable storage areas, generator and compressor locations • Store flammable liquids in well ventilated areas • Prohibit storage, transfer of flammable liquids in plastic containers • Post "NO SMOKING" signs • Store combustible materials away from flammables • Store all compressed gas cylinders upright, caps in place when not in use • Separate Flammables and Oxidizers by 20 feet minimum	Portable fire extinguishers	LEL/O_2
	High/Low Ambient Temperature	• Monitor for Heat/Cold stress in accordance with Shaw Health and Safety Procedures HS400. HS401 • Provide fluids to prevent worker dehydration		

EQUIPMENT REQUIRED	INSPECTION REQUIREMENTS	TRAINING REQUIREMENTS
• Drill Rig • Hand tools	• Daily equipment inspections as per manufacturers requirements • Inspection of all emergency equipment (i.e. first aid kits, fire extinguishers)	• Review JSA with all task personnel • Review SSHP

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APPENDIX C7 ACTIVITY HAZARD ANALYSIS FOR SOIL EXCAVATION				
Task Breakdown	**Potential Hazards**	**Critical Safety Practices**	**Personal Protective Clothing and Equipment**	**Monitoring Devices**
Excavation of Soil	Underground/ Overhead Utilities	• Identify all utilities around the site before work commences • Cease work immediately if unknown utility markers are uncovered • Use manual excavation within 3 feet of known utilities • Utility clearance shall conform with 29 CFR 1926.955 (high voltage >700 kv) 15 feet phase to ground clearance; 31 feet phase to phase clearance		
	Excavation Wall Collapse	• Construct diversion ditches or dikes to prevent surface water from entering excavation • Provide good drainage of area adjacent to excavation • Collect ground water/rain water from excavation and dispose of properly • Store excavated material at least 2 feet from the edge of the excavation; prevent excessive loading of the excavation face • Provide sufficient stairs, ladders, or ramps when workers enter excavations over 4 feet in depth • Place ladders no more than 25 feet apart laterally • Treat excavations over 4 feet deep as confined spaces • Complete confined space permit entry procedure • Monitor atmosphere for flammable/toxic vapors, and oxygen deficiency • Slope, bench, shore, or sheet excavations over 5 feet deep if worker entry is required • Assign a competent person to inspect, decide soil classification, proper sloping, the correct shoring, or sheeting • Inspect excavations (when personnel entry is required) daily, any time conditions change • Provide at least two means of exit for personnel working in excavations	Hard hat, safety glasses, steel toe work boots	

APPENDIX C7 ACTIVITY HAZARD ANALYSIS FOR SOIL EXCAVATION				
Task Breakdown	**Potential Hazards**	**Critical Safety Practices**	**Personal Protective Clothing and Equipment**	**Monitoring Devices**
Excavation of Soil (Continued)	Struck By/ Against Heavy Equipment	• Wear reflective warning vests when exposed to vehicular traffic • Isolate equipment swing areas • Make eye contact with operators before approaching equipment • Understand and review hand signals	Warning vests, hard hat, safety glasses, steel toe work boots	
	Handling Heavy Objects	• Observe proper lifting techniques • Obey sensible lifting limits (60 lb. maximum per person manual lifting) • Use mechanical lifting equipment (hand carts, trucks) to move large, awkward loads		
	Sharp Objects	• Wear cut resistant work gloves when the possibility of lacerations or other injury may be caused by sharp edges or objects • Maintain all hand and power tools in a safe condition • Keep guards in place during use	Leather gloves	
	Slips, Trips, Falls	• Clear walkways, work areas of equipment, vegetation, excavated material, tools, and debris • Mark, identify, or barricade other obstructions • Evaluate fall hazards above 4 ft.; use fall protection equipment (harness/lanyard), standard guardrails or other fall protection systems when working on elevated platforms above 6 ft. • Use Aheavy duty industrial≅ (type IA) ladders • Install and inspect scaffolds according to manufacturers requirements • Only trained operators are permitted to use aerial lifts • Tie-off all straight/extension ladders or manually hold by co-worker at base • Anchorage points for fall arrest systems must support at least 5,400 pounds for each worker		

APPENDIX C7 ACTIVITY HAZARD ANALYSIS FOR SOIL EXCAVATION				
Task Breakdown	**Potential Hazards**	**Critical Safety Practices**	**Personal Protective Clothing and Equipment**	**Monitoring Devices**
Excavation of Soil (Continued)	High Noise Levels	• Use hearing protection when exposed to excessive noise levels (greater than 85 dBA over an 8-hour work period) • Assess noise level with sound level meter if possibility exists that level may exceed 85dBA TWA	Ear plugs	
	Inhalation and Contact with Hazardous Substances	• Provide workers proper skin, eye and respiratory protection based on the exposure hazards present • Review hazardous properties of site contaminants with workers before operations begin • Monitor breathing zone air to determine levels of contaminants • Dampen soil using light water spray to prevent fugitive dust emissions • Cover stockpiled soil with plastic sheeting to prevent fugitive dust emissions • Conduct air monitoring / sampling to determine exposure levels	Tyvek coveralls, nitrile gloves, neoprene boots	LEL/O_2, PID, Mini-RAM, H_2S Monitor; Air sampling pump
	High/Low Ambient Temperature	• Monitor for Heat/Cold stress in accordance with IT Health and Safety Procedures # HS400, HS401 • Provide fluids to prevent worker dehydration • Follow work/rest schedule	Insulated Clothing (subject to ambient temperature)	Meteorological Equipment
EQUIPMENT REQUIRED		**INSPECTION REQUIREMENTS**	**TRAINING REQUIREMENTS**	
• Vehicles • Hand tools • Ladders • Forklift/Hand carts		• Daily equipment inspections as per manufacturers requirements • Inspection of all emergency equipment (i.e. first aid kits, fire extinguishers)	• Review AHA with all task personnel • Review Site Specific Safety and Occupational Health Program • Review operations/safety manuals for all equipment utilized	

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APPENDIX C8 ACTIVITY HAZARD ANALYSIS FOR BACKFILLING AND COMPACTION				
Task Breakdown	**Potential Hazards**	**Critical Safety Practices**	**Personal Protective Clothing and Equipment**	**Monitoring Devices**
Backfill and Compact Soils	Slips, Trips, Falls	• Clear walkways, work areas of equipment, tools, construction debris and other materials • Mark, identify, or barricade other obstructions • Maintain three point contact when ascending/ descending heavy equipment		
	Handling Heavy Objects	• Observe proper lifting techniques • Obey sensible lifting limits (60 lb. maximum per person manual lifting) • Use mechanical lifting equipment (hand carts, trucks) to move large, awkward loads		
	Struck by/ Against Heavy Equipment, Flying Debris, Protruding Objects	• Wear reflective warning vests when exposed to vehicular traffic • Isolate equipment swing areas • Make eye contact with operators before approaching equipment • Verify proper operation of equipment backup alarms • Barricade or enclose the work area • Restrict work area entry to authorized personnel only during construction activities • Wear hard hats, safety glasses with side shields, and steel-toe safety boots • Understand and review hand signals	Warning vests, Hard hat, Safety glasses, Steel toe work boots	
	Vibration	• Rotate compaction tasks to minimize worker exposure to equipment vibration • Use compactors with vibration dampening devices	leather gloves	
	High Noise Levels	• Use hearing protection when exposed to excessive noise levels (greater than 85 dBA over an 8-hour work period) • Assess noise level with sound level meter if possibility exists that level may exceed 85dBA TWA	Ear plugs	Sound Level Meter

APPENDIX C8 ACTIVITY HAZARD ANALYSIS FOR BACKFILLING AND COMPACTION				
Task Breakdown	**Potential Hazards**	**Critical Safety Practices**	**Personal Protective Clothing and Equipment**	**Monitoring Devices**
Backfill and Compact Soils (Continued)	High/Low Ambient Temperature	• Monitor for Heat/Cold stress in accordance with Shaw Health and Safety Procedures # HS400, HS401 • Provide fluids to prevent worker dehydration	Insulated Clothing (subject to ambient temperature)	Meteorological Equipment

EQUIPMENT REQUIRED	**INSPECTION REQUIREMENTS**	**TRAINING REQUIREMENTS**
• Excavator • Shovels, probes • Dump trucks	• Daily equipment inspections as per manufacturers requirements • Excavation inspection/permit • Inspection of all emergency equipment (i.e.: first aid kits, fire extinguishers)	• Review AHA with all task personnel • Review SSHP. • Review operations/safety manuals for all equipment utilized • Review site specific chemical hazards

APPENDIX C9 AHA FOR SITE SURVEY ACTIVITIES				
Task Breakdown	**Potential Hazards**	**Critical Safety Practices**	**Personal Protective Clothing and Equipment**	**Monitoring Devices**
Survey of Site	Struck By/ Against Motor Vehicles/ Operating Equipment	Wear reflective warning vests when exposed to vehicular traffic Isolate potential equipment swing areas Avoid/isolate survey activities in high traffic areas Make eye contact with vehicle operators before approaching/crossing high traffic areas Understand and review hand signals Emphasize The Buddy System where injury potential exists	Hard hat, safety glasses, steel toe work boots, Safety Vest	
	Slips, Trips, Falls	Clear walkways, work areas of equipment and tools Mark, identify, or barricade other obstructions		
	Handling Heavy Objects	Observe proper lifting techniques Obey sensible lifting limits (60 lb. maximum per person manual lifting) Use mechanical lifting equipment (hand carts, trucks) to move large, awkward loads		
	Sharp Objects	Wear cut resistant work gloves when the possibility of lacerations or other injury may be caused by sharp edges or objects Maintain all hand and power tools in a safe condition Keep guards in place during use Close doors, windows on heavy equipment to prevent injuries from tree branches and other vegetation	Leather gloves	
	Insect/ Animal Bites	Review injury potential with workers Avoid insect nests areas, habitats outside work areas Emphasize The Buddy System where such injury potential exists Use insect repellant to protect against sting injuries		

APPENDIX C9 AHA FOR SITE SURVEY ACTIVITIES				
Task Breakdown	**Potential Hazards**	**Critical Safety Practices**	**Personal Protective Clothing and Equipment**	**Monitoring Devices**
Survey of Site (Continued)	Contact Dermatitis	Wear long sleeve shirts / trousers to avoid skin contact with plants or other skin irritants Identify and review poisonous plants with workers Apply protective cream/lotion to exposed skin to prevent poison ivy or similar reactions	latex boot covers	
	High/Low Ambient Temperature	Monitor for Heat/Cold stress in accordance with Shaw Health and Safety Procedures # HS400, HS401 Provide fluids to prevent worker dehydration	Insulated Clothing (subject to ambient temperature)	Meteorological Equipment
EQUIPMENT REQUIRED		**INSPECTION REQUIREMENTS**	**TRAINING REQUIREMENTS**	
• Hand tools		Daily equipment inspections as per manufacturers requirements Inspection of all emergency equipment (i.e. first aid kits, fire extinguishers)	Review JSA with all task personnel Review SSHP	

APPENDIX C10 AHA FOR SITE RESTORATION				
Task Breakdown	**Potential Hazards**	**Critical Safety Practices**	**Personal Protective Clothing and Equipment**	**Monitoring Devices**
Prepare area, fertilize, and sew grass seed.	Use of tractors/mechanical equipment.	Only qualified personnel shall be permitted to operate equipment. The operator shall read the tractor operator manual prior to use. The operator shall review all safety and operational decals applied to the tractor and implements prior to use. The tractor shall be inspected daily (and documented). Inspection forms are located in Appendix D of the SSHP. Do not use unsafe equipment. Deficiencies in equipment shall be noted on the inspection form. Equipment found to be unsafe shall not be used. Keep all shields and guards in place. Do not operate equipment with missing shields or guards. Shut off engine, remove the key, and be sure implement motion has stopped before dismounting the tractor, performing adjustments, or performing maintenance. Personnel shall not wear loose clothing, and stay clear of moving parts. Be careful of pinch points when coupling and uncoupling equipment. Be careful of power take off (PTO) – make sure guards are in place. Never step over the PTO – walk around the tractor or implement. Avoid tight turns that pinch rotating shafts between the tractor and machine.		

APPENDIX C10 AHA FOR SITE RESTORATION				
Task Breakdown	**Potential Hazards**	**Critical Safety Practices**	**Personal Protective Clothing and Equipment**	**Monitoring Devices**
Prepare area, fertilize, and sew grass seed (continued).	Use of tractors/mechanical equipment (continued).	Wear gloves when manually hooking up equipment. Avoid lateral movement on steep slopes where rollover potential may be high. All equipment shall be operated at safe speeds and in a safe manner. Personnel shall ensure all mechanical guards are in place and functioning properly. All equipment shall be shut down with energies dissipated prior to performing maintenance activities - lock out/tag out procedures may apply. Only qualified mechanics shall work on or repair heavy equipment. All equipment shall have backing alarms. The tractor operator shall wear safety belts. Personnel are only permitted to approach equipment after a signal from the operator. Operate the PTO at the speed recommended for the implement being used.		

APPENDIX C10 AHA FOR SITE RESTORATION				
Task Breakdown	**Potential Hazards**	**Critical Safety Practices**	**Personal Protective Clothing and Equipment**	**Monitoring Devices**
Prepare area, fertilize, and sew grass seed (continued).	Slips, trips, falls. Hand injuries. Bright sun (glare) and eye injuries. Fire.	Personnel shall not jump from equipment. Personnel shall be cautious when walking/working on uneven or slippery surfaces. Heavy equipment operators shall use extra care and maintain three-point contact when climbing into or out of equipment. Items to be handled shall be inspected for sharp edges prior to being handled. Personnel shall wear leather gloves when handling sharp materials. Personnel shall be aware of and avoid pinch point hazards. Eye protection equipment shall be worn as necessary. The tractor shall be shut off before refueling. A 2:A-20B:C fire extinguisher shall be available when re-fueling tractor. Smoking shall not be permitted when fueling. The tractor shall be allowed to cool before refueling. Gasoline shall be stored in safety cans with flash arrestors and spring-loaded vents. The tractor shall be equipped with a 5-B:C fire extinguisher. Vehicle shall not be allowed to idle when parked on grass. A Hudson sprayer, filled with water, shall be available at the work location.		

APPENDIX C10 AHA FOR SITE RESTORATION				
Task Breakdown	**Potential Hazards**	**Critical Safety Practices**	**Personal Protective Clothing and Equipment**	**Monitoring Devices**
Prepare area, fertilize, and sew grass seed (continued).	Noise.	Tractor operator shall wear hearing protection to reduce exposures to below the Occupational Safety and Health Administration limits.		
	Heat stress.	Personnel shall keep hydrated by drinking more water than thirst indicates. The heat stress guidelines in the SSHP shall be followed. Personnel shall pace themselves while performing strenuous work and take adequate breaks in a cool area. Personnel shall take adequate breaks in a cool area.		
	Stinging and biting insects.	Follow procedures outlined in SSHP. Use Deep Woods Off (N,N-Diethyl-m-toluamide [DEET]) and Repel Permanone (permethrins), and/or flowers of sulfur to repel chiggers, mosquitoes, and ticks.		
	Use of fertilizer.	Read material safety data sheet for fertilizer prior to use. The precautionary recommendations by the manufacturer shall be followed. Personnel shall avoid contact with the fertilizer. Personnel shall wash their hands and face immediately after using the fertilizer.		

EQUIPMENT REQUIRED	**INSPECTION REQUIREMENTS**	**TRAINING REQUIREMENTS**
Hearing protection Insect repellant Drinking water	Site inspections (daily)	Site orientation Hazard Communication Heat stress procedures

APPENDIX C11
ACTIVITY HAZARD ANALYSIS FOR SOIL BORROW MATERIAL IMPORT (LOADING, TRANSPORTATION, AND DUMPING

Task Breakdown	Potential Hazards	Critical Safety Practices	Personal Protective Clothing and Equipment	Monitoring Devices
Truck Loading and Equipment Operations	Struck By/ Against Heavy Equipment	• Wear reflective warning vests when exposed to vehicular traffic • Obey posted speed limits • Isolate equipment swing areas • . Make eye contact with operators before approaching equipment . Understand and review hand signals	Warning vests, Hard hat, Safety glasses, Steel toe work boots	
	Slips, Trips, Falls	• Clear walk ways, work areas of equipment, tools and debris • . Mark, identify, or barricade other obstructions		
	Sharp Objects	• Wear cut resistant work gloves when the possibility of lacerations or other injury may be caused by sharp edges or objects • Maintain all hand and power tools in a safe condition • Keep guards in place during use	Leather gloves	
	High Noise Levels	• Use hearing protection when exposed to excessive noise levels (Greater than 85 dBA over an 8-hour work period) • Assess noise level with sound level meter if possibility exists that level may exceed 85dBA TWA • Do not attempt verbal communication in high noise backgrounds	Ear plugs	Sound Level Meter
	Handling Heavy Objects	• Observe proper lifting techniques • Obey sensible lifting limits (60 lb. maximum per person manual lifting) • Use mechanical lifting equipment (hand carts, trucks)to move large, awkward loads		

APPENDIX C11
ACTIVITY HAZARD ANALYSIS FOR SOIL BORROW MATERIAL IMPORT (LOADING, TRANSPORTATION, AND DUMPING

Task Breakdown	Potential Hazards	Critical Safety Practices	Personal Protective Clothing and Equipment	Monitoring Devices
Truck Loading and Equipment Operations (Continued)	Caught In/ Between Moving Parts	• Identify and understand parts of equipment which may cause crushing, pinching, rotating or similar motions • Assure guards are in place to protect from these parts of equipment during operation • Wear proper work gloves when the possibility of pinching, or other injury may be caused by moving/ handling large or heavy objects • Maintain all equipment in a safe condition • Keep all guards in place during use • Avoid moving hydraulic, dump or loading equipment		

EQUIPMENT REQUIRED	INSPECTION REQUIREMENTS	TRAINING REQUIREMENTS
• Excavator • Dump trucks • Shovels	• Daily equipment inspections as per manufacturers requirements • Inspection of all emergency equipment (i.e. first aid kits, fire extinguishers)	• Review AHA with all task personnel • Review operations/safety manuals for all equipment utilized

APPENDIX C12 AHA FOR EQUIPMENT DECONTAMINATION				
Task Breakdown	**Potential Hazards**	**Critical Safety Practices**	**Personal Protective Clothing and Equipment**	**Monitoring Devices**
Arrival of new personnel at site.	Unfamiliarity with site, general site hazards, project safety rules, chain of command, and emergency procedures.	All personnel shall attend the site orientation training.		
Unload equipment.	Heavy lifting, strains, and sprains.	No individual employee is permitted to lift any object that weighs over 60 pounds. Proper lifting techniques shall be used. Multiple employees or the use of mechanical lifting devices are required for lifting objects over the 60-pound limit.		
Equipment decontamination.	Use of pressure or steam washer.	All personnel associated with the use of steam/pressure washers shall wear Level D-Modified personal protective equipment (PPE). Rain gear over Saranex or poly-coated Tyvek® coveralls shall be worn by personnel in addition to Nitrile or polyvinyl chloride (PVC) gloves and PVC or Latex boot covers. Physical contact with contaminated media or hazardous chemicals shall be avoided. Personnel who sustain skin contact shall immediately wash the affected area with soap and report the incident to the Site Safety and Health Officer. Personnel shall wash hands and face at the conclusion of decontamination activities and before breaks.		

APPENDIX C12 AHA FOR EQUIPMENT DECONTAMINATION				
Task Breakdown	**Potential Hazards**	**Critical Safety Practices**	**Personal Protective Clothing and Equipment**	**Monitoring Devices**
Equipment decontamination (continued).	Slips, trips, falls. Pressure/steam washing.	Personnel shall be cautious when walking/working on slippery surfaces. Personnel lifts or scaffolding shall be used to access the tops of large/heavy equipment that must be cleaned. Fall protection shall be used when working at heights greater than six feet. Good house keeping shall be maintained in the decontamination area. Hoses and extension cords shall be kept/used in an orderly fashion. All equipment shall be shut off and a positive means taken to prevent its operation prior to decontamination. All dump beds on trucks shall be blocked if bed is cleaned in raised position. The pressure/steam washer shall be inspected before each use. The manufacturer's instruction manual shall be used to guide the inspection process. Personnel shall be trained in the use of the washing equipment. All personnel working in the equipment decontamination area shall be trained in the emergency shut-off procedures for the equipment being used. The minimum amount of steam/pressure that will complete the job should be used. Pressure washers exceeding 3000 psi shall not be used without the approval of the Certified Industrial Hygienist. The spray from such equipment shall only be directed at surfaces to be cleaned and never at body parts or other personnel. Personnel in the immediate area shall use face shields and metatarsal/shin guards.		

APPENDIX C12 AHA FOR EQUIPMENT DECONTAMINATION				
Task Breakdown	**Potential Hazards**	**Critical Safety Practices**	**Personal Protective Clothing and Equipment**	**Monitoring Devices**
Equipment decontamination (continued).	Pressure/steam washing (continued).	Personnel shall keep a firm grip on the wand and not point it at anything that is not being washed. Pressure washer operators must maintain good footing. The trigger on the wand shall never be wired/fixed open. Operators are to take adequate breaks to avoid fatigue. Hot surfaces shall be avoided. Units shall be shut off and allowed to cool prior to re-fueling.		
	Cold stress.	Personnel shall wear clothing commensurate with the ambient temperature. Personnel shall take breaks as necessary to warm up. Hot beverages shall be provided to personnel during breaks. The additional precautionary measures for cold stress, detailed in the Safety, Health, and Emergency Response Plan, may be applicable.		

APPENDIX C12 AHA FOR EQUIPMENT DECONTAMINATION				
Task Breakdown	**Potential Hazards**	**Critical Safety Practices**	**Personal Protective Clothing and Equipment**	**Monitoring Devices**
Equipment decontamination (continued).	Use of methanol.	Methanol shall be kept in storage cabinets when not in use. Methanol shall only be used in areas where smoking is prohibited and all ignition sources have been removed. Methanol will be used outdoors or in areas with adequate ventilation. Personnel using methanol shall wear safety glasses, Silver Shield gloves, and 100% cotton clothing under Saranex coated Tyvek coveralls. A fire extinguisher and charged water hose shall be available in the immediate area where methanol is being used. Physical contact with methanol shall be avoided. Personnel who sustain skin contact shall immediately wash the affected area with soap and water (eyes should be irrigated for 15 minutes with potable water) and report the incident to the Site Safety and Health Officer. A portable eye wash station shall be readily available in the area where methanol is being used. All containers shall be properly labeled.		
EQUIPMENT REQUIRED		**INSPECTION REQUIREMENTS**	**TRAINING REQUIREMENTS**	
• Hand tools • Pressure Washer		Daily equipment inspections as per manufacturers requirements Inspection of all emergency equipment (i.e. first aid kits, fire extinguishers)	Review JSA with all task personnel Review SSHP Hazard communication	

APPENDIX C13 ACTIVITY HAZARD ANALYSIS FOR DEMOBILIZATION				
Task Breakdown	**Potential Hazards**	**Critical Safety Practices**	**Personal Protective Clothing and Equipment**	**Monitoring Devices**
Demobilization/ Tear Down Site	Slips, Trips, Falls	• Clear walkways work areas of equipment, tools, vegetation, excavated material and debris • Mark, identify, or barricade other obstructions		
	Spills	• Clean up spills before initiating maintenance • Review maintenance procedures for safety practices		
	Electrical Shock	• De-energize or shut off utility lines at their source before work begins • Use double insulated or properly grounded electric power-operated tools • Provide an equipment-grounding conductor program or employ ground-fault circuit interrupters • Use qualified electricians to unhook electrical circuits • Inspect all extension cords daily for structural integrity, ground continuity, and damaged insulation • Cover or elevate electric wire or flexible cord passing through work areas to protect from damage • Keep all plugs and receptacles out of water • Use approved water-proof, weather-proof type if exposure to moisture is likely • Inspect all electrical power circuits prior to commencing work • Follow Lockout/Tagout procedure HS315 – Control of Hazardous Energy Sources	Lockout/Tagout Devices	Voltage Meter or Tic Tracer

APPENDIX C13 ACTIVITY HAZARD ANALYSIS FOR DEMOBILIZATION				
Task Breakdown	**Potential Hazards**	**Critical Safety Practices**	**Personal Protective Clothing and Equipment**	**Monitoring Devices**
Demobilization/ Tear Down Site (continued)	Handling Heavy Objects	• Observe proper lifting techniques • Obey sensible lifting limits (60 lb. Maximum per person manual lifting) • Use mechanical lifting equipment (hand carts, trucks) to move large, awkward loads • Avoid carrying heavy objects above shoulder level • Warm up muscles before engaging in manual lifting		
	Sharp Objects	• Wear cut resistant work gloves when the possibility of lacerations or other injury may be caused by sharp edges or objects • Maintain all hand and power tools in a safe condition	Leather gloves	
	High Noise Levels	• Use hearing protection when exposed to excessive noise levels (greater than 85 dBA over an 8-hour work period) • Do not attempt verbal communication in high noise backgrounds	Ear plugs	
	Struck By/ Against Heavy Equipment	• Wear reflective warning vests when exposed to vehicular traffic • Isolate equipment swing areas • Make eye contact with operators before approaching equipment • Understand and review hand signals • Follow hand signals of ground workers for equipment manipulation when placing/loading equipment into bucket. • Step away from equipment when bucket adjustments are made • Do not attempt verbal communication in high noise backgrounds.	Warning vests, Hard hat, Safety glasses, and Steel toe work boots	

APPENDIX C13 ACTIVITY HAZARD ANALYSIS FOR DEMOBILIZATION				
Task Breakdown	**Potential Hazards**	**Critical Safety Practices**	**Personal Protective Clothing and Equipment**	**Monitoring Devices**
Demobilization/ Tear Down Site (continued)	Struck-by/Against (Vehicle-traffic)	• Wear reflective warning vests when exposed to vehicular traffic • Barricade or enclose the work areas • Restrict entry to the work areas to authorized personnel during work activities • Wear hard hats, safety glasses with side shields, and steel-toe safety boots at all times • Follow FDOT roadway and traffic design standards manual • Personnel will perform all work tasks and remain inside barriered work zones • Spotters to be utilized as necessary	Warning vests, Hard hat, Safety glasses, and steel toe work boots	
	Pinch Points	• Review equipment adjustment procedures, identify pinch points • Isolate/block pinch points to limit motion when inserting pins, fasteners, closing tackles	Leather gloves	
	Burns associated with loading/unloading equipment on trucks	• Identify heavy objects for loading that may have hot surfaces • Allow objects to cool or cover hot surfaces with non-combustible material to protect workers from burns		
	Ladders	• Inspect ladders before use for mud buildup on treads • Clean mud from boots before climbing on ladders • Follow the three point of contact rule		
	High/Low Ambient Temperature	• Monitor for Heat Stress in accordance with Health and Safety Procedures HS400, HS401 • Provide fluids to prevent worker dehydration		

EQUIPMENT REQUIRED	**INSPECTION REQUIREMENTS**	**TRAINING REQUIREMENTS**
• Vehicles • Hand tools • Ladders • Forklift/Hand carts	• Daily equipment inspections as per manufacturers requirements • Inspection of all emergency equipment (i.e. first aid kits, fire extinguishers)	• Review AHA with all task personnel • Review Site Specific Safety and Occupational Health Program • Review operations/safety manuals for all equipment utilized

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APPENDIX C14 AHA FOR REFUELING				
Task Breakdown	**Potential Hazards**	**Critical Safety Practices**	**Personal Protective Clothing and Equipment**	**Monitoring Devices**
Fueling operations with gasoline and diesel	Exposures to fuels. Fire: extinguisher requirements.	Personnel shall periodically review the Material Safety Data Sheets (MSDS) for the fuels that are being used at the project. The handling and use of fuels shall be performed in well-ventilated areas – preferably outside of buildings. Personnel shall avoid skin and eye contact with fuels. Safety glasses and disposable nitrile gloves shall be worn while handling fuels. A small eyewash bottle shall be readily available when fueling equipment. If personnel get fuel in their eyes, then the eyes shall be irrigated with the entire contents of the eye wash bottle and then the employee shall seek medical assistance. If personnel sustain skin contact with fuels, then the affected area shall be immediately washed with soap and water. If fuel contact with clothing is made, then clothing shall be removed and changed immediately. A 2-A:10-B:C fire extinguisher shall be readily available when fueling equipment at any location on site. Personnel who intend to extinguish small fires shall be trained in the use of fire extinguishers. Equipment and property are of secondary concern in a fire situation - personnel shall never try to extinguish a fire if there is any doubt that it can be extinguished safely.		

APPENDIX C14 AHA FOR REFUELING				
Task Breakdown	**Potential Hazards**	**Critical Safety Practices**	**Personal Protective Clothing and Equipment**	**Monitoring Devices**
Fueling operations (continued).	Fire: elimination of ignition sources – hot surfaces.	All vehicles and equipment shall be shut down prior to fueling. Small equipment, such as generators, compressors, light plants, etc. shall be allowed to cool prior to re-fueling. Equipment with the fuel cap near the engine or near other hot surfaces shall also be allowed to cool prior to re-fueling.		
	Fire: elimination of ignition sources – arcs/sparks/open flames.	Smoking shall not be allowed within 50 feet of fueling operations. Personnel shall visually survey the immediate area for open flames and other ignition sources prior to commencing fueling operations. Personnel are prohibited from using cell-phones or two-way radios during all fueling operations.		
	Fire: elimination of ignition sources – static electricity.	Personnel shall never fill portable fuel cans that are in the bed of a pickup truck or in the trunk of an automobile. Filling fuel containers on plastic pickup truck bed-liners can cause static electric discharges, which may ignite the fuel. The fuel can(s) shall be removed from the truck bed or automobile trunk and placed on the ground before adding fuel. Electrical continuity shall be maintained between the portable fuel can and the tank being filled. A bonding cable shall be used to maintain continuity between the metal fuel container and the equipment fuel tank. Allowing free-fall of fuel into the tank is prohibited.		

APPENDIX C14 AHA FOR REFUELING				
Task Breakdown	**Potential Hazards**	**Critical Safety Practices**	**Personal Protective Clothing and Equipment**	**Monitoring Devices**
Fueling operations (continued).	Fire: elimination of ignition sources – static electricity. (continued)	Personnel shall not re-enter vehicles while fueling is underway due to the static electric charge generated between clothing and vehicle seats. If you absolutely have to get in your vehicle while the gas is pumping, make sure you get out, close the door touching the metal, before you pull the nozzle out. This way the static from your body will be discharged before you remove the nozzle.		
	Storage and transportation: saddle tanks in pick-up trucks.	Gasoline shall not be transported in portable saddle tanks – only diesel fuel shall be transported in saddle tanks. All portable saddle tanks mounted in pick-up trucks shall be manufactured to meet U.S. Department of Transportation (DOT) specifications. Portable saddle tanks shall be securely mounted to the pick-up truck, as recommended by the manufacturer. Saddle tanks shall be properly marked (see 49 Code of Federal Regulation 172.101) with the proper shipping name and labeled for "No Smoking." No more than 110 gallons of diesel fuel may be transported in a saddle tank unless all the DOT Hazardous Material Regulations are complied with, such as proper packaging, completing shipping papers, placarding, and the appropriate HM 126 Training (as well as having been provided emergency response information and training.) Caps on saddle tanks shall be securely closed. Saddle tanks shall be inspected weekly to check for leaks. Drivers must be notified that they are transporting hazardous materials.		

APPENDIX C14 AHA FOR REFUELING				
Task Breakdown	**Potential Hazards**	**Critical Safety Practices**	**Personal Protective Clothing and Equipment**	**Monitoring Devices**
Fueling operations (continued).	Storage and transportation: five-gallon cans in pick-up trucks.	Gasoline shall be stored and transported in properly marked/labeled five-gallon safety cans (equipped with self-venting cap and flash arrestor). Gasoline cans shall be secured to prevent movement during transportation. No more than six 5 gallon containers of gasoline may be transported in vehicles (back of pick-up trucks or trailers) at the same time unless all the DOT Hazardous Material Regulations are complied with, such as proper packaging, completing shipping papers, placarding (as required), and the appropriate HM 126 Training (as well as having been provided emergency response information and training.) The total quantity of hazardous materials may never exceed 400 pounds total. Hazardous materials must be secured prior to transporting. Drivers must be notified that they are transporting hazardous materials.		
	Storage of gasoline on-site.	Portable gasoline cans must be stored within the flammable materials storage cabinet.		
Other concerns	Spills.	All spills shall be immediately cleaned-up. All spills shall be reported to the Shaw Project Manager.		

EQUIPMENT REQUIRED	**INSPECTION REQUIREMENTS**	**TRAINING REQUIREMENTS**
Five-gallon safety cans (equipped with self-venting cap and flash arrestor	Verify MSDSs for fuels are available in vehicles transporting fuels	Hazard communication Materials of Trade

APPENDIX C15 AHA FOR RIGGING AND LIFTING WITH HYDRAULIC EQUIPMENT				
Task Breakdown	**Potential Hazards**	**Critical Safety Practices**	**Personal Protective Clothing and Equipment**	**Monitoring Devices**
Travel on and off project site (vehicular).	Vehicle Operation.			
Arrival of new personnel at site. Movement of personnel on-site. Prepare for equipment operations, including inspections. Perform equipment operations. Handle equipment and materials. Equipment maintenance.	Newly hired personnel and visitors. Unfamiliarity with: site, general (chemical, physical, environmental) site hazards, project safety rules and hazard control procedures, chain of command, and emergency procedures.	All personnel working on hazardous, toxic, and radioactive waste (HTRW) shall submit HAZWOPER training certificates (40-hour, 8-hour [if applicable], supervisor [if applicable]) to the Site Safety and Health Officer (SSHO). All personnel shall attend a site safety orientation. All site workers shall receive HAZWOPER three-day OJT. After personnel are trained in the contents of the Site Safety and Health Plan (SSHP), they shall sign the SSHP Acknowledgment Form. All training certifications held by personnel shall also be made available and kept in on-site personnel files. Review emergency procedures and evacuation plans.		
Complete Lift Plan Worksheet (Hydraulic Equipment). Rig materials or equipment.	Medical qualifications.	All personnel working on HTRW shall submit current physician's certificate stating that employee is participating in an appropriate medical surveillance program meeting 29 Code of Federal Regulation (CFR) 1910.120.		
Hold pre-lift meeting. Lift materials or equipment.	Allergies.	All personnel should complete the Known Allergies Questionnaire (voluntary only).		

APPENDIX C15 AHA FOR RIGGING AND LIFTING WITH HYDRAULIC EQUIPMENT				
Task Breakdown	**Potential Hazards**	**Critical Safety Practices**	**Personal Protective Clothing and Equipment**	**Monitoring Devices**
See principal steps above.	Complacency.	All personnel shall attend the daily Plan of the Day meetings to re-focus themselves to hazards, emergency procedures and equipment, operational aspects, and change(s) in site/work conditions. Procedures shall be conveyed to control these hazards.		
	Failure to properly plan daily activities.	A Job Safety Analysis (JSA), as required by Shaw Environmental & Infrastructure, Inc. Procedure No. HS045, "Job Safety Analysis (JSA)," shall be prepared by the crew prior to commencing daily activities. The JSA shall be used as a component of the morning Tailgate Safety Meeting. The JSA shall be revised at any time throughout the workday when new tasks are initiated, unforeseen circumstances arise, or if working conditions change. Personnel shall implement Hazard Assessment Resolution Program.		
	Heavy lifting, strains, and sprains.	No individual employee is permitted to lift any object that weighs over 60 pounds. Proper lifting techniques shall be used. Multiple employees or the use of mechanical lifting devices are required for lifting objects over the 60-pound limit.		
	Slips, trips, and falls.	Keep work areas clear and maintain housekeeping. Do not jump from equipment or elevated surfaces. Daily housekeeping will be implemented at the end of each workday. Use three-point contact rule for entering/exiting trucks and equipment. Use extra caution when walking on wet, muddy, frosty, icy, or snow-covered surfaces. Maintain proper illumination in work areas. Fall protection must be provided and used when personnel are exposed to fall hazards greater than six feet.		

APPENDIX C15 AHA FOR RIGGING AND LIFTING WITH HYDRAULIC EQUIPMENT				
Task Breakdown	**Potential Hazards**	**Critical Safety Practices**	**Personal Protective Clothing and Equipment**	**Monitoring Devices**
	Use of mechanical equipment.	Only qualified personnel shall be permitted to operate equipment. Mechanical equipment shall be inspected daily. Deficiencies in equipment shall be noted on the inspection form. Equipment found to be unsafe shall be taken out of serviced. All equipment shall be operated at safe speeds and in a safe manner. Equipment operators shall wear safety belts and hearing protection (as necessary). Ground personnel shall not position themselves between equipment and stationary objects (stay out of swing radius). Personnel are only permitted to approach equipment after a signal from the operator.		
	Hand injuries.	Items to be handled shall be inspected for sharp edges, splinters, burrs, rough surfaces, etc. prior to being handled. Personnel shall wear leather gloves when handling materials with sharp edges, splinters, burrs, rough surfaces, etc. Personnel shall be aware of and avoid pinch point hazards.		
	Fire.	Fire extinguishers shall be available in work areas. The SSHO shall establish smoking areas. Smoke only in designated areas. Only discard cigarette butts in proper receptacles – never discard cigarette butts onto the ground. Engines shall be shut off before refueling. A 2-A:40-B:C fire extinguisher shall be available when refueling at the project site. Smoking shall not be permitted within 50 feet of fueling operations.		

APPENDIX C15 AHA FOR RIGGING AND LIFTING WITH HYDRAULIC EQUIPMENT				
Task Breakdown	**Potential Hazards**	**Critical Safety Practices**	**Personal Protective Clothing and Equipment**	**Monitoring Devices**
See principal steps above.	Chemical hazards.	Perform decontamination as specified in the HASP. The Exclusion Zones and Contamination Reduction Zones shall be set-up and appropriately marked with signage. Avoid contact with contaminated materials. Wear PPE, as specified in the SSHP. The SSHO will perform chemical air monitoring, as specified in the SSHP. Verify emergency eyewash stations have been inspected, cleaned, filled, and in service. Notify all personnel of the emergency eyewash station locations. Project personnel will follow instructions on specific AHA's or as instructed by the SSHO. Project personnel will use appropriate PPE in accordance with the SSHP and as indicated on specific AHA's or as instructed by the SSHO. Barriers such as fences and ropes will be put in place to limit the access to Controlled Areas as specified in the SSHP. Signs will be used to alert persons of specific hazards as specified in the SSHP. Engineering controls (i.e., spraying material with water, calcium chloride solution) will be used as required by the SSHP or as instructed by the SSHO to reduce dust emission. Notify the SSHO if odors are detected.		

APPENDIX C15 AHA FOR RIGGING AND LIFTING WITH HYDRAULIC EQUIPMENT				
Task Breakdown	**Potential Hazards**	**Critical Safety Practices**	**Personal Protective Clothing and Equipment**	**Monitoring Devices**
See principal steps above.	Insect bites and stings.	Review injury and illness potential with workers. Inspect work areas for bee nests and activity prior to commencing work in that area. Wear PPE, such as disposable coveralls, to keep insects away from the skin. Expect to encounter insects when working in warm weather – especially at locations with vegetation present. Use protective insect repellents containing DEET to prevent insect bites, unless individual allergies and sensitivities prevent its use. Check limbs/body for insects/ insect bites upon removing PPE and again during showering. Consider applying Permethrin (Repel Permanone or equivalent) preparations to clothing to repel ticks, chiggers, mosquitoes, and/or spiders. Immediately notify supervisor or SSHO of insect bites, stings, irritations, rashes, or flu-like symptoms.		
	Contact dermatitis from poisonous and irritating plants (poison ivy, poison oak, and poison sumac).	Learn to identify poisonous and irritating plants. Identify workers who are known especially sensitive to poisonous and irritating plants and plan work accordingly. Check around work areas to identify if poisonous and irritating plants are present. Wear long-sleeve shirts/trousers or Tyvek® coveralls to avoid skin contact with plants or other skin irritants. Apply protective cream/lotion to exposed skin to prevent poison ivy or similar reactions. Immediately notify the SSHO if you suspect you contacted an irritating plant. Avoid unnecessary clearing of plant/vegetation areas. Follow additional procedures outlined in the SSHP.		

APPENDIX C15 AHA FOR RIGGING AND LIFTING WITH HYDRAULIC EQUIPMENT				
Task Breakdown	**Potential Hazards**	**Critical Safety Practices**	**Personal Protective Clothing and Equipment**	**Monitoring Devices**
	Severe weather, heat stress, and cold stress.	The SSHO will monitor weather conditions each day in order to plan and prepare for hazardous conditions. The SSHO will identify a suitable storm shelter at each work location. The SSHO will verify that the tornado shelter is accessible and available. Work activities will be suspended prior to weather conditions becoming hazardous so that workers have ample time to seek shelter. Upon seeing lightning or hearing thunder, outdoor activities shall be suspended and personnel shall be evacuated to safe areas (inside vehicles, buildings, or tornado shelters as appropriate). Follow additional procedures outlined in the SSHP. Monitor for heat stress in accordance with Shaw E & I Procedure No. HS400, "Heat Stress" and the requirements of the SSHP. Monitor for cold stress in accordance with Shaw E & I Procedure No. HS401, "Cold Stress" and the requirements of the SSHP. Drink plenty of water and minimal carbonated or caffeine-containing beverages. Perform physiological monitoring as needed. Personnel shall take required breaks to cool down/warm-up as needed. Personnel shall wear insulated clothing based the ambient temperature and wind chill conditions.		
	Struck by and against: • Vehicles • Equipment • Flying debris/projectiles • Splashes.	Wear PPE with high visibility vests when walking or working near moving equipment or vehicles. Stay off roads and streets unless necessary; walk on left side of roads facing on-coming traffic. Personnel shall not be permitted in the swing radius of the equipment. Personnel shall maintain a safe distance from operations. Do not assume equipment and vehicle operators have seen you unless operator have made eye contact with you and signaled to you. Warning signs and signalmen may be necessary.		

APPENDIX C15 AHA FOR RIGGING AND LIFTING WITH HYDRAULIC EQUIPMENT				
Task Breakdown	**Potential Hazards**	**Critical Safety Practices**	**Personal Protective Clothing and Equipment**	**Monitoring Devices**
See principal steps above.	Use of operational chemicals.	Read and follow MSDS for each chemical used. Do not use any chemical that you have not been trained to safely use. Provide ventilation as necessary. Wear proper PPE. Properly label all containers.		
	Noise.	All personnel shall wear hearing protection when exposed to high noise levels. All personnel shall wear hearing protection when operating powered hand tools or noisy equipment. Personnel working in vicinity of noisy tools or equipment shall wear hearing protection. Noise dosimetry shall be performed to verify hearing protection is adequate.		
	Electrical.	Ground-fault circuit interrupters shall be used on all power tools and extension cords. Extension cords, power tools, and lighting equipment shall be inspected before each use, protected from damage, and kept out of wet areas. Keep extension cords off of ground surface. Only qualified electricians are permitted to work on electrical circuits. Electricians must follow NFPA 70 E (2009) when working on electrical circuits.		

APPENDIX C15 AHA FOR RIGGING AND LIFTING WITH HYDRAULIC EQUIPMENT				
Task Breakdown	**Potential Hazards**	**Critical Safety Practices**	**Personal Protective Clothing and Equipment**	**Monitoring Devices**
	Tools.	Select the proper tool – do not improvise. Inspect all power and hand tools before each use (do not use damaged tools). Tools shall be appropriate for the task and maintained in good condition. Only trained and authorized personnel will use hand and power tools. Check your position, footing, and grip before tool use. Avoid distraction, keep your focus, and concentrate on the job. Personnel shall maintain a steady pace when using tools and take adequate rest periods. Keep electric cords untangled and out of the way of rotating tools. Use double-insulated power tools when possible. Protect electric tools with ground fault circuit interrupters (GFCI). Minimum PPE will include safety glasses with side-shields, hard hat, safety-toed work boots, and cut-resistant gloves. Store tools carefully to prevent damage to them and to make the proper tool easier to locate.		
	Dust.	Control dust by maintaining equipment operation rates. Control dust by applying water and/or calcium chloride. Personnel shall stay out of dust and work from upwind when possible. Perform dust monitoring to verify dust control is effective.		

APPENDIX C15 AHA FOR RIGGING AND LIFTING WITH HYDRAULIC EQUIPMENT				
Task Breakdown	**Potential Hazards**	**Critical Safety Practices**	**Personal Protective Clothing and Equipment**	**Monitoring Devices**
	Rigging and lifting with hydraulic equipment.	Determine weight of object to be lifted; never lift any object if weight is unknown. Calculate lift/load capacities using manuals and load capacity charts. Lift supervisor will complete a Lift Plan Worksheet (Hydraulic Equipment) and hold pre-lift meeting prior to attempting lift. Assign operator, rigger, tagline, and signal man responsibilities as necessary. Review lift hand signals with operator, signaler, supervisor, and workers. Select appropriate rigging equipment for the type of lift. Review rigging techniques, position of load, tag lines with workers involved in rigging activities. Perform required daily inspections, of wire ropes, rigging hardware, and attachments. Rigging shall be inspected before each use. Inspect rigging devices to verify slings, straps are free from defects and rated for the lift weight. Deficiencies shall be noted on the inspection form.		

APPENDIX C15 AHA FOR RIGGING AND LIFTING WITH HYDRAULIC EQUIPMENT				
Task Breakdown	**Potential Hazards**	**Critical Safety Practices**	**Personal Protective Clothing and Equipment**	**Monitoring Devices**
See principal steps above.	Rigging and lifting with hydraulic equipment (continued).	Rigging found to be unsafe shall not be used, tagged, and taken out of service. Prohibit use of rigging equipment with missing documentation tags. Verify inspection and maintenance information for hydraulic equipment. Perform daily inspection of mechanical, hydraulic operations of equipment. Establish and isolate swing radius of equipment, rigging and load. Inspect for stability of surfaces beneath the hydraulic excavating equipment. All personnel shall be kept clear when material is being hoisted Hoisting of materials shall be done by use of a shackle that will prevent accidental disengagement. Taglines shall be used for controlling unguided materials. An operational test of equipment and rigging will be conducted in presence of GDA to verify performance. Re-perform operational test if repairs, major maintenance or reconfiguration is required on hydraulic equipment or attachments. Test lift objects for center of gravity. Ensure tag-lines are free of knots and defects. Prohibit looping / winding tag lines around hands or body. Prohibit positioning or moving load using tag lines. Loads shall be lifted at minimum height and carried as low as possible during traveling. Loads shall not be lifted over personnel. Never stand under a suspended load. Maintain adequate clearances from electrical sources. Do not hoist personnel with hydraulic equipment or ride on hoisted load.		

EQUIPMENT REQUIRED	INSPECTION REQUIREMENTS	TRAINING REQUIREMENTS
Personal Protective Equipment Level D: Hard Hat Safety Glasses Safety-Toed Boots Work Gloves ANSI Class 2 reflective warning vests Modified Level D: Refer to SSHP. Equipment: Air monitoring instruments Fire Extinguishers Emergency Eyewash First Aid Kit Insect repellant with DEET Repel Permanone Fall protection Drinking water Weather radio Water truck Rigging	Competent Person (CP) / Qualified Person (QP): CP/SSHO _____ Alternate SSHO/CP _____ QP/First Aid and CPR _____ QP/First Aid and CPR _____ CP/Rigger _____ Training Requirements:	HAZWOPER 40-Hour Site safety orientation Emergency procedures Hazard communication Applicable AHAs Qualified equipment operators Lifting/back safety Fall protection Fire extinguisher use Biological hazard identification and control Tornado shelter location Lightning safety procedures Daily site safety inspection (SSHO) Check training, and medical certifications against personnel roster Mechanized equipment (daily) Overhead and underground utilities Rigging (before each use) Housekeeping (daily) Fire extinguisher (weekly) Vehicle inspection daily Equipment and tools inspection daily and before use Survey areas for poisonous plants, insects, and animals Check body for ticks Verify tornado shelter is available

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APPENDIX C16 ACTIVITY HAZARD ANALYSIS FOR Visual Site Inspection and Surveys				
Task Breakdown	**Potential Hazards**	**Critical Safety Practices**	**Personal Protective Clothing and Equipment**	**Monitoring Devices**
Arrival of new personnel at site	Unfamiliarity with: site, general site hazards, project safety rules, chain of command, and emergency procedures.	• All personnel shall attend the site orientation training.	Warning vests, Hard hat, Safety glasses, and Steel toe work boots	
Visual site inspections and surveys	Slips, Trips, Falls	• Clear walkways work areas of equipment, tools, vegetation, excavated material and debris • Mark, identify, or barricade other obstructions		
	Electrical Shock	• De-energize or shut off utility lines at their source before work begins • Use double insulated or properly grounded electric power-operated tools • Provide an equipment-grounding conductor program or employ ground-fault circuit interrupters • Use qualified electricians to hook up electrical circuits • Inspect all extension cords daily for structural integrity, ground continuity, and damaged insulation • Cover or elevate electric wire or flexible cord passing through work areas to protect from damage • Keep all plugs and receptacles out of water • Use approved water-proof, weather-proof type if exposure to moisture is likely • Inspect all electrical power circuits prior to commencing work • Follow Lockout/Tagout procedure HS315 – Control of Hazardous Energy Sources		

APPENDIX C16 ACTIVITY HAZARD ANALYSIS FOR Visual Site Inspection and Surveys				
Task Breakdown	**Potential Hazards**	**Critical Safety Practices**	**Personal Protective Clothing and Equipment**	**Monitoring Devices**
Visual site inspections and surveys.	Poor planning.	• Complete Job Safety Analysis for each task, as specified in Shaw Environmental & Infrastructure, Inc. Procedure No. HS045, "Job Safety Analysis (JSA)." Use Hazard Assessment Resolution Program frequently – for each task to be completed.		
	Heavy lifting, strains, and sprains.	• No individual employee is permitted to lift any object that weighs over 60 pounds. Proper lifting techniques shall be used. Multiple employees or the use of mechanical lifting devices are required for lifting objects over the 60-pound limit.		
	Struck-by/against.	• Wear reflective warning vests when exposed to vehicular traffic. Personnel working on or near roads and only remain on road long enough to complete work. Personnel walking along roadway shall stay off roadway as far as possible and walk on the side facing traffic.	Warning vests, Hard hat, Safety glasses, and Steel toe work boots	
	Munitions and Explosives of Concern (MEC) / Unexploded Ordnance (UXO).	Personnel shall attend site-specific MEC Awareness (and recognition) Training prior to the commencement of any site activities.	Warning vests, Hard hat, Safety glasses, and steel toe work boots	

APPENDIX C16 ACTIVITY HAZARD ANALYSIS FOR Visual Site Inspection and Surveys				
Task Breakdown	**Potential Hazards**	**Critical Safety Practices**	**Personal Protective Clothing and Equipment**	**Monitoring Devices**
Visual site inspections and surveys (continued)	Hand injuries	• Review equipment adjustment procedures, identify pinch points • Isolate/block pinch points to limit motion when inserting pins, fasteners, closing tackles	Leather gloves	
	Burns associated with loading/unloading equipment on trucks	• Identify heavy objects for loading that may have hot surfaces • Allow objects to cool or cover hot surfaces with non-combustible material to protect workers from burns		
	Insect bites/West Nile virus.	• Wear PPE and tape joints to keep insects away from the skin. Use protective insect repellents containing N,N-diethyl-m-toluamide, such as, Deep Woods OFF, 3M Ultrathon, or equivalent and clothing insecticide preparations containing permethrins (Repel Permanone or equivalent) to prevent insect bites. Check limbs/body for insects/insect bites before showering. Notify Site Safety and Health Officer (SSHO) of flu-like symptoms.		
	Contact dermatitis and poison ivy.	• Check around work areas to identify if poison ivy is present. Wear long-sleeve shirts/trousers or Tyvek® coveralls to avoid skin contact with plants or other skin irritants. Learn to identify poisonous plants. • Avoid unnecessary clearing of plant/vegetation areas. • Cover vegetation with plastic (visqueen) where sampling position raises exposure potential. Apply protective cream / lotion to exposed skin to prevent poison ivy or similar reactions. Identify workers known to contract poison ivy.		

APPENDIX C16 ACTIVITY HAZARD ANALYSIS FOR Visual Site Inspection and Surveys				
Task Breakdown	**Potential Hazards**	**Critical Safety Practices**	**Personal Protective Clothing and Equipment**	**Monitoring Devices**
	Severe weather.	• The SSHO will monitor weather conditions each day in order to plan and prepare for hazardous conditions. The SSHO will identify a suitable tornado shelter at each work location. Work activities will be suspended prior to weather conditions becoming hazardous so that workers have ample time to seek shelter. Upon seeing lightning or hearing thunder, outdoor activities shall be suspended and personnel shall be evacuated to safe areas (inside vehicles, buildings, or tornado shelters as appropriate). Follow procedures outlined in the APP.		
	Hazardous atmospheres	• Personnel shall immediately notify the SSHO if odors are detected.		
	Ladders	• Inspect ladders before use for mud buildup on treads • Clean mud from boots before climbing on ladders • Follow the three point of contact rule		
	High/Low Ambient Temperature	• Monitor for Heat Stress in accordance with Health and Safety Procedures HS400, HS401 • Provide fluids to prevent worker dehydration		
	Fire	• Smoking shall be permitted in designated areas. Vehicles shall not be parked in tall dry grass. • Engines shall be shut off before refueling. • 2A 20-B:C fire extinguisher shall be available when refueling. • Smoking shall not be permitted near fueling areas. Gasoline shall be stored in safety cans with flash arrestors and spring-loaded vents.		

EQUIPMENT REQUIRED	INSPECTION REQUIREMENTS	TRAINING REQUIREMENTS
Survey instrumentation Fire extinguishers Emergency eyewash First aid kit Deep-Woods Off or Ultrathon Repel Permanone Drinking water Weather radio or AM/FM radio	Daily site safety inspection (SSHO) – James Vigerust Daily site safety inspection (QCO) – Check Known Allergies Questionnaire Housekeeping (daily) Fire extinguisher (weekly) Vehicle inspection daily Equipment and tools inspection daily and before use Survey areas for poisonous plants, insects, and animals Check body for ticks Verify tornado shelter available • Monitor approaching storms	Competent Person (CP) / Qualified Person (QP): James Vigerust – CP/SSHO James Vigerust – QP/First Aid and CPR Training Requirements: Site safety orientation HAZWOPER 40-Hour MEC Awareness Lifting/back safety Fire extinguisher use Emergency procedures Biological hazard identification and control Tornado shelter locations National Lightning Safety Institute Lightning Safety procedures

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Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-4

Appendix D
Safety & Health Forms

AIR MONITORING DATA RECORD

Location: _____ **Project No.:** _____ **Date:** _____

Instrument: Mfg/Model/Serial No.: _____ **Calibrated by:** _____

COMBUSTIBLE GAS/OXYGEN/CARBON MONOXIDE METER CALIBRATION

Time	Battery Charged (Y/N)	Zero Checked (Y/N)			Calibration Standard	Calibration Standard			Actual Meter Reading			Ambient Air Re-Zero Check		
		LEL (0%)	O_2 (20.8%)	CO (0 ppm)		% LEL	% O_2	ppm CO	% LEL	% O_2	ppm CO	LEL (0%)	O_2 (20.8%)	CO (0 ppm)

PHOTOIONIZATION DETECTER/FLAME IONIZATION DETECTER CALIBRATION

Time	Battery Charged (Y/N)	Calibration Standard	Calibration Standard Concentration (ppm)	Expected Meter Reading (ppm)	Actual Meter Reading (ppm)	Comments

REAL TIME AIR MONITORING RESULTS

Date	Instrument Operator	Time	Monitoring Results		Action Level Exceeded (Y or N)	Location/Activity	Corrective Actions
			Compound	Concentration			

Comments: _____

Calibration Q.C.: Calibrations are to be within 5% for validity.
Abbreviations: CO = carbon monoxide, %LEL = percent of the lower explosive limit, O_2 = oxygen

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AIR SAMPLING DATA RECORD

SAMPLING INFORMATION

Date of Sampling		Project Name	
Type of Sample Personal/Area		Project Number	
Employee Sampled		Operation/Task Monitored	
Employee Number			
Employee Social Security Number		Location of Air Sampling	
Employee Job Title		Person Performing Sampling/Employee #	

SAMPLING & PUMP CALIBRATION DATA

PROJECT SPECIFIC SAMPLE IDENTIFICATION NUMBER:

Air Pump Manufacturer/ Model/Number:								Ambient Air Temperature:		
Pre-sampling Calibration Flow Rate (mL/min)				Post-sampling Calibration Flow Rate (mL/min)				Final Sample Flow Rate (mL/min)		
1st flow rate	2nd flow rate	3rd flow rate	Pre-average flow rate	1st flow rate	2nd flow rate	3rd flow rate	Post-average flow rate	Pre-average flow rate	Post-average flow rate	Final average flow rate

Pump start time:	Pump stop time:	Total pump run-time (minutes):	Final average flow rate (mL/min):	Total sample volume (liters):

Analytes sampled for:	Analyte #1: _____ NIOSH Method # _____	Analyte #2: _____ NIOSH Method # _____	Analyte #3: _____ NIOSH Method # _____
Date Sample Shipped to Laboratory:	Remarks:		

HAZARD CONTROL MEASURES (check all that apply):

Respirator	☐ None	☐ Half-face APR	☐ Full-face APR	☐ PAPR	☐ Supplied-air (specify):	
Coveralls	☐ None	☐ Cotton	☐ Nomex	☐ Tyvek®	☐ Poly-coated Tyvek®	☐ Saranex
Gloves	☐ None	☐ Cotton	☐ Leather	☐ Sample	☐ Nitrile	☐ Other:
Boots	☐ Work	☐ Tyvek®	☐ Latex	☐ PVC	☐ Neoprene	☐ Other:
Engineering	☐ None	☐ Negative Air	☐ Ventilation		☐ Other:	

LABORATORY INFORMATION:

Laboratory Used (Name/Address/Telephone/Contact):

ANALYTICAL RESULTS:

Analyte #1	Analyte #2	Analyte #3

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Project Location: _____
Client: _____
Project Number: _____

OPTIONAL ALLERGY/SENSITIVITY QUESTIONNAIRE

This information is requested so that you may be assigned work duties, which minimize your exposure to elements that may cause you to have a threatening medical reaction and will be used only in case of an emergency. Your voluntary cooperation is appreciated so that we can operate a safe working environment.

Name: _____ Contractor Name: _____

Date: _____ Contract/Project No.: _____

Are you allergic/sensitive to bee stings?	Yes ☐	No ☐
If yes, do you carry a bee sting kit? _____		
Are you allergic/sensitive to other insect bites?	Yes ☐	No ☐
Are you allergic/sensitive to animal/reptile bites?	Yes ☐	No ☐
Are you allergic/sensitive to any plant materials?	Yes ☐	No ☐
Are you allergic/sensitive to any cloths or fibers?	Yes ☐	No ☐
Are you allergic/sensitive to latex?	Yes ☐	No ☐
Are you allergic/sensitive to any powders?	Yes ☐	No ☐
Are you allergic/sensitive to any medications?	Yes ☐	No ☐
If yes, which medications? _____		
Are you allergic/sensitive to any metals?	Yes ☐	No ☐
Are you allergic/sensitive to pollens?	Yes ☐	No ☐
Are you allergic/sensitive to dusts	Yes ☐	No ☐
Are you allergic/sensitive to foods (i.e., peanuts, etc.)	Yes ☐	No ☐
Are you aware of any known chemical or petroleum sensitivities?	Yes ☐	No ☐
Are you allergic/sensitive to smoke?	Yes ☐	No ☐
Are you allergic/sensitive to smog/ozone?	Yes ☐	No ☐
Have you ever had an asthmatic attack?	Yes ☐	No ☐
Have you ever experienced exercise induced asthma?	Yes ☐	No ☐

Please comment on any of the above questions or provide special instructions that we should provide to a physician in the case of an emergency.

_____

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Project Location: _____
Client: _____
Project Number: _____

AMBIENT AIR TEMPERATURE LOG

Thermometer Location: _____ Date: _____

Time (hours)	Temp. (°F)	Time (hours)	Temp. (°F)
0000 (Midnight)	_____	1200 (Noon)	_____
0100	_____	1300	_____
0200	_____	1400	_____
0300	_____	1500	_____
0400	_____	1600	_____
0500	_____	1700	_____
0600	_____	1800	_____
0700	_____	1900	_____
0800	_____	2000	_____
0900	_____	2100	_____
1000	_____	2200	_____
1100	_____	2300	_____

Comments: _____

_____

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AIR COMPRESSOR SAFETY INSPECTION CHECKLIST

Project Name: _____

Project Number: _____

Equipment I.D. No.: _____ Equipment Name: _____

Week of: _____

Portable Air Compressors (29 CFR 1910.94(a)(6), EM 385-1-1 Section 20 (B))	**Yes**	**No**	**N/A**
1. Has inspection and performance test been completed?			
2. Have air tanks been tested and certified?			
3. Are records of inspection and test available?			
4. Does discharge from any valve create a hazard?			
5. Is the air pressure gauge in working order?			
6. Is the tank equipped with a safety relief valve?			
7. Is equipment that is subject to whipping or rotation if released provided with an automatic shut-off?			
8. Are safety lashings provided at connections to tools and hose and all quick make-up connections of hose?			
9. Will the compressor automatically shut off before discharge pressure exceeds the maximum working pressure?			
10. Is the compressor located so that flammable, toxic vapors, gases, or dust will not be drawn into the intakes?			
11.No valve shall be installed on the air intake pipe of a compressor with an atmospheric intake?			
12. Is the discharge piping from the compressor to the receiver as large as the discharge opening on the compressor?			
13. Is there a convenient stop valve between the air tank and each stationary piece of equipment?			
14. Are air receivers properly installed and in the proper locations?			
15. Does the air tank have an accessible drain valve?			
Remarks:			

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COLORIMETRIC DETECTOR TUBE LOG

Project Name: _____ Project Number: _____

Date: _____ Sampled by: _____

Pump Type, Mfg/Model/Serial Number: _____

Time	Detector Tube Type/ (Expiration Date)	Measurable Range	Pump Leak Test (Y/N)	Pump Strokes	Measured Concentration	Comments

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ENTRY PERMIT FOR
PERMIT-REQUIRED CONFINED SPACE (PRCS)

Project/Location _____ Project No._____

Location of PRCS _____ Identity of PRCS _____

Describe Hazards of PRCS (Chemical and Physical) _____

_____

Purpose This Permit Authorized _____

CHECKLIST	YES	DOES NOT APPLY
All lines leading to and from the space have been blinded or disconnected.		
Electrical service disconnected or locked out.		
All grounding and bonding cables in place.		
All lighting, fittings, power equipment, and extension cords are rated for anticipated atmosphere.		
Ground Fault Circuit Interrupter (GFCI) checked and functioning.		
All ignition sources have been isolated.		
All respiratory equipment and alarms checked and functional.		
All safety harnesses and lifelines checked.		
All required PPE checked and in use.		
Have all entrants, attendants, and entry supervisors received appropriate training?		
Attendant(s) trained in non-entry rescue procedures.		
Rescue service has been identified and will be available for entry rescue.		
Has rescue service passed evaluation?		
Appropriate rescue equipment available and checked.		
Mechanical ventilation system in use and effective.		
All tests have been completed and indicate that entrance requirements have been met.		
Appropriate warning signs have been posted and unauthorized personnel have been excluded from the PRCS.		
IF ANSWER TO ANY OF THE ABOVE QUESTIONS IS *NO*, ENTRY IS NOT PERMITTED.		

PERSONAL PROTECTIVE EQUIPMENT (Circle)

EYE/FACE
Chemical Goggles Face Shield Safety Glasses

EXTREMITIES
Hard Hat Hoods Boot Covers

Gloves (Material _____)

Boots (Material _____)

RESPIRATORY
SCBA Supplied Air Egress System

Air Purifying (Cartridge _____)

Powered Air Purifying (Cartridge _____)

OTHER
Hearing Protection Harness & Lifeline
Chest or Parachute

RESCUE EQUIPMENT
Mechanical Extraction Device
First Aid Kit SCBA
Other (Specify)_____

COMMUNICATION METHOD
Lifeline "Tug" Signals
Air-powered Horn Signals
Other_____

OTHER PERMITS ISSUED FOR WORK IN PRCS: _____

OTHER HAZARD CONTROL PROCEDURES OR INSTRUCTIONS: _____

RESCUE PROCEDURES: _____

TEST DATA
OXYGEN, FLAMMABILITY, AND TOXIC CONTAMINANT(S)

Time	Percent Oxygen	Percent LEL	_____ (Other)	_____ (Other)	_____ (Other)	_____ (Other)	_____ (Other)	Tester's Initials	Comments

TESTER'S SIGNATURE:

AUTHORIZED ENTRANTS

_____ _____
_____ _____
_____ _____
_____ _____
_____ _____
_____ _____
_____ _____

AUTHORIZED ATTENDANT(S)

_____
_____
_____

RESCUE PERSONNEL

_____
_____
_____

Diagram the confined space indicate location of manways and ventilators. Indicate location(s) where tests conducted.

) (Man-way
∞ Ventilator
X Test Location

ACCEPTABLE ENTRY CONDITIONS

1. Entry Permit completely filled out
2. Oxygen between 19.5 and 23.5%
3. Combustible gases below 10% LEL
4. Permissible Levels of toxic gases (list):
5. Other: _____

PRCS SAFE FOR ENTRY _____

Date/Time _____ / _____

Name of Entry Supervisor _____ Signature _____

Current Entry Supervisor (if different) _____

Entry Permit Expires (no longer than 1 shift): Date/Time _____ / _____

ENTRY PERMIT CANCELED

Date/Time _____ / _____ Signature _____

Reason (√) ☐ Work Complete ☐ Authorized Conditions Not Met ☐ Incident

PROBLEMS DURING ENTRY AND RESOLUTION. Please Describe: _____

RECLASSIFICATION TO NON-PERMIT-REQUIRED CONFINED SPACE

Describe hazard removal methods, without use of ventilation. _____

TESTING VERIFICATION SHOWN AT TIME _____ ON TEST DATA CHART ABOVE.

DATE/TIME / ENTRY SUPERVISOR SIGNATURE

REVIEWED BY:

_____ _____

Health and Safety Representative Signature Date

Project Location: _____
Client: _____
Project Number: _____

DAILY SAFETY INSPECTION REPORT

Inspector name: _____ Date: _____

Supervisor: _____ SSHO: _____

General Project Activities Description: _____

_____

_____

Safety conditions and/or deficiencies:	Corrective actions to be completed:

Note: The status of corrective actions is to be tracked through closure on the Safety and Occupational Health Deficiency Tracking Log.

Signature: _____ Signature: _____
(Supervisor) (Safety Representative)

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Direct-Push Rig Inspection Checklist

Project Name/Number: _____
Make/Model Number: _____
Equipment Number: _____
Hours/Mileage: _____

Rig clean and free of soils, oils, and other debris.		Tracks in good condition.	
All hydraulic fittings and hoses free of damage, tightened, and not leaking.		Tires fully inflated and in good condition.	
Rig controls clearly labeled and in working condition.		Back-up alarm working.	
Rig Kill Switch in working order.		First Aid Kit accessible and stocked.	
All of the Rig's connections tightened and leak-free.		Fire Extinguisher accessible and fully charged.	
Parking brake functions properly.		Eye Wash full and accessible.	
Steering controls in working order and clear of obstacles.		Hearing protection available and is being used during hammering.	
Copy of the manual for all drilling equipment available.		All overhead and underground hazards identified.	

√ = OK
N/A = Not Applicable
X = Defective

These items are to be checked each shift before operating this piece of equipment.
Report all items requiring repair to supervisor.

Notes:
Operator/Inspector: Date:

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Drilling Equipment and Operations Inspection Daily	Contractor:
Drill Rig Manufacturer/Model:	Hours/Mileage:
Inspection Completed By:	Equipment No.:
Project Number:	Date:

Answer each question by checking the appropriate column (Yes, No, or NA). If "no" is checked, an explanation should be provided in the space available. This checklist is to be completed daily by the drilling contractor and reviewed by the Site Safety and Health Officer (SSHO).

Daily Drill Rig Inspection	Yes	No	NA
1. Are applicable drilling materials/supplies Material Safety Data Sheets available at the site and attached to the AHA?	☐	☐	☐
Explanation: _____			
2. Are daily safety meetings attended by the crew and are JSAs being completed daily by the crew?	☐	☐	☐
Explanation: _____			
3. Are all warning and control labels on drill rig clean and legible?	☐	☐	☐
Explanation: _____			
4. Are both "kill switches" installed by the manufacturer in operable condition and all workers at the drill site familiar with their location and how to activate them?	☐	☐	☐
Explanation: _____			
5. Are drive shafts, belts, chain drives, and universal joints guarded to prevent accidental insertion of hand, fingers, or tools?	☐	☐	☐
Explanation: _____			
6. Are all hydraulic fittings and hoses free of damage, tightened, and not leaking (including panel)?	☐	☐	☐
Explanation: _____			
7. Do high-pressure hoses have a safety (chain, cable, or strap) at each end of the hose connection to prevent whipping in the event of a failure (safety lashing)?	☐	☐	☐
Explanation: _____			
8. Is the rig clean and free of soils, oils, and other debris?	☐	☐	☐
Explanation: _____			
9. Is the rig free of any miscellaneous leaks?	☐	☐	☐
Explanation: _____			
10. Do controls operate smoothly; cables and lifting devices do not operate erratically to overcome resistance?	☐	☐	☐
Explanation: _____			
11. Do controls have freedom of movement, not blocked, or locked in an action position?	☐	☐	☐
Explanation: _____			
12. Are all safety devices not bypassed or neutralized?	☐	☐	☐
Explanation: _____			
13. Are all cables free of kinks, frayed wires, "bird cages," and worn or missing sections?	☐	☐	☐

Explanation: _____

Daily Drill Rig Inspection (continued)	Yes	No	NA
14. Are wire rope, sockets, splices, thimbles, and clips adequate and properly applied?	☐	☐	☐
Explanation: _____			
15. Are cables terminated on the working end with a proper eye splice, either swaged coupling or using cable clamps?	☐	☐	☐
Explanation: _____			
16. Are cable clamps installed with the saddle on the live or load side? Clamps should not be alternated and should be of the correct size and number for the cable size to which it is installed. Are clamps complete with no missing parts?	☐	☐	☐
Explanation: _____			
17. Are hooks, safety latches, shackles, rings, etc., in good condition?	☐	☐	☐
Explanation: _____			
18. Are safety latches functional and completely span the entire throat of the hook and have a positive action to close the throat except when manually displaced for connecting or disconnecting a load?	☐	☐	☐
Explanation: _____			
19. Are wedge sockets and hoisting plugs in good condition and properly installed?	☐	☐	☐
Explanation: _____			
20. Have all personnel entered their names on the site log today?	☐	☐	☐
Explanation: _____			
21. Is electronic communication effective for the field crews and checked daily?	☐	☐	☐
Explanation: _____			
22. Has the exclusion zone been set-up with a radius equal to or greater than the boom height?	☐	☐	☐
Explanation: _____			
23. Is a 15-minute supply of fresh water available at the work site (eyewash station)?	☐	☐	☐
Explanation: _____			
24. Is an emergency first aid kit immediately available at the work site?	☐	☐	☐
Explanation: _____			
25. Is potable water available to employees?	☐	☐	☐
Explanation: _____			
26. Are 3M Ultrathon or equivalent (DEET preparation) and Repel Permanone available?	☐	☐	☐
Explanation: _____			
27. Are two 2-A:40-B:C fire extinguishers in good working order (i.e., charged, inspected, and serviced up to date) and present at the work site?	☐	☐	☐
Explanation: _____			
28. Are employees on or near drilling equipment complying with the requirement to wear hearing protection?	☐	☐	☐
Explanation: _____			

Drilling Equipment and Operations Inspection Daily	Contractor:
Project Number:	Date:

Daily Drill Rig Inspection (continued)	Yes	No	NA
29. Are personnel being monitored for temperature stress?	☐	☐	☐
Explanation: _____			
30. Are personnel prohibited from drinking, chewing, smoking, taking medications, or other hand-to-mouth contact while in a regulated exclusion zone?	☐	☐	☐
Explanation: _____			
31. Is proper fall protection provided and used for personnel working over 6 feet in height?	☐	☐	☐
Explanation: _____			
32. Are outriggers extended prior to and whenever the mast is raised off its cradle? Hydraulic outriggers must maintain pressure to continuously support and stabilize the drill rig even when unattended.	☐	☐	☐
Explanation: _____			
33. Are outriggers properly supported on the ground surface to prevent settling into the soil?	☐	☐	☐
Explanation: _____			
34. Are slings, chokers, and lifting devices inspected before using and in proper working order? Are rated capacities legible for the type of configuration to be used? Are damaged units removed from service and properly tagged? Is a competent rigger available for all rigging?	☐	☐	☐
Explanation: _____			
35. Are shackles and clevises in proper working order and pins and screws fully inserted before placing under load?	☐	☐	☐
Explanation: _____			
36. Are hoists being used only for their designed intent, are not loaded beyond their rated capacity, and are steps being taken to prevent two-blocking of hoists?	☐	☐	☐
Explanation: _____			
37. Are the rig's manufacturer's procedures being followed if rope becomes caught in, or objects get pulled into, a cathead?	☐	☐	☐
Explanation: _____			
38. Are drill rods not being run or rotated through rod slipping devices? No more than 1 foot (0.3 meter) of drill rod column shall be hoisted above the top of the drill mast. Drill rod tool joints shall not be made up, tightened, or loosened while the rod column is supported by a rod-slipping device.	☐	☐	☐
Explanation: _____			
39. Is there use of side-feed swivel collars on drill rods restricted to those collars that are retained by either a manufacturer-designed stabilizer or a stabilizer approved by a Professional Engineer?	☐	☐	☐
Explanation: _____			
40. Are rotating parts of the drill string, rod, and augers free of sharp projections or hooks that could entrap clothing of foreign objects?	☐	☐	☐
Explanation: _____			

Daily Drill Rig Inspection (continued)	Yes	No	NA
41. Is the work area around the drill rig kept clear of trip hazards?	☐	☐	☐
Explanation: _____			
42. Are walking surfaces kept free of slippery materials?	☐	☐	☐
Explanation: _____			
43. Are open excavations and mud or circulation pit barricaded or fenced? Is the discharge of drilling fluids being channeled away from the work area to prevent the ponding of water?	☐	☐	☐
Explanation: _____			
44. Does the operator verbally alert employees and visually verify employees are clear from dangerous parts of equipment before starting or engaging equipment?	☐	☐	☐
Explanation: _____			
45. Are personnel not wearing loose-fitting clothing, jewelry, or other items that could get caught in moving machinery?	☐	☐	☐
Explanation: _____			
46. Are augers being cleaned only when the rotating mechanism is in neutral and the auger stopped? Are long-handled shovels only being used to remove cutting from the auger?	☐	☐	☐
Explanation: _____			
47. Are open boreholes being capped and flagged?	☐	☐	☐
Explanation: _____			
48. Is a daily inspection of the drilling area being performed and documented by the driller?	☐	☐	☐
Explanation: _____			
49. Is the air hose free of damage, tightened, and not leaking?	☐	☐	☐
Explanation: _____			
Supplemental Inspection Items (from manufacturer's recommendations)			
50. Are hydraulic fluid levels OK according to manufacturer's recommendations?	☐	☐	☐
Explanation: _____			
51. Are motor oil levels OK according to manufacturer's recommendations?	☐	☐	☐
Explanation: _____			
52. Are coolant levels OK according to manufacturer's recommendations?	☐	☐	☐
Explanation: _____			
53. Are air cleaner systems OK according to manufacturer's recommendations?	☐	☐	☐
Explanation: _____			
54. Are belt and pulley systems OK according to manufacturer's recommendations?	☐	☐	☐
Explanation: _____			
55. Are all guards in place and adjusted properly?	☐	☐	☐
Explanation: _____			
56. Is tub oil level OK (if equipped)?	☐	☐	☐
Explanation: _____			

57. Are hydraulic stabilizer pads OK? ☐ ☐ ☐
Explanation: _____

58. Are welder and generator oil levels OK according to manufacturer's recommendations? ☐ ☐ ☐
Explanation: _____

59. Are fuel levels adequate to run a complete shift? ☐ ☐ ☐
Explanation: _____

60. Are pull down cables inspected and in good condition? ☐ ☐ ☐
Explanation: _____

61. Are pull down cables properly adjusted? ☐ ☐ ☐
Explanation: _____

62. Are pull down cables properly lubricated? ☐ ☐ ☐
Explanation: _____

63.
Explanation: _____

64.
Explanation: _____

65.
Explanation: _____

66.
Explanation: _____

67.
Explanation: _____

68.
Explanation: _____

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The Foundation of Our Targeting Zero Environment Mission

Shaw's E&I Group will achieve its goal of "Targeting Zero" accidents and injuries while working as a team to provide a workplace that is free from recognized hazards.

Vision

We will be recognized and respected as the leading company in our industry and as the standard by which our competitors are benchmarked by providing the leadership, guidance and operations excellence necessary to identify and control all recognized hazards in the workplace.

Values

Leadership – provide the necessary tools to identify and control all hazards in the workplace.
Commitment – we will never be satisfied that we have done enough.
Pride – all employees will own the safety process.
Dedication – to strive for continual improvement.
Appreciation – to embrace the safety of our employees.

Operating Principles

- Safety is a core value.
- We plan work to ensure it is done safely.
- We are a safety team.
- We follow good safety practices in all work that we do.
- We will actively demonstrate our commitment to safety.
- All accidents are preventable.
- We will not perform any job that cannot be performed safely.
- We will not compromise safety in the interest of time or comfort.
- We will constantly review our performance to ensure continuous improvement.
- We will encourage employees to commit to safety as a lifestyle and carry the culture of "Targeting Zero" home with them.

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Shaw® Shaw E & I

Medical Forms
Authorization for Treatment of Occupational Injury/Illness

Employee Name: _____

Social Security #: _____ Injury: ☐ Illness: ☐

Job Title: _____ Incident Date: _____

Project/Location: _____ Location of Accident/Exposure: _____

Telephone Number: _____ H&S Representative: _____

Illness/Injury Description: _____

TO TREATING PHYSICIAN:

In the case of occupational injury/illness, please examine the employee and render necessary conservative treatment directly related to the occupational injury/illness.

Light Duty Work: It is the policy of our company to provide work assignments, whenever possible, for employees with physical activity restrictions resulting from an occupational injury/illness. If the employee will be subject to a restriction, please contact **CORE Health Networks** before releasing the employee, so that a light duty assignment may be arranged.

Medically Unfit to Return to Work: It is the policy of our company to assist employees unable to return to work, due to an injury/illness, in obtaining needed medical care and other available benefits. Medical findings are also used to help evaluate unsafe conditions that may have led to the incident. Please help us assist our employees by contacting **CORE Health Networks** with your findings as soon as possible, preferably before the employee leaves your office, but not later than the close of business on the day of initial treatment.

CORE Health Networks:	Telephone: 1-877-347-7429	Fax: (225) 295-4846
Please Send Reports To	**CORE Health Networks *and***	**The Shaw Group, Inc. Corporate Claims Department**
Both of the Following:	12091 Bricksome Ave Suite B Baton Rouge, LA 70816	4171 Essen Lane Baton Rouge, LA 70809

Please Send Bills To: **The Shaw Group, Inc. Corporate Claims Department**
4171 Essen Lane
Baton Rouge, LA 70809

DOCTOR, Please provide:

Medical Diagnosis: _____

Treatment Provided: _____

Recommended Work Limitation/Restriction: _____

Return Visit Needed: No ☐ Yes ☐ Date if Yes _____ First Aid Only ☐

Physician Name: _____ Physician Telephone: _____

Physician Signature: _____ Date: _____

You must call CORE Health Networks for all occupational injuries/illnesses requiring outside medical treatment: 1-877-347-7429.

Fax completed form to CORE Health Networks (225) 295-4846.

Send Bills to Shaw Corporate Claims Department

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Shaw® Shaw E & I

Injured Employee Statement

MUST BE COMPLETED WITHIN 24 HOURS OF THE INCIDENT

This form should be completed by the injured employee involved in the incident. Describe only the facts for which you have personal knowledge. If you have no knowledge of a particular question, write "no knowledge."

Company: _____

Exact Location of Incident/Accident: _____

Name of Injured Employee: _____

Date of Incident/Accident: _____ Time _____ am pm

Date of this Statement: _____ Time _____ am pm

Time your shift begins? _____ am pm Ends? _____ am pm

Name of Known Witnesses:

Name: _____

Name: _____

Name: _____

Name: _____

Your Immediate Supervisor's Name: _____

If not employed by Shaw E&I, enter name of company and phone number: _____

Have you had prior injury similar to this injury? _____

Was it while you were at work? _____

What date did the prior injury occur? _____

Stating only factual information, describe in detail what happened and include any applicable events leading to the Incident/Accident:

_____

_____

_____

_____

I certify that, to the best of my knowledge, all of the above information is complete, accurate and factual. I acknowledge that the intentional falsification or altering of facts or making misleading statements may be grounds for disciplinary action.

_____ _____

Signature/Date Print Name

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Shaw® Shaw E & I

Medical Forms
Authorization for Release of Protected Medical Information

Printed Name: _____ Date of Birth: _____

Address: _____

Social Security #: _____ Home Telephone: _____

Authority to Release Protected Health Information
I hereby authorize the release of medical information, identified in this authorization form, and provide such information to:

CORE Health Networks
12091 Bricksome Ave Suite B
Baton Rouge, LA 70816
Phone: (877) 347-7429
Fax: (225) 295-4846

AND

The Shaw Group Inc.
4171 Essen Lane
Baton Rouge, Louisiana 70809
Phone: 225-932-2500
Fax: 225-932-2636

The information to be released includes the following:

Complete health record	Discharge summary	Progress notes
History and physical exam	Consultation reports	X-ray films / images
Laboratory test results	X-ray & Image reports	Itemized bill
Diagnosis & treatment codes	Complete billing record	

Other (specify) _____

Purpose of the Requested Disclosure of Protected Health Information

I am authorizing the release of my protected health information.

Drug and/or Alcohol Abuse, and/or Psychiatric, and/or HIV/AIDS Records Release

I understand if my medical or billing record contains information in reference to, psychiatric care, sexually transmitted disease, hepatitis B or C testing, previous drug and/or alcohol abuse and/or other sensitive information, I agree to its release.

Check One: ☐ **Yes** ☐ **No**

I understand if my medical or billing record contains information in reference to HIV/AIDS (Human Immunodeficiency Virus/Acquired Immunodeficiency Syndrome) testing and/or treatment I agree to its release.

Check One: ☐ **Yes** ☐ **No**

Right to Revoke Authorization

Except to the extent that action has already been taken in reliance on this authorization, the authorization may be revoked at any time by submitting a written notice to ***The Corporate Claims Dept.*** **at** ***The Shaw Group Inc., 4171 Essen Lane, Baton Rouge, Louisiana, 70809***. Unless revoked, this authorization will expire at which time completion of treatment for the injury or illness has been accomplished.

Re-disclosure

I understand the information disclosed by this authorization may be subject to re-disclosure by the recipient and no longer be protected by the Health Insurance Portability and Accountability Act of 1996.

Signature of Patient or Personal Representative Who May Request Disclosure

I understand that I do not have to sign this authorization. However, if health care services are being provided to me for the purpose of providing information to a third-party (*e.g.,* fitness-for-work test), I understand that services may be denied if I do not authorize the release of information related to such health care services to the third-party. I can inspect or copy the protected health information to be used or disclosed. **I hereby release and discharge.** ***The Shaw Group Inc.*** **of any liability and the undersigned will hold** ***The Shaw Group Inc.*** **harmless for complying with this Authorization.**

Signature: _____ Date: _____

Description of relationship if not patient: _____

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Shaw® Shaw E & I

Medical Forms
Return-to-Work Examination Form

Exam Date: _____ / _____ / _____ **Employee Name:** _____

Birth Date: _____ / _____ / _____ **Social Security #:** _____ - _____ - _____

Job Title: _____ **Sex:** ☐ Male ☐ Female

Examining Provider: **Please complete this form and fax to CORE Health Networks at (225) 295-4846. Please contact CORE Health Networks at (877) 347-7429 to report status of employee post-treatment.**

Diagnosis: _____

Treatment Plan: _____

Medications: _____

Physical Therapy: _____

Other: _____

☐ May return to full duty work effective ___/___/

☐ May return to limited duty from ___/___/___ to ___/___/

☐ Unable to return to work from ___/___/___ to ___/___/

WORK LIMITATIONS:

☐ Restricted lifting/pushing/pulling: maximum weight in lbs: _____ (Company limits all lifting to ≤ 60 lbs).

☐ Work only with right/left hand.

☐ Restricted repetitive motion right/left hand.

☐ Sitting job only.

☐ Restricted operation of moving equipment.

☐ Other: _____

FOLLOW-UP PLAN:

☐ Release from care.

☐ Schedule for follow-up appointment on ___/___/___.

Time _____ AM/PM

☐ Referral to _____

Appointment date ___/___/___ Time _____ AM/PM

Comments: _____

_____ _____ _____

Examiner's Name (*print)* Examiner's Signature Date

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Shaw® Shaw E & I

Supervisor's Employee Injury/Illness Report Form

EMPLOYEE INFORMATION		
Employees Social Security Number	Claim Number	
Employee's Name:	Home Phone Number:	
Home Address:		Business Line Code:
Male ☐ Female ☐	Date of Birth:	Hire Date:
Dependents:	Dependents under 18:	Marital Status:
Occupation:		Department Name:
State Hired:	Currently Weekly Wage:	Hourly Wage:
Hours/Days Worked Per Week:	Days Per Week:	Hours Worked Per Day:
Employment Status:	Employee Report No.: NA	Employee ID No.: NA
Salaried Continued:	Paid for Date of Injury:	Education No. of Years:
Ever injured on the Job:	Supervisors Name and Phone:	

EMPLOYER INFORMATION	
Employer Name: **The Shaw Group, Inc.**	Work Location:
Project Name:	Project Number:
Contract Name:	Contract Number:
Contact Name: **Troy Allen**	Telephone Number: **1-800-747-3322**
Employer SIC:	Employer Location Code:
Employer FED ID:	Employer Code: NA
Nature of Business:	
Policy Number:	

ACCIDENT INFORMATION	
Date and Time of Injury:	
Did the Accident Occur at the Work Location	If no, where did the accident occur? NA
Accident Address:	
Nature of Accident:	
Give a Full Description of the Accident (Be as factually complete as possible):	
Are Other WC Claims Involved" No	Date and Time Reported to Employer:
Person Reported To:	

WITNESS INFORMATION
Were There Any Witnesses?
If Yes, List Names and How to Contact Them:

INJURY INFORMATION	
Which Part of the Body Was Injured? (*e.g.*, Head, Neck, Arm, Leg)	
What was the Nature of the Injury? (*e.g.*, Fracture, Sprain, Laceration)	
Part of the Body Location? (*e.g.*, Left, Right, Upper, Lower)	
Injury Description:	
Source of Injury:	Is Employee Hospitalized?
Lost Time:	If Yes, What was First Full Day Out:
Date Last Day Worked:	Date Disability Began: NA
Date Returned to Work:	Estimated Return Date: NA

MEDICAL INFORMATION		
ER Treated & Released:	Hospitalized:	Phy./Clinic:
Hospital – Name, Address, Phone Number:	Was Employee Transported via Ambulance: Yes No	
NA		
Clinic – Name, Address, Phone Number:		

ADDITIONAL COMMENTS AND INFORMATION

REPORT PREPARED BY	
Name:	Title:
Signature:	Phone Number:

REPORT ALL WORKER'S COMPENSATION INJURIES TO SHAW CLAIMS DEPARTMENT
FAX REPORT WITHIN 24 HOURS OF INCIDENT TO **225-932-2636**.
Phone all injuries/illnesses to **Shaw Notification Hotline/Helpdesk 1-866-299-3445**

Shaw® Shaw E & I

Incident Investigation Report

*** Must Be Completed Within 72 HOURS & Relevant Support Documentation Must Be Attached/ Submitted***

Investigation Date _____ Date of Incident _____

Employee Name _____ Supervisor Name _____

Project Number _____ Project Name _____

Contract Number _____ Contract Name _____

Location of Incident _____

Incident Classification

Injury	☐ First Aid	Vehicle	☐ Chargeable	DOT	☐ DOT Vehicle
	☐ OSHA Recordable		☐ Non-chargeable		☐ DOT Reportable
	☐ Lost Workday				
	☐ Restricted Workday	Near Miss	☐	General Liability	☐

Description (Provide facts, describe how incident occurred, provide diagram [on back] or photos)

_____

_____

_____

Analysis (What unsafe acts or conditions contributed to the incident?)

_____

_____

_____

Corrective Action(s) (List corrective action items, responsible person, scheduled completion date)

_____

_____

_____

Witness Names (Complete Attachment 6 – Employee Witness Statement)

_____

_____

_____

Investigated By: _____ _____ _____

Print Name Signature Date

Project/Location Mgr.: _____ _____ _____

Print Name Signature Date

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Shaw® Shaw E & I

Employee Witness Statement

MUST BE COMPLETED WITHIN 24 HOURS OF THE INCIDENT

This form should be completed by every employee working in the crew of the injured employee and by every other employee with knowledge of events or circumstances involved in the incident.

This information is being solicited from you so that the company can accurately assess the reported incident to avoid similar occurrences in the future. Describe only the facts for which you have personal knowledge. If you have no knowledge of the incident, write "no knowledge."

Company: _____

Exact Location of Incident/Accident: _____

Name of Injured Employee: _____

Date of Incident/Accident: _____ Time _____ am pm

Date of this Statement: _____ Time _____ am pm

Time your shift begins? _____ am pm Ends _____ am pm

Witness Information:

Name: _____

Home Phone No.: _____

Home Address: _____

County: _____ Zip: _____

Witness' Supervisor Name: _____

If not employed by Shaw E&I, enter name of company: _____

Company Phone Number: _____

Did you see the Incident/Accident? _____

How far from you (approx., in feet) did the Incident/Accident occur? _____

Stating only factual information, describe in detail what happened and include any applicable events leading to the Incident/Accident:

_____

_____

_____

_____

I certify that, to the best of my knowledge, all of the above information is complete, accurate, and factual. I acknowledge that the intentional falsification or altering of facts or making misleading statements may be grounds for disciplinary action.

_____ _____

Witness Signature/Date Print Name

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Shaw® Shaw E & I

Accident Review Board

DATE:	LOCATION:
BOARD MEMBERS:	
ACCIDENT DATE:	EMPLOYEE(S) INVOLVED IN INCIDENT:
INVESTIGATION COMPLETE: YES ☐ NO ☐	ACCIDENT CLASSIFICATION:

The following information must be provided by the Accident Review Board for this incident (print):

SUPERVISOR: _____ **PROJECT/LOCATION MGR.:** _____

POTENTIAL CAUSE OF ACCIDENT:

ACTION BY BOARD*:

* All actions by the Accident Review Board are subject to final review by the Human Resources and Legal Departments.

ACCEPTED:

_____ _____

(Employee Signature) (Supervisor Signature)

APPROVED: REJECTED FOR:

_____ _____

(Project/Location Manager)

APPROVED: REJECTED FOR:

_____ _____

(Business Line Health and Safety Manager or Designee)

APPROVED: REJECTED FOR:

_____ _____

(Business Line Vice President)

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Shaw® Shaw E & I

Vehicle Accident Report

ACCIDENT DESCRIPTION

This report is to be initiated by the employee involved in the accident or his/her direct supervisor. Please answer all questions completely. This report must be forwarded to the appropriate health and safety representative within 24 HOURS of the accident. Attach police report.

ACCIDENT DATE _____ TIME _____ ☐ A.M. or ☐ P.M.
LOCATION OF ACCIDENT (CITY, STATE) _____
DESCRIPTION OF ACCIDENT _____
_____
_____
WITNESS _____ PHONE NO. _____
ADDRESS _____ CITY _____ STATE _____ ZIP _____
POLICE OFFICER'S NAME AND BADGE # _____ DEPARTMENT _____

COMPANY VEHICLE

DRIVER _____ DRIVERS LICENSE NO. _____ STATE _____
ADDRESS _____ CITY _____ STATE _____ ZIP _____
WORK PHONE NO. _(_____)_____ S.S. NO. _____ PROJECT NAME/NO. _____
VEHICLE NO. _____ YEAR _____ MAKE _____ MODEL _____ LICENSE PLATE NO. _____
STATE _____ VEHICLE OWNER: ☐ COMPANY ☐ LEASED/RENTED ☐ PRIVATE VEHICLE
VEHICLE TYPE: ☐ COMMERCIAL MOTOR VEHICLE ☐ NON-COMMERCIAL
IF NOT COMPANY-OWNED: OWNER _____ PHONE NO _(____)_____
ADDRESS _____ CITY _____ STATE _____ ZIP _____
VEHICLE DAMAGE _____
NO. OF VEHICLES TOWED FROM SCENE _____ NUMBER OF INJURIES _____ NUMBER OF FATALITIES _____
WERE HAZARDOUS MATERIALS RELEASED? ☐ NO ☐ YES IF YES, DESCRIBE MATERIALS _____
_____

OTHER VEHICLE

DRIVER _____ DRIVERS LICENSE NO. _____ STATE _____
ADDRESS _____ CITY _____ STATE _____ ZIP _____
PHONE NO. _(_____)_____ S.S. NO. _____
OWNER'S NAME (☐ CHECK IF SAME AS DRIVER) _____
ADDRESS _____ CITY _____ STATE _____ ZIP _____
INSURAMCE COMPANY _____ POLICY NO.: _____
AGENT'S NAME _____ PHONE NO.: _(_____)_____
ADDRESS _____ CITY _____ STATE _____ ZIP _____
VEHICLE YEAR. _____ MAKE _____ MODEL _____ PLATE NO. _____ STATE _____
VEHICLE I.D. NO. _____
VEHICLE DAMAGE _____

PASSENGERS ☐ NO ☐ YES INJURIES ☐ NO ☐ YES (If yes, list names and telephone numbers below)

_____
_____
_____

Shaw® Shaw E & I

Vehicle Accident Report

WEATHER: ❑ Clear ❑ Cloudy ❑Fog ❑Rain ❑Sleet ❑Snow Other ___
PAVEMENT: ❑Asphalt ❑Steel ❑Concrete ❑Wood ❑Gravel/Dirt
❑Brick/Stone Other _____
CONDITION: ❑Dry ❑Wet ❑Icy ❑Pot Holes Other _____
TRAFFIC CONTROL: ❑Traffic Light ❑Stop Sign ❑Railroad ❑No Intersection ❑No Control
ROADWAY: No. of Lanes Each Direction: _____ ❑Residential ❑Divided Highway ❑Undivided Highway

Draw and name <u>roadways</u> showing <u>each vehicle</u>, <u>direction of travel</u>, and <u>point of impact</u>. Indicate travel before the accident with a solid line, and post-accident movement with a broken line.

SYMBOLS:

Your Vehicle ①

Other Vehicle(s) ②③

Pedestrian

Stop Sign

Yield

Railroad ‡

ADDITIONAL INFORMATION: _____

Employee _____ (Print) _____ (Signature) _____ (Date)

Supervisor _____ (Print) _____ (Signature) _____ (Date)

H&S Rep. _____ (Print) _____ (Signature) _____ (Date)

<u>Attach police report to vehicle accident report</u>

Report must be faxed to Corporate Claims Department (Fax: 225-932-2636) within <u>24 hours</u>, or not later than next business day.

Report all vehicle accidents to Shaw Notification Hotline/Helpdesk (Phone: 1-866-299-3445)

Shaw® Shaw E & I

Equipment, Property Damage, and General Liability and Loss Report

This report is to be completed for all losses or damage to company property in excess of $2,500.00 and all third party damage, regardless of value, resulting from company activities.

PROJECT/LOCATION: _____ PROJECT NO.: _____ DATE: _____

PROGRAM NAME: _____ TASK ORDER NUMBER: _____

ADDRESS: _____

HOW DID DAMAGE OR LOSS OCCUR: _____

_____

_____

DESCRIPTION AND VALUE ($) OF DAMAGED/LOST/STOLEN PROPERTY: _____

_____

LOCATION OF DAMAGED/LOST/STOLEN PROPERTY (Before Loss): _____

_____

DATE AND TIME OF DAMAGE, LOSS, OR THEFT: Date: _____ Time: _____ a.m./p.m.

OWNER OF DAMAGED/LOST/STOLEN PROPERTY:

Name _____ Phone No. (____) _____

Address _____ City _____

Employer and Address _____

INJURED PARTIES (Also complete a Supervisor's Employee Injury Report if a Company Employee):

Name _____ Phone No. (____) _____

Address _____ City _____

Employer and Address _____

Description of Injury _____

WITNESSES:

1. Name _____ Phone No. (____) _____

   Home Address _____ City _____

   Employer and Address _____

2. Name _____ Phone No. (____) _____

   Home Address _____ City _____

   Employer and Address _____

WERE PICTURES TAKEN? ☐ YES ☐ NO

WERE POLICE NOTIFIED? ☐ YES ☐ NO DEPT. _____ REPORT NO. _____

COMPLETED BY: _____ _____ _____
(Print) (Signature) (Date)

PROJECT/LOCATION MANAGER: _____ _____ _____
(Print) (Signature) (Date)

REPORT MUST BE FAXED TO:
CORPORATE CLAIMS DEPARTMENT (FAX: 225-932-2636)
WITHIN 24 HOURS, OR NOT LATER THAN NEXT BUSINESS DAY

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EMERGENCY EYEWASH STATION/FIRE EXTINGUISHER INSPECTION CHECKLIST

Location: _____ Project Number: _____

Client: _____ Date: _____

Inspected by: _____

EMERGENCY EYEWASH STATIONS

Inspection Points	Unit #1	Unit #2
Is unit in assigned location?		
Is unit full of water?		
Is unit location well marked?		
Is access to unit unobstructed?		
Is unit in sanitary condition?		
Has water been changed with disinfectant added within the last six months?		
Has inspection tag on unit been signed and dated?		

PORTABLE FIRE EXTINGUISHERS

Inspection Points	Unit #	Unit #	Unit #	Unit #	Unit #
Fire extinguisher is in assigned location?					
Access to fire extinguisher is not obstructed?					
Fire extinguisher is fully charged?					
Lock-pin in place?					
Service tag attached and serviced within past year?					
Has inspection tag on unit been signed and dated?					

√ = OK N/A = Not Applicable X = Defective Comments: _____

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EMPLOYEE NOTIFICATION OF INDUSTRIAL HYGIENE MONITORING RESULTS

Employee Name _____ SS# _____

Project Name _____ Project No. _____

Project Manager _____

Substance Monitored _____ Date Monitored _____ Sample Number _____

Results _____ mg/m^3 _____ ppm Other _____

Exposure Standard _____ mg/m^3 _____ ppm Other _____

Protective Equipment Used _____

For instance where exposures were found to be in excess of an exposure limit, the following corrective action steps (engineer administrative, job techniques, etc.) are being taken to reduce potential future exposures:

H&S Representative: _____ _____ _____

Name Printed Signature Date

Employee monitored: _____ _____ _____

Name Printed Signature Date

This page intentionally left blank.

Employee Physiological Monitoring Record For Heat Stress

Employee Name _____ Date _____ Employee SS# _____

PPE used during performance of work: _____ Shift Start Time _____ Location _____

Shift Stop Time _____ Job Number _____

Site Safety & Health Officer _____ Supervisor _____

Temperatures

A. Initial Reading
- 1. Ambient Air Temp. °F _____
- 2. Baseline Body Temp. °F _____
- 3. Time Temp. Taken _____

B. After First Work Period
- 1. Ambient Air Temp. °F _____
- 2. Body Temp. °F _____
- 3. Length of work period _____

C. After Second Work Period
- 1. Ambient Air Temp. °F _____
- 2. Body Temp. °F _____
- 3. Length of work period _____

D. After Third Work Period
- 1. Ambient Air Temp. °F _____
- 2. Body Temp. °F _____
- 3. Length of work period _____

E. After Fourth Work Period
- 1. Ambient Air Temp. °F _____
- 2. Body Temp. °F _____
- 3. Length of work period _____

Heart Rate

A. Initial Reading
- 1. Baseline Heart Rate _____ Beats per minute

B. After First Work Period
- 1. Heart Rate _____ Beats per minute

C. After Second Work Period
- 1. Heart Rate _____ Beats per minute

D. After Third Work Period
- 1. Heart Rate _____ Beats per minute

E. After Fourth Work Period
- 1. Heart Rate _____ Beats per minute

- Baseline Body Temperature and Heart Rate to be taken at project site location at beginning of shift before engaging in physical activity.
- Heart Rate – Each individual will count his/her radial (wrist) pulse as early as possible during each rest period. If the heart rate of any individual exceeds 75 percent of their calculated maximum heart rate (MHR = 200 – age) at the beginning of the rest period, then the work cycle will be decreased by one-third. The rest period will remain the same. An individual is not permitted to return to work until his/her sustained heart rate is below 75 percent of their calculated MHR.
- Temperature – Each individual will measure his/her temperature with a thermometer for one minute as early as possible in the first rest period. If the temperature exceeds 99.6°F at the beginning of the rest period, then the work cycle will be decreased by one-third. The rest period will remain the same.
  An individual is not permitted to return to work if her/her temperature exceeds 100.4 °F. Note: due to the lack of accuracy in measuring body temperatures, heart rate is probably a better measurement of heat stress and should be weighted accordingly.
- This completed form should be retained in project file.

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EMPLOYEE REQUEST FOR MATERIAL SAFETY DATA SHEET (MSDS)

Project Name: _____ Project Number: _____

Employee Name: (Please Print) _____

Employee Number: _____

Job Title/Location: _____

Department/Work Area: _____

I am requesting a copy of the MSDS(s) for the following chemical(s):

(Chemical name, Common name, Trade name)

1. _____

2. _____

3. _____

_____ _____

Signature Date

I have received a copy of the above MSDS(s) I requested.

_____ _____

Signature Date

cc: Local Health and Safety Representative

This page intentionally left blank.

Equipment No: _____ **Date:** _____

Equipment Type: _____ **Location:** _____

Equipment Hrs: _____ **Supervisor:** _____

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Shaw Environmental & Infrastructure, Inc.

DAILY EQUIPMENT INSPECTION

List Quantities And Kinds of Fluids Added In Space At Bottom Of Sheet

ITEM		OK	Add	N/A	Comments
1	Check Engine Oil Level And Engine Compartment For Trash, Debris, etc.	☐	☐	☐	☐
2	Check Hydraulic Oil Level, Cap And Vent.	☐	☐	☐	☐
3	Check Radiator Coolant Level And Radiator Fins For Dirt, Leaves, etc.	☐	☐	☐	☐
4	Check Transmission Oil Level (Dozers) or Swing Case (Excavators).	☐	☐	☐	☐
5	Check Oil Level in Frame Joint Bearing, Consult Manual. (Volvo A-40 only)	☐	☐	☐	☐
6	Check For Oil or Coolant Leaks.	☐	☐	☐	☐
7	Check Wheels / Tires / Tracks For Damage, Cuts And Proper Inflation PSI._____	☐	☐	☐	☐
8	Check Ground Engaging Implements, Cutting Edges, Teeth, Blade, etc.	☐	☐	☐	☐
9	Inspect Visible Hydraulic Hoses / Lines For Scuffs, Wear, Leaks, etc.	☐	☐	☐	☐
10	Inspect ROPS, FOPS, For Any Obvious Signs Of Loose Mounts, etc.	☐	☐	☐	☐
11	Check All Guages, Lights, Controls, Backup Alarms, Horn, etc.	☐	☐	☐	☐
12	Inspect Operators Compartment For Debris And Fire Extinguisher Charge. Check Floor For Build-up Of Dirt Around Pedals. Inspect Seat Belts, Lap Bar, Etc. Clean The Windows And Note Any Cracks.	☐	☐	☐	☐
13	Do a Walk Around Inspection Looking For Obvious Signs Of Future Problem Areas. Check Grab Handles and Step Treads, etc.	☐	☐	☐	☐
14	Check Operation Of All Systems, Boom, Bucket, Dump Bed, Grapple, Shears. Look for Leaks, Damage, Warning Signs, Excess Slack, Obvious Wear, etc.	☐	☐	☐	☐
15	Check Under The Machine For Any Loose Or Hanging Objects, Leaks, Or Anything Out Of The Ordinary.	☐	☐	☐	☐
16	Check Fuel Level And Cap Condition, Fill Tank Prior To Beginning Daily Operation.	☐	☐	☐	☐
17	**Lube All Moving Parts**, Such As Blade, Bucket, Stick, Connecting Links Equalizer bar, Cylinder Pins And Any Point That Is Subject To Grease Being Pushed Or Worn Out Due To Daily Use. Consult Manual For Grease Points.	☐	☐	☐	☐
18	Check Breathing Air Sustem (If Used). Make Sure Bottle Is Full And Mask / Hose Assembly Is Clean And In Good Working Condition Before Each Use.	☐	☐	☐	☐
19	**Verify The Presence Of The Operations / Maintenance Manual.**	☐	☐	☐	☐

Report All Damage To Supervisor Immediately

COMMENTS:

USE LINE NUMBER, BE SPECIFIC, NOTIFY REGIONAL MAINTENANCE COORDINATOR IF IMMEDIATE ATTENTION IS NEEDED.

EMPLOYEE NAME: **EMPLOYEE NUMBER:**

THESE SHEETS ARE TO BE RETAINED ON THE PROJECT FOR REVIEW BY ESG PERSONNEL.

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EXCAVATION INSPECTION

THIS INSPECTION IS TO BE COMPLETED BY THE COMPETENT PERSION EACH DAY THAT EMPLOYEES WILL BE ENTERING AN EXCAVATION

Project Name: _____ Project No.: _____

Date: _____ Time: _____ Competent Person: _____

Soil Classification (see Soil Classification Worksheet): _____

Excavation Depth: _____ Excavation Width: _____

Type of Protective System Used: _____

		√		
		Yes	No	N/A
1.	General:			
	Surface encumbrances removed or supported			
	Employees protected from loose rock or soil that could pose a hazard by falling or rolling into the excavation			
	Hard hats, steel-toed boots, and safety glasses worn by all employees.			
	Spoils, materials, and equipment set back at least two (2) feet from the edge of the excavation.			
	Walkways over excavation 6 feet or more above lower levels are equipped with standard guardrails.			
	Warning vest or other highly visible clothing provided and worn by all employees exposed to public vehicular traffic.			
	Employees required to stand away from vehicles being loaded or unloaded.			
	Warning system established and utilized when mobile equipment is operating near excavation edge.			
	Employees prohibited from going under suspended loads.			
2.	Utilities:			
	Initiate “One-Call Utility Protection” at least 48-hours in advance of intrusive activity.			
	Utility company’s contacted and/or utility locations delineated.			
	Underground installations protected, supported, or removed while excavation is open.			
3.	Means of Access and Egress:			
	Lateral travel to means of egress no greater than 25 feet in trench excavations 4 feet or more in depth.			
	Ladders used in excavations secured and extended three (3) feet above the edge of the trench.			
	Structural ramps used by employees designed by a competent person.			
	Structural ramps used for equipment designed by a registered professional engineer.			

EXCAVATION INSPECTION (Page 2 of 2) Date:

		√		
		Yes	No	N/A
4.	Wet Conditions:			
	Precautions taken to protect from the accumulation of water.			
	Water removal equipment monitored by a competent person.			
	Surface water or runoff diverted or controlled to prevent accumulation in the excavation.			
	Inspections made after every rainstorm or other hazard-increasing occurrence.			
5.	Hazardous Atmosphere			
	Atmosphere within the excavation tested where there is a reasonable possibility of an oxygen deficient, combustible, or otherwise hazardous atmosphere.			
	Adequate precautions taken to protect employee from exposure to a hazardous atmosphere.			
	Testing conducted to ensure that the atmosphere remains safe.			
	Emergency equipment, such as breathing apparatus, safety harness and line, and basket stretcher readily available where hazardous atmosphere does exist.			
6.	Support Systems:			
	Materials and/or equipment for support systems selected based on soil analysis, trench depth, and expected loads.			
	Materials and equipment used for protective systems inspected and in good condition.			
	Damaged materials & equipment used for protective systems inspected by a Registered Professional Engineer after repairs and before being placed back into service.			
	Protective systems installed without exposing employees to the hazards of cave-ins, collapses, or from being struck by materials or equipment.			
	Members of support systems securely fastened to prevent failure.			
	Support systems provided to insure stability of adjacent structures, buildings, roadways, sidewalks, walls, etc.			
	Excavations below the level of the base or footings approved by a registered professional engineer.			
	Removal of support systems progresses from the bottom, and members are released slowly as to note any indication of possible failure.			
	Excavation of material to a level of greater than 2 feet below the bottom of the support system and only if the system is designed to support the loads calculated for the full depth.			
	Shield system placed to prevent lateral movement.			
	Employees are prohibited from remaining in shield system during vertical movement.			
7.	Remarks:			
	_____			
	_____			

FIRST AID KIT INSPECTION LOG
(Inventory Kit)

Location: _____ Project Name: _____

Project Number: _____ Client: _____ Date: _____

Inspected by: _____ SSHO Approval Signature: _____

Contents	Fixed Location Kit		Vehicular Kit*			
				Actual Quantity		
	Minimum Required Quantity	Actual Quantity	Required Quantity	Vehicle 1 ID	Vehicle 2 ID	Vehicle 3 ID
Telfa Bandage Compress, 4"x4"	4		2			
Adhesive Bandages, 1"x3-3/8"	25		25			
Ammonia Inhalants	2		1			
Triangular Bandage 40" x 40" x 56"	1		-			
Eye Covering with Means of Attachment	1		-			
Eye Flush, 1oz.	2		2			
Absorbent Compress 24 sq. in.	1		1			
Antiseptic Wipes 1" x 1"	10		5			
Antiseptic Swabs 0.14 fl. oz.	10		5			
Antiseptic Towelettes 24 sq. in.	10		-			
Sterile Pad 3" x 3"	4		2			
Burn Treatment 0.14 fl. Oz.	6		1			
Roller Bandage 4" x 6 yd.	1		-			
Roller Bandage 2" x 6 yd.	2		-			
Kwik-Kold Ice Pak	2		-			
Adhesive Tape, 1" x 5 yd.	2		1			
Scissors and Forceps Kit	1		-			
Tick Removal Kit	1		-			
Emergency Blanket	1		-			
Disposable Gloves	4 pair		2 pair			
Flashlight	1		-			
Cotton-tip Applicators	10		-			
Disposable mouth-to-mouth Resuscitators	2		1			
Multi-Trauma Dressings 8"x10"	2		-			
2" Bandage Compress 2" x 36"	4		-			
3" Bandage Compress 3" x 60"	2		-			
4" Bandage Compress 4" x 72"	1		-			
Supervisor's Employee Injury Report	1		1			
Inventory Kit	1		-			

* Readily available "vehicle-size" first aid kits may be purchased at the local department store to fulfill vehicle kit stocking requirements. The kit contents do not need to be inspected as long as the shrink-wrap sanitary covering is intact.

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HAZARD COMMUNICATION AND RIGHT-TO-KNOW STANDARDS
EMPLOYEE TRAINING RECORD

Project Name: _____ Project Number: _____

		INITIAL:
1.	I have been informed about the Hazard Communication Program, Material Safety Data Sheets (MSDS), their use and location, and the procedures to obtain copies.	
2.	I have been informed that some of my work may involve exposure to toxic substances, the hazards of which will be reviewed with me in tailgate safety meetings or site-specific training.	
3.	I have been informed about the right of employees to have access to relevant exposure and medical records, and the procedures for requesting access.	
4.	I understand that the company must act upon a request in a reasonable amount of time so as to avoid interruption of normal work operations.	
5.	I have been provided access to the applicable regulations governing hazard communication, and access to employee exposure and medical records.	

PRINT NAME: _____

SIGNATURE: _____

EMPLOYEE NUMBER: _____

DATE: _____

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HAZCOM PROGRAM ACKNOWLEDGMENT FORM

Project Name: _____ Project Number: _____

1. I have been informed about the Hazard Communication Program, Material Safety Data Sheets (MSDS), their use and location, and the procedures to obtain copies.

2. I have been informed that some of my work may involve exposure to toxic substances, the hazards of which will be reviewed with me in tailgate safety meetings or site-specific training.

3. I have been informed about the right of employees to have access to relevant exposure and medical records, and the procedures for requesting access.

4. I understand that the company must act upon a request in a reasonable amount of time so as to avoid interruption of normal work operations.

5. I have been provided access to the applicable regulations governing hazard communication, and access to employee exposure and medical records.

Printed Name	Signature	Representing	Date

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HEPATITIS B AND TETANUS VACCINATION DECLINATION

Due to the potential for you to have occupational exposure to potentially infectious materials in your work, the company will provide, and encourages you to accept, vaccinations for Hepatitis B and Tetanus. Information to assist you in this decision is provided below.

Tetanus

- Bacterial disease causing muscle spasms, seizures, and "lockjaw"
- Single injection vaccination has few side effects
- Minimal loss in protection if the vaccination is given at the time of an exposure/injury rather than in advance

Hepatitis B

- Viral infection of the liver
- About 9,500 occupational cases occur annually, mostly in health care workers, with about 200 deaths
- Three-injection vaccination has few side effects
- Vaccination is 90 percent effective for at least 7 years when given prior to exposure
- Vaccination is 70 to 88 percent effective when given within 1 week of exposure
- Can survive in the environment for 24 to 48 hours after drying
- Risk of infection from one cut or puncture wound from a contaminated object:
  - Hepatitis B virus 6 to 30 percent
  - Human Immunodeficiency Virus (AIDS) 0.5 percent

If you wish to talk to a company doctor before making your decision, please ask the Health and Safety Manager to make arrangements for you. *If you choose to decline vaccination at this time, you must print and sign your name, and date the bottom of this form.*

I understand that due to my occupational exposure to blood or other potentially infectious materials I may be at risk of acquiring Hepatitis B Virus (HBV) infection.

I have been given the opportunity to receive the Hepatitis B vaccine, at no charge to myself. However, I decline Hepatitis B vaccination at this time. I understand that by declining this vaccine, I continue to be at risk of acquiring Hepatitis B, a serious disease.

If in the future I continue to have occupational exposure to blood or other potentially infectious materials and I want to be vaccinated with the Hepatitis B vaccine, I can receive this vaccination series at no charge to me.

Name (print) _____

Signature _____ Date _____

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HOT WORK PERMIT

Project Name _____ Project # _____

Good for This Date Only ____/____/____ Time From _____ To _____

Hot Work Area _____

Specific Work to be Done _____

Personal Protective Equipment Required: _____

_____

Emergency Equipment Required: _____

_____

CHECKLIST	INITIAL	
	YES	DOES NOT APPLY
Area personnel have been informed of work to be performed.		
All tanks, lines, valves are disconnected, blinded, or blocked out.		
Electrical service has been locked out and tagged.		
Equipment and all attached piping has been cleaned and purged with: (check blank) Water _____ Steam _____ Inert gas _____ Air		
All grounding/bonding wire in place.		
Surrounding equipment and operations are safe for hot work.		
No open vessels, lines or combustible items within 35 feet of hot work area.		
Fully charged and appropriate fire extinguisher easily accessible.		
Fire watch has been provided.		
No flammable gases greater than 10% LEL in hot work area.		
Compressed gas cylinders kept upright and secured.		
Air monitoring required.		

AIR MONITORING (If Required)						
STATE EXACT LOCATION OF TEST	TIME	% LOWER EXPLOSION LIMIT	% OXYGEN	OTHER TEST _____	OTHER TEST _____	INITIAL

Special Instructions: _____

_____

Completed by: _____ _____ _____

Printed Name Signature Date

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INTRUSIVE ACTIVITIES PERMIT	Permit Number

Project Name: _____ Project Number: _____

Clearance is permitted for intrusive activity at: _____

The attached map indicates the limits of the permitted intrusive activity. The area __has __has not been staked or clearly marked.

Utilities Locate Service Reference Number: _____

Limits of Work Permitted		
Description of permitted work:		
Specific location of permitted work:		
Precautions or comments:		
Date Clearance Permitted:	Date Clearance Terminated:	
Request Initiated By:	Phone No.	Organization

Permission to proceed with intrusive activity granted:

_____ _____

Field Supervisor/Project Manager Date

Permission to proceed with intrusive activity granted:

_____ _____

Site Safety and Health Officer Date

I agree to perform work within the limits of this permit:

_____ _____

Supervisor/Foreman/Contractor Date

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LIFT PLAN WORKSHEET

General Information

Date:_____ Project No:_____

Location: _____ Crane Owner:_____

Item to be Lifted:_____ Equipment No:_____

Item Weight:_____(lbs) _____(lbs)
Actual Calculated Weight (from below)

If actual weight is not known, the item weight must be determined by one of the following methods:
Manufacturer Data Sheet
Truck Weigh Ticket (only for single piece loads)
Calculated Weight

Standard weight per cubic foot of this material: _____

Dimension of item/material: L _____ x W _____ x H _____ = _____ cu. ft.

Cubic feet of item _____ x Standard Weight _____ =
Calculated Weight

Lifting Responsibility

Lift Supervisor:_____ Employee No:_____
(Required for lifts over 75% of capacity)

Lift Supervisor:_____ _____
Print Name Signature

Crane Operator:_____ _____
Print Name Signature

Rig:_____ _____
Print Name Signature

Rigging Personnel:_____ _____
Print Name Signature

Tag Line 1: _____ _____
Print Name Signature

Tag Line 2: _____ _____
Print Name Signature

Crane Capacity Determination

Item Weight: _____

Block Weight: + _____

Stowed Jib: + _____

Spreader Bar Weight: + _____

Sling Weight: + _____

Accessories: + _____

Other: + _____

Lift Total: = _____

Anticipated Maximum Boom Extension: _____ feet

Anticipated Minimum Boom Angle: _____ °

Anticipated Maximum Load Radius: _____ feet

Based on the above configuration, this crane can safely lift * _____ lbs.

*The crane capacity must exceed the lift total while also taking the following into account:

- Crane/Boom Lift Point (i.e. main boom or jib)
- Quadrant of Operation (over front or 360°)
- Line Pull & Reeving Requirements (parts of line required)
- Crane is level and on fully extended outriggers; or
- Within "On Rubber" Capacity chart if not fully extended or a pick and carry lift is required.

Rigging Capacity Determination

_____ x _____ = _____

Item weight (from page 1) | Sling angle factor | Implied Sling Load

Sling capacity must be determined based on the following items:

- When using multiple slings, the sling with the least lifting capacity must be capable of lifting the load.
- Hitch (vertical, basket, chock)
- Number of sling legs for calculation purpose; never use more than 3 legs.
- Sling angle

NOTE: Sling angle factors can be found in Attachment 4.

Rigging Accessories

Shackles: Number _____ Size _____ Capacity

Other: Number _____ Size _____ Capacity

Implied Sling Load: _____ Sling Capacity:

NOTE: Implied sling load must not exceed sling capacity.

Pre-Lift Checklist

- ☐ rigger has inspected all rigging
- ☐ equipment operator has inspected equipment
- ☐ wind conditions acceptable
- ☐ other weather conditions acceptable
- ☐ keep all unnecessary personnel clear of the lift area
- ☐ no personnel allowed down slope during operations done safely
- ☐ use all PPE properly (hard hats, boots, etc.)
- ☐ weight of lift remains unchanged
- ☐ pre-lift meeting with all personnel
- ☐ personnel are qualified
- ☐ equipment in accordance with plan
- ☐ no hazardous conditions in lift area
- ☐ equipment is properly set up
- ☐ signal person assigned if necessary
- ☐ Lift Supervisor (LS) to ensure job
- ☐ LS to stop job if unsafe condition
- ☐ LS to stabilize job if accident occurs

Critical lifts require drawings of lift configuration. Use box below or attach drawing to worksheet.

Lifting Approvals

Lifts which exceed 25 tons or greater outlined on this lift planning worksheet require the approval of a competent civil, structural/mechanical engineer.

_____ _____

Print Name Signature

This page intentionally left blank.

Project Location: _____
Client: _____
Project Number: _____

LOCKOUT LOG

AUTHORIZED EMPLOYEE	DATE	EQUIPMENT NAME	EQUIPMENT NUMBER	REASON FOR LOCKOUT

This page intentionally left blank.

LOCKOUT/TAGOUT FOR COMPRESSED AIR AND GASES

Project Name: _____ Project Number: _____

Job: _____

Device: _____

Location: _____

Authorized Person: _____

Site Supervisors: _____

PREPARATION FOR SHUTDOWN

1. Determine types and shutoff location.
2. Determine if there is more than one energy source.
3. Determine magnitude of compressed air, gas, steam, water, or fluids.
4. Notify affected employees in the area that equipment will be locked out for maintenance.
5. Shutoff main supply to machine.

LOCKOUT/TAGOUT

6. Lock and tag main supply in the OFF position.
7. Bleed line and verify that no air or gases remain in the equipment.
8. Repair equipment.

RETURN TO SERVICE

9. Be sure all connections are made and any unused tools and equipment are removed.
10. Remove lock if necessary to verify proper operations.
11. Remove tag.
12. Notify employees in the area that the equipment is available.

Signature:

Authorized Person: _____

Site Supervisor: _____

This page intentionally left blank.

LOCKOUT/TAGOUT FOR ELECTRICAL EQUIPMENT

Project Name: _____ Project Number: _____

Job: _____

Device: _____

Location: _____

Authorized Person: _____

Site Supervisors: _____

PREPARATION FOR SHUTDOWN

1. Determine power type and shutoff location.
2. Determine if there is more than one energy source.
3. Determine magnitude of power (voltage).
4. Notify affected employees in the area that equipment will be locked out for maintenance.
5. Shutoff power sources to machine.

LOCKOUT/TAGOUT

6. Lock and tag main switches in the OFF position, remove fuses.
7. Verify that no power is available to the equipment using a voltmeter, if necessary.
8. Drain devices such as capacitor banks.
9. Verify that these devices have no stored energy by use of the voltmeter.
10. Repair equipment.

RETURN TO SERVICE

11. Be sure all connections are made and any unused tools and equipment are removed.
12. Remove lock if necessary to verify machine is repaired. The maintenance employee, while verifying the machine is repaired cannot leave the immediate area.
13. Remove tag from machine.
14. Notify employees in the area that the equipment is available.

Signature:

Authorized Person: _____

Site Supervisor: _____

This page intentionally left blank.

LOCKOUT/TAGOUT FOR HYDRAULIC EQUIPMENT

Project Name: _____ Project Number: _____

Job: _____

Device: _____

Location: _____

Authorized Person: _____

Site Supervisors: _____

PREPARATION FOR SHUTDOWN

1. Determine power type and shutoff location.
2. Determine if there is more than one energy source.
3. Determine magnitude of energy (pressure).
4. Notify affected employees in the area that equipment will be locked out for maintenance.
5. Shutoff main hydraulic to equipment.

LOCKOUT/TAGOUT

6. Lock and tag main supply in the OFF position.
7. Drain fluids from shutoff valves to equipment.
8. Verify that the hydraulic fluid is disconnected.
9. Block ram or items controlled by the hydraulic system using the appropriate blocking.
10. Repair equipment.

RETURN TO SERVICE

11. Be sure all connections are made and any unused tools and equipment are removed.
12. Remove lock if necessary to verify machine is repaired. Maintenance employee cannot leave the immediate area, while verifying the machine is repaired.
13. Remove tag from machine.
14. Notify employees in the area that the equipment is available.

Signature:

Authorized Person: _____

Site Supervisor: _____

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LOCKOUT/TAGOUT FOR STEAM, WATER, AND FLUID LINES

Project Name: _____ Project Number: _____

Job: _____

Device: _____

Location: _____

Authorized Person: _____

Site Supervisors: _____

PREPARATION FOR SHUTDOWN

1. Determine types and shutoff location.
2. Determine if there is more than one energy source.
3. Determine magnitude of compressed air or gas.
4. Notify affected employees in the area that equipment will be locked out for maintenance.
5. Disconnect/shutoff main steam, water, or fluid lines to equipment.

LOCKOUT/TAGOUT

6. Lock and tag main supply (i.e. chaining through valve handle with lock) in the OFF position with a bleeder open on the load side.
7. Drain fluids from shutoff valves to equipment.
8. Repair equipment.

RETURN TO SERVICE

9. Be sure all connections are made and any unused tools and equipment are removed.
10. Remove lock if necessary to verify machine is repaired. The maintenance employee cannot leave the immediate area, while verifying the machine is repaired.
11. Remove tag from machine.
12. Notify employees in the area that the equipment is available.

Signature:

Authorized Person: _____

Site Supervisor: _____

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LOCKOUT/TAGOUT PROCEDURE FOR SPECIFIC EQUIPMENT

Project Name: _____ Project Number: _____

Equipment:		
Cat. No. and Location:		
Serial Number (if available):		
Electrical:	Voltage:	Location:
Describe:		
Air (Type):		Location:
Describe:		
Gases (Type):		Location:
Describe:		
Steam (Type):		Location:
Describe:		
Water:		Location:
Describe:		
Fluids:		Location:
Describe:		
Hydraulic:		Location:
Describe:		
Stored Energy – Capacitors, Springs, Etc.:		
Describe:		

LOG DATA AND RETURN TO SITE-SUPERVISOR

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Near Miss Report

Employee Name (optional): _____

Shaw Location: _____ **Date of Report:** _____

Near Miss

POTENTIAL LOSS		
◉ Injury	◯ Illness	◯ Property Damage
Describe potential loss:		

Incident

EVENTS
Describe event:

Causes

SUBSTANDARD ACTS/PRACTICES	SUBSTANDARD CONDITIONS
◯ Failure to warn	◯ Inclement weather
◯ Failure to secure	◯ Inadequate guards or barriers
◯ Operating at improper speed	◯ Inadequate or improper protective equipment
◯ Making safety devices inoperable	◯ Defective tools, equipment or materials
◯ Removing safety devices	◯ Congestion or restricted action
◯ Using defective equipment	◯ Inadequate warning system
◯ Using equipment improperly	◯ Fire and explosion hazards
◯ Failing to use PPE properly	◯ Poor housekeeping; disorderly workplace
◯ Improper loading	◯ Hazardous environmental conditions: gases,
◯ Improper placement	◯ Dusts, smokes, fumes, vapors
◯ Improper lifting	◯ Noise exposures
◯ Improper position for task	◯ High or low temperature exposures
◯ Servicing equipment in operation	◯ Other
Describe immediate cause(s):	

IMPROVEMENT ACTIONS		
1		
2		
3		
Person responsible for follow-up:	Expected completion date:	Actual completion date:
Verified by:	Validated by:	
Supervisor Name:		
Signature:		

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Noise Dosimeter
Field Data Log

Project Name _____ Project# _____

Date _____ Calibrated by _____

Survey Location _____

Dosimeter Serial No.	Employee Name	Job Description	Calibration dBA (pre)	Dose	Lavg	Lmax	Time	Calibration dBA (post)	Comments

Comments _____

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Noise Survey
Field Data Log

Project Name _____ Project# _____

Date _____ Calibrated by _____

Survey Location _____

Sound Level Meter Serial No.	Employee Name/ Equipment Name	Job Description/ Equipment Location	Time	Calibration dBA (pre-survey)	dBA/ Distance from Source	dBA/ Distance from Source	dBA/ Distance from Source	Calibration dBA (post-survey)	Comments

Comments _____

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PROJECT SAFETY INSPECTION REPORT

DATE _____

BUSINESS LINE: _____

PROJECT NAME/NUMBER: _____

PROGRAM MANAGER: _____ PROJECT MANAGER: _____

GENERAL PROJECT DESCRIPTION: _____

SITE ACTIVITIES AT TIME OF INSPECTION: _____

_____

_____

INTERVIEWED EMPLOYEE: _____

SAFETY ISSUE: _____

CORRECTIVE ACTION: _____

_____

ASSIGNED TO: _____ FOLLOW-UP DATE: _____

CORRECTION VERIFIED BY: _____ DATE: _____

INTERVIEWED EMPLOYEE: _____

SAFETY ISSUE: _____

CORRECTIVE ACTION: _____

_____

ASSIGNED TO: _____ FOLLOW-UP DATE: _____

CORRECTION VERIFIED BY: _____ DATE: _____

INSPECTION COMPLETED BY: _____ DATE: _____

HEALTH AND SAFETY REVIEW BY: _____ DATE: _____

PROJECT SAFETY INSPECTION REPORT

PROJECT _____ DATE _____

	YES	NO	N/A
FIRST AID			
1. Are first aid kit locations identified and accessible?			
2. Are emergency eye wash/safety showers available and inspected monthly?			
3. Are first aid kits inspected weekly?			
4. Is a qualified first aid/CPR provider on-site?			
PERSONAL PROTECTIVE EQUIPMENT			
1. Have levels of personnel protection been established?			
2. Are respirators decontaminated, inspected, and stored according to standard procedures?			
3. Have employees been fit-tested?			
4. Is defective personal protective equipment tagged and taken out of service?			
5. Does compressed breathing air meet CGA Grade "D" minimum?			
6. Are there sufficient sizes and quantities of protective equipment?			
7. At a minimum, are employees utilizing safety glasses, hard hats, and steel toe boots?			
FIRE PREVENTION			
1. Are employees smoking only in designated outdoor areas?			
2. Are fire lanes established and maintained?			
3. Are flammable liquid dispensing systems bonded?			
4. Are approved safety cans available for storage of flammable liquids?			
5. Has the local fire department been contacted?			
6. Are fire extinguishers available and inspected monthly?			
7. Are flammables and combustibles properly stored?			
8. Are flammable storage cabinets available and used when needed?			
AIR MONITORING			
1. Is required air monitoring being conducted?			
2. Are air monitoring instruments calibrated daily?			
3. Are air monitoring logs up to date?			
4. Are instrument user manuals available?			
5. Are instruments being maintained?			
6. Are employees notified of personal sampling results within 5 days of receipt?			
WELDING AND CUTTING			
1. Are fire extinguishers present at welding and cutting operations?			
2. Are confined spaces evaluated prior to and during cutting and welding operations?			
3. Have Hot Work Permits been completed?			
4. Are proper helmets, goggles, aprons, and gloves available for welding and cutting operations?			
5. Are welding machines properly grounded?			
6. Are oxygen and fuel gas cylinders stored a minimum of 20 feet apart?			
7. Are only trained personnel permitted to operate welding and cutting equipment?			
8. Are gas cylinders transported in a secured vertical position with caps in place?			
HAND AND POWER TOOLS			
1. Are defective hand and power tools tagged and taken out of service?			
2. Is eye protection available and used when operating power tools?			
3. Are guards and safety devices in place on power tools?			
4. Are power tools inspected before each use?			
5. Are nonsparking tools available when necessary?			

PROJECT SAFETY INSPECTION REPORT

PROJECT _____ DATE _____

	YES	NO	N/A
HAND AND POWER TOOLS (continued)			
6. Is the correct tool being used for the job?			
MOTOR VEHICLES			
1. Are vehicles regularly inspected?			
2. Are personnel licensed for the vehicles they operate?			
3. Are unsafe vehicles tagged and reported to supervision?			
4. Is vehicle's safety equipment operating properly?			
5. Are loads secure?			
6. Are vehicle occupants using safety belts?			
7. Are current insurance cards and blank accident report forms located in vehicles?			
EMERGENCY PLANS			
1. Are emergency telephone numbers posted?			
2. Have emergency escape routes been designated?			
3. Are employees familiar with the emergency signal?			
4. Has the emergency route to the hospital been established and posted?			
5. Is a vehicle on site that can transport injured employees to the hospital?			
MATERIALS HANDLING			
1. Are materials stacked and stored to prevent sliding or collapsing?			
2. Are tripping hazards identified?			
3. Are semi-trailers chocked?			
4. Are fixed jacks used under semi-trailers?			
5. Are riders prohibited on materials handling equipment?			
6. Are approved manlifts provided for the lifting of personnel?			
7. Are personnel in manlifts wearing approved fall protection devices?			
FIRE PROTECTION			
1. Has a fire alarm system been established?			
2. Do employees know the location and use of all fire extinguishers?			
3. Are fire extinguisher locations posted?			
4. Are combustible materials segregated from open flames?			
5. Have fire extinguishers been professionally inspected during the last year?			
6. Are fire extinguishers visually inspected monthly?			
ELECTRICAL			
1. Is electrical equipment and wiring properly guarded and maintained in good condition?			
2. Are extension cords kept out of wet areas?			
3. Is damaged electrical equipment tagged and taken out of service?			
4. Have underground electrical lines been identified by proper authorities?			
5. Has a lockout/tagout system been established?			
6. Are GFCIs being used on all temporary electrical systems and as needed?			
7. Are extension cords being inspected daily (i.e., group pin in place, no unapproved splices)?			
8. Are warning signs exhibited on high voltage equipment (250V or greater)?			
9. Is adequate distance maintained from overhead electrical lines?			
10. Are switches, circuit breakers, and switchboards installed in wet locations enclosed in weatherproof enclosures?			

PROJECT SAFETY INSPECTION REPORT

PROJECT _____ DATE _____

	YES	NO	N/A
CRANES AND RIGGING			
1. Are cranes inspected daily prior to use?			
2. Are crane swing areas barricaded or demarked?			
3. Is all rigging equipment tagged with an identification number and rated capacity?			
4. Is rigging equipment inspection documented?			
5. Are slings, chains, and rigging inspected before each use?			
6. Are damaged slings, chains, and rigging tagged and taken out of service?			
7. Are slings padded or protected from sharp corners?			
8. Do employees keep clear of suspended loads?			
9. Are rated load capacities and special hazard warnings posted on crane?			
10. Are the records of annual crane inspection available?			
11. Has accessible areas within the swing radius of the rear of the crane been barricaded?			
12. Do crane operators have required training/certification?			
COMPRESSED GAS CYLINDERS			
1. Are breathing air cylinders charged only to prescribed pressures?			
2. Are like cylinders segregated and stored in well-ventilated areas?			
3. Is smoking prohibited in cylinder storage areas?			
4. Are cylinders stored secure and upright?			
5. Are cylinders protected from snow, rain, etc.?			
6. Are cylinder caps in place before cylinders are moved?			
7. Are fuel gas and oxygen cylinders stored a minimum of 20 feet apart?			
8. Are propane cylinders stored and used only outside of buildings?			
SCAFFOLDING			
1. Is scaffolding placed on a flat, firm surface?			
2. Are scaffold planks free of mud, ice, grease, etc.?			
3. Is scaffolding inspected before each use?			
4. Are defective scaffold parts taken out of service?			
5. Have employees completed scaffold user training?			
6. On scaffolds where platforms are overlapped, is planking overlapped a minimum of 12 inches?			
7. Does scaffold planking extend over end supports between 6 to 18 inches (dependent upon platform length)?			
8. Are employees restricted from working on scaffolds during storms and high winds?			
9. Are all pins in place and wheels locked?			
10. Is required perimeter guarding (top rail, mid rail, and toe board) present?			
11. Has a competent person been designated to oversee scaffold construction?			
12. Are employees prohibited from moving mobile scaffold horizontally while employees are on them?			
13. Are all scaffold components manufactured by the same company?			
WALKING AND WORKING SURFACES			
1. Are ladders regularly inspected?			
2. Are accessways, stairways, ramps, and ladders clean of ice, mud, snow, or debris?			
3. Are ladders being used in a safe manner?			
4. Are ladders kept out of passageways, doors, or driveways?			
5. Are broken or damaged ladders tagged and taken out of service?			
6. Are metal ladders prohibited in electrical service?			

WALKING AND WORKING SURFACES (continued)			
7. Are stairways and floor openings guarded?			
8. Are safety feet installed on straight and extension ladders?			
9. Is general housekeeping being maintained?			
10. Are ladders tied off?			
11. Are handrails and side rails installed along the unprotected sides of stairways having 4 or more risers or rising more than 30 inches?			
SITE SAFETY PLAN			
1. Is a site safety plan available on site or accessible to all employees?			
2. Does the safety plan accurately reflect site conditions and tasks?			
3. Have potential hazards been described to employees on site?			
4. Is there a designated safety official on site?			
5. Have all employees signed the safety plan acknowledgment form?			
SITE POSTERS			
1. Are the following posters displayed in a prominent and accessible area?			
A. Minimum Wage			
B. OSHA Job Protection			
C. Equal Employment Opportunity			
2. Are all required state-specific posters displayed?			
SITE CONTROL			
1. Are work zones clearly marked?			
2. Are support trailers located to minimize exposure from a potential release?			
3. Are support trailers accessible for approach by emergency vehicles?			
4. Is the site properly secured during and after work hours?			
5. Is an exclusion zone sign-in/sign-out log maintained?			
6. Are only employees with current training and physicals permitted in exclusion zone?			
HEAVY EQUIPMENT			
1. Is heavy equipment inspected as prescribed by the manufacturer?			
2. Is defective heavy equipment tagged and taken out of service?			
3. Are project roads and structures inspected for load capacities and proper clearances?			
4. Is heavy equipment shut down for fueling and maintenance?			
5. Are backup alarms installed and working on mobile equipment?			
6. Have qualified equipment operators been designated?			
7. Are riders prohibited on heavy equipment?			
8. Are guards and safety appliances in place and used?			
9. Are operators using the "three point" system when mounting/dismounting equipment?			
EXCAVATION			
1. Has a "competent person" been designated to oversee excavation activities?			
2. Prior to opening excavations, are utilities located and marked?			
3. Has a professional engineer evaluated all excavations greater than 20 feet deep?			
4. Is there rescue equipment on site and accessible to the excavation area?			
5. Is excavated material placed a minimum of 24 inches from the excavation?			
6. Are the sides of excavations sloped or shored to prevent cave ins?			
EXCAVATION (continued)			
7. Have excavations greater than 4 feet deep been monitored for hazardous atmospheres (i.e., LEL/O_2 deficiency)?			
8. Are ladders or ramps used in excavations over 4 feet deep?			
9. Are means of egress available so as to require no more than 25 feet of lateral travel?			

PROJECT SAFETY INSPECTION REPORT

PROJECT _____ DATE _____

	YES	NO	N/A
10. Are barriers, i.e., guardrails or fences, placed around excavations near pedestrian or vehicle thoroughfares?			
11. Is excavation inspected daily by competent persons and documented?			
CONFINED SPACES			
1. Have employees been trained in the hazards of confined spaces?			
2. Are confined space permits posted at entrance to confined space?			
3. Is a copy of the confined space entry procedure available?			
4. Has a rescue plan been established?			
5. Is an entry supervisor present at each permit-required entry?			
6. Are required extraction/fall protection devices being used?			
DECONTAMINATION			
1. Are decontamination stations set up on site?			
2. Is decontamination water properly contained and disposed of?			
3. Are all pieces of equipment inspected for proper decontamination before leaving the site?			
4. Are shin/metatarsal guards being used during power washing activities?			
HAZARD COMMUNICATION			
1. Is there a copy of the HAZCOM procedure on site?			
2. Are their MSDSs for required materials/chemicals present on site?			
3. Are all containers properly labeled, as to content, hazard?			
4. Have employees been trained in accordance with the HAZCOM procedure?			
5. Do employees (including subcontractors) know and understand the effects of exposure from the chemicals on site?			
6. Have all personnel signed the HAZCOM acknowledgment form?			
7. Is there an updated list of chemicals maintained on site?			
TRAINING			
1. Are tailgate safety meetings being conducted daily?			
2. Are current training/medical records maintained on site?			
DOCUMENTATION			
1. Is an OSHA 300 Log maintained on site and posted during the months of February, March, and April?			
2. Are accident report forms available?			
3. Is a copy of health and safety policy and procedures available on site?			

PROJECT SAFETY INSPECTION REPORT

PROJECT _____ DATE _____

ALL NEGATIVE RESPONSES	CORRECTIVE ACTION	ASSIGNED TO	DATE ASSIGNED	DATE COMPLETED	VERIFIED BY

DESCRIBE POSITIVE SAFETY OBSERVATIONS

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REAL TIME AEROSOL MONITORING LOG

Project Name: _____ Project No. _____

Date: _____

Sampled By	Instrument Type (Mfg./Model/Serial No.)	Battery Charged (Y/N)	Zeroed (Y/N)	Sample Time		Sample Readings (mg/m^3)			Comments
				Start	Finish	TWA	Shift Average	Direct	

General Weather Conditions _____

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RESCUE SERVICE EVALUATION

INITIAL EVALUATION

Project/Location _____ Project No. _____

Identity of PRCS _____

Name of Rescue Service _____

Address _____

Contact Person/Phone Number _____

Required Response Time _____ Estimated Response Time _____

Availability of Rescue Service _____

PERFORMANCE EVALUATION (Observe Test Rescue and Answer Following Questions)	YES	NO
Have all members of the service been trained in the potential hazards of the permit space(s), or of a representative permit space(s) from which rescue may be needed?		
Can team members recognize the signs, symptoms, and consequences of exposure to any hazardous atmospheres that may be present in the permit space(s)?		
Is every team member provided with, and properly trained in, the use and need for PPE which may be required to perform permit space rescues?		
Is every team member properly trained to perform his/her functions and make rescues, and to use any rescue equipment, such as ropes and backboards, that may be needed in a rescue attempt?		
Are team members trained in the first aid and medical skills needed to treat victims overcome or injured by the types of hazards that may be encountered in the permit space(s)?		
Do all team members perform their functions safely and efficiently?		
Do rescue service personnel focus on their own safety before considering the safety of the victim?		
Can the rescue service properly test the atmosphere of the identified PRCS?		
Can the rescue personnel identify information pertinent to the rescue from entry permits, hot work permits, and MSDSs?		
Has the rescue service been informed of any hazards to personnel that may arise from outside the space, such as those that may be caused by future work near the space?		
Can the rescue service safely perform rescue(s) from the identified PRCS?		
Does the rescue service have a plan for rescue from the identified PRCS?		
Is the plan adequate for all types of rescue operations that may be needed?		

I certify that the evaluated rescue service is equipped and capable of providing rescue services during entry activities for the identified PRCS.

Evaluator:

_____ _____ _____

Name Signature Date

I acknowledge our responsibility to provide rescue services during entry activities for the identified PRCS.

Rescue Service Representative:

_____ _____ _____

Name Signature Date

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Safety and Occupational Health Deficiency Tracking Log

Section and Item #	Date Deficiency Identified	Description of Deficiency or Comment	Recommended Action	Person Responsible for Correcting Deficiency	Projected Resolution Date	Date Deficiency Actually Resolved

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SAFETY MEETING / TRAINING LOG

- ☐ Tailgate (daily)
- ☐ Activity Hazard Analysis (prior to new task or operation)
- ☐ Job Safety Analysis (prior to new task or operation)
- ☐ Site Safety Orientation (new personnel)
- ☐ Supervisor's (monthly)
- ☐ Supervisor's (weekly)
- ☐ UXO Awareness
- ☐ Asbestos Awareness
- ☐ Health and Safety Plan Addendum: _____
- ☐ Other: _____

Date/Time: _____ Client: _____

Location: _____ Job No.: _____

Meeting/training conducted by: _____

Work Activities: _____

Safety / Training Topics Presented

Chemical Hazards: _____

Physical Hazards: _____

Specific Safety Topic(s): _____

_____

Specific Training Covered: _____

_____

Attendees

Name Printed and Employee Number:	Signature:

SAFETY MEETING / TRAINING LOG
(Continued)

Date: ______________________________ Job No.: ____________________

Attendees

Name Printed and Employee Number:	Signature:

SITE ENTRY LOG

Date: _____ Client: _____

Location: _____ Job No.: _____

Name	Representing	Time In	Time Out

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SOILS CLASSIFICATION WORKSHEET

The following worksheet outlines the visual and manual tests that the competent person must perform at least once, and each time soil conditions change. At least one visual and one manual test must be performed; however, performing several tests is recommended so that the condition of the excavation is thoroughly examined.

Project Name: _____ Project Number: _____

Date: _____ Time: _____

Where was the sample taken from? _____

I.	**Visual Tests:** *One or more visual tests are required for each classification and each time conditions change*		
1.	Estimate range of particle sizes:	a. primarily fine-grained = cohesive material b. primarily coarse-grained = granular material	
2.	Observe excavated soil:	a. clumps = cohesive material b. breaks up easily = granular material	
3.	Observe sides and adjacent surface area of opened excavation:	a. crack like openings = fissured material b. soil spills off vertical sides = possible fissured material	
4.	Previous excavation activities:	a. previously disturbed soil	b. not previously disturbed soil
5.	Observe opened side of excavation:	a. layered systems c. estimate degree of slope of layers:	b. layers sloped towards excavation _____
6.	Water condition:	a. evidence of surface water c. depth of water table:	b. water seeping from sides _____
7.	Vibration present:	a. Area adjacent to excavation	b. Area within excavation
II.	**Manual Tests** – *One or more manual tests are required for classification and each time soil conditions change*		
1.	Plastically – soil is cohesive if following is true:	a. mold soil samples into a small ball b. roll ball into thread ___ " diameter c. pick up 2" length of ___ " thread by one end without breaking	
2.	Dry Soil Strength:	a. crumbles on its own or with moderate pressure = granular b. falls into clumps which break into smaller clumps that are only broken with difficulty = clay with gravel, sand, or silt. c. breaks into clumps which do not break into smaller clumps and can only be broken with difficulty with no visual indication of fissures = unfissured.	
3.	Thumb penetration test: *(These tests are to be run on a large clump of material as soon as it is excavated).*	a. can be easily indented by the thumb but penetrated by thumb only with great effort = Type a b. easily penetrated several inches by thumb and molded by light finger pressure = Type c	
4.	Unconfined Compressive Strength: *(Saturated Soil Needed)*	a. Pocket Penetrometer reading (take 10 readings and average) 0 – 0.5 = Type C, 0.5 – 1.5 = Type B, 1.5 – 2.0 – Type A b. Shear Vane reading X2: 0 – 0.5 = Type C, 0.5 – 1.5 = Type B, 1.5 – 2.0 = Type A	
5.	Drying Test: (A dry soil sample 1" thick X 6" diameter is needed)	a. develops cracks = fissured material dries without cracks and breaks by hand with considerable force significant b. cohesive content = unfissured cohesive material c. sample breaks easily by hand = fissured cohesive or granular material d. easily pulverized dry clumps by hand or by stepping on them = granular e. don't pulverize easily = fissured cohesive.	

Soil Classification: Type A Type B Type C Stable Rock Other _____

Competent Person: _____ (Print Name) _____ (Signature) _____ (Date)

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Sound Level Meter/Noise Dosimeter Calibration Log

Project Name _____ Project# _____

Date _____ Calibrated by _____

Instrument: Manufacturer/Model Number _____

Time	Battery Charged (Y/N)	Sound Level Meter/Dosimeter Serial No.	Calibration Standard dBA	Span Setting (if applicable)	Meter Scale Setting (if applicable)	Zeroed (Y/N)	Expected Meter Reading	Actual Meter Reading	Comments

Comments _____

This page intentionally left blank.

Project: _____

Project Number: _____

TRAINING ACKNOWLEDGMENT FORM

By signing this certificate, you are acknowledging that you have completed the following formal training courses that meet OSHA's requirements:

Training	Date Completed
24-Hour HAZWOPER	_____
40-Hour HAZWOPER	_____
8-Hour Refresher	_____
8-Hour Supervisor	_____

Site-specific Training: I have been provided and have completed the site-specific training. The Site Safety and Health Officer conducted the training.

_____
Employee/Visitor Initials

Respiratory Protection: I have been trained in accordance with the criteria in Shaw Environmental, Inc.'s/my Employer's Respiratory Protection Program. I have been trained in the proper work procedures and use and limitations of the respirator(s) I will potentially wear. I have been trained in and will abide by the facial hair policy.

_____
Employee/Visitor Initials

Respirator Fit-test Training: I have been trained in the proper selection, fit, use, care, cleaning, and maintenance, and storage of the respirator(s) that I will potentially wear. I have been fit-tested in accordance with the criteria in Shaw Environmental, Inc.'s/my Employer's Respiratory Protection Program and have received a satisfactory fit. I have been assigned my individual respirator. I have been taught how to properly perform positive and negative pressure fit-check upon donning negative pressure respirators each time.

_____
Employee/Visitor Initials

Medical Examination: I have had a medical examination within the last twelve months which was paid for by my employer. The examination included: health history, pulmonary function tests and may have included an evaluation of a chest x-ray. A physician made a determination regarding my physical capacity to perform work tasks on the project while wearing protective equipment including a respirator. I was personally provided a copy and informed of the results of that examination. The Site Safety and Health Officer evaluated the medical certification provided by the physician and signed the appropriate blank below. The physician determined that there:

Were no limitations to performing the required work tasks:

_____
Employee/Visitor Initials

Were identified physical limitations to performing the required work tasks:

_____
Employee/Visitor Initials

[Employee's] [Visitor's] Signature _____

Date _____

Printed Name _____

Site Safety and Health Officer Signature _____

Date _____

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U.S. ARMY CORPS OF ENGINEERS
Safety Inspection Checklist for Construction Equipment
(Including Cranes, Derricks, and Hoisting Equipment)

Project Name:	Project Number:	Client:
Project	Contractor	Contract No.
Type and Make of Equipment	Model	Serial No.

Before any machinery or mechanized equipment is placed in use it shall be inspected and tested by a competent mechanic and certified to be in good operating condition. Records of tests and inspections shall be maintained as part of the active contract File at Project or Resident Office. Checklist set forth herein requires the application of EM 385-1-1, US Army Corps of Engineers Safety and Health Requirements Manual, September 1996. The appropriate EM paragraph to be applied is listed at the end of each testing requirement.

CHECKLIST	Yes	No	N/A
1. Are adequate and serviceable fire extinguishers provided? (09.E.01 through 09.E.03)			
2. Are all wire rope cables in good condition? (15.B.01 and 15.B.02)			
3. Are wire rope, sockets, splices, thimbles, and clips and adequate and properly applied? (15.B.03 through 15.B.08)			
4. Are hooks, safety nooks, shackles, rings, etc., in good condition?			
5. Are necessary platforms, foot-walks, etc., provided? (22.A.01 and 22.A.02)			
6. Are access steps, platforms, etc., provided with non-slip surfaces? (21.A.13)			
7. Is operator protected against the elements, falling or flying objects, swinging loads, and similar hazards? (16.B.10, 16.B.11, and 21.A.11)			
8. Are all glasses in operator's compartment safety glass and in good repair? (16.B.10 and 18.A.07)			
9. Is suitable access provided at lubrication points? (16.B.13)			
10. Do all modifications, extensions, replacement parts, and/or repairs to equipment maintain the same factor of safety as original designed equipment? (16.A.18)			
11. Are drums for load lines equipped with at least one positive holding device, applied directly to the motor shaft or some part of the train gear?			
12. Is there sufficient cable to allow three full wraps of cable on drums at all working positions? (16.C.10)			
13. Are adequate headlights, taillights, and turn signals provided and are they in proper operating condition (16.A.07 and 18.A.02 through 18.A.04)			
14. Are all approved brakes on wheeled equipment and in good operating condition? (16.A.07, 18.A.02, and 18.A.05)			
15. Do windshields have wipers in proper operating condition? (16.A.07, 18.A.02, and 18.A.06)			

This form has been amended by ECC to update the references to the September 1996 edition of EM 385-1-1.

CHECKLIST	Yes	No	N/A
16. Are rear view mirrors provided? (18.A.02 and 18.A.06)			
17. Are operating levers equipped with latch and other devices to prevent accidental starting? (18.A.10)			
18. Is engine equipped with power-operated starting device in operative condition? (18.A.06)			
19. Do all pressure vessels have valid inspection certificates? (20.A.03)			
20. Are reverse signal alarms on equipment? (16.B.01)			
21. Are belts, gears, shafts, electrical contacts, etc., adequately guarded? (16.B.03)			
22. Are all hot pipes and surfaces suitably guarded? (16.B.03)			
23. Are fuel tanks located so that spills or overflows will not come in contact with engine or exhaust? (16.B.04)			
24. Are exhausts and discharges so directed as not to endanger workmen or obstruct view of operator? (16.B.05)			
25. Are guards in place on equipment with drop type skip pans? (16.B.03)			
26. Are adequate seats provided for all riders? (16.A.07 and 18.C.01)			
27. Are tires in serviceable condition? Are testing/inspections documented? (18.A.02)			
28. Are steering linkage and tie rod in good operating condition? Are testing/inspections documented? (18.A.02)			
29. Are dump bodies provided with holding device or other suitable device for locking body in raised position? (18.A.10)			
30. Are tailgate dumping devices so arranged that operator will be in the clear while dumping loads? (18.A.10)			
31. Are trip handles provided on tailgates to facilitate handling? (18.A.10)			
32. Is the air hose free from leaks or defects? (20.B.03)			
33. Are safety lashings for quick make-up type connections provided? (20.A.16)			
34. Is an acceptable spark arrestor installed and working?			
35. Do heating devices comply with references?			
36. Does welding equipment comply with code requirements? (10.A.10 and 10.E.01)			
37. Is equipment adequately grounded? (10.E.04 and 10.E.07)			
38. Do electrical components comply with code? (10.E.01)			
39. Are required pressure, temperature, or relief gages and valves installed and operable? (20.A.10 through 20.A.13 and 20.B.02)			
40. Are approved seat belts and rollover protection provided? (16.B.08, 16.B.12, and 18.B.02)			
41. Is recommended preventive maintenance being followed? (16.A.08 and 18.A.02)			
42. Do helicopter cranes meet construction requirements (16.J.01)			
43. Does hydraulic equipment meet special safety conditions (11.H.08, 11.H.09, and 13.A.09)			
44. Is concrete equipment fitted with adequate safety devices? (27.A.04)			

This form has been amended by ECC to update the references to the September 1996 edition of EM 385-1-1.

CHECKLIST	Yes	No	N/A
45. Are elevating and rotating work platforms in conformance with ANSI A92.2? (22.K.01)			
46. Do conveyors, cableways, and related equipment conform to ANSI 320.01?			
47. Are pile drivers equipped with all appropriate safety devices? (16.L)			
48. Do material hoists conform to ANSI A10.5? (16.K.01)			
49. Do passenger elevators conform to ANSI A10.4? Do temporary hoists conform to ANSI A10.22: (21.H)			
50. Do hand and power tools comply with applicable ANSI standards (13.A through 13.G)			
51. Is high voltage sign posted?			
52. Is equipment fitted with positive stops for rotation when near power lines? (11.E and 16.D.06)			
53. Is there any visible evidence of damage to boom? (16.C.12 and Appendix H)			
54. Is the boom position indicator operating and visible to operator? (16.D.01 and 16.D.04)			
55. Have all operators had a current physical examination? (1.C and 16.C.04)			
56. Is breaking equipment capable of effectively braking, lowering, and safely holding a load of at least the full rated load as required?			

Remarks:

Certification: I hereby certify that this item of equipment is in good operating condition and that it meets all above requirements except as noted in the remarks.

_____ _____

Signature of Competent Mechanic Date

_____ _____

Signature of Superintendent/Quality Control Engineer Date

This form has been amended by ECC to update the references to the September 1996 edition of EM 385-1-1.

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UTILITY MARK-OUT DOCUMENTATION

Project Name: _____ Location: _____
FTL Name: _____ Date: _____
Utility Called: _____ Confirmation #: _____
Subcontractor: _____ Task/Activity: _____
County of work: _____ Municipality of work: _____

Before work is done on any site, contact the appropriate local utility locating service (One Call, Miss Dig, Uloco, etc.) or a local utility contractor to have sub grade utilities marked. NOTE: Boring locations to be placed not in the public right of way are typically not marked out by the public utility mark out, and a private utility locate service must be engaged. Indicate to the utility locator the nearest intersecting street for the site: _____

_____ Confirmation No: _____.

List utility firms (public and private) and the utility they will mark.

Utility Marker Emergency Telephone Numbers Major Utilities Marked by Color Code			
Name of Utility Company	Utility	Color Code	Emergency Telephone Number
	Water	Blue	
	Gas	Yellow	
	Electric	Red	
	Telephone/Cable/ Communication	Orange	
	Sewer	Green	
"ALL UNDERGROUND UTILITIES MAY NOT BE LOCATED BY THE LOCAL UTILITY SERVICE." Accordingly, you must list other known utilities in the area that the "One Call" service will not contact:			

Attach photos of the area prior to placing boreholes.
Take photos of the area indicating minimum 5 feet hand dig, post hole dig, probe, GPR, or other.
NOTE: For any borehole, should 5 feet minimum clearance not be obtained, you must contact Business Line VP or equivalent (Operations Director or other on the Federal Business Line) and obtain a variance.

Completed by:

_____ _____ _____
Name Signature Date

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Equipment Services Group

VEHICLE INSPECTION

UNIT NO: _____ **DATE:** _____
MILEAGE: _____ **CURRENT PROJECT NO:** _____
VEHICLE TYPE: _____ **LICENSE NUMBER:** _____
INSPECTED BY: _____ **FUEL FRONT:** _____
EMPLOYEE NUMBER: _____ **FUEL REAR:** _____

For Authorized Repairs On Donlen Vehicles, Call 1-800-323-1483

RETAIN THIS INSPECTION DOCUMENT IN PROJECT FILES

PRE-TRIP **Yes / No** **DAILY (USACE Project)** **Yes / No**

N / A = NOT APPLICABLE **C** = COMMENTS **O** = OKAY **N** = NEEDS ATTENTION

_____	Exterior / Interior Clean	_____	Engine Oil, Oil Pressure
_____	Lights: Head-Tail-Turn-Stop-Emergency-Backup	_____	Transmission Oil & Drive Line
_____	Operating Controls / Gauges	_____	Radiator / Cooling System
_____	Battery / Starter / Horn	_____	Exhaust / Muffler
_____	Air Conditioner / Heater / Defroster	_____	Front Axle / Steering / Suspension System
_____	Back-up Alarm (Trucks)	_____	Donlen Coupon Book
_____	Windshield, Other Glass, Wipers / Washers	_____	First Aid Kit
_____	Mirrors: Inside-Outside (Convex - trucks)	_____	Fire Extinguisher (mounted/accessible/charged)
_____	Insurance Card & Accident Report Kit	_____	Emergency Flares or Reflective Markers
_____	Emergency Phone Number List	_____	Tires / Wheels / Rims
_____	Map to Urgent Care Facility & Hospital	_____	Spare Tire, Jack, Lug Wrench
_____	Current Registration, Plates	_____	Frame / Bumpers
_____	Service Brakes, Emergency/Parking Brakes	_____	Seat Belts (One for Each Passenger)
_____	Trailer Aux Brake Controller/Electrical Connection	_____	Visible Damage to Body
_____	Coupling Devices/Safety Chain Anchor Point	_____	Driver Safety Notification Sticker
_____	Wheel Chocks (When Equipped With Trailer)	_____	Other, Please Enter Comments Below

Was Unit Serviced? Y / N **DATE** **MILES**

COMMENTS: _____

I am authorized to operate this vehicle. _____ Initials

I am licensed to operate this vehicle. _____ Initials

INSPECTORS SIGNATURE: _____ **DATE:** _____

REPORT ALL DEFICIENCIES TO YOUR SUPERVISOR

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Zero Accident Pledge

Shaw® Shaw Environmental, Inc.

We, the undersigned personnel of the _____ Project are committed to a goal of **ZERO ACCIDENTS** for the duration of the project.

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Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-4

Appendix E
Hazardous Chemical Inventory List and Material Safety Data Sheets

Chemical Inventory
November 1, 2011

Argon
Bentonite
Bleach
Calcium Hydroxide (Hydrated Lime)
Diesel Fuel
Fire extinguisher
Gasoline
Gear lubricant
Grease
Hand cleaner
Hydraulic oil
Hydrochloric Acid
Argon (cryogenic liquified gas)
Hydrogen peroxide (20% - 60% sol)
Isobutylene
Liquinox
Motor oil
Portland cement
Potassium permanganate
Silica sand

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Section 1 - Chemical Product and Company Identification 61

Material Name: Argon
CAS Number: 7440-37-1
Chemical Formula: Ar
Structural Chemical Formula: Ar
EINECS Number: 231-147-0
ACX Number: X1002784-0
Synonyms: Argon; ARGON; ARGON-40
General Use: To provide an inert i.e. non reactive, non oxidizing atmosphere for gas welding; usually TIG and MIG welding.
Used in incandescent and fluorescent tubes, also with mixtures of neon for neon lights. Argon alone produces a bluish-purplish light.
As an inerting gas in rectifier tubes; in thermometers above mercury; in lasers; in chromatography and ionization chambers and particle counters.

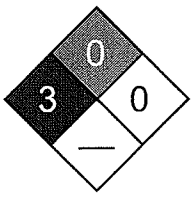
Section 2 - Composition / Information on Ingredients

Name	CAS	%
argon	7440-37-1	>99

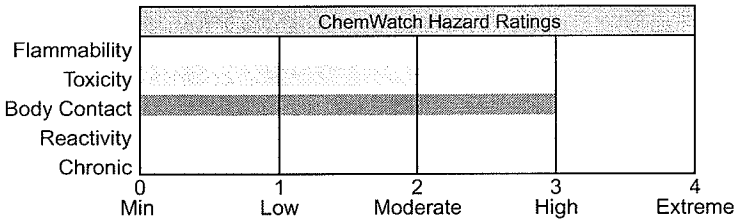
OSHA PEL **NIOSH REL**

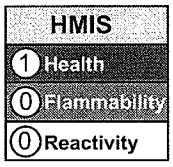
ACGIH TLV

Section 3 - Hazards Identification



Fire Diamond





ANSI Signal Word
Warning!


Compressed Gas

☆☆☆☆☆ Emergency Overview ☆☆☆☆☆

Odorless, colorless gas. Stored as a compressed gas which may cause frostbite. Other Acute Effects: simple asphyxiant.

Potential Health Effects

Target Organs: central nervous system (CNS) (gas as an indirect effect of lack of oxygen), skin (liquid)
Primary Entry Routes: inhalation, skin contact
Acute Effects
Inhalation: The gas is a simple asphyxiant (precludes access to oxygen) and inhalation may cause loss of consciousness.
Material is highly volatile and may quickly form concentrated atmosphere in confined or unventilated area. Vapor is heavier than air and may displace and replace air in breathing zone, acting as a simple asphyxiant. This may happen with little warning of overexposure.
Symptoms of asphyxia (suffocation) may include headache, dizziness, shortness of breath, muscular weakness, drowsiness and ringing in the ears.

If the asphyxia is allowed to progress, there may be nausea and vomiting, further physical weakness and unconsciousness and, finally, convulsions, coma and death. Significant concentrations of the non-toxic gas reduce the oxygen level in the air. As the amount of oxygen is reduced from 21 to 14 volume %, the pulse rate accelerates and the rate and volume of breathing increase. The ability to maintain attention and think clearly is diminished and muscular coordination is somewhat disturbed. As oxygen decreases from 14-10% judgement becomes faulty; severe injuries may cause no pain. Muscular exertion leads to rapid fatigue. Further reduction to 6% may produce nausea and vomiting and the ability to move may be lost.

Permanent brain damage may result even after resuscitation at exposures to this lower oxygen level. Below 6% breathing is in gasps and convulsions may occur. Inhalation of a mixture containing no oxygen may result in unconsciousness from the first breath and death will follow in a few minutes.

Eye: The gas is non-irritating and non-toxic.

The liquid is capable of causing severe cold burns and is capable of causing severe damage with loss of sight.

Skin: The gas is non-irritating and non-toxic.

Vaporizing liquid causes rapid cooling and contact may cause cold burns, frostbite.

Ingestion: Overexposure is unlikely in this form.

Considered an unlikely route of entry in commercial/industrial environments.

Carcinogenicity: NTP - Not listed; IARC - Not listed; OSHA - Not listed; NIOSH - Not listed; ACGIH - Not listed; EPA - Not listed; MAK - Not listed.

Chronic Effects: No data found.

Section 4 - First Aid Measures

Inhalation: Remove to fresh air.

Lay patient down. Keep warm and rested.

If breathing is shallow or has stopped, ensure clear airway and apply resuscitation. Transport to hospital or doctor.

Eye Contact: In case of contact with liquid: promptly flush eyes with tepid water. Seek medical attention immediately.

Skin Contact: In case of cold burns (frost-bite): Bathe the affected area immediately in cold water for 10 to 15 minutes, immersing if possible and without rubbing.

Do not apply hot water or radiant heat. Apply a clean, dry dressing.

Transport to hospital or doctor.

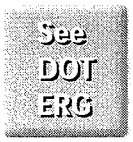
Ingestion: Not applicable.

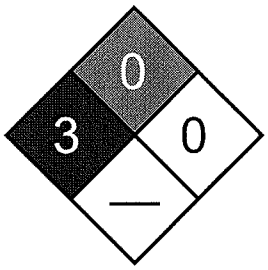
After first aid, get appropriate in-plant, paramedic, or community medical support.

Note to Physicians: Treat symptomatically.

Give oxygen therapy following asphyxiation.

Section 5 - Fire-Fighting Measures





Fire Diamond

Flash Point: Will not burn

Autoignition Temperature: Nonflammable

LEL: Not applicable

UEL: Not applicable

Extinguishing Media: There is no restriction on the type of extinguisher which may be used.

Use fire fighting procedures suitable for surrounding area.

General Fire Hazards/Hazardous Combustion Products: Noncombustible. Heating may cause expansion or decomposition leading to violent rupture of containers.

Fire Incompatibility: Very inert, chemically.

Fire-Fighting Instructions: Contact fire department and tell them location and nature of hazard.

Product is not combustible. No special firefighting procedures required.

Use fire fighting procedures suitable for surrounding area.

Wear breathing apparatus plus protective gloves. May be washed to drain with large quantities of water.

Cool fire-exposed containers with water spray from a protected location.

If safe to do so, remove containers from path of fire.

Section 6 - Accidental Release Measures

Small Spills: Increase ventilation. Avoid breathing vapors and contact with skin and eyes.

Apply leak detection solution to suspected sites in lines and equipment.

Stop leak if safe to do so.

Large Spills: Clear area of personnel.

Wear breathing apparatus plus protective gloves. May be washed to drain with large quantities of water.

Increase ventilation.
Stop leak if safe to do so.
Remove leaking cylinders to a safe place if possible. Release pressure under safe, controlled conditions by opening the valve.
Regulatory Requirements: Follow applicable OSHA regulations (29 CFR 1910.120).

Section 7 - Handling and Storage

Handling Precautions: Avoid breathing vapors and contact with skin and eyes. Avoid sources of heat.
Avoid physical damage to containers.
Use in a well-ventilated area.
Keep containers securely sealed when not in use.
Prevent concentration in hollows and sumps. DO NOT enter confined spaces until atmosphere has been checked.
Recommended Storage Methods: Check that containers are clearly labeled. Cylinder. Ensure the use of equipment rated for cylinder pressure.
Ensure the use of compatible materials of construction.
Valve protection cap to be in place until cylinder is secured, connected.
Cylinder must be properly secured either in use or in storage.
Cylinder valve must be closed when not in use or when empty.
Segregate full from empty cylinders.
WARNING: Suckback into cylinder may result in rupture.
Use back-flow preventive device in piping.
Regulatory Requirements: Follow applicable OSHA regulations.

Section 8 - Exposure Controls / Personal Protection

Engineering Controls: General exhaust is adequate under normal operating conditions. Air-line hood.
If risk of overexposure exists, wear air supplied breathing apparatus.
Provide adequate ventilation in warehouse or closed storage areas.
Personal Protective Clothing/Equipment:
Eyes: Safety glasses with side shields; or as required, chemical goggles.
Contact lenses pose a special hazard; soft lenses may absorb irritants and all lenses concentrate them.
Hands/Feet: Wear chemical protective gloves, eg. PVC. Wear safety footwear.
Other: Overalls. Eyewash unit.

Section 9 - Physical and Chemical Properties

Appearance/General Info: Colorless, odorless compressed gas. Constitutes approximately 0.93% of dry atmospheric air. An element characterized by its extreme lack of chemical reactivity. Permanent gas: Critical temperature; -122.4 °C. Critical pressure: 4864 kPa.

Physical State: Compressed gas
Vapor Density (Air=1): 1.38
Formula Weight: 39.95
Specific Gravity (H_2O=1, at 4 °C): Not applicable
Evaporation Rate: > 1
pH: Not applicable
pH (1% Solution): Not applicable
Boiling Point: -185.8 °C (-302 °F)
Freezing/Melting Point: -192.2 °C (-313.96 °F)
Volatile Component (% Vol): 100
Decomposition Temperature (°C): Not applicable
Water Solubility: Slightly soluble in water

Section 10 - Stability and Reactivity

Stability/Polymerization/Conditions to Avoid: Product is considered stable. Hazardous polymerization will not occur.
Storage Incompatibilities: Very inert, chemically.

Section 11 - Toxicological Information

No relevant toxicological data found at time of research.

See *RTECS* CF 2300000, for additional data.

Section 12 - Ecological Information

Environmental Fate: No data found.
Ecotoxicity: No data found.

Section 13 - Disposal Considerations

Disposal: Return empty containers to supplier.

Section 14 - Transport Information

DOT Hazardous Materials Table Data (49 CFR 172.101):

Shipping Name and Description: Argon, compressed
ID: UN1006
Hazard Class: 2.2 - Non-flammable compressed gas
Packing Group:
Symbols:
Label Codes: 2.2 - Non-Flammable Gas
Special Provisions:
Packaging: **Exceptions:** 306 **Non-bulk:** 302 **Bulk:** 314, 315
Quantity Limitations: **Passenger aircraft/rail:** 75 kg **Cargo aircraft only:** 150 kg
Vessel Stowage: **Location:** A **Other:**

Section 15 - Regulatory Information

EPA Regulations:
RCRA 40 CFR: Not listed
CERCLA 40 CFR 302.4: Not listed
SARA 40 CFR 372.65: Not listed
SARA EHS 40 CFR 355: Not listed
TSCA: Listed

Section 16 - Other Information

Disclaimer: Judgments as to the suitability of information herein for the purchaser's purposes are necessarily the purchaser's responsibility. Although reasonable care has been taken in the preparation of such information, Genium Group, Inc. extends no warranties, makes no representations, and assumes no responsibility as to the accuracy or suitability of such information for application to the purchaser's intended purpose or for consequences of its use.

BAROID DRILLING FLUIDS
BENTONITE PELLETS 3\8 INCH **Revised: 01/03/2008**

MSDS Contents

HALLIBURTON

MATERIAL SAFETY DATA SHEET

PRODUCT TRADE NAME: BENTONITE PELLETS 3\8 INCH

REVISION DATE: 03-JAN-2008

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

PRODUCT TRADE NAME: BENTONITE PELLETS 3\8 INCH

SYNONYMS: NONE

CHEMICAL FAMILY: MINERAL

APPLICATION: WEIGHT ADDITIVE

MANUFACTURER/SUPPLIER:
BAROID FLUID SERVICES
PRODUCT SERVICE LINE OF HALLIBURTON
P.O. BOX 1675
HOUSTON, TX 77251

TELEPHONE: (281) 871-4000

EMERGENCY TELEPHONE: (281) 575-5000

PREPARED BY: CHEMICAL COMPLIANCE

TELEPHONE: 1-580-251-4335

E-MAIL: FDUNEXCHEM@HALLIBURTON.COM

2. COMPOSITION/INFORMATION ON INGREDIENTS

SUBSTANCE	CAS NUMBER	PERCENT

CRYSTALLINE SILICA, CRISTOBALITE	14464-46-1	0 - 1%
CRYSTALLINE SILICA, TRIDYMITE	15468-32-3	0 - 1%
CRYSTALLINE SILICA, QUARTZ	14808-60-7	<3
BENTONITE	1302-78-9	60 - 100%

SUBSTANCE	ACGIH TLV-TWA	OSHA PEL-TWA
CRYSTALLINE SILICA, CRISTOBALITE	0.025 MG/M3	1/2 X 10 MG/M3/ %SiO2 + 2
CRYSTALLINE SILICA, TRIDYMITE	0.05 MG/M3	1/2 X 10 MG/M3/ %SiO2 + 2
CRYSTALLINE SILICA, QUARTZ	0.025 MG/M3	10 MG/M3/ %SiO2 + 2
BENTONITE	NOT APPLICABLE	NOT APPLICABLE

MORE RESTRICTIVE EXPOSURE LIMITS MAY BE ENFORCED BY SOME STATES, AGENCIES, OR OTHER AUTHORITIES.

3. HAZARDS IDENTIFICATION

HAZARD OVERVIEW:

CAUTION!

ACUTE HEALTH HAZARD: MAY CAUSE EYE AND RESPIRATORY IRRITATION.

DANGER!

CHRONIC HEALTH HAZARD:
BREATHING CRYSTALLINE SILICA CAN CAUSE LUNG DISEASE, INCLUDING SILICOSIS AND LUNG CANCER. CRYSTALLINE SILICA HAS ALSO BEEN ASSOCIATED WITH SCLERODERMA AND KIDNEY DISEASE.

THIS PRODUCT CONTAINS QUARTZ, CRISTOBALITE, AND/OR TRIDYMITE WHICH MAY BECOME AIRBORNE WITHOUT A VISIBLE CLOUD. AVOID BREATHING DUST. AVOID CREATING DUSTY CONDITIONS. USE ONLY WITH ADEQUATE VENTILATION TO KEEP EXPOSURES BELOW RECOMMENDED EXPOSURE LIMITS. WEAR A NIOSH CERTIFIED, EUROPEAN STANDARD EN 149, OR EQUIVALENT RESPIRATOR WHEN USING THIS PRODUCT. REVIEW THE MATERIAL SAFETY DATA SHEET (MSDS) FOR THIS PRODUCT, WHICH HAS BEEN PROVIDED TO YOUR EMPLOYER.

4. FIRST AID MEASURES

INHALATION:
IF INHALED, REMOVE FROM AREA TO FRESH AIR. GET MEDICAL ATTENTION IF RESPIRATORY IRRITATION DEVELOPS OR IF BREATHING BECOMES DIFFICULT.

SKIN: WASH WITH SOAP AND WATER. GET MEDICAL ATTENTION IF IRRITATION PERSISTS.

EYES:
IN CASE OF CONTACT, IMMEDIATELY FLUSH EYES WITH PLENTY OF WATER FOR AT LEAST 15 MINUTES AND GET MEDICAL ATTENTION IF IRRITATION PERSISTS.

INGESTION: UNDER NORMAL CONDITIONS, FIRST AID PROCEDURES ARE NOT REQUIRED.

NOTES TO PHYSICIAN: TREAT SYMPTOMATICALLY.

5. FIRE FIGHTING MEASURES

FLASH POINT/RANGE (F): NOT DETERMINED
FLASH POINT/RANGE (C): NOT DETERMINED
FLASH POINT METHOD: NOT DETERMINED

AUTOIGNITION TEMPERATURE (F): NOT DETERMINED

AUTOIGNITION TEMPERATURE (C): NOT DETERMINED

FLAMMABILITY LIMITS IN AIR - LOWER (%): NOT DETERMINED
FLAMMABILITY LIMITS IN AIR - UPPER (%): NOT DETERMINED

FIRE EXTINGUISHING MEDIA: ALL STANDARD FIREFIGHTING MEDIA.

SPECIAL EXPOSURE HAZARDS: NOT APPLICABLE.

SPECIAL PROTECTIVE EQUIPMENT FOR FIRE-FIGHTERS: NOT APPLICABLE.

NFPA RATINGS:
HEALTH 0
FLAMMABILITY 0
REACTIVITY 0

HMIS RATINGS:
HEALTH 0*
FLAMMABILITY 0
REACTIVITY 0

6. ACCIDENTAL RELEASE MEASURES

PERSONAL PRECAUTIONARY MEASURES:
USE APPROPRIATE PROTECTIVE EQUIPMENT. AVOID CREATING AND BREATHING DUST.

ENVIRONMENTAL PRECAUTIONARY MEASURES: NONE KNOWN.

PROCEDURE FOR CLEANING / ABSORPTION:
COLLECT USING DUSTLESS METHOD AND HOLD FOR APPROPRIATE DISPOSAL. CONSIDER POSSIBLE TOXIC OR FIRE HAZARDS ASSOCIATED WITH CONTAMINATING SUBSTANCES AND USE APPROPRIATE METHODS FOR COLLECTION, STORAGE AND DISPOSAL.

7. HANDLING AND STORAGE

HANDLING PRECAUTIONS:
THIS PRODUCT CONTAINS QUARTZ, CRISTOBALITE, AND/OR TRIDYMITE WHICH MAY BECOME AIRBORNE WITHOUT A VISIBLE CLOUD. AVOID BREATHING DUST. AVOID CREATING DUSTY CONDITIONS. USE ONLY WITH ADEQUATE VENTILATION TO KEEP EXPOSURE BELOW RECOMMENDED EXPOSURE LIMITS. WEAR A NIOSH CERTIFIED, EUROPEAN STANDARD EN 149, OR EQUIVALENT RESPIRATOR WHEN USING THIS PRODUCT. MATERIAL IS SLIPPERY WHEN WET.

STORAGE INFORMATION:

USE GOOD HOUSEKEEPING IN STORAGE AND WORK AREAS TO PREVENT ACCUMULATION OF DUST.

CLOSE CONTAINER WHEN NOT IN USE. DO NOT REUSE EMPTY CONTAINER.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

ENGINEERING CONTROLS:
USE APPROVED INDUSTRIAL VENTILATION AND LOCAL EXHAUST AS REQUIRED TO MAINTAIN EXPOSURES BELOW APPLICABLE EXPOSURE LIMITS LISTED IN SECTION 2.

RESPIRATORY PROTECTION:
WEAR A NIOSH CERTIFIED, EUROPEAN STANDARD EN 149, OR EQUIVALENT RESPIRATOR WHEN USING THIS PRODUCT.

HAND PROTECTION: NORMAL WORK GLOVES.

SKIN PROTECTION:
WEAR CLOTHING APPROPRIATE FOR THE WORK ENVIRONMENT. DUSTY CLOTHING SHOULD BE LAUNDERED BEFORE REUSE. USE PRECAUTIONARY MEASURES TO AVOID CREATING DUST WHEN REMOVING OR LAUNDERING CLOTHING.

EYE PROTECTION: WEAR SAFETY GLASSES OR GOGGLES TO PROTECT AGAINST EXPOSURE.

OTHER PRECAUTIONS: NONE KNOWN.

9. PHYSICAL AND CHEMICAL PROPERTIES

PHYSICAL STATE: SOLID

COLOR: VARIOUS

ODOR: ODORLESS

pH: 8 - 10

SPECIFIC GRAVITY @ 20 C (WATER=1): 2.55

DENSITY @ 20 C (LBS./GALLON): 62

BULK DENSITY @ 20 C (LBS/FT3): 71

BOILING POINT/RANGE (F): NOT DETERMINED
BOILING POINT/RANGE (C): NOT DETERMINED

FREEZING POINT/RANGE (F): NOT DETERMINED
FREEZING POINT/RANGE (C): NOT DETERMINED

VAPOR PRESSURE @ 20 C (MMHg): NOT DETERMINED

VAPOR DENSITY (AIR=1): NOT DETERMINED

PERCENT VOLATILES: NOT DETERMINED

EVAPORATION RATE (BUTYL ACETATE=1): NOT DETERMINED

SOLUBILITY IN WATER (G/100 ML): INSOLUBLE

SOLUBILITY IN SOLVENTS (G/100 ML): NOT DETERMINED

VOCS (LBS./GALLON): NOT DETERMINED

VISCOSITY, DYNAMIC @ 20 C (CENTIPOISE): NOT DETERMINED

VISCOSITY, KINEMATIC @ 20 C (CENTISTROKES): NOT DETERMINED

PARTITION COEFFICIENT/n-OCTANOL/WATER: NOT DETERMINED

MOLECULAR WEIGHT (G/MOLE): NOT DETERMINED

10. STABILITY AND REACTIVITY

STABILITY DATA: STABLE

HAZARDOUS POLYMERIZATION: WILL NOT OCCUR

CONDITIONS TO AVOID: NONE ANTICIPATED

INCOMPATIBILITY (MATERIALS TO AVOID): HYDROFLUORIC ACID.

HAZARDOUS DECOMPOSITION PRODUCTS:
AMORPHOUS SILICA MAY TRANSFORM AT ELEVATED TEMPERATURES TO TRIDYMITE (870 C) OR CRISTOBALITE (1470 C).

ADDITIONAL GUIDELINES: NOT APPLICABLE

11. TOXICOLOGICAL INFORMATION

PRINCIPLE ROUTE OF EXPOSURE: EYE OR SKIN CONTACT, INHALATION.

INHALATION:
INHALED CRYSTALLINE SILICA IN THE FORM OF QUARTZ OR CRISTOBALITE FROM OCCUPATIONAL SOURCES IS CARCINOGENIC TO HUMANS (IARC, GROUP 1). THERE IS SUFFICIENT EVIDENCE IN EXPERIMENTAL ANIMALS FOR THE CARCINOGENICITY OF TRIDYMITE (IARC, GROUP 2A).

BREATHING SILICA DUST MAY CAUSE IRRITATION OF THE NOSE, THROAT, AND RESPIRATORY PASSAGES. BREATHING SILICA DUST MAY NOT CAUSE NOTICEABLE INJURY OR ILLNESS EVEN THOUGH PERMANENT LUNG DAMAGE MAY BE OCCURRING. INHALATION OF DUST MAY ALSO HAVE SERIOUS CHRONIC HEALTH EFFECTS (SEE "CHRONIC EFFECTS/CARCINOGENICITY" SUBSECTION BELOW).

SKIN CONTACT: MAY CAUSE MECHANICAL SKIN IRRITATION.

EYE CONTACT: MAY CAUSE EYE IRRITATION.

INGESTION: NONE KNOWN

AGGRAVATED MEDICAL CONDITIONS:
INDIVIDUALS WITH RESPIRATORY DISEASE, INCLUDING BUT NOT LIMITED TO ASTHMA AND BRONCHITIS, OR SUBJECT TO EYE IRRITATION, SHOULD NOT BE EXPOSED TO QUARTZ DUST.

CHRONIC EFFECTS/CARCINOGENICITY:

SILICOSIS:
EXCESSIVE INHALATION OF RESPIRABLE CRYSTALLINE SILICA DUST MAY CAUSE A PROGRESSIVE, DISABLING, AND SOMETIMES-FATAL LUNG DISEASE CALLED SILICOSIS.

SYMPTOMS INCLUDE COUGH, SHORTNESS OF BREATH, WHEEZING, NON-SPECIFIC CHEST ILLNESS, AND REDUCED PULMONARY FUNCTION. THIS DISEASE IS EXACERBATED BY SMOKING. INDIVIDUALS WITH SILICOSIS ARE PREDISPOSED TO DEVELOP TUBERCULOSIS.

CANCER STATUS:
THE INTERNATIONAL AGENCY FOR RESEARCH ON CANCER (IARC) HAS DETERMINED THAT CRYSTALLINE SILICA INHALED IN THE FORM OF QUARTZ OR CRISTOBALITE FROM OCCUPATIONAL SOURCES CAN CAUSE LUNG CANCER IN HUMANS (GROUP 1 - CARCINOGENIC TO HUMANS) AND HAS DETERMINED THAT THERE IS SUFFICIENT EVIDENCE IN EXPERIMENTAL ANIMALS FOR THE CARCINOGENICITY OF TRIDYMITE (GROUP 2A - POSSIBLE CARCINOGEN TO HUMANS). REFER TO IARC MONOGRAPH 68, SILICA, SOME SILICATES AND ORGANIC FIBRES (JUNE 1997) IN CONJUNCTION WITH THE USE OF THESE MINERALS. THE NATIONAL TOXICOLOGY PROGRAM CLASSIFIES RESPIRABLE CRYSTALLINE SILICA AS "KNOWN TO BE A HUMAN CARCINOGEN". REFER TO THE 9TH REPORT ON CARCINOGENS (2000). THE AMERICAN CONFERENCE OF GOVERNMENTAL INDUSTRIAL HYGIENISTS (ACGIH) CLASSIFIES CRYSTALLINE SILICA, QUARTZ, AS A SUSPECTED HUMAN CARCINOGEN (A2).

THERE IS SOME EVIDENCE THAT BREATHING RESPIRABLE CRYSTALLINE SILICA OR THE DISEASE SILICOSIS IS ASSOCIATED WITH AN INCREASED INCIDENCE OF SIGNIFICANT DISEASE ENDPOINTS SUCH AS SCLERODERMA (AN IMMUNE SYSTEM DISORDER MANIFESTED BY SCARRING OF THE LUNGS, SKIN, AND OTHER INTERNAL ORGANS) AND KIDNEY DISEASE.

OTHER INFORMATION:
FOR FURTHER INFORMATION CONSULT "ADVERSE EFFECTS OF CRYSTALLINE SILICA EXPOSURE" PUBLISHED BY THE AMERICAN THORACIC SOCIETY MEDICAL SECTION OF THE AMERICAN LUNG ASSOCIATION, AMERICAN JOURNAL OF RESPIRATORY AND CRITICAL CARE MEDICINE, VOLUME 155, PAGES 761-768 (1997).

TOXICITY TESTS:
ORAL TOXICITY: NOT DETERMINED
DERMAL TOXICITY: NOT DETERMINED
INHALATION TOXICITY: NOT DETERMINED
PRIMARY IRRITATION EFFECT: NOT DETERMINED

CARCINOGENICITY:
REFER TO IARC MONOGRAPH 68, SILICA, SOME SILICATES AND ORGANIC FIBRES (JUNE 1997).

GENOTOXICITY: NOT DETERMINED

REPRODUCTIVE / DEVELOPMENTAL TOXICITY: NOT DETERMINED

12. ECOLOGICAL INFORMATION

MOBILITY (WATER/SOIL/AIR): NOT DETERMINED

PERSISTENCE/DEGRADABILITY: NOT DETERMINED

BIO-ACCUMULATION: NOT DETERMINED

ECOTOXICOLOGICAL INFORMATION:

ACUTE FISH TOXICITY: NOT DETERMINED

ACUTE CRUSTACEANS TOXICITY:NOT DETERMINED

ACUTE ALGAE TOXICITY: NOT DETERMINED

CHEMICAL FATE INFORMATION: NOT DETERMINED

OTHER INFORMATION: NOT APPLICABLE

13. DISPOSAL CONSIDERATIONS

DISPOSAL METHOD:
BURY IN A LICENSED LANDFILL ACCORDING TO FEDERAL, STATE, AND LOCAL REGULATIONS.

CONTAMINATED PACKAGING: FOLLOW ALL APPLICABLE NATIONAL OR LOCAL REGULATIONS.

14. TRANSPORT INFORMATION

LAND TRANSPORTATION:
DOT: NOT RESTRICTED
CANADIAN TDG: NOT RESTRICTED
ADR: NOT RESTRICTED

AIR TRANSPORTATION:
ICAO/IATA: NOT RESTRICTED

SEA TRANSPORTATION:
IMDG: NOT RESTRICTED

OTHER SHIPPING INFORMATION:
LABELS: NONE

15. REGULATORY INFORMATION

US REGULATIONS:

US TSCA INVENTORY: ALL COMPONENTS LISTED ON INVENTORY.

EPA SARA TITLE III EXTREMELY HAZARDOUS SUBSTANCES: NOT APPLICABLE

EPA SARA (311,312) HAZARD CLASS:
ACUTE HEALTH HAZARD
CHRONIC HEALTH HAZARD

EPA SARA (313) CHEMICALS:
THIS PRODUCT DOES NOT CONTAIN A TOXIC CHEMICAL FOR ROUTINE ANNUAL "TOXIC CHEMICAL RELEASE REPORTING" UNDER SECTION 313 (40 CFR 372).

EPA CERCLA/SUPERFUND REPORTABLE SPILL QUANTITY: NOT APPLICABLE.

EPA RCRA HAZARDOUS WASTE CLASSIFICATION:
IF PRODUCT BECOMES A WASTE, IT DOES NOT MEET THE CRITERIA OF A HAZARDOUS WASTE AS DEFINED BY THE US EPA.

CALIFORNIA PROPOSITION 65:
THE CALIFORNIA PROPOSITION 65 REGULATIONS APPLY TO THIS PRODUCT.

MA RIGHT-TO-KNOW LAW: ONE OR MORE COMPONENTS LISTED.

NJ RIGHT-TO-KNOW LAW: ONE OR MORE COMPONENTS LISTED.

PA RIGHT-TO-KNOW LAW: ONE OR MORE COMPONENTS LISTED.

CANADIAN REGULATIONS:

CANADIAN DSL INVENTORY: ALL COMPONENTS LISTED ON INVENTORY.

WHMIS HAZARD CLASS:
D2A: VERY TOXIC MATERIALS CRYSTALLINE SILICA

16. OTHER INFORMATION

THE FOLLOWING SECTIONS HAVE BEEN REVISED SINCE THE LAST ISSUE OF THIS MSDS:
NOT APPLICABLE

ADDITIONAL INFORMATION:
FOR ADDITIONAL INFORMATION ON THE USE OF THIS PRODUCT, CONTACT YOUR LOCAL HALLIBURTON REPRESENTATIVE.

FOR QUESTIONS ABOUT THE MATERIAL SAFETY DATA SHEET FOR THIS OR OTHER HALLIBURTON PRODUCTS, CONTACT CHEMICAL COMPLIANCE AT:
1-580-251-4335.

DISCLAIMER STATEMENT:
THIS INFORMATION IS FURNISHED WITHOUT WARRANTY, EXPRESSED OR IMPLIED, AS TO ACCURACY OR COMPLETENESS. THE INFORMATION IS OBTAINED FROM VARIOUS SOURCES INCLUDING THE MANUFACTURER AND OTHER THIRD PARTY SOURCES. THE INFORMATION MAY NOT BE VALID UNDER ALL CONDITIONS NOR IF THIS MATERIAL IS USED IN COMBINATION WITH OTHER MATERIALS OR IN ANY PROCESS. FINAL DETERMINATION OF SUITABILITY OF ANY MATERIAL IS THE SOLE RESPONSIBILITY OF THE USER.

ADVANCED BLENDING
DETERGENT, BLEACH LAUNDRY FEDERAL STOCK 7930-01-236-7280 **Revised: 07/04/1999**

MSDS Contents

MATERIAL SAFETY DATA SHEET

MAY BE USED TO COMPLY WITH OSHA'S HAZARD COMMUNICATION STANDARD, 29 CFR 1910.1200. STANDARD MUST BE CONSULTED FOR SPECIFIC REQUIREMENTS.

U.S. DEPARTMENT OF LABOR

OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION (NON-MANDATORY FORM)

FORMS APPROVED OMB NO.: 1218-0072

N/A-NOT APPLICABLE
N/D-NOT DETERMINED
N/E-NOT ESTIMATED

IDENTITY (AS USED ON LABEL AND LIST):
DETERGENT, BLEACH LAUNDRY FEDERAL STOCK # 7930-01-236-7280

NOTE:
BLANK SPACES ARE NOT PERMITTED. IF ANY ITEM IS NOT APPLICABLE, OR NO INFORMATION IS AVAILABLE, THE SPACE MUST BE MARKED TO INDICATE THAT.

SECTION 1. COMPANY IDENTIFICATION

MANUFACTURER'S NAME: ADVANCED BLENDING

ADDRESS:
645 TOWER DR.
KENNEDALE, TX 76060

EMERGENCY TELEPHONE NUMBER: 817-572-7722 (8-5 PM EST)

NUMBER FOR INFORMATION: SAME

DATE PREPARED: 7/4/99

CONTRACT NUMBER: TC GS 07F-J0119

SECTION 2. HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

HAZARDOUS COMPONENTS (SPECIFIC CHEMICAL IDENTITY; COMMON NAMES)	OSHA PEL	ACGIH TLV	OTHER LIMITS
NO HAZARDOUS COMPONENTS.			

SECTION 3. HAZARDOUS INFORMATION

THIS PRODUCT IS NOT CLASSIFIED AS A HAZARDOUS MATERIAL BY THE U.S. DEPARTMENT OF TRANSPORTATION.

SECTION 4. PHYSICAL CHARACTERISTICS

BOILING POINT: ND

SPECIFIC GRAVITY (H2O = 1): ND

VAPOR PRESSURE (MMHg.): ND

MELTING POINT: NA

VAPOR DENSITY (AIR = 1): ND

EVAPORATION RATE (BUTYL ACETATE = 1): ND

SOLUBILITY IN WATER: COMPLETE

APPEARANCE & ODOR: WHITE POWDER.

SECTION 5. FIRE & EXPLOSION & HAZARD DATA

FLASH POINT (METHOD USED): NA

FLAMMABLE LIMITS: NA
LEL: NA
UEL: NA

EXTINGUISHING MEDIA:
NOT COMBUSTIBLE. WATER SPRAY, DRY CHEMICAL, CO2 OR FOAM MAY BE USED IN AREAS WHERE PRODUCT IS STORED.

SPECIAL FIRE FIGHTING PROCEDURES:
PRODUCT PRESENTS NO UNUSUAL FIRE HAZARD AND REQUIRES NO SPECIAL PROCEDURES.

UNUSUAL FIRE AND EXPLOSION HAZARDS: NONE KNOWN

SECTION 6. REACTIVITY DATA

STABILITY: STABLE

CONDITIONS TO AVOID: STRONG ACIDS

INCOMPATIBILITY (MATERIALS TO AVOID): STRONG ACIDS

HAZARDOUS DECOMPOSITION OR BYPRODUCTS: NONE

HAZARDOUS POLYMERIZATION: WILL NOT OCCUR

CONDITIONS TO AVOID: N/A

SECTION 7. HEALTH HAZARD DATA

ROUTES OF ENTRY:
EYES (X)
INHALATION (X)
SKIN (X)
INGESTION (X)

HEALTH HAZARD (ACUTE & CHRONIC):
MAY BE IRRITATING TO EYES OR SKIN WITH SOME INDIVIDUALS.

CARCINOGENICITY: NONE
NTP:
IARC MONOGRAPHS:
OSHA REGULATED:

SECTION 8. FIRST AID MEASURES

INGESTION: IF INGESTED IN LARGE QUANTITIES, SEEK MEDICAL ATTENTION.

EYES:
IMMEDIATELY FLUSH WITH A DIRECTED STREAM OF WATER FOR AT LEAST 15 MINUTES
HOLDING THE EYELID APART THE ENSURE COMPLETE IRRIGATION OF THE EYE.

SECTION 9. PRECAUTIONS FOR SAFE HANDLING & USE

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED:
IF SPILLED, STEPS SHOULD BE TAKEN TO CONTAIN SPILL, CLEAN AREA OF SPILL
IMMEDIATELY. FOLLOW PROTECTIVE MEASURES PROVIDED UNDER CONTROL MEASURES IN
SECTION 9.

PRECAUTIONS TO BE TAKEN IN HANDLING OR STORING:
FOR BEST PRODUCT PERFORMANCE STORE IN COOL, DRY AREA.

OTHER PRECAUTIONS: KEEP OUT OF THE REACH OF CHILDREN.

SECTION 10. CONTROL MEASURES

RESPIRATORY PROTECTION (SPECIFY TYPE): NONE

VENTILATION:
LOCAL EXHAUST: NA
SPECIAL: NA
MECHANICAL (GENERAL): NA

OTHER: NA

PROTECTIVE GLOVES: NA

EYE PROTECTION: REQUIRED

OTHER PROTECTIVE CLOTHING OR EQUIPMENT: NONE

WORK/HYGIENIC PRACTICES:
CLEAN ALL SPILLS IMMEDIATELY. OBSERVE PERSONAL HYGIENE.

SECTION 11. TOXICOLOGICAL INFORMATION

PRODUCT MAY BE CONSIDERED ALKALINE.

SECTION 12. ECOLOGICAL INFORMATION

THERE IS LIMITED INFORMATION AVAILABLE ON THE ENVIRONMENTAL FATE AND EFFECTS OF THIS MATERIAL. IT IS MISCIBLE IN WATER. THIS COMPOUND IS ALKALINE AND MAY RAISE THE pH OF SURFACE WATERS WITH LOW BUFFERING CAPACITY IF SPILLED. DUE CAUTION SHOULD BE EXERCISED TO PREVENT THE ACCIDENTAL RELEASE OF THIS MATERIAL TO THE ENVIRONMENT. IN CONCENTRATED FORM THIS PRODUCT MAY SHOW TRACE LEVELS OF TOXICITY TO AQUATIC ORGANISMS.

SECTION 13. DISPOSAL CONSIDERATIONS

DISPOSE OF ALL WASTE AND CONTAMINATED EQUIPMENT IN ACCORDANCE WITH ALL APPLICABLE FEDERAL, STATE AND LOCAL HEALTH AND ENVIRONMENTAL REGULATIONS.

SECTION 14. TRANSPORTATION INFORMATION

THIS PRODUCT IS NOT REGULATED.

SECTION 15. REGULATORY INFORMATION

WE REQUEST THAT YOU MAKE ALL INFORMATION IN THIS MATERIAL SAFETY DATA SHEET AVAILABLE TO ALL EMPLOYEES.

SARA/TITLE III HAZARD CATEGORIES:
IF THE WORD "YES" APPEARS NEXT TO ANY CATEGORY, THIS PRODUCT MAY BE REPORTABLE BY YOU UNDER THE REQUIREMENTS OF 40 CFR 370. PLEASE CONSULT THOSE REGULATIONS FOR DETAILS.
IMMEDIATE (ACUTE) HEALTH: YES
DELAYED (CHRONIC) HEALTH: NO
FIRE HAZARD: NO
REACTIVE HAZARD: NO
SUDDEN RELEASE OF PRESSURE: NO

HMIS HAZARD RATINGS:
HEALTH HAZARD 1

FIRE HAZARD 0
REACTIVITY 0

INTERNATIONAL REGULATIONS: CONSULT THE REGULATIONS OF THE IMPORTING COUNTRY.

SECTION 16. OTHER INFORMATION

MSDS LEGEND:
CAS = CHEMICAL ABSTRACTS SERVICE REGISTRY NUMBER
CEILING LIMIT = CEILING LIMIT (15 MINUTES)
OSHA = OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION
TLV = THRESHOLD LIMIT VALUE (ACGIH)
ACGIH = AMERICAN CONFERENCE OF GOVERNMENTAL INDUSTRIAL HYGIENISTS

IMPORTANT:
THE INFORMATION PRESENTED HEREIN, WHILE NOT GUARANTEED, WAS PREPARED BY COMPETENT TECHNICAL PERSONNEL AND IS TRUE AND ACCURATE TO THE BEST OF OUR KNOWLEDGE. WHILE OUR TECHNICAL PERSONNEL WILL BE HAPPY TO RESPOND TO QUESTIONS REGARDING SAFE HANDLING AND USE PROCEDURES, SAFE HANDLING AND USE REMAINS THE RESPONSIBILITY OF THE USER. NO SUGGESTIONS FOR USE ARE INTENDED AS, AND NOTHING HEREIN SHALL BE CONSTRUED AS A RECOMMENDATION TO INFRINGE ANY EXISTING PATENTS OR VIOLATE ANY FEDERAL, STATE, OR LOCAL LAWS, RULES, REGULATIONS OR ORDINANCES.

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Genium group inc.
1171 RiverFront Center, Amsterdam, NY 12010
(518) 842-4111

Issue Date: 2006-06

Section 1 - Chemical Product and Company Identification 61

Material Name: Calcium Hydroxide **CAS Number:** 1305-62-0
Chemical Formula: CaH_2O_2
Structural Chemical Formula: $Ca(OH)_2$
EINECS Number: 215-137-3
ACX Number: X1000175-3
Synonyms: BELL MINE; BIOCALC; CALCIUM DIHYDROXIDE; CALCIUM HYDRATE; CALCIUM HYDROXIDE; CALVIT; CALVITAL; CARBOXIDE; CAUSTIC LIME; HYDRATED LIME; KALKHYDRATE; KEMIKAL; LIMBUX; LIME; LIME MILK; LIME WATER; MILK OF LIME; SLAKED LIME
General Use: Laboratory reagent. A large volume industrial chemical. Manufacture of calcium salts. A binder in mortar, plaster, cement and in building and paving materials. A component in drilling muds, pesticides, fireproof coatings, water paints. As an acid neutralizing agent in water and sewage treatment. Disinfectant. As a flux in steel production; in manufacture of paper pulp. Depilatory, dehairing hides. Poultry food additive - shell forming agent. In purification of sugar.

Section 2 - Composition / Information on Ingredients

Name	CAS	%
calcium hydroxide	1305-62-0	>95

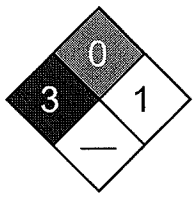
OSHA PEL
TWA: 15 mg/m^3 (total), 5 mg/m^3 (respirable).

NIOSH REL
TWA: 5 mg/m^3.

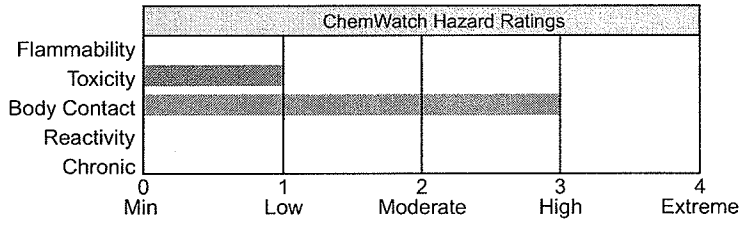
ACGIH TLV
TWA: 5 mg/m^3.

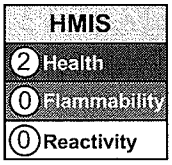
EU OEL
TWA: 5 mg/m^3.

Section 3 - Hazards Identification



Fire Diamond





ANSI Signal Word
Danger!


Corrosive

☆☆☆☆☆ Emergency Overview ☆☆☆☆☆

Odorless, colorless or white crystals or powder. Corrosive, causes severe burns to eyes/skin/respiratory tract.
Chronic Effects: repeated skin contact can cause dermatitis.

Potential Health Effects

Target Organs: eyes, skin, mucous membranes
Primary Entry Routes: inhalation, ingestion, eye contact, skin contact
Acute Effects
Inhalation: The dust may be discomforting if inhaled.
Reactions may not occur on exposure but response may be delayed with symptoms only appearing many hours later.
Minor exposures / slow dissolution in body fluids in the upper respiratory tract and lungs may produce delayed severe irritation or burning sensation.
Severe acute dust inhalation may produce laryngitis and pulmonary edema.

Eye: The dust may be extremely discomforting to the eyes and is capable of causing pain and severe conjunctivitis.
Corneal injury may develop, with possible permanent impairment of vision, if not promptly and adequately treated.
The material may produce severe irritation to the eye causing pronounced inflammation. Repeated or prolonged exposure to irritants may produce conjunctivitis.

Skin: The material is moderately discomforting to the skin and may cause drying of the skin which may lead to dermatitis or if exposure is prolonged may cause blisters or burns.
Solution of material in moisture on the skin or in perspiration may markedly increase skin corrosion and accelerate tissue destruction.
Open cuts, abraded or irritated skin should not be exposed to this material.
The material may accentuate any pre-existing skin condition.

Ingestion: Considered an unlikely route of entry in commercial/industrial environments.
Small amounts or low dose rates are regarded as practically non-harmful.
The material is highly discomforting and may be harmful if swallowed in large quantity.

Carcinogenicity: NTP - Not listed; IARC - Not listed; OSHA - Not listed; NIOSH - Not listed; ACGIH - Not listed; EPA - Not listed; MAK - Not listed.

Chronic Effects: Chronic exposure symptom is narrowing of the esophagus, with difficulty in swallowing. This may happen after weeks, months or years of exposure.

Section 4 - First Aid Measures

Inhalation: Remove to fresh air.
Encourage patient to blow nose to ensure clear breathing passages. Rinse mouth with water. Consider drinking water to remove dust from throat.
Seek medical attention if irritation or discomfort persist.

Eye Contact: Immediately hold the eyes open and flush continuously for at least 15 minutes with fresh running water. Ensure irrigation under eyelids by occasionally lifting the upper and lower lids.
Transport to hospital or doctor without delay. Removal of contact lenses after an eye injury should only be undertaken by skilled personnel.

Skin Contact: Immediately remove all contaminated clothing, including footwear (after rinsing with water).
Wash affected areas thoroughly with water (and soap if available).
Seek medical attention in event of irritation.

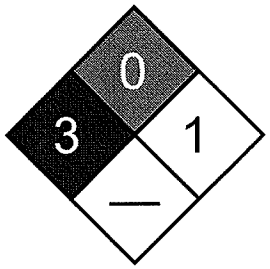
Ingestion: Rinse mouth out with plenty of water. DO NOT induce vomiting.
Observe the patient carefully. Never give liquid to a person showing signs of being sleepy or with reduced awareness; i.e. becoming unconscious.
Give water (or milk) to rinse out mouth. Then provide liquid slowly and as much as casualty can comfortably drink.
Transport to hospital or doctor without delay.

After first aid, get appropriate in-plant, paramedic, or community medical support.

Note to Physicians: For acute or short-term repeated exposures to highly alkaline materials:
1.Respiratory stress is uncommon but presents occasionally because of soft tissue edema.
2.Unless endotracheal intubation can be accomplished under direct vision, cricothyroidotomy or tracheotomy may be necessary.
3.Oxygen is given as indicated.
4.The presence of shock suggests perforation and mandates an intravenous line and fluid administration.
5.Alkali corrosives cause damage by liquefaction necrosis whereby the saponification of fats and solubilization of proteins allow deep penetration into the tissue.
Alkalis continue to cause damage after exposure.
INGESTION:
1.Milk and water are the preferred dilutents. No more than 2 glasses of water should be given to an adult.
2.Neutralizing agents should never be given since exothermic heat reaction may compound injury.
* Catharsis and emesis are absolutely contra-indicated.
* Activated charcoal does not absorb alkali.
* Gastric lavage should not be used.
Supportive care involves the following.
1. Withhold oral feedings initially.
2. If endoscopy confirms transmucosal injury start steroids only within the first 48 hours.
3. Carefully evaluate the amount of tissue necrosis before assessing the need for surgical intervention.
4. Patients should be instructed to seek medical attention whenever they develop difficulty in swallowing (dysphagia).
SKIN AND EYE:
Injury should be irrigated for 20-30 minutes. Eye injuries require saline.

Section 5 - Fire-Fighting Measures

Flash Point: Nonflammable
Autoignition Temperature: Not applicable
LEL: Not applicable
UEL: Not applicable
Extinguishing Media: There is no restriction on the type of extinguisher which may be used.
General Fire Hazards/Hazardous Combustion Products: Noncombustible.
Not considered to be a significant fire risk; however, containers may burn.
In a fire may decompose on heating and produce toxic/corrosive fumes.
Fire Incompatibility: Reacts violently with maleic anhydride, phosphorus, acids.
Reacts with aluminum/zinc producing flammable, explosive hydrogen gas.
Fire-Fighting Instructions: Contact fire department and tell them location and nature of hazard.
Wear breathing apparatus plus protective gloves for fire only. Prevent, by any means available, spillage from entering drains or waterways.
Use fire fighting procedures suitable for surrounding area.
Do not approach containers suspected to be hot.
Cool fire-exposed containers with water spray from a protected location.
If safe to do so, remove containers from path of fire.
Equipment should be thoroughly decontaminated after use.



Fire Diamond

Section 6 - Accidental Release Measures

Small Spills: Clean up all spills immediately. Avoid contact with skin and eyes.
Wear impervious gloves and safety glasses.
Use dry clean-up procedures and avoid generating dust.
Place spilled material in clean, dry, sealable, labeled container.
Large Spills: Clear area of personnel and move upwind.
Contact fire department and tell them location and nature of hazard.
Control personal contact by using protective equipment.
Stop leak if safe to do so.
Use dry clean-up procedures and avoid generating dust.
Collect recoverable product into labeled containers for recycling.
Collect residues and place in labeled polyethylene bag.
Wash area down with large quantity of water and prevent runoff into drains.
After clean-up operations, decontaminate and launder all protective clothing and equipment before storing and reusing.
If contamination of drains or waterways occurs, advise emergency services.
Regulatory Requirements: Follow applicable OSHA regulations (29 CFR 1910.120).

Section 7 - Handling and Storage

Handling Precautions: Use good occupational work practices. Observe manufacturer's storing and handling recommendations.
Atmosphere should be regularly checked against established exposure standards to ensure safe working conditions are maintained.
Avoid all personal contact, including inhalation.
Avoid generating and breathing dust.
Wear personal protective equipment when handling.
Use in a well-ventilated area.
Avoid contact with incompatible materials.
When handling, DO NOT eat, drink or smoke.
Keep containers securely sealed when not in use.
Avoid physical damage to containers.
Always wash hands with soap and water after handling. Work clothes should be laundered separately.
Launder contaminated clothing before reuse.
Recommended Storage Methods: Multi-ply paper bag with sealed plastic liner or heavy gauge plastic bag. Check that all containers are clearly labeled and free from leaks. Packing as recommended by manufacturer.
Regulatory Requirements: Follow applicable OSHA regulations.

Section 8 - Exposure Controls / Personal Protection

Engineering Controls: Use in a well-ventilated area.

General exhaust is adequate under normal operating conditions.
If exposure to workplace dust is not controlled, respiratory protection is required; wear NIOSH-approved dust respirator.
Provide adequate ventilation in warehouse or closed storage areas.

Personal Protective Clothing/Equipment:

Eyes: Safety glasses with side shields; or as required, chemical goggles.
Contact lenses pose a special hazard; soft lenses may absorb irritants and all lenses concentrate them.

Hands/Feet: Barrier cream. Wear physical protective gloves, eg. leather or Cotton gloves or PVC gloves.
Wear safety footwear.

Respiratory Protection:

Exposure Range >5 to 50 mg/m^3: Air Purifying, Negative Pressure, Half Mask
Exposure Range >50 to 500 mg/m^3: Air Purifying, Negative Pressure, Full Face
Exposure Range >500 to 5000 mg/m^3: Supplied Air, Constant Flow/Pressure Demand, Full Face
Exposure Range >5000 to unlimited mg/m^3: Self-contained Breathing Apparatus, Pressure Demand, Full Face
Cartridge Color: dust/mist filter (use P100 or consult supervisor for appropriate dust/mist filter)

Other: Overalls. Eyewash unit. Ensure there is ready access to a safety shower.

Glove Selection Index:

NATURAL RUBBER..... Best selection
NATURAL+NEOPRENE..... Best selection

Section 9 - Physical and Chemical Properties

Appearance/General Info: White or off white amorphous odorless powder with bitter, alkaline taste; insoluble in alcohol. Readily absorbs carbon dioxide from the air to form calcium carbonate; and loses water when heated strongly to form calcium oxide. Soluble in glycerol, sugar or ammonium chloride solutions. Soluble in acids with evolution of heat. Bulk density: 400-500 kg/m^3. Grades available: Builders Lime, technical, Pure, BP sterilized.

Physical State: Divided solid
Vapor Pressure (kPa): Negligible
Vapor Density (Air=1): Not applicable
Formula Weight: 74.10
Specific Gravity (H_2O=1, at 4 °C): 2.2-2.3
Evaporation Rate: Non-volatile
pH: Not applicable
pH (1% Solution): 12.4 (saturated)
Boiling Point: Decomposes
Freezing/Melting Point: 580 °C (1076 °F) (loses water)
Volatile Component (% Vol): Nil
Decomposition Temperature (°C): 580
Water Solubility: 0.185 g/100 cc at 0 °C

Section 10 - Stability and Reactivity

Stability/Polymerization/Conditions to Avoid: Product is considered stable. Hazardous polymerization will not occur.
Storage Incompatibilities: Avoid storage with acids, maleic anhydride, ammonium salts, nitromethane, nitroethane, nitropropane, nitroparaffins, phosphorus.
Forms salts with nitroparaffins in the presence of water which are explosive when dried.
DO NOT use aluminum or galvanized containers.

Section 11 - Toxicological Information

Toxicity
Oral (rat) LD_{50}: 7340 mg/kg

Irritation
Eye (rabbit): 10 mg - SEVERE

See *RTECS* EW 2800000, for additional data.

Section 12 - Ecological Information

Environmental Fate: No data found.
Ecotoxicity: Aquatic toxicity: 92 ppm/7 hr/trout/toxic/fresh water 240 ppm/24 hr/mosquito fish/TL_m/fresh water

Section 13 - Disposal Considerations

Disposal: Recycle wherever possible. Consult manufacturer for recycling options.
Follow applicable federal, state, and local regulations.
Bury residue in an authorized landfill.
Decontaminate empty containers.

Section 14 - Transport Information

DOT Hazardous Materials Table Data (49 CFR 172.101):

Shipping Name and Description: None

Section 15 - Regulatory Information

EPA Regulations:

RCRA 40 CFR: Not listed
CERCLA 40 CFR 302.4: Not listed
SARA 40 CFR 372.65: Not listed
SARA EHS 40 CFR 355: Not listed
TSCA: Listed

Section 16 - Other Information

Disclaimer: Judgments as to the suitability of information herein for the purchaser's purposes are necessarily the purchaser's responsibility. Although reasonable care has been taken in the preparation of such information, Genium Group, Inc. extends no warranties, makes no representations, and assumes no responsibility as to the accuracy or suitability of such information for application to the purchaser's intended purpose or for consequences of its use.

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Material Safety Data Sheet Collection
Genium group inc.
1171 RiverFront Center, Amsterdam, NY 12010
(518) 842-4111

Diesel Fuel Oil No. 2-D
DIE1400

Issue Date: 2006-06

Section 1 - Chemical Product and Company Identification 61

Material Name: Diesel Fuel Oil No. 2-D **CAS Number:** 68334-30-5
Chemical Formula: Un
Structural Chemical Formula: Unspecified; variable
EINECS Number: 269-822-7
ACX Number: X1012054-0
Synonyms: AUTOMOTIVE DIESEL OIL; DIESEL FUEL; DIESEL FUEL OIL NO. 2-D; DIESEL OIL (PETROLEUM); DIESEL OILS; DIESEL TEST FUEL; FUELS,DIESEL; OLEJ NAPEDOWY III; SANTOS MOOMBA DISTILLATE
Derivation: Fuel oil may be a distilled fraction of petroleum, a residuum from refinery operations, a crude petroleum or a blend of two or more of these.
General Use: This medium viscosity residual fuel oil has both light and heavy grades, and is used in furnaces and boilers of utility and industrial power plants, ships, locomotives, and metallurgical operations.

Section 2 - Composition / Information on Ingredients

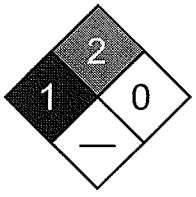
Name	CAS	%
Diesel fuel oil no. 2-D	68334-30-5	ca 100% vol;

diesel fuels consist primarily of aliphatic (64% vol), aromatic (35% vol), and olefinic (1-2% vol) hydrocarbons.
Trace Impurities: May contain sulfur (< 0.5), benzene (<100 ppm), and additives such as sulfurized esters.

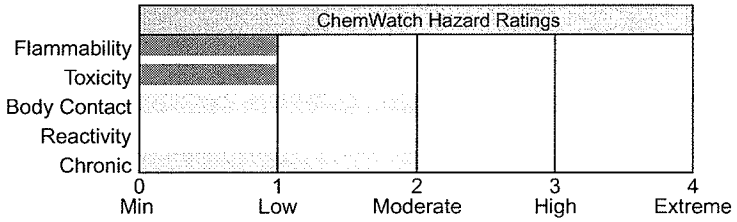
OSHA PEL **NIOSH REL**

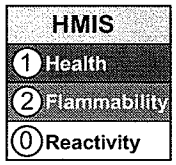
ACGIH TLV
TWA: 100 mg/m^3; skin.

Section 3 - Hazards Identification



Fire Diamond





ANSI Signal Word
Warning!


Flammable

☆☆☆☆☆ Emergency Overview ☆☆☆☆☆

Brown, slightly viscous liquid; kerosene-like odor. Irritating to skin/respiratory tract. Other Acute Effects: headache, nausea, vomiting, diarrhea, CNS depression, tachycardia, cyanosis, pulmonary edema, liver/kidney injury. Flammable.

Potential Health Effects

Target Organs: Skin, CNS, cardiovascular system (CVS), respiratory system, liver, kidneys
Primary Entry Routes: Inhalation, ingestion, skin contact/absorption
Acute Effects
Inhalation: Euphoria, respiratory irritation, cardiac dysrhythmia, increased respiration rates, cyanosis, pulmonary edema, hemoptysis (spitting up blood from the respiratory tract), respiratory arrest, renal (kidney) and liver injury, and CNS toxicity can result from inhalation of diesel fuel oil no. 2-D mist or vapor.
Eye: Contact may result in irritation.
Skin: Contact may cause irritation, systemic effects, and block the sebaceous (oil) glands, resulting in a rash of acne-like pimples and spots, usually on the arms and legs.

Ingestion: Gastrointestinal irritation, vomiting, diarrhea, and in severe cases, CNS depression progressing to coma and death and other systemic effects can result. Aspiration can result in transient CNS depression or excitement, hypoxia, infection, pneumatocele (abnormal cavities in lungs) formation, and chronic lung dysfunction.

Carcinogenicity: NTP - Not listed; IARC - Group 3, Not classifiable as to carcinogenicity to humans; OSHA - Not listed; NIOSH - Not listed; ACGIH - Not listed; EPA - Not listed; MAK - Not listed.

Medical Conditions Aggravated by Long-Term Exposure: None reported.

Chronic Effects: Prolonged or repeated skin contact causes dermatitis and possible systemic toxicity. Prolonged or repeated inhalation can cause CNS and peripheral nervous system damage.

Section 4 - First Aid Measures

See DOT ERG

Inhalation: Remove exposed person to fresh air and support breathing as needed.

Eye Contact: *Do not* allow victim to rub or keep eyes tightly shut. Gently lift eyelids and flush immediately and continuously with flooding amounts of water for at least 15 minutes. Consult a physician or ophthalmologist if pain and/or irritation develops.

Skin Contact: Quickly remove contaminated clothing. Rinse with flooding amounts of water followed by washing the exposed area with soap and water. For reddened or blistered skin, consult a physician.

Ingestion: Never give anything by mouth to an unconscious or convulsing person. Have the *conscious and alert* person drink 1 to 2 glasses of water. Contact a poison control center. Because of aspiration risk, *do not* induce vomiting unless the poison control center advises otherwise.

After first aid, get appropriate in-plant, paramedic, or community medical support.

Note to Physicians: Gastric lavage is contraindicated due to aspiration risk. Instead, consider administration of charcoal or milk. If ingestion amount is large, gastric emptying in the alert patient can be accomplished through administration of Syrup of Ipecac. Treat overexposure symptomatically and supportively.

Section 5 - Fire-Fighting Measures

See DOT ERG

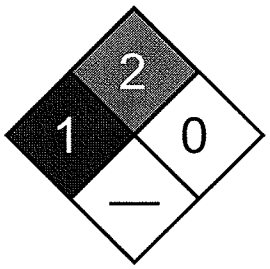
Flash Point: 100.4 °F (38 °C), Closed Cup

Autoignition Temperature: 351-624 °F (177-329 °C)

LEL: 1.3% v/v

UEL: 75% v/v

Flammability Classification: OSHA Class II Combustible Liquid



Fire Diamond

Extinguishing Media: Use dry chemical, carbon dioxide, foam, low velocity water fog or spray. Use a smothering technique to extinguish fire. Water may be ineffective in putting out a fire involving diesel fuel oil no. 2-D, and a solid water stream may spread the flames; however, a water spray may be used to cool fire-exposed containers, and flush spills away from ignition sources.

General Fire Hazards/Hazardous Combustion Products: Heating diesel fuel oil no. 2-D to decomposition can produce acrid smoke and irritating vapors. Vapor or mist can form explosive mixtures in air. In still air, the heavier-than-air vapors of diesel fuel oil no. 2-D from a large source may travel along low-lying surfaces to distant sources of ignition and flash back to the material source. Containers may explode in heat of fire.

Fire-Fighting Instructions: *Do not* release runoff from fire control methods to sewers or waterways. Because fire may produce toxic thermal decomposition products, wear a self-contained breathing apparatus (SCBA) with a full facepiece operated in pressure-demand or positive-pressure mode.

Section 6 - Accidental Release Measures

See DOT ERG

Spill/Leak Procedures: Eliminate all ignition sources (no smoking, flares, sparks or flames in immediate area). Ground all equipment used when handling this product. *Do not* touch or walk through spilled material. Stop leak if you can do it without risk. Prevent entry into waterways, sewers, basements or confined areas. A fire fighting foam may be used to suppress vapors. Absorb or cover with dry earth, sand or other non-combustible material and transfer to containers. Use clean non-sparking tools to collect absorbed material.

Small Spills: Absorb diesel fuel oil no. 2-D with vermiculite, earth, sand or similar material.

Large Spills: For large spills, consider downwind evacuation of at least 1000 ft (300 m). Dike far ahead of liquid spill for later disposal. *Do not* release into sewers or waterways. Ground all equipment. Use non-sparking tools. Spills can be absorbed with materials such as peat, activated carbon, polyurethane foam, or straw. Sinking agents, gelling agents, dispersants, and mechanical systems can also be use to treat oil spills.

Regulatory Requirements: Follow applicable OSHA regulations (29 CFR 1910.120).

Section 7 - Handling and Storage

Handling Precautions: Avoid vapor or mist inhalation, and skin and eye contact. Use only with ventilation sufficient to reduce airborne concentrations to non-hazardous levels (see Sec. 2). Wear protective gloves (or use barrier cream), and clothing (see Sec. 8). Keep away from heat and ignition sources. Ground and bond all containers during transfers to prevent static sparks. Use non-sparking tools to open and close containers. .

Never eat, drink, or smoke in work areas. Practice good personal hygiene after using this material, especially before eating, drinking, smoking, using the toilet, or applying cosmetics.

Recommended Storage Methods: Store in tightly closed container in cool, well-ventilated area, away from heat, ignition sources and incompatibles (see Sec. 10). Periodically inspect stored materials. Equip drums with self-closing valves, pressure vacuum bungs, and flame arrestors.

Regulatory Requirements: Follow applicable OSHA regulations. Also 29 CFR 1910.106 for Class II Combustible Liquid.

Section 8 - Exposure Controls / Personal Protection

Engineering Controls: To prevent static sparks, electrically ground and bond all containers and equipment used in shipping, receiving, or transferring operations. Provide general or local exhaust ventilation systems to maintain airborne concentrations as low as possible. Local exhaust ventilation is preferred because it prevents contaminant dispersion into the work area by controlling it at its source.

Administrative Controls: Enclose operations and/or provide local exhaust ventilation appropriately designed for flammable mist and vapor at the site of chemical release. Where possible, transfer diesel fuel oil no. 2-D from drums or other storage containers directly to process containers. Minimize sources of ignition in surrounding low-lying areas.

Personal Protective Clothing/Equipment: Wear chemically protective gloves, boots, aprons, and gauntlets. Wear protective eyeglasses, per OSHA eye- and face-protection regulations (29 CFR 1910.133). Contact lenses are not eye protective devices. Appropriate eye protection must be worn instead of, or in conjunction with contact lenses.

Respiratory Protection: Seek professional advice prior to respirator selection and use. Follow OSHA respirator regulations (29 CFR 1910.134) and, if necessary, wear a MSHA/NIOSH-approved respirator. Select respirator based on its suitability to provide adequate worker protection for given working conditions, level of airborne contamination, and presence of sufficient oxygen. For emergency or nonroutine operations (cleaning spills, reactor vessels, or storage tanks), use an SCBA. *Warning! Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.* If respirators are used, OSHA requires a written respiratory protection program that includes at least: medical certification, training, fit-testing, periodic environmental monitoring, maintenance, inspection, cleaning, and convenient, sanitary storage areas.

Other: Separate contaminated work clothes from street clothes. Launder before reuse. Remove this material from your shoes and clean personal protective equipment. Make emergency eyewash stations, safety/quick-drench showers, and washing facilities available in work area.

Section 9 - Physical and Chemical Properties

Appearance/General Info: Brown, slightly viscous; kerosene-like odor.

Physical State: Liquid

Odor Threshold: 0.7 ppm

Vapor Pressure (kPa): < 0.1 mm Hg at 68 °F (20 °C)

Vapor Density (Air=1): > 6

Formula Weight: N/A

Specific Gravity (H_2O=1, at 4 °C): < 0.86

Boiling Point: 340-676 °F (171-358 °C)

Freezing/Melting Point: -29.2 °F (-34 °C)

Viscosity: 1.9-4.1 centistoke at 104 °F (40 °C)

Surface Tension: 23-32 dynes/cm at 68 °F (20 °C)

Water Solubility: Insoluble

Section 10 - Stability and Reactivity

Stability/Polymerization/Conditions to Avoid: Diesel fuel oil no. 2-D is stable at room temperature in closed containers under normal storage and handling conditions. Hazardous polymerization cannot occur. Exposure to heat and ignition sources.

Storage Incompatibilities: Include strong oxidizing agents.

Hazardous Decomposition Products: Thermal oxidative decomposition of diesel fuel oil no. 2-D can produce low molecular weight hydrocarbons, hydrocarbon derivatives, carbon oxides (CO_x), and sulfur oxides (SO_x).

Section 11 - Toxicological Information

Acute Oral Effects:
Rat, oral, LD_{50}: 7500 mg/kg.
Acute Skin Effects:
Rabbit, skin, LD: > 5 mL/kg.
Irritation Effects:
Rabbit, skin, standard Draize test: 500 µL/24 hr, resulted in severe reaction.
Other Effects:
Rat, inhalation: 2 g/m^3/6 hr/3 weeks, intermittently, resulted in changes in blood erythrocyte (RBC) count, and focal fibrosis (pneumonoconiosis) and other changes in the lung, thorax or respiration.
Rat, inhalation: 400 $\mu g/m^3$/16 hr/2.5 years, intermittently, caused other changes in the blood, and biochemical effects - transaminases.
Rabbit, skin: 80 mL/kg/12 days, continuously, resulted in other changes in the liver, kidney, ureter, and bladder, and death.

See *RTECS* HZ1800000, for additional data.

Section 12 - Ecological Information

Environmental Fate: Diesel fuel oil no. 2-D will evaporate from water or soil. In surface water, it may partition from the water column to suspended sediments. Biodegradation may occur in soil and water.
Ecotoxicity: Juvenile American shad, salt water TL_m: 204 mg/L/24 hr; mallard duck, LD_{50}=20 mg/kg.

Section 13 - Disposal Considerations

Disposal: Contact your supplier or a licensed contractor for detailed recommendations. Follow applicable Federal, state, and local regulations.

Section 14 - Transport Information

DOT Hazardous Materials Table Data (49 CFR 172.101):

Note: This material has multiple possible HMT entries. Choose the appropriate one based on state and condition of specific material when shipped.

Shipping Name and Description: Diesel fuel
ID: NA1993
Hazard Class: 3 - Flammable and combustible liquid
Packing Group: III - Minor Danger
Symbols: D - Domestic transportation
Label Codes: None
Special Provisions: 144, B1, IB3, T4, TP1, TP29
Packaging: **Exceptions:** 150 **Non-bulk:** 203 **Bulk:** 242
Quantity Limitations: **Passenger aircraft/rail:** 60 L **Cargo aircraft only:** 220 L
Vessel Stowage: **Location:** A **Other:**

Shipping Name and Description: Diesel fuel
ID: UN1202
Hazard Class: 3 - Flammable and combustible liquid
Packing Group: III - Minor Danger
Symbols: I - International transportation
Label Codes: 3 - Flammable Liquid
Special Provisions: 144, B1, IB3, T2, TP1
Packaging: **Exceptions:** 150 **Non-bulk:** 203 **Bulk:** 242
Quantity Limitations: **Passenger aircraft/rail:** 60 L **Cargo aircraft only:** 220 L
Vessel Stowage: **Location:** A **Other:**

Section 15 - Regulatory Information

EPA Regulations:
RCRA 40 CFR: Not listed
CERCLA 40 CFR 302.4: Not listed
SARA 40 CFR 372.65: Not listed
SARA EHS 40 CFR 355: Not listed
TSCA: Listed

Section 16 - Other Information

Disclaimer: Judgments as to the suitability of information herein for the purchaser's purposes are necessarily the purchaser's responsibility. Although reasonable care has been taken in the preparation of such information, Genium Group, Inc. extends no warranties, makes no representations, and assumes no responsibility as to the accuracy or suitability of such information for application to the purchaser's intended purpose or for consequences of its use.

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ANSUL FIRE PROTECTION
ABC FIRE EXTINGUISHER Revised: 11/06/2002

MSDS Contents

CRL ONLINE

MATERIAL SAFETY DATA SHEET

COMPANY NAME: ANSUL FIRE PROTECTION

ADDRESS: ONE STANTON ST.
CITY / STATE / ZIP: MARINETTE / WI / 54143

US-CHEMTREC PHONE (I): (800) 424-9300
US-CHEMTREC PHONE (II): (703) 527-3887
CAN-CANUTEC PHONE: (613) 996-6666

VENDOR UPDATE: 11/6/2002

DATE PREPARED: 11/6/2002

MSDS NUMBER: 2025AV; 2100AH

I. CHEMICAL PRODUCT IDENTIFICATION

PRODUCT NAME: ABC FIRE EXTINGUISHER

HMIS RATINGS:
HEALTH 1 SLIGHT
FLAMMABILITY 0 MINIMAL
INSTABILITY/REACTIVITY 0 MINIMAL

NFPA RATINGS:

II. COMPOSITION, INFORMATION ON INGREDIENTS

CHEMICAL INGREDIENTS	CAS. NUMBER	% BY WEIGHT
MUSCOVITE MICA	12001-26-2	

NOTES:

MAGNESIUM ALUMINUM SILICATE (ATTAPULGITE CLAY)	8031-18-3
MONOAMMONIUM PHOSPHATE	7722-76-1
AMMONIUM SULFATE	7783-20-2
METHYL HYDROGEN POLYSILOXANE	63148-57-2
YELLOW PIGMENT	5468-75-7

NOTES:

CHEMICAL INGREDIENTS	ACGIH TLV TWA/STEL	OSHA PEL TWA/STEL	OTHER TWA/STEL	LD50	LC50
MUSCOVITE MICA	20 MILLION PARTICLES PER CUBIC FOOT			NO DATA AVAILABLE	
MAGNESIUM ALUMINUM SILICATE (ATTAPULGITE CLAY)	10 MG/M3			NO DATA AVAILABLE	
MONOAMMONIUM PHOSPHATE				ORAL (RAT): 5750 MG/KG	
AMMONIUM SULFATE				ORAL (RAT): 3000 MG/KG	
METHYL HYDROGEN POLYSILOXANE				NO DATA AVAILABLE	
YELLOW PIGMENT				NO DATA AVAILABLE	

NOTES:

OTHER:

TLV:
OSHA NUISANCE DUST LIMIT OF 15 MG/M3 OR ACGIH NUISANCE DUST VALUE OF 10 MG/M3 FOR THE EIGHT HOUR TIME-WEIGHTED AVERAGE.

CHEMICAL LISTED AS CARCINOGEN OR POTENTIAL:
NTP: NO
IARC MONOGRAPH: NO

OSHA: NO

III. HAZARDS IDENTIFICATION PRIMARY ROUTE OF ENTRY

EYES: MILDLY IRRITATING FOR A SHORT PERIOD OF TIME.

SKIN: MAY BE MILDLY IRRITATING.

INGESTION: NOT AN EXPECTED ROUTE OF ENTRY.

INHALATION:
TREAT AS A MINERAL DUST, IRRITANT TO THE RESPIRATORY TRACT.

SIGNS AND SYMPTOMS OF EXPOSURE:
ACUTE OVEREXPOSURE: TRANSIENT COUGH, SHORTNESS OF BREATH.
CHRONIC OVEREXPOSURE: CHRONIC FIBROSIS OF THE LUNG, PNEUMOCONIOSIS.

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: REACTIVE AIRWAY.

IV. FIRST AID MEASURES

EYES:
FLUSH WITH LARGE AMOUNTS OF WATER; IF IRRITATION PERSIST, SEEK MEDICAL ATTENTION.

SKIN:
WASH WITH SOAP AND WATER; IF IRRITATION PERSISTS, SEEK MEDICAL ATTENTION.

INGESTION:
IF PATIENT IS CONSCIOUS, GIVE LARGE AMOUNTS OF WATER AND INDUCE VOMITING.
SEEK MEDICAL HELP.

INHALATION:
REMOVE VICTIM TO FRESH AIR. SEEK MEDICAL ATTENTION IF DISCOMFORT CONTINUES.

V. FIRE FIGHTING MEASURES

FLASH POINT: NONE

UNUSUAL FIRE OR EXPLOSION HAZARDS: NONE - THIS IS AN EXTINGUISHING AGENT

FIRE FIGHTING PROCEDURES: NONE

VI. ACCIDENTAL RELEASE MEASURES

CONTAINMENT/CLEANUP: SWEEP UP.

VII. HANDLING AND STORAGE

OTHER:

SHOULD BE STORED IN ORIGINAL CONTAINER OR ANSUL FIRE EXTINGUISHER.

OTHER PRECAUTIONS: DO NOT MIX AGENTS.

VIII. EXPOSURE CONTROLS/PERSONAL PROTECTION

EYES: RECOMMENDED AS MECHANICAL BARRIER FOR PROLONGED EXPOSURE.

SKIN:
N/A
IF IRRITATION OCCURS, LONG SLEEVES AND IMPERVIOUS GLOVES SHOULD BE WORN.

RESPIRATORY:
DUST MASK WHERE DUSTINESS IS PREVALENT, OR TLV EXCEEDED. MECHANICAL FILTER RESPIRATOR IF EXPOSURE IS PROLONGED.

ENGINEERING:
LOCAL EXHAUST: DISCRETIONARY
MECHANICAL (GENERAL): RECOMMENDED.

IX. PHYSICAL AND CHEMICAL PROPERTIES

APPEARANCE: YELLOW COLORED POWDER

BOILING POINT: N/A

SOLUBILITY IN WATER: SLIGHT

SPECIFIC GRAVITY: N/A

VAPOR PRESSURE: N/A

VAPOR DENSITY: N/A

VOLATILE CONTENT: N/A

X. STABILITY AND REACTIVITY

STABILITY: STABLE

HAZARDOUS POLYMERIZATION: WILL NOT OCCUR

HAZARDOUS DECOMPOSITION PRODUCTS: NH3 AND/OR POx MAY BE EVOLVED.

INCOMPATIBLE PRODUCTS:
STRONG ALKALIS, MG, OXIDIZERS THAT CAN RELEASE CHLORINE PER NFPA 43A.

CONDITIONS TO AVOID: N/A

XI. TOXICOLOGICAL INFORMATION

XII. ECOLOGICAL INFORMATION

ECOTOXICITY:

XIII. DISPOSAL CONSIDERATIONS

DISPOSAL METHOD:
DISPOSE OF IN COMPLIANCE WITH LOCAL, STATE, AND FEDERAL REGULATIONS.

XIV. TRANSPORT INFORMATION

XV. REGULATORY INFORMATION

SUPPLEMENTAL STATE COMPLIANCE INFORMATION:

XVI. OTHER INFORMATION

WARRANTY INFORMATION:
THIS INFORMATION IS OFFERED IN GOOD FAITH AS TYPICAL VALUES AND NOT AS A PRODUCT SPECIFICATION. NO WARRANTY, EXPRESSED OR IMPLIED, IS HEREBY MADE. THE RECOMMENDED INDUSTRIAL HYGIENE AND SAFE HANDLING PROCEDURES ARE BELIEVED TO BE GENERALLY APPLICABLE. HOWEVER, EACH USER SHOULD REVIEW THESE RECOMMENDATIONS IN THE SPECIFIC CONTEXT OF THE INTENDED USE AND DETERMINE WHETHER THEY ARE APPROPRIATE.

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Gasoline

Material Safety Data Sheet Collection
Genium group inc.
1171 RiverFront Center, Amsterdam, NY 12010
(518) 842-4111

Issue Date: 2006-06

Unleaded Petrol
AUT5000

Section 1 - Chemical Product and Company Identification 61

Material Name: Unleaded Petrol **CAS Number:** 8006-61-9
Chemical Formula: Mixture of hydrocarbons
EINECS Number: 232-349-1
ACX Number: X1003056-5
Synonyms: AUTOMOTIVE GASOLINE, LEAD-FREE; GASOLINE; MOTOR FUEL; MOTOR SPIRITS; NATURAL GASOLINE; PETROL; UNLEADED PETROL
General Use: Lead free motor fuel for internal combustion engines, 2-stroke and 4-stroke.

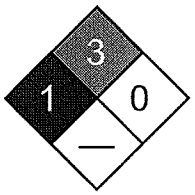
Section 2 - Composition / Information on Ingredients

Name	CAS	%
gasoline	8006-61-9	>90
benzene	71-43-2	5 max.

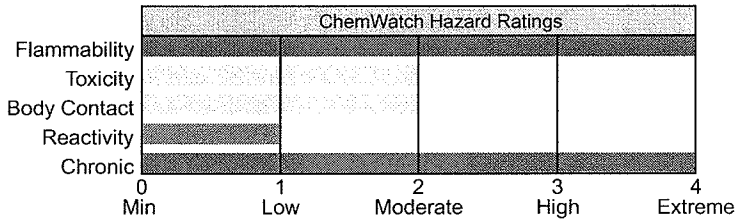
OSHA PEL **NIOSH REL**

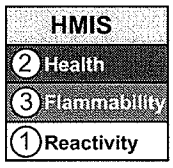
ACGIH TLV
TWA: 300 ppm, 890 mg/m^3;
STEL: 500 ppm, 1480 mg/m^3.

Section 3 - Hazards Identification



Fire Diamond





ANSI Signal Word
Danger!


Flammable

☆☆☆☆☆ Emergency Overview ☆☆☆☆☆

Clear liquid; distinctive odor. Irritating to eyes/skin/respiratory tract. Other Acute Effects: dizziness, drunkenness, unconsciousness. Chronic Effects: dermatitis. Possible cancer hazard. Flammable.

Potential Health Effects

Target Organs: skin, eye, respiratory system, central nervous system (CNS)
Primary Entry Routes: inhalation, ingestion, skin contact

Acute Effects

Inhalation: The vapor is discomforting to the upper respiratory tract and may be harmful if exposure is prolonged. Inhalation hazard is increased at higher temperatures. Acute effects from inhalation of high concentrations of vapor are pulmonary irritation, including coughing, with nausea; central nervous system depression - characterized by headache and dizziness, increased reaction time, fatigue and loss of coordination. If exposure to highly concentrated solvent atmosphere is prolonged this may lead to narcosis, unconsciousness, even coma and possible death. WARNING: Intentional misuse by concentrating/inhaling contents may be lethal. High inhaled concentrations of mixed hydrocarbons may produce narcosis characterized by nausea, vomiting and lightheadedness. Inhalation of aerosols may produce severe pulmonary edema, pneumonitis and pulmonary hemorrhage. Inhalation of petroleum hydrocarbons consisting substantially of low molecular weight species may produce irritation of mucous membranes, incoordination, giddiness, nausea, vertigo, confusion, headache, appetite loss, drowziness, tremors and anesthetic stupor. Massive exposures may produce central nervous system depression with sudden collapse and deep coma; fatalities have been recorded. Irritation of the brain and/or apneic anoxia may produce convulsions. Although recovery following overexposure is generally complete, cerebral micro- hemorrhage of focal post-inflammatory scarring may produce eleptiform seizures some months after the exposure. Pulmonary episodes may include chemical pneumonitis with edema and hemorrhage. The lighter hydrocarbons may produce kidney and neurotoxic effects. Liquid paraffins may produce anesthesia and depressant actions leading to weakness, dizziness, slow and shallow respiration, unconsciousness, convulsions and death. C_{5-7} paraffins may also produce polyneuropathy. Aromatic hydrocarbons accumulate in lipid-rich tissues (typically the brain, spinal cord and peripheral nerves) and may produce functional impairment manifested by nonspecific symptoms such as nausea, weakness, fatigue, vertigo; severe exposures may produce inebriation or unconsciousness. Many of the petroleum hydrocarbons are cardiac sensitizers and may cause ventricular fibrillations.

Eye: The liquid may produce eye discomfort and is capable of causing temporary impairment of vision and/or transient eye inflammation, ulceration. The vapor is discomforting to the eyes. Petroleum hydrocarbons may produce pain after direct contact with the eyes. Slight, but transient, disturbances of the corneal epithelium may also result. The aromatic fraction may produce irritation and lachrymation. The material may produce moderate eye irritation leading to inflammation. Repeated or prolonged exposure to irritants may produce conjunctivitis.

Skin: The material is moderately discomforting to the skin if exposure is prolonged. The material contains a component that may be absorbed through the skin and may cause drying of the skin, which may lead to dermatitis from repeated exposures over long periods. Toxic effects may result from skin absorption. Open cuts, abraded or irritated skin should not be exposed to this material. The material may accentuate any pre-existing dermatitis condition.

Ingestion: Considered an unlikely route of entry in commercial/industrial environments. The liquid may produce gastrointestinal discomfort and may be harmful if swallowed. Ingestion may result in nausea, pain and vomiting. Vomit entering the lungs by aspiration may cause potentially lethal chemical pneumonitis. Ingestion of petroleum hydrocarbons may produce irritation of the pharynx, esophagus, stomach and small intestine with edema and mucosal ulceration. Resulting symptoms include a burning sensation in the mouth and throat. Large amounts may produce narcosis with nausea and vomiting, weakness or dizziness, slow and shallow respiration, swelling of the abdomen, unconsciousness and convulsions. Myocardial injury may produce arrhythmias, ventricular fibrillation and electrocardiographic changes. Central nervous system depression may also occur. Light aromatic hydrocarbons produce a warm, sharp, tingling sensation on contact with taste buds and may anesthetize the tongue. Aspiration into the lungs may produce coughing, gagging, and a chemical pneumonitis with pulmonary edema and hemorrhage.

Carcinogenicity: NTP - Not listed; IARC - Group 2B, Possibly carcinogenic to humans; OSHA - Not listed; NIOSH - Listed as carcinogen; ACGIH - Class A3, Animal carcinogen; EPA - Not listed; MAK - Not listed.

Chronic Effects: Chronic solvent inhalation exposures may result in nervous system impairment and liver and blood changes. Prolonged or continuous skin contact with the liquid may cause defatting with drying, cracking, irritation and dermatitis following. Chronic poisoning may occur from vapor inhalation or skin absorption. The most significant toxic effect is insidious and irreversible injury to the blood-forming tissue by benzene. Leukemia may develop. Chronic exposure may cause headache, fatigue, loss of appetite and lassitude with incipient blood effects including anemia and blood changes. Gasoline "sniffing" has caused severe nerve damage. Repeated or prolonged exposure to mixed hydrocarbons may produce narcosis with dizziness, weakness, irritability, concentration and/or memory loss, tremor in the fingers and tongue, vertigo, olfactory disorders, constriction of visual field, paresthesias of the extremities, weight loss and anemia and degenerative changes in the liver and kidney. Chronic exposure by petroleum workers to the lighter hydrocarbons has been associated with visual disturbances, damage to the central nervous system, peripheral neuropathies (including numbness and paresthesias), psychological and neurophysiological deficits, bone marrow toxicities (including hypoplasia, possibly due to benzene) and hepatic and renal involvement. Chronic dermal exposure to petroleum hydrocarbons may result in defatting which produces localized dermatoses. Surface cracking and erosion may also increase susceptibility to infection by microorganisms.

Section 4 - First Aid Measures

Inhalation: Remove to fresh air. Lay patient down. Keep warm and rested.
If breathing is shallow or has stopped, ensure clear airway and apply resuscitation. Transport to hospital, or doctor.

See DOT ERG

Eye Contact: Immediately hold the eyes open and wash continuously for at least 15 minutes with fresh running water. Ensure irrigation under eyelids by occasionally lifting the upper and lower lids. Transport to hospital or doctor without delay. Removal of contact lenses after an eye injury should only be undertaken by skilled personnel.

Skin Contact: Immediately remove all contaminated clothing, including footwear (after rinsing with water). Wash affected areas thoroughly with water (and soap if available). Seek medical attention in event of irritation.

Ingestion: Contact a Poison Control Center. If swallowed, do NOT induce vomiting. Give a glass of water.

After first aid, get appropriate in-plant, paramedic, or community medical support.

Note to Physicians: For acute or short term repeated exposures to petroleum distillates or related hydrocarbons:

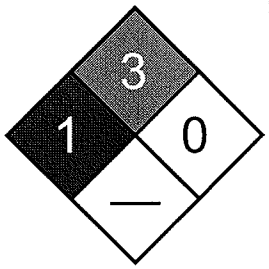
1. Primary threat to life from pure petroleum distillate ingestion and/or inhalation is respiratory failure.
2. Patients should be quickly evaluated for signs of respiratory distress (e.g. cyanosis, tachypnea, intercostal retraction, obtundation) and given oxygen. Patients with inadequate tidal volumes or poor arterial blood gases (pO_2 <50 mm Hg or pCO_2 >50 mm Hg) should be intubated.
3. Arrhythmias complicate some hydrocarbon ingestion and/or inhalation and electrocardiographic evidence of myocardial injury has been reported; intravenous lines and cardiac monitors should be established in obviously symptomatic patients. The lungs excrete inhaled solvents, so that hyperventilation improves clearance.
4. A chest x-ray should be taken immediately after stabilization of breathing and circulation to document aspiration and detect the presence of pneumothorax.
5. Epinephrine (adrenalin) is not recommended for treatment of bronchospasm because of potential myocardial sensitization to catecholamines.
Inhaled cardioselective bronchodilators (e.g. Alupent, Salbutamol) are the preferred agents, with aminophylline a second choice.
6. Lavage is indicated in patients who require decontamination; ensure use of cuffed endotracheal tube in adult patients.

Section 5 - Fire-Fighting Measures

Flash Point: -43 °C
Autoignition Temperature: 280 °C
LEL: 1.4% v/v
UEL: 7.6% v/v

See DOT ERG

Extinguishing Media: Foam. Dry chemical powder.
Bromochlorodifluoromethane (BCF) (where regulations permit). Carbon dioxide.



Fire Diamond

General Fire Hazards/Hazardous Combustion Products: Liquid and vapor are highly flammable. Severe fire hazard when exposed to heat, flame and/or oxidizers. Vapor forms an explosive mixture with air. Severe explosion hazard, in the form of vapor, when exposed to flame or spark. Vapor may travel a considerable distance to source of ignition. Heating may cause expansion/decomposition with violent rupture of containers. On combustion, may emit toxic fumes of carbon monoxide (CO).

Fire Incompatibility: Avoid contamination with oxidizing agents, i.e. nitrates, oxidizing acids, chlorine bleaches, pool chlorine etc., as ignition may result.

Fire-Fighting Instructions: Alert fire department and tell them location and nature of hazard. May be violently or explosively reactive. Wear breathing apparatus plus protective gloves. Prevent, by any means available, spillage from entering drains or water ways. If safe, switch off electrical equipment until vapour fire hazard removed. Use water delivered as a fine spray to control fire and cool adjacent area. Avoid spraying water onto liquid pools. Do not approach containers suspected to be hot. Cool fire exposed containers with water spray from a protected location. If safe to do so, remove containers from path of fire.

Section 6 - Accidental Release Measures

Small Spills: Remove all ignition sources. Clean up all spills immediately. Avoid breathing vapors and contact with skin and eyes. Control personal contact by using protective equipment. Contain and absorb small quantities with vermiculite or other absorbent material. Wipe up. Collect residues in a flammable waste container.

See DOT ERG

Large Spills: Clear area of personnel and move upwind. Alert fire department and tell them location and nature of hazard. May be violently or explosively reactive. Wear breathing apparatus plus protective gloves. Prevent, by any means available, spillage from entering drains or water ways. No smoking, naked lights or ignition sources. Increase ventilation. Stop leak if safe to do so.
Water spray or fog may be used to disperse/absorb vapor. Contain spill with sand, earth or vermiculite. Use only

spark-free shovels and explosion proof equipment. Collect recoverable product into labeled containers for recycling. Absorb remaining product with sand, earth or vermiculite. Collect solid residues and seal in labelled drums for disposal. Wash area and prevent runoff into drains.
If contamination of drains or waterways occurs, advise emergency services.
Regulatory Requirements: Follow applicable OSHA regulations (29 CFR 1910.120).

Section 7 - Handling and Storage

Handling Precautions: Avoid generating and breathing mist. Avoid all personal contact, including inhalation. Wear protective clothing when risk of exposure occurs. Use in a well-ventilated area. Prevent concentration in hollows and sumps. DO NOT enter confined spaces until atmosphere has been checked. Avoid smoking, bare lights, heat or ignition sources. When handling, DO NOT eat, drink or smoke. Vapor may ignite on pumping or pouring due to static electricity. DO NOT use plastic buckets. Ground and secure metal containers when dispensing or pouring product. Use spark-free tools when handling. Avoid contact with incompatible materials. Keep containers securely sealed. Avoid physical damage to containers. Always wash hands with soap and water after handling. Work clothes should be laundered separately. Use good occupational work practices. Observe manufacturer's storing and handling recommendations. Atmosphere should be regularly checked against established exposure standards to ensure safe working conditions.
Recommended Storage Methods: Metal can, metal drum. Packing as recommended by manufacturer. Check all containers are clearly labeled and free from leaks.
Regulatory Requirements: Follow applicable OSHA regulations.

Section 8 - Exposure Controls / Personal Protection

Engineering Controls: CARE: Use of a quantity of this material in confined space or poorly ventilated area, where rapid build-up of concentrated atmosphere may occur, could require increased ventilation and/or protective gear. Use in a well-ventilated area. If inhalation risk of overexposure exists, wear a NIOSH approved organic-vapor respirator. Correct respirator fit is essential to obtain adequate protection. In confined spaces where there is inadequate ventilation, wear full-face air supplied breathing apparatus. Provide adequate ventilation in warehouse or closed storage areas.
Personal Protective Clothing/Equipment:
Eyes: Safety glasses with side shields; or as required, chemical goggles.
Contact lenses pose a special hazard; soft lenses may absorb irritants and all lenses concentrate them.
Hands/Feet: Barrier cream with polyethylene gloves or PVC gloves. Safety footwear. Do NOT use this product to clean the skin.
Respiratory Protection:
Exposure Range >300 to 1000 ppm: Air Purifying, Negative Pressure, Half Mask
Exposure Range >1000 to 15,000 ppm: Air Purifying, Negative Pressure, Full Face
Exposure Range >15,000 to 300,000 ppm: Supplied Air, Constant Flow/Pressure Demand, Full Face
Exposure Range >300,000 to unlimited ppm: Self-contained Breathing Apparatus, Pressure Demand, Full Face
Cartridge Color: black
Other: Overalls. Ensure that there is ready access to eye wash unit. Ensure there is ready access to an emergency shower.

Section 9 - Physical and Chemical Properties

Appearance/General Info: Purple, highly flammable, volatile liquid with characteristic sharp odor. Floats on water. Consists of a complex mixture of hydrocarbons with small amounts of residual benzene from the refining operations.

Physical State: Liquid
Odor Threshold: 0.005 ppm
Vapor Pressure (kPa): 53.33 at 20 °C
Vapor Density (Air=1): > 2
Formula Weight: Not applicable.
Specific Gravity (H_2O=1, at 4 °C): 0.72-0.735 at 15 °C
Evaporation Rate: Fast

pH: Not applicable
pH (1% Solution): Not applicable.
Boiling Point: 38.89 °C (102 °F)
Freezing/Melting Point: Not available
Volatile Component (% Vol): 100
Decomposition Temperature (°C): Not available.
Water Solubility: Insoluble

Section 10 - Stability and Reactivity

Stability/Polymerization/Conditions to Avoid: Presence of incompatible materials. Product is considered stable. Hazardous polymerization will not occur.
Storage Incompatibilities: Avoid storage with oxidizers.

Section 11 - Toxicological Information

Toxicity
Oral (rat) LD_{50}: 18800 mg/kg

Irritation
Skin (rabbit): 500 mg/24h mild

Section 12 - Ecological Information

Environmental Fate: No data found.
Ecotoxicity: No data found.
Biochemical Oxygen Demand (BOD): 8%, 5 days

Section 13 - Disposal Considerations

Disposal: Consult manufacturer for recycling options and recycle where possible. Follow all applicable federal, state, and local laws. Incinerate residue at an approved site. Recycle containers where possible, or dispose of in an authorized landfil.
BEWARE: Empty solvent, paint, lacquer and flammable liquid drums present a severe explosion hazard if cut by flame torch or welded. Even when thoroughly cleaned or reconditioned, the drum seams may retain sufficient solvent to generate an explosive atmosphere in the drum.

Section 14 - Transport Information

DOT Hazardous Materials Table Data (49 CFR 172.101):

Shipping Name and Description: Gasoline
ID: UN1203
Hazard Class: 3 - Flammable and combustible liquid
Packing Group: II - Medium Danger
Symbols:
Label Codes: 3 - Flammable Liquid
Special Provisions: 139, B33, B101, T8
Packaging: **Exceptions:** 150 **Non-bulk:** 202 **Bulk:** 242
Quantity Limitations: **Passenger aircraft/rail:** 5 L **Cargo aircraft only:** 60 L
Vessel Stowage: **Location:** E **Other:**

Section 15 - Regulatory Information

EPA Regulations:
RCRA 40 CFR: Not listed
CERCLA 40 CFR 302.4: Not listed
SARA 40 CFR 372.65: Not listed
SARA EHS 40 CFR 355: Not listed
TSCA: Listed

Section 16 - Other Information

Disclaimer: Judgments as to the suitability of information herein for the purchaser's purposes are necessarily the purchaser's responsibility. Although reasonable care has been taken in the preparation of such information, Genium Group, Inc. extends no warranties, makes no representations, and assumes no responsibility as to the accuracy or suitability of such information for application to the purchaser's intended purpose or for consequences of its use.

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BENCH PRODUCTS
HAND CLEANER DEGREASER **Revised: 01/02/1991**

MSDS Contents

BENCH PRODUCTS INC.

MATERIAL SAFETY DATA SHEET

REVISED 1/2/91

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MANUFACTURER'S NAME: BENCH PRODUCTS

ADDRESS: 4124 SO. 500 W.
SALT LAKE CITY, UT 84123

EMERGENCY PHONE: 801-261-3666
801-268-6320

TRADE NAME: SPARKLENE HAND CLEANER DEGREASER

HAZARDOUS INGREDIENTS

PAINTS, SOLVENTS PRESERVATIVES	(0)	TLV UNITS	ALLOYS AND METALS	(0)	TLV UNITS
PIGMENTS	(0)		BASE METAL	(0)	
CATALYST	(0)		ALLOYS	(0)	
VEHICLE	(0)		METALLIC COATINGS	(0)	
SOLVENTS	(0)		FILLER MATERIAL AND COATINGS	(0)	
ADDITIVES	(0)		OTHERS	(0)	
OTHERS	(0)				

HAZARDOUS MIXTURES OF OTHER LIQUIDS, SOLIDS OR GASES (%) (0) TLV UNITS

CONTAINS:
NONIONIC SURFACTANT & GANTREZ AN119 WHICH CONTAINS BENZENE BUT THIS FORMULA CONTAINS LESS THAN 1/10%

PHYSICAL DATA

BOILING POINT (F): NA

SPECIFIC GRAVITY (WATER = 1): NA

VAPOR PRESSURE (MMHG): NA

VOLATILE (% BY VOLUME): NA

VAPOR DENSITY (AIR=1): NA

EVAPORATION RATE (=1): NA

SOLUBILITY IN WATER: 100%

APPEARANCE AND ODOR: LIGHT BLUE LIQUID WITH LEMON FRAGRANCE.

FIRE AND EXPLOSION

FLASH POINT (METHOD USED):

FLAMMABILITY LIMITS: NOT FLAMMABLE

EXTINGUISHING MEDIA: NOT FLAMMABLE

SPECIAL FIRE PROCEDURES: NONE

UNUSUAL FIRE AND EXPLOSION HAZARDS: NONE

HEALTH HAZARD DATA

THRESHOLD LIMIT VALUE: NOT ESTABLISHED

EFFECTS OF OVER EXPOSURE: NONE

EMERGENCY AND FIRST AID PROCEDURES:

EXTERNAL:
FLUSH WITH WATER FOR 15 MINUTES, CALL PHYSICIAN IF IRRITATION PERSISTS.

INTERNAL:
GIVE LARGE QUANTITIES OF MILK OR WATER, CALL A PHYSICIAN.

REACTIVITY DATA

STABILITY: UNSTABLE ( )
STABLE (X)

CONDITIONS TO AVOID:
MIXING WITH ALKALINE PRODUCTS.

INCOMPATIBILITY: (MATERIALS TO AVOID):
COMPATIBLE WITH MOST OTHER HOUSEHOLD CLEANERS.

HAZARDOUS DECOMPOSITION PRODUCTS: NONE.

HAZARDOUS POLYMERIZATION:
MAY OCCUR ( )
MAY NOT OCCUR (X)

CONDITIONS TO AVOID:
MIXING WITH ALKALINE PRODUCTS.

SPILL OR LEAK PROCEDURES

STEPS TO BE TAKEN IN CASE OF MATERIAL SPILL: RINSE AREA WITH WATER.

WASTE DISPOSAL METHOD:
IN LAND FILL IN ACCORDANCE TO ALL STATE AND LOCAL REGULATIONS.

SPECIAL PROTECTION INFORMATION

RESPIRATORY PROTECTION (SPECIFY TYPE): NOT NORMALLY NEEDED.

VENTILATION: (NA) LOCAL EXHAUST: (NA)
MECHANICAL: (NA)
SPECIAL: (NA)
OTHER: (NA)

PROTECTIVE GLOVES: REGULAR HOUSEHOLD RUBBER GLOVES.

EYE PROTECTION: SIMPLE GOGGLES CAN BE USED.

OTHER PROTECTIVE EQUIPMENT: NONE

SPECIAL PRECAUTIONS

OTHER PRECAUTIONS:
AVOID CONTACT WITH MUCOUS MEMBRANES.

BENCH PRODUCTS INC.

HAND CLEANER DEGREASER

THIS HEAVY DUTY CLEANER HAS BEEN FORMULATED WITH A UNIQUE BLEND OF WETTING AGENTS, DETERGENTS AND GENTLE SURFACTANTS TO HELP REMOVE GROUND IN DIRT AND GREASE. FORTIFIED WITH SPECIAL EMMOLLIENTS TO HELP THE SKIN.

PRODUCT SPECIFICATIONS:

COLOR:	ORANGE
ODOR :	ALMOND
FLASH POINT:	NONE
P.H.	5
DENSITY	8.4 LBS PER GALLON
STORAGE STABILITY:	EXCELLENT. 1 YEAR MINIMUM

FREEZING STABILITY:
WILL FREEZE. USABLE AFTER THAWING WITH NO CHANGE IN PERFORMANCE.
AGITATE AFTER THAWING AND BEFORE USE.

PHOSPHATE FREE	YES
BIODEGRADABLE	YES

DIRECTIONS:

WET HANDS WITH WATER, APPLY A SMALL AMOUNT TO HANDS AND WORK INTO A LATHER; RINSE CLEAN WITH WATER.

CAUTION:
KEEP AWAY FROM CHILDREN, IF SWALLOWED GIVE A GLASSFUL OF WATER, CALL A PHYSICIAN. IF CONTACT WITH EYES, FLUSH WITH WATER FOR 15 MINUTES, CALL A PHYSICIAN.

PACKAGING:	SPARKLENE:	GALLONS (6 PER CASE)
	PRIVATE LABEL:	GALLONS (6 PER CASE)
		5 GALLON PAILS, 55 GALLON DRUMS.

WARRANTY:
CUSTOMER SATISFACTION GUARANTEED. ALL PRODUCTS ARE GUARANTEED FOR ONE YEAR FROM THE DATE OF INVOICE. ANY RETURNED PRODUCT SHOULD BE AVAILABLE AT THE DISTRIBUTORS WAREHOUSE FOR INSPECTION. LIABILITY TO THE MANUFACTURER IS LIMITED TO THE OPTION OF REPLACEMENT OF GOODS OR CREDIT OF INVOICE.

DISCLAIMER:
MANUFACTURER OR SELLER MAKES NO WARRANTY EXPRESS OR IMPLIED CONCERNING THE USE OF THIS PRODUCT OTHER THAN FOR THE PURPOSE INDICATED ON THE LABEL. MANUFACTURER OR SELLER IS NOT LIABLE FOR ANY INJURY OR DAMAGE CAUSED BY THIS PRODUCT DUE TO MISUSE, MISHANDLING OR ANY APPLICATION NOT SPECIFICALLY DESCRIBED AND RECOMMENDED ON THE LABEL.

BENCH PRODUCTS INC., SALT LAKE CITY, UTAH 84123

76 LUBRICANTS
UNOBA MOLY XD GREASE 2 Revised: 01/01/2002

MSDS Contents

76 UNOBA MOLY XD GREASE 2

(MSDS #5477020000)

MATERIAL SAFETY DATA SHEET

76 LUBRICANTS COMPANY
A DIVISION OF TOSCO CORPORATION

76 UNOBA MOLY XD GREASE 2

1. PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME: 76 UNOBA MOLY XD GREASE 2

PRODUCT CODE: 5477020000

SAP CODE:

INTENDED USE: GREASE

CHEMICAL FAMILY: PETROLEUM HYDROCARBON

RESPONSIBLE PARTY:
PHILLIPS 66 COMPANY
LUBRICANTS DIVISION
P.O. BOX 25376
SANTA ANA, CA 92799-5376

FOR ADDITIONAL MSDSS: 800-762-0942

TECHNICAL INFORMATION:
THE INTENDED USE OF THIS PRODUCT IS INDICATED ABOVE. IF ANY ADDITIONAL USE IS KNOWN, PLEASE CONTACT US AT THE TECHNICAL INFORMATION NUMBER LISTED.

EMERGENCY OVERVIEW:

24 HOUR EMERGENCY TELEPHONE NUMBERS:
SPILL, LEAK, FIRE OR ACCIDENT:
CALL CHEMTREC:
NORTH AMERICA: (800) 424-9300

OTHERS: (703) 527-3887 (COLLECT)

CALIFORNIA POISON CONTROL SYSTEM: (800) 356-3129

HEALTH HAZARDS/PRECAUTIONARY MEASURES:
AVOID CONTACT WITH EYES, SKIN AND CLOTHING. WASH THOROUGHLY AFTER HANDLING.

PHYSICAL HAZARDS/PRECAUTIONARY MEASURES:
KEEP AWAY FROM ALL SOURCES OF IGNITION.

APPEARANCE: BLACK

PHYSICAL FORM: SEMI-SOLID

ODOR: CHARACTERISTIC PETROLEUM

NFPA HAZARD CLASS:
HEALTH 1 (SLIGHT)
FLAMMABILITY 1 (SLIGHT)
REACTIVITY 0 (LEAST)

HMIS HAZARD CLASS: NOT EVALUATED

2. COMPOSITION/INFORMATION ON INGREDIENTS

HAZARDOUS COMPONENTS	% WEIGHT	EXPOSURE GUIDELINE LIMITS	AGENCY	TYPE
DEASPHALTED RESIDUUM C24 CAS#: 64741-95-3	30-50	(SEE: OIL MIST, IF GENERATED)		
MOLYBDENUM DISULFIDE CAS#: 1317-33-5	1-5	(SEE: MOLYBDENUM, INSOLUBLE COMPOUNDS (AS Mo))		
ZINC COMPOUND CAS#: PROPRIETARY	<1	NOT ESTABLISHED		

OTHER COMPONENTS	% WEIGHT	EXPOSURE GUIDELINE LIMITS	AGENCY	TYPE
LUBRICANT BASE OIL (PETROLEUM) CAS#: VARIOUS	50-70	(SEE: OIL MIST, IF GENERATED)		
ADDITIVES CAS#: PROPRIETARY	5-13	NOT ESTABLISHED		

REFERENCE	EXPOSURE GUIDELINE LIMITS	AGENCY	TYPE
MOLYBDENUM, INSOLUBLE COMPOUNDS (AS Mo) CAS#: NONE	10 MG/M3	ACGIH	TWA
	3 MG/M3	ACGIH	TWA-RESP.
	15 MG/M3	OSHA	TWA-TOT.
OIL MIST, IF GENERATED CAS#: NONE	5 MG/M3	ACGIH	TWA
	10 MG/M3	ACGIH	STEL
	5 MG/M3	OSHA	TWA
	2500 MG/M3	NIOSH	IDLH

ALL COMPONENTS ARE LISTED ON THE TSCA INVENTORY

THE BASE OIL FOR THIS PRODUCT CAN BE A MIXTURE OF ANY OF THE FOLLOWING HIGHLY REFINED PETROLEUM STREAMS:
CAS 64741-88-4; CAS 64741-89-5; CAS 64741-96-4; CAS 64741-97-5;
CAS 64742-01-4; CAS 64742-52-5; CAS 64742-53-6; CAS 64742-54-7;
CAS 64742-55-8; CAS 64742-56-9; CAS 64742-57-0; CAS 64742-62-7;
CAS 64742-63-8; CAS 64742-65-0; CAS 72623-85-9; CAS 72623-86-0;
CAS 72623-87-1

NOTE:
STATE, LOCAL OR OTHER AGENCIES OR ADVISORY GROUPS MAY HAVE ESTABLISHED MORE STRINGENT LIMITS. CONSULT AN INDUSTRIAL HYGIENIST OR SIMILAR PROFESSIONAL, OR YOUR LOCAL AGENCIES, FOR FURTHER INFORMATION.

3. HAZARDS IDENTIFICATION

POTENTIAL HEALTH EFFECTS:

EYE:
CONTACT MAY CAUSE MILD EYE IRRITATION INCLUDING STINGING, WATERING, AND REDNESS.

SKIN:
CONTACT MAY CAUSE MILD SKIN IRRITATION INCLUDING REDNESS, AND A BURNING SENSATION. PROLONGED OR REPEATED CONTACT CAN WORSEN IRRITATION BY CAUSING DRYING AND CRACKING OF THE SKIN LEADING TO DERMATITIS (INFLAMMATION). NO HARMFUL EFFECTS FROM SKIN ABSORPTION ARE EXPECTED.

INHALATION (BREATHING):
NO DATA AVAILABLE. HOWEVER, INHALATION IS NOT AN EXPECTED ROUTE OF EXPOSURE.

INGESTION (SWALLOWING): LOW DEGREE OF TOXICITY BY INGESTION.

SIGNS AND SYMPTOMS:
EFFECTS OF OVEREXPOSURE MAY INCLUDE IRRITATION OF THE NOSE AND THROAT, IRRITATION OF THE DIGESTIVE TRACT, IRRITATION OF THE RESPIRATORY TRACT, NAUSEA AND DIARRHEA.

CANCER:
INADEQUATE EVIDENCE AVAILABLE TO EVALUATE THE CANCER HAZARD OF THIS MATERIAL. SEE SECTION 11 FOR CARCINOGENICITY INFORMATION OF INDIVIDUAL COMPONENTS, IF ANY.

TARGET ORGANS: NO DATA AVAILABLE FOR THIS MATERIAL.

DEVELOPMENTAL: NO DATA AVAILABLE FOR THIS MATERIAL.

PRE-EXISTING MEDICAL CONDITIONS:
CONDITIONS AGGRAVATED BY EXPOSURE MAY INCLUDE SKIN DISORDERS.

4. FIRST AND MEASURES

EYE:
IF IRRITATION OR REDNESS DEVELOPS, MOVE VICTIM AWAY FROM EXPOSURE AND INTO FRESH AIR. FLUSH EYES WITH CLEAN WATER. IF SYMPTOMS PERSIST, SEEK MEDICAL ATTENTION.

SKIN:
WIPE MATERIAL FROM SKIN AND REMOVE CONTAMINATED SHOES AND CLOTHING. CLEANSE

AFFECTED AREA(S) THOROUGHLY BY WASHING WITH MILD SOAP AND WATER AND, IF NECESSARY, A WATERLESS SKIN CLEANSER. IF IRRITATION OR REDNESS DEVELOPS AND PERSISTS, SEEK MEDICAL ATTENTION.

INHALATION (BREATHING):
FIRST AID IS NOT NORMALLY REQUIRED. IF BREATHING DIFFICULTIES DEVELOP, MOVE VICTIM AWAY FROM SOURCE OF EXPOSURE AND INTO FRESH AIR. SEEK IMMEDIATE MEDICAL ATTENTION.

INGESTION (SWALLOWING):
FIRST AID IS NOT NORMALLY REQUIRED; HOWEVER, IF SWALLOWED AND SYMPTOMS DEVELOP, SEEK MEDICAL ATTENTION.

NOTE TO PHYSICIANS:
HIGH-PRESSURE HYDROCARBON INJECTION INJURIES MAY PRODUCE SUBSTANTIAL NECROSIS OF UNDERLYING TISSUE DESPITE AN INNOCUOUS APPEARING EXTERNAL WOUND. OFTEN THESE INJURIES REQUIRE EXTENSIVE EMERGENCY SURGICAL DEBRIDEMENT AND ALL INJURIES SHOULD BE EVALUATED BY A SPECIALIST IN ORDER TO ASSESS THE EXTENT OF INJURY.

5. FIRE FIGHTING MEASURES

FLAMMABLE PROPERTIES:

FLASHPOINT: 450 DEG. F/232 DEG. C (COC)

OSHA FLAMMABILITY CLASS: NOT APPLICABLE

LEL%: 0.9
UEL%: 7.0

AUTOIGNITION TEMPERATURE: NO DATA

BURN RATE (SOLIDS): NO DATA

UNUSUAL FIRE & EXPLOSION HAZARDS:
THIS MATERIAL MAY BURN, BUT WILL NOT IGNITE READILY.

EXTINGUISHING MEDIA:
DRY CHEMICAL, CARBON DIOXIDE, FOAM, WATER, SAND, OR EARTH IS RECOMMENDED. CARBON DIOXIDE CAN DISPLACE OXYGEN. USE CAUTION WHEN APPLYING CARBON DIOXIDE IN CONFINES SPACES.

FIRE FIGHTING INSTRUCTIONS:
FOR FIRES BEYOND THE INCIPIENT STAGE, EMERGENCY RESPONDERS IN THE IMMEDIATE HAZARD AREA SHOULD WEAR BUNKER GEAR. WHEN THE POTENTIAL CHEMICAL HAZARD IS UNKNOWN, IN ENCLOSED OR CONFINED SPACES, OR WHEN EXPLICITY REQUIRED BY DOT, A SELF CONTAINED BREATHING APPARATUS SHOULD BE WORN. IN ADDITION, WEAR OTHER APPROPRIATE PROTECTIVE EQUIPMENT AS CONDITIONS WARRANT (SEE SECTION 8).

ISOLATE IMMEDIATE HAZARD AREA, KEEP UNAUTHORIZED PERSONNEL OUT. CONTAIN SPILL IF IT CAN BE DONE WITH MINIMAL RISK. MOVE UNDAMAGED CONTAINERS FROM IMMEDIATE HAZARD AREA IF IT CAN BE DONE WITH MINIMAL RISK.

COOL EQUIPMENT EXPOSED TO FIRE WITH WATER, IF IT CAN BE DONE WITH MINIMAL RISK.

6. ACCIDENTAL RELEASE MEASURES

THIS MATERIAL MAY BURN, BUT WILL NOT IGNITE READILY. KEEP ALL SOURCES OF IGNITION AWAY FROM SPILL/RELEASE. STAY UPWIND AND AWAY FROM SPILL. NOTIFY PERSONS DOWN WIND OF THE SPILL/RELEASE, ISOLATE IMMEDIATE HAZARD AREA AND KEEP UNAUTHORIZED PERSONNEL OUT. CONTAIN SPILL IF IT CAN BE DONE WITH MINIMAL RISK. WEAR APPROPRIATE PROTECTIVE EQUIPMENT INCLUDING RESPIRATORY PROTECTION AS CONDITIONS WARRANT (SEE SECTION 8).

PREVENT SPILLED MATERIAL FROM ENTERING SEWERS, STORM DRAINS, OTHER UNAUTHORIZED DRAINAGE SYSTEMS, AND NATURAL WATERWAYS. NOTIFY FIRE AUTHORITIES AND APPROPRIATE FEDERAL, STATE, AND LOCAL AGENCIES. CLEANUP UNDER EXPERT SUPERVISION IS ADVISED. MINIMIZE DUST GENERATION. SWEEP UP AND PACKAGE APPROPRIATELY FOR DISPOSAL. IF SPILL OF ANY AMOUNT IS MADE INTO OR UPON NAVIGABLE WATERS, THE CONTIGUOUS ZONE, OR ADJOINING SHORELINES, NOTIFY THE NATIONAL RESPONSE CENTER (PHONE NUMBER 800-424-8802).

7. HANDLING AND STORAGE

HANDLING:
THE USE OF APPROPRIATE RESPIRATORY PROTECTION IS ADVISED WHEN CONCENTRATIONS EXCEED ANY ESTABLISHED EXPOSURE LIMITS (SEE SECTIONS 2 AND 8).

DO NOT WEAR CONTAMINATED CLOTHING OR SHOES. USE GOOD PERSONAL HYGIENE PRACTICES.

HIGH PRESSURE INJECTION OF HYDROCARBON FUELS, HYDRAULIC OILS OR GREASES UNDER THE SKIN MAY HAVE SERIOUS CONSEQUENCES EVEN THOUGH NO SYMPTOMS OR INJURY MAY BE APPARENT. THIS CAN HAPPEN ACCIDENTALLY WHEN USING HIGH PRESSURE EQUIPMENT SUCH AS HIGH PRESSURE GREASE GUNS, FUEL INJECTION APPARATUS OR FROM PINHOLE LEAKS IN TUBING OF HIGH PRESSURE HYDRAULIC OIL EQUIPMENT.

"EMPTY" CONTAINERS RETAIN RESIDUE AND MAY BE DANGEROUS. DO NOT PRESSURIZE, CUT, WELD, BRAZE, SOLDER, DRILL, GRIND, OR EXPOSE SUCH CONTAINERS TO HEAT, FLAME, SPARKS, OR OTHER SOURCES OF IGNITION. THEY MAY EXPLODE AND CAUSE INJURY OR DEATH. "EMPTY" DRUMS SHOULD BE COMPLETELY DRAINED, PROPERLY BUNGED, AND PROMPTLY SHIPPED TO THE SUPPLIER OR A DRUM RECONDITIONER. ALL CONTAINERS SHOULD BE DISPOSED OF IN AN ENVIRONMENTALLY SAFE MANNER AND IN ACCORDANCE WITH GOVERNMENTAL REGULATIONS.

BEFORE WORKING ON OR IN TANKS WHICH CONTAIN OR HAVE CONTAINED THIS MATERIAL, REFER TO OSHA REGULATIONS, ANSI Z49.1 AND OTHER REFERENCES PERTAINING TO CLEANING, REPAIRING, WELDING, OR OTHER CONTEMPLATED OPERATIONS.

STORAGE:
KEEP CONTAINER(S) TIGHTLY CLOSED. USE AND STORE THIS MATERIAL IN COOL, DRY, WELL-VENTILATED AREAS AWAY FROM HEAT AND ALL SOURCES OF IGNITION. STORE ONLY IN APPROVED CONTAINERS. KEEP AWAY FROM ANY INCOMPATIBLE MATERIAL (SEE SECTION 10). PROTECT CONTAINER(S) AGAINST PHYSICAL DAMAGE.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

ENGINEERING CONTROLS:
IF CURRENT VENTILATION PRACTICES ARE NOT ADEQUATE TO MAINTAIN AIRBORNE CONCENTRATIONS BELOW THE ESTABLISHED EXPOSURE LIMITS (SEE SECTION 2), ADDITIONAL VENTILATION OR EXHAUST SYSTEMS MAY BE REQUIRED.

PERSONAL PROTECTIVE EQUIPMENT (PPE):

RESPIRATORY:

INHALATION IS NOT AN EXPECTED ROUTE OF EXPOSURE. HOWEVER, A NIOSH CERTIFIED AIR PURIFYING RESPIRATOR WITH A TYPE 95 (R OR P) PARTICULATE FILTER MAY BE USED UNDER CONDITIONS WHERE AIRBORNE CONCENTRATIONS ARE EXPECTED TO EXCEED EXPOSURE LIMITS (SEE SECTION 2).

PROTECTION PROVIDED BY AIR PURIFYING RESPIRATORS IS LIMITED (SEE MANUFACTURER'S RESPIRATOR SELECTION GUIDE). USE A POSITIVE PRESSURE AIR SUPPLIED RESPIRATOR IF THERE IS POTENTIAL FOR UNCONTROLLED RELEASE, EXPOSURE LEVELS ARE NOT KNOWN, OR ANY OTHER CIRCUMSTANCES WHERE AIR PURIFYING RESPIRATORS MAY NOT PROVIDE ADEQUATE PROTECTION.

A RESPIRATORY PROTECTION PROGRAM THAT MEETS OSHA'S 29 CFR 1910.134 AND ANSI Z88.2 REQUIREMENTS MUST BE FOLLOWED WHENEVER WORKPLACE CONDITIONS WARRANT A RESPIRATOR'S USE.

SKIN:
THE USE OF GLOVES IMPERVIOUS TO THE SPECIFIC MATERIAL HANDLED IS ADVISED TO PREVENT SKIN CONTACT, POSSIBLE IRRITATION, AND ABSORPTION (SEE GLOVE MANUFACTURER LITERATURE FOR INFORMATION ON PERMEABILITY).

EYE/FACE:
APPROVED EYE PROTECTION TO SAFEGUARD AGAINST POTENTIAL EYE CONTACT, IRRITATION, OR INJURY IS RECOMMENDED. DEPENDING ON CONDITIONS OF USE, A FACE SHIELD MAY BE NECESSARY.

OTHER PROTECTIVE EQUIPMENT:
A SOURCE OF CLEAN WATER SHOULD BE AVAILABLE IN THE WORK AREA FOR FLUSHING EYES AND SKIN. IMPERVIOUS CLOTHING SHOULD BE WORN AS NEEDED.

9. PHYSICAL AND CHEMICAL PROPERTIES

NOTE:
UNLESS OTHERWISE STATED, VALUES ARE DETERMINED AT 20 DEG. C (68 DEG. F) AND 760 MMHg (1 ATM).

BURN RATE (SOLIDS ONLY): NO DATA

APPEARANCE: BLACK

PHYSICAL STATE: SEMI-SOLID

ODOR: CHARACTERISTIC PETROLEUM

VAPOR PRESSURE (MMHg): <0.01

VAPOR DENSITY (AIR = 1): >5

BOILING POINT/RANGE: NO DATA

FREEZING/MELTING POINT: 365 DEG. F/185 DEG. C

SOLUBILITY IN WATER: NEGLIGIBLE

SPECIFIC GRAVITY: 0.90 @ 60 DEG. F

PERCENT VOLATILE: NEGLIGIBLE

EVAPORATION RATE (nBuAc = 1): <0.01

BULK DENSITY: 7.50 LBS/GAL

FLASHPOINT: 450 DEG. F / 232 DEG. C (COC)

FLAMMABLE/EXPLOSIVE LIMITS (%):
LEL: 0.9
UEL: 7.0

10. STABILITY AND REACTIVITY

STABILITY:
STABLE UNDER NORMAL AMBIENT AND ANTICIPATED STORAGE AND HANDLING CONDITIONS OF TEMPERATURE AND PRESSURE.

CONDITIONS TO AVOID:
EXTENDED EXPOSURE TO HIGH TEMPERATURES CAN CAUSE DECOMPOSITION.

MATERIALS TO AVOID (INCOMPATIBLE MATERIALS):
AVOID CONTACT WITH STRONG OXIDANTS SUCH AS LIQUID CHLORINE, CONCENTRATED OXYGEN, SODIUM HYPOCHLORITE OR CALCIUM HYPOCHLORITE.

HAZARDOUS DECOMPOSITION PRODUCTS:
COMBUSTION CAN YIELD MAJOR AMOUNTS OF OXIDES OF CARBON AND MINOR AMOUNTS OF OXIDES OF SULFUR AND NITROGEN. OXIDES OF MOLYBDENUM MAY ALSO BE FORMED.

HAZARDOUS POLYMERIZATION: WILL NOT OCCUR.

11. TOXICOLOGICAL INFORMATION

LUBRICANT BASE OIL (PETROLEUM (CAS# VARIOUS):

CARCINOGENICITY:
THE PETROLEUM BASE OILS CONTAINED IN THIS PRODUCT HAVE BEEN HIGHLY REFINED BY A VARIETY OF PROCESSES INCLUDING SOLVENT EXTRACTION, HYDROTREATING, AND DEWAXING TO REMOVE AROMATICS AND IMPROVE PERFORMANCE CHARACTERISTICS. NONE OF THE OILS USED ARE LISTED AS A CARCINOGEN BY NTP, IARC, OR OSHA.

DEASPHALTED RESIDUUM.. C24 (CAS# 64741-95-3):

CARCINOGENICITY:
SKIN APPLICATION OF A SIMILAR MATERIAL, VACUUM TOWER BOTTOMS, PRODUCED EQUIVOCAL RESULTS IN MOUSE TUMOR BIOASSAYS, BUT NEGATIVE RESULTS IN BOTH SKIN TUMOR INITIATION AND PROMOTION STUDIES. UNTREATED VACUUM DISTILLATES HAVE BEEN IDENTIFIED AS A CARCINOGEN BY IARC.

12. ECOLOGICAL INFORMATION

NOT EVALUATED AT THIS TIME

13. DISPOSAL CONSIDERATIONS

THIS MATERIAL, IF DISCARDED AS PRODUCED, IS NOT A RCRA "LISTED" OR "CHARACTERISTIC" HAZARDOUS WASTE. USE WHICH RESULTS IN CHEMICAL OR PHYSICAL CHANGE OR CONTAMINATION MAY SUBJECT IT TO REGULATION AS A HAZARDOUS WASTE. ALONG WITH PROPERLY CHARACTERIZING ALL WASTE MATERIALS, CONSULT STATE AND LOCAL REGULATIONS REGARDING THE PROPER DISPOSAL OF THIS MATERIAL.

14. TRANSPORT INFORMATION

NOTE: NOT CLASSIFIED AS HAZARDOUS

15. REGULATORY INFORMATION

EPA SARA 311/312 (TITLE III HAZARD CATEGORIES):
ACUTE HEALTH: NO
CHRONIC HEALTH: NO
FIRE HAZARD: NO
PRESSURE HAZARD: NO
REACTIVE HAZARD: NO

SARA 313 AND 40 CFR 372:
THIS MATERIAL CONTAINS THE FOLLOWING CHEMICALS SUBJECT TO THE REPORTING REQUIREMENTS OF SARA 313 AND 40 CFR 372:

COMPONENT	CAS NUMBER	WEIGHT %
ZINC COMPOUND	PROPRIETARY	<1

CALIFORNIA PROPOSITION 65:

WARNING:
THIS MATERIAL CONTAINS THE FOLLOWING CHEMICALS WHICH ARE KNOWN TO THE STATE OF CALIFORNIA TO CAUSE CANCER, BIRTH DEFECTS OR OTHER REPRODUCTIVE HARM, AND ARE SUBJECT TO THE REQUIREMENTS OF CALIFORNIA PROPOSITION 65 (CA HEALTH & SAFETY CODE SECTION 25249.5):

COMPONENT	EFFECT
RESIDUAL FUEL OILS	SKIN CANCER

CARCINOGEN IDENTIFICATION:
THIS MATERIAL HAS NOT BEEN IDENTIFIED AS A CARCINOGEN BY NTP, IARC, OR OSHA, SEE SECTION 11 FOR CARCINOGENICITY INFORMATION OF INDIVIDUAL COMPONENTS, IF ANY.

EPA (CERCLA) REPORTABLE QUANTITY: NONE

16. OTHER INFORMATION

ISSUE DATE: 01/01/02

PREVIOUS ISSUE DATE: 05/31/01

PRODUCT CODE: 5477020000

REVISED SECTIONS: NONE

PREVIOUS PRODUCT CODE: 5477020000

MSDS NUMBER: 5477020000

DISCLAIMER OF EXPRESSED AND IMPLIED WARRANTIES:

THE INFORMATION PRESENTED IN THIS MATERIAL SAFETY DATA SHEET IS BASED ON DATA BELIEVED TO BE ACCURATE AS OF THE DATE THIS MATERIAL SAFETY DATA SHEET WAS PREPARED. HOWEVER, NO WARRANTY OF MERCHANTABILITY, FITNESS FOR ANY PARTICULAR PURPOSE, OR ANY OTHER WARRANTY IS EXPRESSED OR IS TO BE IMPLIED REGARDING THE ACCURACY OR COMPLETENESS OF THE INFORMATION PROVIDED ABOVE, THE RESULTS TO BE OBTAINED FROM THE USE OF THIS INFORMATION OR THE PRODUCT, THE SAFETY OF THIS PRODUCT, OR THE HAZARDS RELATED TO ITS USE. NO RESPONSIBILITY IS ASSUMED FOR ANY DAMAGE OR INJURY RESULTING FROM ABNORMAL USE OR FROM ANY FAILURE TO ADHERE TO RECOMMENDED PRACTICES. THE INFORMATION PROVIDED ABOVE, AND THE PRODUCT, ARE FURNISHED ON THE CONDITION THAT THE PERSON RECEIVING THEM SHALL MAKE THEIR OWN DETERMINATION AS TO THE SUITABILITY OF THE PRODUCT FOR THEIR PARTICULAR PURPOSE AND ON THE CONDITION THAT THEY ASSUME THE RISK OF THEIR USE. IN ADDITION, NO AUTHORIZATION IS GIVEN NOR IMPLIED TO PRACTICE ANY PATENTED INVENTION WITHOUT A LICENSE.

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76 LUBRICANTS
EXTRA DUTY GEAR LUBE (ALL GRADES) **Revised: 02/22/2005**

MSDS Contents

MSDS CODE: 720080

STATUS: FINAL

DATE OF ISSUE: 22-FEB-2005

76 LUBRICANTS

MATERIAL SAFETY DATA SHEET

76 EXTRA DUTY GEAR LUBE (ALL GRADES)

1. PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME: 76 EXTRA DUTY GEAR LUBE (ALL GRADES)

PRODUCT CODE: 47601, 47602, 47603, 47604, 47605, 47606, 47607, 47609

INTENDED USE: GEAR LUBRICANT

SYNONYMS:
76 EXTRA DUTY GEAR LUBE 2EP
76 EXTRA DUTY GEAR LUBE 3EP
76 EXTRA DUTY GEAR LUBE 4EP
76 EXTRA DUTY GEAR LUBE 5EP
76 EXTRA DUTY GEAR LUBE 6EP
76 EXTRA DUTY GEAR LUBE 7EP
76 EXTRA DUTY GEAR LUBE 8EP
76 EXTRA DUTY GEAR LUBE 9EP

CHEMICAL FAMILY: PETROLEUM HYDROCARBON

RESPONSIBLE PARTY:
76 LUBRICANTS
A DIVISION OF CONOCO PHILLIPS
600 N. DAIRY ASHFORD
HOUSTON, TEXAS 77079-1175

CUSTOMER SERVICE: 888-766-7676

TECHNICAL INFORMATION: 800-435-7761

THE INTENDED USE OF THIS PRODUCT IS INDICATED ABOVE. IF ANY ADDITIONAL USE
IS KNOWN, PLEASE CONTACT US AT THE TECHNICAL INFORMATION NUMBER LISTED.

EMERGENCY OVERVIEW:

24 HOUR EMERGENCY TELEPHONE NUMBERS:
SPILL, LEAK, FIRE OR ACCIDENT CALL CHEMTREC:
NORTH AMERICA: (800) 424-9300
OTHERS: (703) 527-3887 (COLLECT)

CALIFORNIA POISON CONTROL SYSTEM: (800) 356-3219

HEALTH HAZARDS/PRECAUTIONARY MEASURES:
AVOID CONTACT WITH EYES, SKIN AND CLOTHING. WASH THOROUGHLY AFTER HANDLING.

PHYSICAL HAZARDS/PRECAUTIONARY MEASURES:
KEEP AWAY FROM ALL SOURCES OF IGNITION.

APPEARANCE: CLEAR AND BRIGHT

PHYSICAL FORM: LIQUID

ODOR: CHARACTERISTIC PETROLEUM

NFPA 704 HAZARD CLASS:
HEALTH 1 (SLIGHT)
FLAMMABILITY 1 (SLIGHT)
INSTABILITY 0 (LEAST)

HMIS HAZARD CLASS:
HEALTH 1 (SLIGHT)
FLAMMABILITY 1 (SLIGHT)
PHYSICAL HAZARDS 0 (LEAST)

2. COMPOSITION / INFORMATION ON INGREDIENTS

NON-HAZARDOUS COMPONENTS:

COMPONENT	CAS NO	PERCENT (%)	ACGIH	OSHA	NIOSH	OTHER
LUBRICANT BASE OIL (PETROLEUM)	VARIOUS	97-98	5 MG/M3 TWA 10 MG/M3 STEL	5 MG/M3 TWA	2500 MG/M3 IDLH	AS OIL MIST, IF GENERATED 5 MG/M3 NOHSC TWA
ADDITIVES	PROP-RIETARY	2-3	NE	NE	NE	NE

ALL COMPONENTS ARE LISTED ON THE TSCA INVENTORY.

THE BASE OIL FOR THIS PRODUCT CAN BE A MIXTURE OF ANY OF THE FOLLOWING HIGHLY
REFINED PETROLEUM STREAMS:
CAS 64741-88-4; CAS 64741-89-5; CAS 64741-96-4; CAS 64741-97-5;
CAS 64742-01-4; CAS 64742-52-5; CAS 64742-53-6; CAS 64742-54-7;
CAS 64742-55-8; CAS 64742-56-9; CAS 64742-57-0; CAS 64742-62-7;
CAS 64742-63-8; CAS 64742-65-0; CAS 72623-83-7; CAS 72623-85-9;
CAS 72623-86-0; CAS 72623-87-1

NOTE:
STATE, LOCAL OR OTHER AGENCIES OR ADVISORY GROUPS MAY HAVE ESTABLISHED MORE

STRINGENT LIMITS. CONSULT AN INDUSTRIAL HYGIENIST OR SIMILAR PROFESSIONAL, OR YOUR LOCAL AGENCIES, FOR FURTHER INFORMATION.

1%=10,000 PPM.
NE=NOT ESTABLISHED

3. HAZARDS IDENTIFICATION

POTENTIAL HEALTH EFFECTS:

EYE:
CONTACT MAY CAUSE MILD EYE IRRITATION INCLUDING STINGING, WATERING, AND REDNESS.

SKIN:
CONTACT MAY CAUSE MILD SKIN IRRITATION INCLUDING REDNESS, AND A BURNING SENSATION. PROLONGED OR REPEATED CONTACT CAN WORSEN IRRITATION BY CAUSING DRYING AND CRACKING OF THE SKIN LEADING TO DERMATITIS (INFLAMMATION). NO HARMFUL EFFECTS FROM SKIN ABSORPTION ARE EXPECTED.

INHALATION (BREATHING):
NO INFORMATION AVAILABLE. STUDIES BY OTHER EXPOSURE ROUTES SUGGEST A LOW DEGREE OF TOXICITY BY INHALATION.

INGESTION (SWALLOWING): NO HARMFUL EFFECTS EXPECTED FROM INGESTION.

SIGNS AND SYMPTOMS:
EFFECTS OF OVEREXPOSURE MAY INCLUDE IRRITATION OF THE EYES, IRRITATION OF THE NOSE AND THROAT, IRRITATION OF THE DIGESTIVE TRACT, IRRITATION OF THE RESPIRATORY TRACT, NAUSEA, DIARRHEA.

CANCER:
INADEQUATE EVIDENCE AVAILABLE TO EVALUATE THE CANCER HAZARD OF THIS MATERIAL. SEE SECTION 11 FOR CARCINOGENICITY INFORMATION OF INDIVIDUAL COMPONENTS, IF ANY.

TARGET ORGANS: NO DATA AVAILABLE FOR THIS MATERIAL.

DEVELOPMENTAL: NO DATA AVAILABLE FOR THIS MATERIAL.

PRE-EXISTING MEDICAL CONDITIONS:
CONDITIONS AGGRAVATED BY EXPOSURE MAY INCLUDE SKIN DISORDERS, RESPIRATORY (ASTHMA-LIKE) DISORDERS.

4. FIRST AID MEASURES

EYE:
IF IRRITATION OR REDNESS DEVELOPS, MOVE VICTIM AWAY FROM EXPOSURE AND INTO FRESH AIR. FLUSH EYES WITH CLEAN WATER. IF SYMPTOMS PERSIST, SEEK MEDICAL ATTENTION.

SKIN:
REMOVE CONTAMINATED SHOES AND CLOTHING AND CLEANSE AFFECTED AREA(S) THOROUGHLY BY WASHING WITH MILD SOAP AND WATER. IF IRRITATION OR REDNESS DEVELOPS AND PERSISTS, SEEK MEDICAL ATTENTION.

INHALATION (BREATHING):
IF RESPIRATORY SYMPTOMS DEVELOP, MOVE VICTIM AWAY FROM SOURCE OF EXPOSURE AND INTO FRESH AIR. IF SYMPTOMS PERSIST, SEEK MEDICAL ATTENTION. IF VICTIM

IS NOT BREATHING, CLEAR AIRWAY AND IMMEDIATELY BEGIN ARTIFICIAL RESPIRATION.
IF BREATHING DIFFICULTIES DEVELOP, OXYGEN SHOULD BE ADMINISTERED BY QUALIFIED
PERSONNEL. SEEK IMMEDIATE MEDICAL ATTENTION.

INGESTION (SWALLOWING):
FIRST AID IS NOT NORMALLY REQUIRED; HOWEVER, IF SWALLOWED AND SYMPTOMS
DEVELOP, SEEK MEDICAL ATTENTION.

NOTES TO PHYSICIAN:
HIGH-PRESSURE HYDROCARBON INJECTION INJURIES MAY PRODUCE SUBSTANTIAL
NECROSIS OF UNDERLYING TISSUE DESPITE AN INNOCUOUS APPEARING EXTERNAL WOUND.
OFTEN THESE INJURIES REQUIRE EXTENSIVE EMERGENCY SURGICAL DEBRIDEMENT AND
ALL INJURIES SHOULD BE EVALUATED BY A SPECIALIST IN ORDER TO ASSESS THE
EXTENT OF INJURY.

ACUTE ASPIRATIONS OF LARGE AMOUNTS OF OIL-LADEN MATERIAL MAY PRODUCE A
SERIOUS ASPIRATION PNEUMONIA. PATIENTS WHO ASPIRATE THESE OILS SHOULD BE
FOLLOWED FOR THE DEVELOPMENT OF LONG-TERM SEQUELAE. INHALATION EXPOSURE TO
OIL MISTS BELOW CURRENT WORKPLACE EXPOSURE LIMITS IS UNLIKELY TO CAUSE
PULMONARY ABNORMALITIES.

5. FIRE-FIGHTING MEASURES

FLAMMABLE PROPERTIES:

FLASH POINT: >399 DEG. F / 204 DEG. C

OSHA FLAMMABILITY CLASS: NOT APPLICABLE

NFPA FLAMMABILITY CLASS: NO DATA

LEL%: NO DATA
UEL%: NO DATA

AUTOIGNITION TEMPERATURE: NO DATA

UNUSUAL FIRE & EXPLOSION HAZARDS:
THIS MATERIAL MAY BURN, BUT WILL NOT IGNITE READILY. VAPORS ARE HEAVIER THAN
AIR AND CAN ACCUMULATE IN LOW AREAS. IF CONTAINER IS NOT PROPERLY COOLED, IT
CAN RUPTURE IN THE HEAT OF A FIRE.

EXTINGUISHING MEDIA:
DRY CHEMICAL, CARBON DIOXIDE, FOAM, OR WATER SPRAY IS RECOMMENDED. WATER OR
FOAM MAY CAUSE FROTHING OF MATERIALS HEATED ABOVE 212 DEG. F CARBON DIOXIDE
CAN DISPLACE OXYGEN. USE CAUTION WHEN APPLYING CARBON DIOXIDE IN CONFINED
SPACES.

FIRE FIGHTING INSTRUCTIONS:
FOR FIRES BEYOND THE INCIPIENT STAGE, EMERGENCY RESPONDERS IN THE IMMEDIATE
HAZARD AREA SHOULD WEAR BUNKER GEAR. WHEN THE POTENTIAL CHEMICAL HAZARD IS
UNKNOWN, IN ENCLOSED OR CONFINED SPACES, OR WHEN EXPLICITLY REQUIRED BY DOT,
A SELF CONTAINED BREATHING APPARATUS SHOULD BE WORN. IN ADDITION, WEAR OTHER
APPROPRIATE PROTECTIVE EQUIPMENT AS CONDITIONS WARRANT (SEE SECTION 8).

ISOLATE IMMEDIATE HAZARD AREA, KEEP UNAUTHORIZED PERSONNEL OUT. STOP
SPILL/RELEASE IF IT CAN BE DONE WITH MINIMAL RISK. MOVE UNDAMAGED CONTAINERS
FROM IMMEDIATE HAZARD AREA IF IT CAN BE DONE WITH MINIMAL RISK.

WATER SPRAY MAY BE USEFUL IN MINIMIZING OR DISPERSING VAPORS AND TO PROTECT
PERSONNEL. COOL EQUIPMENT EXPOSED TO FIRE WITH WATER, IF IT CAN BE DONE WITH
MINIMAL RISK. AVOID SPREADING BURNING LIQUID WITH WATER USED FOR COOLING
PURPOSES.

6. ACCIDENTAL RELEASE MEASURES

THIS MATERIAL MAY BURN, BUT WILL NOT IGNITE READILY. KEEP ALL SOURCES OF IGNITION AWAY FROM SPILL/RELEASE.

STAY UPWIND AND AWAY FROM SPILL/RELEASE. NOTIFY PERSONS DOWN WIND OF THE SPILL/RELEASE, ISOLATE IMMEDIATE HAZARD AREA AND KEEP UNAUTHORIZED PERSONNEL OUT. STOP SPILL/RELEASE IF IT CAN BE DONE WITH MINIMAL RISK. WEAR APPROPRIATE PROTECTIVE EQUIPMENT INCLUDING RESPIRATORY PROTECTION AS CONDITIONS WARRANT (SEE SECTION 8).

PREVENT SPILLED MATERIAL FROM ENTERING SEWERS, STORM DRAINS, OTHER UNAUTHORIZED DRAINAGE SYSTEMS, AND NATURAL WATERWAYS. DIKE FAR AHEAD OF SPILL FOR LATER RECOVERY OR DISPOSAL. SPILLED MATERIAL MAY BE ABSORBED INTO AN APPROPRIATE ABSORBENT MATERIAL.

NOTIFY FIRE AUTHORITIES AND APPROPRIATE FEDERAL, STATE, AND LOCAL AGENCIES. IMMEDIATE CLEANUP OF ANY SPILL IS RECOMMENDED. IF SPILL OF ANY AMOUNT IS MADE INTO OR UPON NAVIGABLE WATERS, THE CONTIGUOUS ZONE, OR ADJOINING SHORELINES, NOTIFY THE NATIONAL RESPONSE CENTER (PHONE NUMBER 800-424-8802).

7. HANDLING AND STORAGE

HANDLING:
DO NOT ENTER CONFINED SPACES SUCH AS TANKS OR PITS WITHOUT FOLLOWING PROPER ENTRY PROCEDURES SUCH AS ASTM D-4276 AND 29 CFR 1910.146. THE USE OF APPROPRIATE RESPIRATORY PROTECTION IS ADVISED WHEN CONCENTRATIONS EXCEED ANY ESTABLISHED EXPOSURE LIMITS (SEE SECTIONS 2 AND 8).

DO NOT WEAR CONTAMINATED CLOTHING OR SHOES. USE GOOD PERSONAL HYGIENE PRACTICES.

"EMPTY" CONTAINERS RETAIN RESIDUE AND MAY BE DANGEROUS. DO NOT PRESSURIZE, CUT, WELD, BRAZE, SOLDER, DRILL, GRIND, OR EXPOSE SUCH CONTAINERS TO HEAT, FLAME, SPARKS, OR OTHER SOURCES OF IGNITION. THEY MAY EXPLODE AND CAUSE INJURY OR DEATH. "EMPTY" DRUMS SHOULD BE COMPLETELY DRAINED, PROPERLY BUNGED, AND PROMPTLY SHIPPED TO THE SUPPLIER OR A DRUM RECONDITIONER. ALL CONTAINERS SHOULD BE DISPOSED OF IN AN ENVIRONMENTALLY SAFE MANNER AND IN ACCORDANCE WITH GOVERNMENTAL REGULATIONS.

HIGH PRESSURE INJECTION OF HYDROCARBON FUELS, HYDRAULIC OILS OR GREASES UNDER THE SKIN MAY HAVE SERIOUS CONSEQUENCES EVEN THOUGH NO SYMPTOMS OR INJURY MAY BE APPARENT. THIS CAN HAPPEN ACCIDENTALLY WHEN USING HIGH PRESSURE EQUIPMENT SUCH AS HIGH PRESSURE GREASE GUNS, FUEL INJECTION APPARATUS OR FROM PINHOLE LEAKS IN TUBING OF HIGH PRESSURE HYDRAULIC OIL EQUIPMENT.

BEFORE WORKING ON OR IN TANKS WHICH CONTAIN OR HAVE CONTAINED THIS MATERIAL, REFER TO OSHA REGULATIONS, ANSI Z49.1, AND OTHER REFERENCES PERTAINING TO CLEANING, REPAIRING, WELDING, OR OTHER CONTEMPLATED OPERATIONS.

STORAGE:
KEEP CONTAINER(S) TIGHTLY CLOSED. USE AND STORE THIS MATERIAL IN COOL, DRY, WELL-VENTILATED AREAS AWAY FROM HEAT AND ALL SOURCES OF IGNITION. STORE ONLY IN APPROVED CONTAINERS. KEEP AWAY FROM ANY INCOMPATIBLE MATERIAL (SEE SECTION 10). PROTECT CONTAINER(S) AGAINST PHYSICAL DAMAGE.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

ENGINEERING CONTROLS:
IF CURRENT VENTILATION PRACTICES ARE NOT ADEQUATE TO MAINTAIN AIRBORNE CONCENTRATIONS BELOW THE ESTABLISHED EXPOSURE LIMITS (SEE SECTION 2), ADDITIONAL ENGINEERING CONTROLS MAY BE REQUIRED.

PERSONAL PROTECTIVE EQUIPMENT (PPE):

RESPIRATORY:
A NIOSH CERTIFIED AIR PURIFYING RESPIRATOR WITH A TYPE 95 (R OR P) PARTICULATE FILTER MAY BE USED UNDER CONDITIONS WHERE AIRBORNE CONCENTRATIONS ARE EXPECTED TO EXCEED EXPOSURE LIMITS (SEE SECTION 2).

PROTECTION PROVIDED BY AIR PURIFYING RESPIRATORS IS LIMITED (SEE MANUFACTURER'S RESPIRATOR SELECTION GUIDE). USE A NIOSH APPROVED SELF-CONTAINED BREATHING APPARATUS (SCBA) OR EQUIVALENT OPERATED IN A PRESSURE DEMAND OR OTHER POSITIVE PRESSURE MODE IF THERE IS POTENTIAL FOR AN UNCONTROLLED RELEASE, EXPOSURE LEVELS ARE NOT KNOWN, OR ANY OTHER CIRCUMSTANCES WHERE AIR PURIFYING RESPIRATORS MAY NOT PROVIDE ADEQUATE PROTECTION.

A RESPIRATORY PROTECTION PROGRAM THAT MEETS OSHA'S 29 CFR 1910.134 AND ANSI Z88.2 REQUIREMENTS MUST BE FOLLOWED WHENEVER WORKPLACE CONDITIONS WARRANT A RESPIRATOR'S USE.

SKIN:
THE USE OF GLOVES IMPERVIOUS TO THE SPECIFIC MATERIAL HANDLED IS ADVISED TO PREVENT SKIN CONTACT AND POSSIBLE IRRITATION (SEE MANUFACTURERS LITERATURE FOR INFORMATION ON PERMEABILITY).

EYE/FACE:
APPROVED EYE PROTECTION TO SAFEGUARD AGAINST POTENTIAL EYE CONTACT, IRRITATION, OR INJURY IS RECOMMENDED. DEPENDING ON CONDITIONS OF USE, A FACE SHIELD MAY BE NECESSARY.

OTHER PROTECTIVE EQUIPMENT:
A SOURCE OF CLEAN WATER SHOULD BE AVAILABLE IN THE WORK AREA FOR FLUSHING EYES AND SKIN. IMPERVIOUS CLOTHING SHOULD BE WORN AS NEEDED.

SUGGESTIONS FOR THE USE OF SPECIFIC PROTECTIVE MATERIALS ARE BASED ON READILY AVAILABLE PUBLISHED DATA. USERS SHOULD CHECK WITH SPECIFIC MANUFACTURERS TO CONFIRM THE PERFORMANCE OF THEIR PRODUCTS.

9. PHYSICAL AND CHEMICAL PROPERTIES

NOTE:
UNLESS OTHERWISE STATED, VALUES ARE DETERMINED AT 20 DEG. C (68 DEG. F) AND 760 MMHg (1 ATM).

APPEARANCE: CLEAR AND BRIGHT

PHYSICAL FORM: LIQUID

ODOR: CHARACTERISTIC PETROLEUM

ODOR THRESHOLD: NO DATA

pH: NOT APPLICABLE

VAPOR PRESSURE (MMHg): <1

VAPOR DENSITY (AIR=1): >1

BOILING POINT: NO DATA

MELTING/FREEZING POINT: <5 DEG. F / -15 DEG. C

SOLUBILITY IN WATER: NEGLIGIBLE

PARTITION COEFFICIENT (n-OCTANOL/WATER): NO DATA

SPECIFIC GRAVITY: 0.87-0.91

BULK DENSITY: 7.3-7.6
BULK DENSITY UNITS: LBS/GAL

VISCOSITY CST @ 100 DEG. C: 8.8-65
VISCOSITY CST @ 40 DEG. C: 60-1100

PERCENT VOLATILE: NEGLIGIBLE

EVAPORATION RATE (nBuAc=1): <1

FLASH POINT: >399 DEG. F / 204 DEG. C

LEL%: NO DATA
UEL%: NO DATA

AUTOIGNITION TEMPERATURE: NO DATA

10. STABILITY AND REACTIVITY

STABILITY:
STABLE UNDER NORMAL AMBIENT AND ANTICIPATED STORAGE AND HANDLING CONDITIONS OF TEMPERATURE AND PRESSURE.

CONDITIONS TO AVOID:
EXTENDED EXPOSURE TO HIGH TEMPERATURES CAN CAUSE DECOMPOSITION.

MATERIALS TO AVOID (INCOMPATIBLE MATERIALS):
AVOID CONTACT WITH STRONG OXIDIZING AGENTS, STRONG ACIDS, STRONG BASES.

HAZARDOUS DECOMPOSITION PRODUCTS:
COMBUSTION CAN YIELD CARBON, NITROGEN AND SULFUR OXIDES.

HAZARDOUS POLYMERIZATION: WILL NOT OCCUR.

11. TOXICOLOGICAL INFORMATION

CHRONIC DATA:

LUBRICANT BASE OIL (PETROLEUM) - CAS: VARIOUS:

CARCINOGENICITY:
THE PETROLEUM BASE OILS CONTAINED IN THIS PRODUCT HAVE BEEN HIGHLY REFINED BY A VARIETY OF PROCESSES INCLUDING SOLVENT EXTRACTION, HYDROTREATING, AND DEWAXING TO REMOVE AROMATICS AND IMPROVE PERFORMANCE CHARACTERISTICS. ALL OF THE OILS MEET THE IP-346 CRITERIA OF LESS THAN 3 PERCENT PAH'S AND THEREFORE NONE ARE LISTED AS A CARCINOGEN BY NTP, IARC, OR OSHA.

ACUTE DATA:

LUBRICANT BASE OIL (PETROLEUM) - CAS: VARIOUS
DERMAL LD50: >2 G/KG
LC50: NO INFORMATION AVAILABLE
ORAL LD50: >5 G/KG

ADDITIVES - CAS: PROPRIETARY:
DERMAL LD50: NO INFORMATION AVAILABLE
LC50: NO INFORMATION AVAILABLE
ORAL LD50: NO INFORMATION AVAILABLE

12. ECOLOGICAL INFORMATION

NOT EVALUATED AT THIS TIME.

13. DISPOSAL CONSIDERATIONS

THIS MATERIAL UNDER MOST INTENDED USES WOULD BECOME USED OIL DUE TO CONTAMINATION BY PHYSICAL OR CHEMICAL IMPURITIES. RECYCLE ALL USED OIL. WHILE BEING RECYCLED, USED OIL IS REGULATED BY 40 CFR 279. USE RESULTING IN CHEMICAL OR PHYSICAL CHANGE OR CONTAMINATION MAY ALSO SUBJECT IT TO REGULATION AS HAZARDOUS WASTE. UNDER FEDERAL REGULATIONS, USED OIL IS A SOLID WASTE MANAGED UNDER 40 CFR 279. HOWEVER, IN CALIFORNIA, USED OIL IS MANAGED AS HAZARDOUS WASTE UNTIL TESTED TO SHOW IT IS NOT HAZARDOUS. CONSULT STATE AND LOCAL REGULATIONS REGARDING THE PROPER HANDLING OF USED OIL. IN THE CASE OF USED OIL, THE INTENT TO DISCARD IT MAY CAUSE THE USED OIL TO BE REGULATED AS HAZARDOUS WASTE.

CONTENTS SHOULD BE COMPLETELY USED AND CONTAINERS EMPTIED PRIOR TO DISCARD. RINSATE MAY BE CONSIDERED A RCRA HAZARDOUS WASTE AND MUST BE DISPOSED OF WITH CARE AND IN COMPLIANCE WITH FEDERAL, STATE AND LOCAL REGULATIONS. LARGE EMPTY CONTAINERS, SUCH AS DRUMS, SHOULD BE RETURNED TO THE DISTRIBUTOR OR A DRUM RECONDITIONER. TO ASSURE PROPER DISPOSAL OF SMALL EMPTY CONTAINERS, CONSULT WITH STATE AND LOCAL REGULATIONS AND DISPOSAL AUTHORITIES.

14. TRANSPORTATION INFORMATION

DOT PROPER SHIPPING NAME: NOT REGULATED

NOTE:
MATERIAL IS UNREGULATED UNLESS IN CONTAINER OF 3500 GALLONS OR MORE, THEN PROVISIONS OF 49 CFR PART 130 APPLY FOR LAND SHIPMENT.

IMDG SHIPPING DESCRIPTION: NOT REGULATED

ICAO/IATA SHIPPING DESCRIPTION: NOT REGULATED

15. REGULATORY INFORMATION

U.S. REGULATIONS:

EPA SARA 311/312 (TITLE III HAZARD CATEGORIES):
ACUTE HEALTH: NO
CHRONIC HEALTH: NO
FIRE HAZARD: NO
PRESSURE HAZARD: NO
REACTIVE HAZARD: NO

SARA - SECTION 313 AND 40 CFR 372:
THIS MATERIAL CONTAINS THE FOLLOWING CHEMICALS SUBJECT TO THE REPORTING REQUIREMENTS OF SARA 313 AND 40 CFR 372: NONE KNOWN

EPA (CERCLA) REPORTABLE QUANTITY (IN POUNDS): NONE KNOWN

CERCLA/SARA - SECTION 302 EXTREMELY HAZARDOUS SUBSTANCES AND TPQS (IN POUNDS):
THIS MATERIAL CONTAINS THE FOLLOWING CHEMICALS SUBJECT TO THE REPORTING REQUIREMENTS OF SARA 302 AND 40 CFR 372: NONE KNOWN

CALIFORNIA PROPOSITION 65:
WARNING:
THIS MATERIAL CONTAINS THE FOLLOWING CHEMICALS WHICH ARE KNOWN TO THE STATE OF CALIFORNIA TO CAUSE CANCER, BIRTH DEFECTS OR OTHER REPRODUCTIVE HARM, AND ARE SUBJECT TO THE REQUIREMENTS OF CALIFORNIA PROPOSITION 65 (CA HEALTH & SAFETY CODE SECTION 25249.5): NONE KNOWN

CARCINOGEN IDENTIFICATION:
THIS MATERIAL HAS NOT BEEN IDENTIFIED AS A CARCINOGEN BY NTP, IARC, OR OSHA. SEE SECTION 11 FOR CARCINOGENICITY INFORMATION OF INDIVIDUAL COMPONENTS, IF ANY.

TSCA: ALL COMPONENTS ARE LISTED ON THE TSCA INVENTORY.

INTERNATIONAL REGULATIONS:

CANADIAN REGULATIONS:
THIS PRODUCT HAS BEEN CLASSIFIED IN ACCORDANCE WITH THE HAZARD CRITERIA OF THE CONTROLLED PRODUCTS REGULATIONS (CPR) AND THE MSDS CONTAINS ALL THE INFORMATION REQUIRED BY THE CPR.

DOMESTIC SUBSTANCES LIST: LISTED

WHMIS CLASSIFICATION: NOT REGULATED

16. OTHER INFORMATION

ISSUE DATE: 22-FEB-2005

PREVIOUS ISSUE DATE: 01/01/2002

PRODUCT CODE: 47601, 47602, 47603, 47604, 47605, 47606, 47607, 47609

REASON FOR REVISION:
COMBINED ALL GRADES INTO SINGLE MSDS.
CHANGED RESPONSIBLE PARTY FROM PHILLIPS TO CONOCO PHILLIPS. OTHER FORMATTING CHANGES

PREVIOUS PRODUCT CODE:
5246020000, 5233030000, 5247040000, 5248050000, 5249060000, 5250070000, 5251080000, 5252090000

MSDS CODE: 720080

DISCLAIMER OF EXPRESSED AND IMPLIED WARRANTIES:

THE INFORMATION PRESENTED IN THIS MATERIAL SAFETY DATA SHEET IS BASED ON DATA BELIEVED TO BE ACCURATE AS OF THE DATE THIS MATERIAL SAFETY DATA SHEET WAS PREPARED. HOWEVER, NO WARRANTY OF MERCHANTABILITY, FITNESS FOR ANY PARTICULAR PURPOSE, OR ANY OTHER WARRANTY IS EXPRESSED OR IS TO BE IMPLIED REGARDING THE ACCURACY OR COMPLETENESS OF THE INFORMATION PROVIDED ABOVE, THE RESULTS TO BE OBTAINED FROM THE USE OF THIS INFORMATION OR THE PRODUCT, THE SAFETY OF THIS PRODUCT, OR THE HAZARDS RELATED TO ITS USE. NO RESPONSIBILITY IS ASSUMED FOR ANY DAMAGE OR INJURY RESULTING FROM ABNORMAL USE OR FROM ANY FAILURE TO ADHERE TO RECOMMENDED PRACTICES. THE INFORMATION PROVIDED ABOVE, AND THE PRODUCT, ARE FURNISHED ON THE CONDITION THAT THE PERSON RECEIVING THEM SHALL MAKE THEIR OWN DETERMINATION AS TO THE SUITABILITY OF THE PRODUCT FOR THEIR PARTICULAR PURPOSE AND ON THE CONDITION THAT THEY ASSUME THE RISK OF THEIR USE. IN ADDITION, NO AUTHORIZATION IS GIVEN NOR IMPLIED TO PRACTICE ANY PATENTED INVENTION WITHOUT A LICENSE.

ACME REFINING
PREMIUM AW HYDRAULIC OIL LIGHT **Revised: 03/01/2009**

MSDS Contents

MATERIAL SAFETY DATA SHEET

SECTION I PRODUCT IDENTIFICATION

MANUFACTURER'S NAME: ACME REFINING

TELEPHONE NO: (216) 961-6900

ADDRESS:
3591 WEST 56TH STREET
CLEVELAND, OHIO 44102

TRADE NAME: ACME PREMIUM AW HYDRAULIC OIL LIGHT

DATE: MARCH 1, 2009

SECTION II HAZARDOUS INGREDIENTS

COMPONENT NAME PERCENT (OPTIONAL) TLV (UNITS) C.A.S REG. NO.

SARA TITLE III SECTION 313

NO ITEM LISTED IN SECTION 313 IS PRESENT IN THIS PRODUCT IN A REPORTABLE QUANTITY.

IN EVENT OF OIL MISTING - 5 MG./CUBIC METER

SECTION III PHYSICAL DATA

PROX. BOILING POINT C: N/A

FREEZING POINT: N/A

VOLATILITY/VOL (%): N/A

VAPOR PRESSURE (MMHg) @ 20 C: N/A

VAPOR DENSITY (AIR = 1): N/A

SOLUBILITY IN H2O: INSOLUBLE

APPEARANCE: CLEAR AMBER LIQUID

SPECIFIC GRAVITY: 0.87

EVAPORATION RATE: N/A

NFPA HAZARD IDENTIFICATION:

DEGREE OF HAZARD:
HEALTH 1
FIRE 1
REACTIVITY 0

HAZARD RATING:
0-LEAST
1-SLIGHT
2-MODERATE
3-HIGH
4-EXTREME

SECTION IV FIRE AND EXPLOSION HAZARD DATA

FLASH POINT F: 400 F. COC

LOWER EXPLOSIVE LIMIT: N/A
UPPER EXPLOSIVE LIMIT: N/A

EXTINGUISH MEDIA: USE CARBON DIOXIDE, FOAM, FOG, OR DRY CHEMICAL

FIRE & EXPLOSION HAZARDS: NONE

FIRE FIGHTING PROCEDURES:
HANDLE AS A PETROLEUM FIRE, AVOID SMOKE INHALATION, WEAR SELF-CONTAINED BREATHING APPARATUS.

SECTION V HEALTH INFORMATION

CARCINOGENICITY:
NTP?: NO
IARC MONOGRAPHS?: NO
OSHA REGULATED?: NO

EFFECTS OF OVEREXPOSURE: MILD IRRITATION OF EYES AND SKIN.

INGESTION: MAY CAUSE NAUSEA AND VOMITING

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: ALLERGY, ECZEMA OR SKIN CONDITIONS

FIRST AID:
EYE CONTACT: FLUSH WITH WATER UNTIL IRRITATION SUBSIDES
SKIN CONTACT: WIPE OFF WITH DRY CLOTH, WASH THOROUGHLY WITH SOAP.
INHALATION: REMOVE INDIVIDUAL TO FRESH AIR.
INGESTION: DO NOT INDUCE VOMITING, DRINK WATER OR MILK.

SECTION VI REACTIVITY DATA

CHEMICAL STABILITY: STABLE

CONDITIONS TO AVOID: NONE

INCOMPATIBLE MATERIALS: STRONG OXIDANTS

DECOMPOSITION PRODUCTS: CO., AND OTHER ASPHYXIATES

HAZARDOUS POLYMERIZATION: WILL NOT OCCUR

SECTION VII SPILL, LEAK & DISPOSAL PROCEDURES

ACTION TO TAKE FOR SPILL:
SOAK UP WITH CHEMICAL ABSORBENT. SHOVEL INTO A CONTAINER FOR DISPOSAL.

DISPOSAL METHOD:
DISPOSE OF IN ACCORDANCE WITH ALL LOCAL, STATE, AND FEDERAL REGULATIONS.

SECTION VIII SPECIAL HANDLING INFORMATION

VENTILATION:
LOCAL EXHAUST: RECOMMENDED
RESPIRATORY PROTECTION: NONE REQUIRED FOR NORMAL CONDITIONS.

PROTECTIVE CLOTHING: CHEMICAL RESISTANT GLOVES, SAFETY GOGGLES

HANDLING AND STORAGE: KEEP CONTAINER CLOSED WHEN NOT IN USE.

OTHER PRECAUTIONS:
DO NOT REUSE EMPTY CONTAINERS. DO NOT PRESSURIZE OR EXPOSE CONTAINERS TO HEAT OR FLAME. KEEP CLOSED WHEN NOT IN USE.

THE INFORMATION SUPPLIED ABOVE IS PRESENTED IN GOOD FAITH AND HAS BEEN DERIVED FROM SOURCES BELIEVED TO BE RELIABLE. HOWEVER, NO WARRANTY, EXPRESSED OR IMPLIED IS EXTENDED REGARDING ITS ACCURACY OR THE RESULTS TO BE OBTAINED FROM ITS USE, SINCE CONDITIONS OF USE ARE BEYOND OUR CONTROL. ALL RISKS ARE ASSUMED BY THE USER.

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Material Safety Data Sheet Collection
Genium group inc.
1171 RiverFront Center, Amsterdam, NY 12010
(518) 842-4111

Issue Date: 2006-06

Hydrochloric Acid
HYD2200

Section 1 - Chemical Product and Company Identification 61

Material Name: Hydrochloric Acid
CAS Number: 7647-01-0
Chemical Formula: ClH
Structural Chemical Formula: HCl
EINECS Number: 231-595-7
ACX Number: X1002202-3
Synonyms: 4-D BOWL SANITIZER; ACIDE CHLORHYDRIQUE; ACIDO CLORHIDRICO; ACIDO CLORIDRICO; ANHYDROUS HYDROCHLORIC ACID; ANHYDROUS HYDROGEN CHLORIDE; AQUEOUS HYDROGEN CHLORIDE; BOWL CLEANER; CHLOORWATERSTOF; CHLOROHYDRIC ACID; CHLOROWODOR; CHLORURE D'HYDROGENE; CHLORURE D'HYDROGENE ANHYDRE; CHLORURO DE HIDROGENO; CHLORWASSERSTOFF; CLORURO DE HIDROGENO ANHIDRO; EMULSION BOWL CLEANER; EPA PESTICIDE CHEMICAL CODE 045901; HYDROCHLORIC ACID; HYDROCHLORIC ACID GAS; HYDROCHLORIDE; HYDROGEN CHLORIDE; HYDROGEN CHLORIDE (HCL); HYGEIA CREME MAGIC BOWL CLEANER; MURIATIC ACID; MURIATIC ACID); NOW SOUTH SAFTI-SOL BRAND CONCENTRATED BOWL CLEANSE WITHMAGIC ACTIO; PERCLEEN BOWL AND URINAL CLEANER; SPIRITS OF SALT; VARLEY'S OCEAN BLUE SCENTED TOILET BOWL CLEANER; VARLEY POLY-PAK BOWL CREME; WHITE EMULSION BOWL CLEANER; WUEST BOWL CLEANER SUPER CONCENTRATED
General Use: Hydrogen chloride is used to produce pharmaceutical hydrochlorides; vinyl chloride from acetylene; alkyl chlorides from olefins and arsenious chloride from arsenious oxide; electronic grade for etching semiconductor crystals. Used in the chlorination of rubber; in organic reactions involving isomerization, polymerization and alkylation; as a catalyst and condensing agent; for making chlorine where economical; in the separation of cotton from wool and cotton de-linting; as flux in the babbitt type of metal alloy; etching semi-conductor crystals.
Hydrochloric acid is used for pickling and heavy duty cleaning of metal parts; rust and scale removal. The production of chlorides; neutralizing bases; a laboratory reagent. For hydrolyzing starch and proteins in preparations for food. As a catalyst and solvent in organic synthesis. As "spirits of salts" for cleaning of lime and masonry from new brickwork. As flux or flux component for soldering; manufacture of "killed spirits".

Section 2 - Composition / Information on Ingredients

Name	CAS	%
hydrogen chloride	7647-01-0	> 99.0

OSHA PEL
Ceiling: 5 ppm, 7 mg/m^3.

NIOSH REL
Ceiling: 5 ppm (7 mg/m^3).

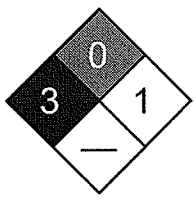
DFG (Germany) MAK
TWA: 5 ppm; PEAK: 5 ppm.

ACGIH TLV
Ceiling: 2 ppm.

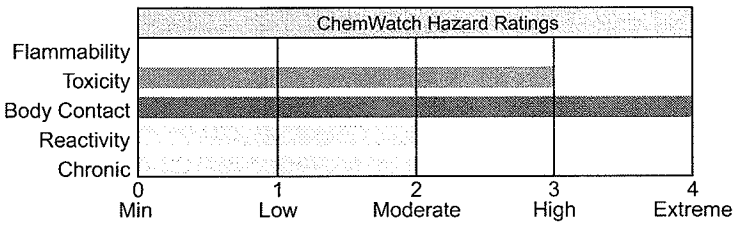
IDLH Level
50 ppm.

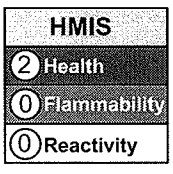
EU OEL
TWA: 5 ppm; STEL: 10 ppm.

Section 3 - Hazards Identification

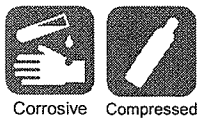


Fire Diamond





ANSI Signal Word
Danger!


Corrosive Compressed Gas

☆☆☆☆☆ Emergency Overview ☆☆☆☆☆

Colorless gas; characteristic suffocating, pungent odor. Corrosive. Stored as compressed gas which may cause frostbite. Chronic Effects: erosion of teeth.

Potential Health Effects

Target Organs: eyes, skin, respiratory system, liver (in animals)
Primary Entry Routes: inhalation, skin contact, eye contact
Acute Effects

Inhalation: The vapor is extremely discomforting to the upper respiratory tract, may cause severe mucous membrane damage and may be harmful if inhaled.
Inhalation of quantities of liquid mist may be extremely hazardous, even lethal due to spasm, extreme irritation of larynx and bronchi, chemical pneumonitis and pulmonary edema.
A single severe exposure may cause coughing and choking; bleeding of nose, inflammation and occasionally ulceration of the nose, throat and larynx. Fluid on the lungs followed by generalized lung damage may follow.
Breathing of vapor may aggravate asthma and inflammatory or fibrotic pulmonary disease.
High concentrations cause necrosis of the tracheal and bronchial epithelium, pulmonary edema, atelectasis and emphysema and damage to the pulmonary blood vessels and liver.
Inhalation hazard is increased at higher temperatures.
The vapor from heated material is extremely discomforting to the upper respiratory tract and lungs if inhaled.
Continued severe exposure can result in pulmonary edema and corrosion of tissues in the nose and throat.

Eye: Hydrogen Chloride: The vapor is extremely discomforting to the eyes and is capable of causing pain and severe conjunctivitis. Corneal injury may develop, with possible permanent impairment of vision, if not promptly and adequately treated.
The material may be irritating to the eye, with prolonged contact causing inflammation. Repeated or prolonged exposure to irritants may produce conjunctivitis.
Hydrochloric Acid: Eye contact is extremely painful and may cause rapid corneal damage. The liquid is extremely corrosive to the eyes and is capable of causing severe damage with loss of sight.
The vapor is highly discomforting and may be corrosive to the eyes. The vapor from heated material is extremely discomforting to the eyes.

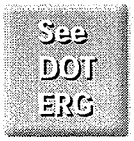
Skin: The material is corrosive to the skin and may cause chemical burns.
Toxic effects may result from skin absorption. Bare unprotected skin should not be exposed to this material. The material may accentuate any pre-existing skin condition.
The vapor is discomforting to the skin.

Ingestion: Considered an unlikely route of entry in commercial/industrial environments.
The liquid is extremely corrosive if swallowed and is capable of causing burns to mouth, throat, esophagus, with extreme discomfort, pain and may be fatal if swallowed in quantity. Ingestion may result in nausea, abdominal irritation, pain and vomiting.

Carcinogenicity: NTP - Not listed; IARC - Group 3, Not classifiable as to carcinogenicity to humans; OSHA - Not listed; NIOSH - Not listed; ACGIH - Not listed; EPA - Not listed; MAK - Not listed.

Chronic Effects: Chronic exposure may cause discoloration or erosion of the teeth, bleeding of the nose and gums; and ulceration of the nasal mucous membranes.
Repeated exposures of animals to concentrations of about 34 ppm produced no immediate toxic effects.
Workers exposed to hydrochloric acid suffered from gastritis and a number of cases of chronic bronchitis have also been reported.
Repeated or prolonged exposure to dilute solutions may cause dermatitis. Repeated exposure to low vapor concentrations can cause skin tenderness, bleeding of the nose and gums, chronic bronchitis, gastritis.

Section 4 - First Aid Measures



Inhalation: Remove to fresh air.
Lay patient down. Keep warm and rested.
If breathing is shallow or has stopped, ensure clear airway and apply resuscitation. Transport to hospital or doctor.

Eye Contact: Immediately hold the eyes open and flush continuously for at least 15 minutes with fresh running water. Ensure irrigation under eyelids by occasionally lifting the upper and lower lids.
Transport to hospital or doctor without delay. Removal of contact lenses after an eye injury should only be undertaken by skilled personnel.

Skin Contact: Immediately flush body and clothes with large amounts of water, using safety shower if available.
Quickly remove all contaminated clothing, including footwear.
Wash affected areas with water (and soap if available) for at least 15 minutes. Transport to hospital or doctor.

Ingestion: Contact a Poison Control Center. Rinse mouth out with plenty of water. Do NOT induce vomiting. Give a glass of water.

After first aid, get appropriate in-plant, paramedic, or community medical support.

Note to Physicians: For acute or short-term repeated exposures to strong acids:
1.Airway problems may arise from laryngeal edema and inhalation exposure.
Treat with 100% oxygen initially.
2.Respiratory distress may require cricothyroidotomy if endotracheal intubation is contraindicated by excessive swelling.

3. Intravenous lines should be established immediately in all cases where there is evidence of circulatory compromise.
4.Strong acids produce a coagulation necrosis characterized by formation of a coagulum (eschar) as a result of the desiccating action of the acid on proteins in specific tissues.

INGESTION:

1.Immediate dilution (milk or water) within 30 minutes post-ingestion is recommended.
2.Do not attempt to neutralize the acid since exothermic reaction may extend the corrosive injury.
3.Be careful to avoid further vomiting since re-exposure of the mucosa to the acid is harmful. Limit fluids to one or two glasses in an adult.
4.Charcoal has no place in acid management.
5.Some authors suggest the use of lavage within 1 hour of ingestion.

SKIN:

1.Skin lesions require copious saline irrigation. Treat chemical burns as thermal burns with non-adherent gauze and wrapping.
2.Deep second-degree burns may benefit from topical silver sulfadiazine.

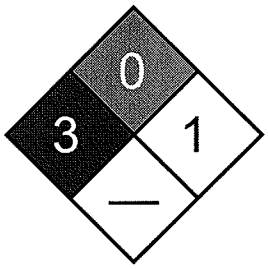
EYE:

1.Eye injuries require retraction of the eyelids to ensure thorough irrigation of the conjunctival cul-de-sacs. Irrigation should last at least 20-30 minutes. Do not use neutralizing agents or any other additives. Several liters of saline are required.
2.Cycloplegic drops (1% cyclopentolate for short-term use or 5% homatropine for longer term use), antibiotic drops, vasoconstrictive agents, or artificial tears may be indicated dependent on the severity of the injury.
3.Steroid eye drops should only be administered with the approval of a consulting ophthalmologist.

Section 5 - Fire-Fighting Measures

See DOT ERG

Flash Point: Nonflammable
Autoignition Temperature: Not applicable
LEL: Not applicable
UEL: Not applicable
Extinguishing Media: Water spray or fog; foam; Bromochlorodifluoromethane (BCF) (where regulations permit); Dry agent; Carbon dioxide.



Fire Diamond

General Fire Hazards/Hazardous Combustion Products: Noncombustible liquid. Will not burn, but heat produces highly toxic fumes/vapors.
Heating may cause expansion or decomposition leading to violent rupture of containers. Decomposes on heating and produces toxic fumes of hydrogen chloride. Decomposition may produce toxic fumes of chlorine.
Reacts with metals producing flammable/explosive hydrogen gas. Contact with moisture or water may generate heat causing ignition. Reacts vigorously with alkalis. Moderate fire hazard when in contact with reducing agents.

Fire Incompatibility: Reacts with metals producing flammable/explosive hydrogen gas.
Avoid reactions with metals, metal oxides, hydroxides, amines, carbonates, alkaline materials, acetic anhydride, cyanides, sulphides, sulphites, phosphides, acetylides, borides, carbides, silicides, vinyl acetate, formaldehyde and potassium permanganate, unsaturated organics, metal acetylides, sulphuric acid.
Note: Compatibility with plastics should be confirmed prior to use.

Fire-Fighting Instructions: Contact fire department and tell them location and nature of hazard.
Wear full body protective clothing with breathing apparatus. Prevent, by any means available, spillage from entering drains or waterways. Consider evacuation. Cool fire-exposed containers with water spray from a protected location. If safe to do so, remove containers from path of fire. Equipment should be thoroughly decontaminated after use. Water spray or fog may be used to disperse vapor. Do not approach cylinders suspected to be hot. If safe to do so, stop flow of gas.

Section 6 - Accidental Release Measures

See DOT ERG

Small Spills: DO NOT touch the spill material. Clean up all spills immediately. Wear fully protective PVC clothing and breathing apparatus. Contain and absorb spill with sand, earth, inert material or vermiculite. Use soda ash or slaked lime to neutralize. Collect residues and place in labeled plastic containers with vented lids. Clear area of personnel and move upwind. Avoid breathing vapors and contact with skin and eyes. Do not exert excessive pressure on valve; do not attempt to operate damaged valve. Water spray or fog may be used to disperse vapor.

Large Spills: Contact fire department and tell them location and nature of hazard. Clear area of personnel and move upwind. Wear full body protective clothing with breathing apparatus. Prevent, by any means available, spillage from entering drains or waterways. Consider evacuation. Stop leak if safe to do so. Remove leaking cylinders to a safe place if possible. Release pressure under safe, controlled conditions by opening the valve. Do not exert excessive pressure on valve; do not attempt to operate damaged valve. Shut off all possible sources of ignition and increase ventilation. Water spray or fog may be used to disperse vapor. Use soda ash or slaked lime to neutralize. Collect and seal in labeled drums for disposal. Wash spill area with large quantities of water. If contamination of

drains or waterways occurs, advise emergency services. After clean-up operations, decontaminate and launder all protective clothing and equipment before storing and reusing. DO NOT touch the spill material. Contain and absorb spill with sand, earth, inert material or vermiculite.
DO NOT USE WATER OR NEUTRALIZING AGENTS INDISCRIMINATELY ON LARGE SPILLS.
Regulatory Requirements: Follow applicable OSHA regulations (29 CFR 1910.120).

Section 7 - Handling and Storage

Handling Precautions: Avoid generating and breathing mist and vapor, breathing vapors and contact with skin and eyes.
Avoid physical damage to containers. Use in a well-ventilated area. Wear protective clothing and gloves when handling containers. Handle and open container with care.
WARNING: To avoid violent reaction, ALWAYS add material to water and NEVER water to material. When handling, DO NOT eat, drink or smoke. Always wash hands with soap and water after handling. Work clothes should be laundered separately. Use good occupational work practices. Observe manufacturer's storing and handling recommendations.
Atmosphere should be regularly checked against established exposure standards to ensure safe working conditions are maintained.
Local exhaust ventilation may be required for safe working, i.e. to keep exposures below required standards; otherwise, PPE is required.
Keep dry. Reacts violently with water.
Transport containers on a trolley. Avoid sources of heat. DO NOT transfer gas from one cylinder to another.
Recommended Storage Methods: Packaging as recommended by manufacturer. Check that containers are clearly labeled.
Cylinder. Ensure the use of equipment rated for cylinder pressure. Ensure the use of compatible materials of construction. Valve protection cap to be in place until cylinder is secured, connected. Cylinder must be properly secured either in use or in storage. Cylinder valve must be closed when not in use or when empty. Segregate full from empty cylinders. WARNING: Suckback into cylinder may result in rupture. Use back-flow preventive device in piping.
Hydrochloric acid: Packs of 2.5 litres or less require a child-resistant closure. Glass container or Plastic carboy or Polylined drum.
Regulatory Requirements: Follow applicable OSHA regulations.

Section 8 - Exposure Controls / Personal Protection

Engineering Controls: If risk of overexposure exists, wear air supplied breathing apparatus. Provide adequate ventilation in warehouse or closed storage areas. Use in a well-ventilated area. Local exhaust ventilation may be required for safe working, i. e. , to keep exposures below required standards; otherwise, PPE is required.
If risk of inhalation or overexposure exists, wear NIOSH-approved respirator or work in fume hood. Hydrogen chloride vapors will not be adequately absorbed by organic vapor respirators.
Personal Protective Clothing/Equipment:
Eyes: Chemical goggles. Full face shield.
DO NOT wear contact lenses. Contact lenses pose a special hazard; soft contact lenses may absorb irritants and all lenses concentrate them.
Hands/Feet: Neoprene gloves; rubber gloves. Nitrile gloves.
Safety footwear. Rubber boots.
Hydrochloric acid: Barrier cream and Neoprene gloves or Elbow length PVC gloves. Nitrile gloves.
PVC boots or PVC safety gumboots.
Respiratory Protection:
Exposure Range >5 to <50 ppm: Air Purifying, Negative Pressure, Half Mask
Exposure Range 50 to unlimited ppm: Self-contained Breathing Apparatus, Pressure Demand, Full Face
Cartridge Color: white
Other: Ensure there is ready access to a safety shower; Eyewash unit.
Acid-resistant overalls. Full protective suit. Operators should be trained in procedures for safe use of this material.
Glove Selection Index:

BUTYL	Best selection
BUTYL/NEOPRENE	Best selection
HYPALON	Best selection
NEOPRENE	Best selection
NEOPRENE/NATURAL	Best selection
NITRILE+PVC	Best selection
PE/EVAL/PE	Best selection
SARANEX-23	Best selection
VITON/NEOPRENE	Best selection
PVC	Best selection

NITRILE ..... Best selection
NATURAL RUBBER..... Satisfactory; may degrade after 4 hours continuous immersion
NATURAL+NEOPRENE..... Satisfactory; may degrade after 4 hours continuous immersion
NAT+NEOPR+NITRILE ..... Poor to dangerous choice for other than short-term immersion

Section 9 - Physical and Chemical Properties

Appearance/General Info: Hydrogen chloride: Colorless, corrosive gas. Pungent suffocating odor. White fumes in moist air. Soluble in methanol, ethanol, ether and benzene.
Hydrochloric acid: Clear to light yellow (orange tint for inhibited grades) fuming corrosive liquid with sharp, suffocating odor.

Physical State: Hydrogen chloride: Compressed gas; Hydrochloric acid: Liquid
Odor Threshold: 0.26 to 0.3 ppm
Vapor Pressure (kPa): < 24.8 at 25 °C
Vapor Density (Air=1): 1.268 at 20 °C
Formula Weight: 36.461
Specific Gravity (H_2O=1, at 4 °C): < 1.19 at 20 °C
Evaporation Rate: Slow

pH: Hydrochloric acid: < 1
Boiling Point: -85 °C (-121 °F)
Freezing/Melting Point: -114.44 °C (-173.992 °F)
Volatile Component (% Vol): 100
Decomposition Temperature (°C): Not applicable
Water Solubility: 56.1 g/100 cc hot water at 60 °C

Section 10 - Stability and Reactivity

Stability/Polymerization/Conditions to Avoid: Decomposes in the presence of moisture to produce corrosive acid. May generate sufficient heat to ignite combustible materials. Presence of heat source and direct sunlight (ultra-violet radiation). Product is considered stable under normal handling conditions. Hazardous polymerization will not occur.
Storage Incompatibilities: Hydrogen chloride: Segregate from most common metals and their alloys, alkalis, unsaturated organics, fluorine, metal carbides, metal acetylides, potassium permanganate and sulfuric acid. Compatibility with plastics should be confirmed prior to use.
Hydrochloric acid: Segregate from alkalies, oxidizing agents and chemicals readily decomposed by acids, i.e. cyanides, sulfides, carbonates. Avoid storage with metals, metal oxides, hydroxides, amines, carbonates, alkaline materials, acetic anhydride, cyanides, sulphides, sulphites, phosphides, acetylides, borides, carbides, silicides, vinyl acetate, formaldehyde and potassium permanganate. Reacts with zinc, brass, galvanized iron, aluminum, copper and copper alloys.

Section 11 - Toxicological Information

Toxicity
Inhalation (human) LC_{Lo}: 1300 ppm/30 m
Inhalation (human) LC_{Lo}: 3000 ppm/5 m
Inhalation (rat) LC_{50}: 3124 ppm/60 m
Inhalation (rat) LC_{50}: 4701 ppm/30 m
Oral (rat) LD_{50}: 900 mg/kg

Irritation
Eye (rabbit): 5 mg/30 s - mild

See *RTECS* MW 4025000, for additional data.

Section 12 - Ecological Information

Environmental Fate: No data found.
Ecotoxicity: TL_m Gambusia affinis (mosquito fish) 282 ppm/96 hr (fresh water) /Conditions of bioassay not specified; Lethal Lepomis macrochirus (bluegill sunfish) 3.6 mg/l/48 hr /Conditions of bioassay not specified; LC_{50} Cockle 330 to 1,000 mg/l/48 hr /Conditions of bioassay not specified; LC_{50} Carassius auratus (goldfish) 178 mg/l (1 to 2 hr survival time) /Conditions of bioassay not specified; LC_{50} Shore crab 240 mg/l/48 hr /Conditions of bioassay not specified; LC_{50} Shrimp 100 to 330 ppm/48 hr (salt water) /Conditions of bioassay not specified; LC_{100} Trout 10 mg/l 24 hr /Conditions of bioassay not specified
Biochemical Oxygen Demand (BOD): none

Section 13 - Disposal Considerations

Disposal: Recycle wherever possible. Consult manufacturer for recycling options. Treat and neutralize at an effluent treatment plant. Bury residue in an authorized landfill. Decontaminate empty containers with a lime slurry. Return empty containers to supplier or bury empty containers at an authorized landfill.
Return empty cylinders to supplier.

Section 14 - Transport Information

DOT Hazardous Materials Table Data (49 CFR 172.101):

Note: This material has multiple possible HMT entries. Choose the appropriate one based on state and condition of specific material when shipped.

Shipping Name and Description: Hydrogen chloride, anhydrous
ID: UN1050
Hazard Class: 2.3 - Poisonous gas
Packing Group:
Symbols:
Label Codes: 2.3 - Poison Gas, 8 - Corrosive
Special Provisions: 3
Packaging: **Exceptions:** None **Non-bulk:** 304 **Bulk:** None
Quantity Limitations: **Passenger aircraft/rail:** Forbidden **Cargo aircraft only:** Forbidden
Vessel Stowage: **Location:** D **Other:** 40

Shipping Name and Description: Hydrochloric acid
ID: UN1789
Hazard Class: 8 - Corrosive material
Packing Group: II - Medium Danger
Symbols:
Label Codes: 8 - Corrosive
Special Provisions: A3, A6, B3, B15, IB2, N41, T8, TP2, TP12
Packaging: **Exceptions:** 154 **Non-bulk:** 202 **Bulk:** 242
Quantity Limitations: **Passenger aircraft/rail:** 1 L **Cargo aircraft only:** 30 L
Vessel Stowage: **Location:** C **Other:**

Shipping Name and Description: Hydrochloric acid
ID: UN1789
Hazard Class: 8 - Corrosive material
Packing Group: III - Minor Danger
Symbols:
Label Codes: 8 - Corrosive
Special Provisions: IB3, T4, TP1, TP12
Packaging: **Exceptions:** 154 **Non-bulk:** 203 **Bulk:** 241
Quantity Limitations: **Passenger aircraft/rail:** 5 L **Cargo aircraft only:** 60 L
Vessel Stowage: **Location:** C **Other:**

Section 15 - Regulatory Information

EPA Regulations:
RCRA 40 CFR: Not listed
CERCLA 40 CFR 302.4: Listed per CWA Section 311(b)(4) 5000 lb (2268 kg)
SARA 40 CFR 372.65: Listed
SARA EHS 40 CFR 355: Listed
RQ: 5000 lb
TPQ: 500 lb
TSCA: Listed

Section 16 - Other Information

Disclaimer: Judgments as to the suitability of information herein for the purchaser's purposes are necessarily the purchaser's responsibility. Although reasonable care has been taken in the preparation of such information, Genium Group, Inc. extends no warranties, makes no representations, and assumes no responsibility as to the accuracy or suitability of such information for application to the purchaser's intended purpose or for consequences of its use.

Material Safety Data Sheet Collection
Genium group inc.
1171 RiverFront Center, Amsterdam, NY 12010
(518) 842-4111

Hydrogen Peroxide Solution 20-60%
HYD2600

Issue Date: 2006-06

Section 1 - Chemical Product and Company Identification 61

Material Name: Hydrogen Peroxide Solution 20-60% **CAS Number:** 7722-84-1
Chemical Formula: H_2O_2
Structural Chemical Formula: H_2O_2
EINECS Number: 231-765-0
ACX Number: X1002204-7
Synonyms: ALBONE; ALBONE 35; ALBONE 50; ALBONE 70; ALBONE 35CG; ALBONE 50CG; ALBONE 70CG; ALBONE DS; DIHYDROGEN DIOXIDE; HIGH-STRENGTH HYDROGEN PEROXIDE; HIOXYL; HYDROGEN DIOXIDE; HYDROGEN DIOXIDE SOLUTION; HYDROGEN PEROXIDE; HYDROGEN PEROXIDE (AQUEOUS); HYDROGEN PEROXIDE SOLUTION; HYDROGEN PEROXIDE SOLUTION (30%); HYDROGEN PEROXIDE SOLUTION 20-60%; HYDROPEROXIDE; INHIBINE; INTEROX; KASTONE; PERHYDROL; PERONE 30; PERONE 35; PERONE 50; PEROSSIDO DI IDROGENO; PEROXAAN; PEROXAN; PEROXIDE; PEROXYDE D'HYDROGENE; T-STUFF; SUPEROXOL; WASSERSTOFFPEROXID; WATERSTOFPEROXYDE
General Use: At varying concentrations used for bleaching and deodorizing of textiles, wood pulp, hair, fur etc.; source of organic and inorganic peroxides; pulp and paper industry; plasticizers; rocket fuel; foam rubber; manufacture of glycerol; antichlor; dyeing; electroplating; antiseptic, laboratory reagent, epoxidation, hydroxylation, oxidation and reduction; viscosity control for starch and cellulose derivatives; refining and cleaning metals; bleaching and oxidizing agent in food; neutralizing agent in wine distillation; seed disinfectant; substitute for chlorine water and sewage treatment.
Pharmaceutical grades : 200 Volume (50% H_2O_2) and 100 Volume (30% H_2O_2).

Section 2 - Composition / Information on Ingredients

Name	CAS	%
hydrogen peroxide	7722-84-1	20 - 60
water	7732-18-5	40 - 80

OSHA PEL
TWA: 1 ppm, 1.4 mg/m^3.

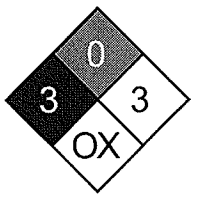
NIOSH REL
TWA: 1 ppm (1.4 mg/m^3).

DFG (Germany) MAK
TWA: 1 ppm; PEAK: 1 ppm.

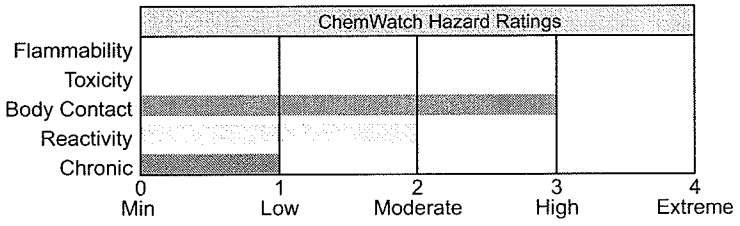
ACGIH TLV
TWA: 1 ppm.

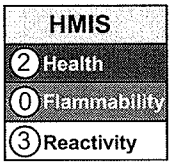
IDLH Level
75 ppm.

Section 3 - Hazards Identification



Fire Diamond





ANSI Signal Word
Danger!


Corrosive

☆☆☆☆☆ Emergency Overview ☆☆☆☆☆

Colorless liquid; slight acrid odor (high concentrations). Corrosive. Other Acute Effects: difficulty breathing, salivation, giddiness, muscle weakness, tremors/numbness of extremities, pulmonary edema, possible sight loss. Strong oxidizer.

Potential Health Effects

Target Organs: eyes, skin, respiratory system, central nervous system (CNS)
Primary Entry Routes: inhalation, skin contact, eye contact

Acute Effects

Inhalation: The vapor/mist is highly discomforting and corrosive to the upper respiratory tract.
Inhalation of excessive levels of mist may result in headache, dizziness, vomiting, diarrhea, irritability, insomnia and, in extreme cases, pulmonary edema.

Eye: The liquid is discomforting and is highly corrosive to the eyes and is capable of causing severe damage with loss of sight.
Reactions may not occur on exposure but response may be delayed with symptoms only appearing many hours later and may cause severe ulceration.

Skin: Skin contact will result in rapid drying and bleaching, leading to chemical burns on prolonged contact. Bare unprotected skin should not be exposed to this material. The material may accentuate any pre-existing skin condition.

Ingestion: The liquid is highly corrosive if swallowed and is capable of causing burns to mouth, throat, esophagus, with extreme discomfort, pain. Ingestion may result in nausea, abdominal irritation, pain, vomiting, and possible internal bleeding. Released oxygen gas may cause distension, pain, even severe organ damage.

Carcinogenicity: NTP - Not listed; IARC - Group 3, Not classifiable as to carcinogenicity to humans; OSHA - Not listed; NIOSH - Not listed; ACGIH - Class A3, Animal carcinogen; EPA - Not listed; MAK - Not listed.

Chronic Effects: Severe systemic poisoning can cause tremors and numbness of the extremities, shock, convulsions, and unconsciousness.

Section 4 - First Aid Measures

See DOT ERG

Inhalation: Remove to fresh air. Lay patient down. Keep warm and rested. If breathing is shallow or has stopped, ensure clear airway and apply resuscitation. Transport to hospital or doctor.

Eye Contact: Immediately hold the eyes open and wash continuously for at least 15 minutes with fresh running water. Ensure irrigation under eyelids by occasionally lifting the upper and lower lids. Transport to hospital or doctor without delay.
Removal of contact lenses after an eye injury should only be undertaken by skilled personnel.

Skin Contact: Immediately flush body and clothes with large amounts of water, using safety shower if available. Quickly remove all contaminated clothing, including footwear. Wash affected areas with water (and soap if available) for at least 15 minutes. Transport to hospital or doctor.

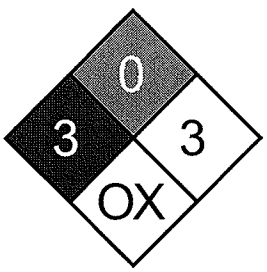
Ingestion: Rinse mouth out with plenty of water. Contact a Poison Control Center.
If swallowed, do NOT induce vomiting. Give a glass of water.

After first aid, get appropriate in-plant, paramedic, or community medical support.

Note to Physicians: Treat symptomatically.

Section 5 - Fire-Fighting Measures

See DOT ERG



Fire Diamond

Flash Point: Nonflammable

LEL: 40% v/v

UEL: 100% v/v

Extinguishing Media: Flooding quantities of water only in the early stages of a fire.
Water spray or fog. DO NOT use halogenated fire extinguishing agents.

General Fire Hazards/Hazardous Combustion Products: Non combustible liquid. Will not burn but increases intensity of fire. Contact with readily oxidizable organic material may cause ignition/fire. Heating may cause expansion or decomposition, leading to violent rupture of containers.

Fire Incompatibility: Avoid contact with organic materials/compounds, particularly finely divided combustible materials, as ignition may result. Violent catalytic decomposition will occur in contact with certain metals such as iron, copper, chromium, brass, bronze, lead, silver, manganese or their salts.

Fire-Fighting Instructions: Alert fire department and tell them location and nature of hazard..
May be violently or explosively reactive. Wear full body protective clothing with breathing apparatus. Prevent, by any means available, spillage from entering drains or water ways. Use fire fighting procedures suitable for surrounding area. Cool fire exposed containers with water spray from a protected location. Do not approach containers suspected to be hot. If safe to do so, remove containers from path of fire.

Section 6 - Accidental Release Measures

See DOT ERG

Small Spills: Clean up all spills immediately. Avoid contact with skin and eyes. Wear impervious gloves and safety glasses. Remove all ignition sources. Small quantities may be discharged to sewer with a large excess of water. Wipe up.

Large Spills: Clear area of personnel and move upwind. Alert fire department and tell them location and nature of hazard.
May be violently or explosively reactive. Wear full body protective clothing with breathing apparatus. Prevent, by any means available, spillage from entering drains or water ways. No smoking, bare lights or ignition sources.

Increase ventilation. Stop leak if safe to do so. Contain spill with sand, earth or vermiculite. Collect recoverable product into labeled containers for recycling. DO NOT return unused product to containers. Absorb remaining product with sand, earth or vermiculite. Collect residues and place in labeled plastic containers with vented lids. Wash spill area with large quantities of water.

After clean up operations, decontaminate and launder all protective clothing and equipment before storing and re-using. If contamination of drains or waterways occurs, advise emergency services.

Regulatory Requirements: Follow applicable OSHA regulations (29 CFR 1910.120).

Section 7 - Handling and Storage

Handling Precautions: Avoid generating and breathing mist. Handle and open container with care. Atmosphere should be regularly checked against established exposure standards to ensure safe working conditions are maintained. Use good occupational work practice. Observe manufacturer's storing and handling recommendations. Avoid all personal contact, including inhalation. Wear protective clothing when risk of exposure occurs. Avoid smoking, bare lights, heat or ignition sources. Use in a well-ventilated area. Avoid contact with incompatible materials. DO NOT return unused product to containers. Avoid sources of heat. Mild steel, brass, bronze and copper equipment should not be used. When handling, DO NOT eat, drink or smoke. Always wash hands with soap and water after handling. Work clothes should be laundered separately. Launder contaminated clothing before re-use.

Recommended Storage Methods: Packaging as recommended by manufacturer. Check that containers are clearly labelled. Glass container. Container to have vented cap. Properly passivated aluminium or stainless steel containers. Polyethylene containers or porcelain, vitreous stoneware.

Regulatory Requirements: Follow applicable OSHA regulations.

Section 8 - Exposure Controls / Personal Protection

Engineering Controls: Use in a well-ventilated area.

Personal Protective Clothing/Equipment:

Eyes: Chemical goggles. Full face shield.

Contact lenses pose a special hazard; soft lenses may absorb irritants and all lenses concentrate them.

Hands/Feet: Barrier cream and PVC gloves. Rubber boots.

Respiratory Protection:

Exposure Range >1 to 50 ppm: Supplied Air, Constant Flow/Pressure Demand, Half Mask

Exposure Range >50 to <75 ppm: Supplied Air, Constant Flow/Pressure Demand, Full Face

Exposure Range 75 to unlimited ppm: Self-contained Breathing Apparatus, Pressure Demand, Full Face

Note: odor threshold unknown

Other: Do not allow clothing wet with material to stay in contact with skin. Overalls, PVC apron and impervious apron. Eyewash unit. Ensure there is ready access to a safety shower.

Glove Selection Index:

NEOPRENE..... Best selection

NATURAL RUBBER..... Satisfactory; may degrade after 4 hours continuous immersion

Section 9 - Physical and Chemical Properties

Appearance/General Info: Clear, colorless, water-like liquid with a slightly sharp odor. Hydrogen peroxide readily decomposes and requires stabilization. Soluble in ether, insoluble in hydrocarbons and decomposed by many organic solvents.

Material hazard increases as concentration of peroxide increases.

Concentration (%w/w)	27.5	35	50	59.5
Boiling Pt.	106	107	114	119
Melting Pt.	-23	-33	-52	-56
Vap. Press. (mmHg)	15	13	10	8
Spec. grav.	1.10	1.13	1.20	1.24

Self accelerating decomposition temperature SADT (°C) >50 for all concentrations.

Physical State: Liquid

Vapor Density (Air=1): Not applicable.

Formula Weight: Not applicable.

Evaporation Rate: Not available

pH: Not available

pH (1% Solution): Not available.

Volatile Component (% Vol): Not available.

Decomposition Temperature (°C): Not applicable

Water Solubility: Miscible with water

Section 10 - Stability and Reactivity

Stability/Polymerization/Conditions to Avoid: Avoid any contamination of this material as it is very reactive and any contamination is potentially hazardous. Presence of heat source and direct sunlight. Solutions of hydrogen peroxide decompose slowly releasing oxygen. Heat or contaminants will accelerate decomposition. Containers may be pressurized. Hydrogen peroxide is decomposed by alkalis and even ordinary dust or rust.

Storage Incompatibilities: Rotate all stock to prevent aging. Use on FIFO (First In-First Out) basis. Segregate from combustible materials, particularly finely divided combustible materials and reducing agents.

Section 11 - Toxicological Information

Not available. Refer to individual constituents.

See *RTECS* MX 0899500, for additional data.

Section 12 - Ecological Information

Environmental Fate: No data found.
Ecotoxicity: Aquatic toxicity: more than 40 ppm/time period not specified/fingerling trout/toxic/salt water
Biochemical Oxygen Demand (BOD): none

Section 13 - Disposal Considerations

Disposal: Recycle wherever possible. Consult manufacturer for recycling options. Consult State Land Waste Management Authority for disposal. Decompose small amounts by slowly adding to warm caustic solution. Puncture containers to prevent re-use.

Section 14 - Transport Information

DOT Hazardous Materials Table Data (49 CFR 172.101):

Note: This material has multiple possible HMT entries. Choose the appropriate one based on state and condition of specific material when shipped.

Shipping Name and Description: Hydrogen peroxide, aqueous solutions *with more than 40 percent but not more than 60 percent hydrogen peroxide (stabilized as necessary)*
ID: UN2014
Hazard Class: 5.1 - Oxidizer
Packing Group: II - Medium Danger
Symbols:

Label Codes: 5.1 - Oxidizer, 8 - Corrosive
Special Provisions: 12, A3, A6, B53, B80, B81, B85, IB2, IP5, T7, TP2, TP6, TP24, TP37
Packaging: **Exceptions:** None **Non-bulk:** 202 **Bulk:** 243
Quantity Limitations: **Passenger aircraft/rail:** Forbidden **Cargo aircraft only:** Forbidden
Vessel Stowage: **Location:** D **Other:** 25, 66, 75, 106

Shipping Name and Description: Hydrogen peroxide, aqueous solutions *with not less than 20 percent but not more than 40 percent hydrogen peroxide (stabilized as necessary)*
ID: UN2014
Hazard Class: 5.1 - Oxidizer
Packing Group: II - Medium Danger
Symbols:

Label Codes: 5.1 - Oxidizer, 8 - Corrosive
Special Provisions: A2, A3, A6, B53, IB2, IP5, T7, TP2, TP6, TP24, TP37
Packaging: **Exceptions:** None **Non-bulk:** 202 **Bulk:** 243
Quantity Limitations: **Passenger aircraft/rail:** 1 L **Cargo aircraft only:** 5 L
Vessel Stowage: **Location:** D **Other:**

Section 15 - Regulatory Information

EPA Regulations:
RCRA 40 CFR: Not listed
CERCLA 40 CFR 302.4: Not listed
SARA 40 CFR 372.65: Not listed
SARA EHS 40 CFR 355: Listed
RQ: 1000 lb
TPQ: 1000 lb
TSCA: Listed

Section 16 - Other Information

Disclaimer: Judgments as to the suitability of information herein for the purchaser's purposes are necessarily the purchaser's responsibility. Although reasonable care has been taken in the preparation of such information, Genium Group, Inc. extends no warranties, makes no representations, and assumes no responsibility as to the accuracy or suitability of such information for application to the purchaser's intended purpose or for consequences of its use.

76 LUBRICANTS
SUPER MOTOR OIL **Revised: 10/15/2004**

MSDS Contents

76 LUBRICANTS

MSDS CODE: 721780

STATUS: FINAL

DATE OF ISSUE: 15-OCT-2004

MATERIAL SAFETY DATA SHEET

76 SUPER MOTOR OIL

1. PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME: 76 SUPER MOTOR OIL

PRODUCT CODE: 1043226, 1043286, 1043331, 1043376, 1043401

INTENDED USE: CRANKCASE OIL

SYNONYMS:
76 SUPER MOTOR OIL, SAE 10W-30
76 SUPER MOTOR OIL, SAE 10W-40
76 SUPER MOTOR OIL, SAE 20W-50
76 SUPER MOTOR OIL, SAE 30
76 SUPER MOTOR OIL, SAE 40

RESPONSIBLE PARTY:
76 LUBRICANTS
A DIVISION OF CONOCOPHILLIPS
600 N. DAIRY ASHFORD
HOUSTON, TEXAS 77079-1175

CUSTOMER SERVICE: 888-766-7676

TECHNICAL INFORMATION: 800-435-7761

THE INTENDED USE OF THIS PRODUCT IS INDICATED ABOVE. IF ANY ADDITIONAL USE IS KNOWN, PLEASE CONTACT US AT THE TECHNICAL INFORMATION NUMBER LISTED.

EMERGENCY OVERVIEW:

24 HOUR EMERGENCY TELEPHONE NUMBERS:
SPILL, LEAK, FIRE OR ACCIDENT CALL CHEMTREC:
NORTH AMERICA: (800) 424-9300
OTHERS: (703) 527-3887 (COLLECT)

CALIFORNIA POISON CONTROL SYSTEM: (800) 356-3219

HEALTH HAZARDS/PRECAUTIONARY MEASURES:
AVOID CONTACT WITH EYES, SKIN AND CLOTHING. WASH THOROUGHLY AFTER HANDLING.

PHYSICAL HAZARDS/PRECAUTIONARY MEASURES:
KEEP AWAY FROM ALL SOURCES OF IGNITION.

APPEARANCE: CLEAR, AMBER

PHYSICAL FORM: LIQUID

ODOR: CHARACTERISTIC PETROLEUM

NFPA 704 HAZARD CLASS:
HEALTH: 1 (SLIGHT)
FLAMMABILITY: 1 (SLIGHT)
INSTABILITY: 0 (LEAST)

HMIS HAZARD CLASS:
HEALTH: 1 (SLIGHT)
FLAMMABILITY: 1 (SLIGHT)
PHYSICAL HAZARDS: 0 (LEAST)

2. COMPOSITION/INFORMATION ON INGREDIENTS

HAZARDOUS COMPONENTS:

COMPONENT/CAS NO	PERCENT (%)	ACGIH	OSHA	NIOSH	OTHER
ZINC COMPOUND(S) PROPRIETARY	0.5-1.5	NE	NE	NE	NE

NON-HAZARDOUS COMPONENTS:

COMPONENT/CAS NO	PERCENT (%)	ACGIH	OSHA	NIOSH	OTHER
LUBRICANT BASE OIL (PETROLEUM) VARIOUS STEL 5 MG/M3 NOHSC TWA	77-91	5 MG/M3 TWA 10 MG/M3	5 MG/M3 TWA	2500 MG/M3 IDLH	AS OIL MIST, IF GENERATED
ADDITIVES PROPRIETARY	9-23	NE	NE	NE	NE

ALL COMPONENTS ARE LISTED ON THE TSCA INVENTORY.

THE BASE OIL FOR THIS PRODUCT CAN BE A MIXTURE OF ANY OF THE FOLLOWING HIGHLY REFINED PETROLEUM STREAMS:
CAS 64741-88-4; CAS 64741-89-5; CAS 64741-96-4; CAS 64741-97-5;
CAS 64742-01-4; CAS 64742-52-5; CAS 64742-53-6; CAS 64742-54-7;
CAS 64742-55-8; CAS 64742-56-9; CAS 64742-57-0; CAS 64742-62-7;
CAS 64742-63-8; CAS 64742-65-0; CAS 72623-83-7; CAS 72623-85-9;
CAS 72623-86-0; CAS 72623-87-1

NOTE:
STATE, LOCAL OR OTHER AGENCIES OR ADVISORY GROUPS MAY HAVE ESTABLISHED MORE STRINGENT LIMITS. CONSULT AN INDUSTRIAL HYGIENIST OR SIMILAR PROFESSIONAL, OR YOUR LOCAL AGENCIES, FOR FURTHER INFORMATION.

1%=10,000 PPM.
NE=NOT ESTABLISHED

3. HAZARDS IDENTIFICATION

POTENTIAL HEALTH EFFECTS:

EYE:
CONTACT MAY CAUSE MILD EYE IRRITATION INCLUDING STINGING, WATERING, AND REDNESS.

SKIN:
CONTACT MAY CAUSE MILD SKIN IRRITATION INCLUDING REDNESS, AND A BURNING SENSATION. PROLONGED OR REPEATED CONTACT CAN WORSEN IRRITATION BY CAUSING DRYING AND CRACKING OF THE SKIN LEADING TO DERMATITIS (INFLAMMATION). NO HARMFUL EFFECTS FROM SKIN ABSORPTION ARE EXPECTED.

INHALATION (BREATHING):
NO INFORMATION AVAILABLE. STUDIES BY OTHER EXPOSURE ROUTES SUGGEST A LOW DEGREE OF TOXICITY BY INHALATION.

INGESTION (SWALLOWING): NO HARMFUL EFFECTS EXPECTED FROM INGESTION.

SIGNS AND SYMPTOMS:
EFFECTS OF OVEREXPOSURE MAY INCLUDE IRRITATION OF THE NOSE AND THROAT, IRRITATION OF THE RESPIRATORY TRACT, NAUSEA, DIARRHEA.

CANCER:
INADEQUATE EVIDENCE AVAILABLE TO EVALUATE THE CANCER HAZARD OF THIS MATERIAL. SEE SECTION 11 FOR CARCINOGENICITY INFORMATION OF INDIVIDUAL COMPONENTS, IF ANY.

TARGET ORGANS: NO DATA AVAILABLE FOR THIS MATERIAL.

DEVELOPMENTAL: NO DATA AVAILABLE FOR THIS MATERIAL.

PRE-EXISTING MEDICAL CONDITIONS:
CONDITIONS AGGRAVATED BY EXPOSURE MAY INCLUDE SKIN DISORDERS.

4. FIRST AID MEASURES

EYE:
IF IRRITATION OR REDNESS DEVELOPS, MOVE VICTIM AWAY FROM EXPOSURE AND INTO FRESH AIR. FLUSH EYES WITH CLEAN WATER. IF SYMPTOMS PERSIST, SEEK MEDICAL ATTENTION.

SKIN:
WIPE MATERIAL FROM SKIN AND REMOVE CONTAMINATED SHOES AND CLOTHING. CLEANSE AFFECTED AREA(S) THOROUGHLY BY WASHING WITH MILD SOAP AND WATER AND, IF NECESSARY, A WATERLESS SKIN CLEANSER. IF IRRITATION OR REDNESS DEVELOPS AND PERSISTS, SEEK MEDICAL ATTENTION.

INHALATION (BREATHING):

IF RESPIRATORY SYMPTOMS DEVELOP, MOVE VICTIM AWAY FROM SOURCE OF EXPOSURE AND INTO FRESH AIR. IF SYMPTOMS PERSIST, SEEK MEDICAL ATTENTION. IF VICTIM IS NOT BREATHING, CLEAR AIRWAY AND IMMEDIATELY BEGIN ARTIFICIAL RESPIRATION. IF BREATHING DIFFICULTIES DEVELOP, OXYGEN SHOULD BE ADMINISTERED BY QUALIFIED PERSONNEL. SEEK IMMEDIATE MEDICAL ATTENTION.

INGESTION (SWALLOWING):
FIRST AID IS NOT NORMALLY REQUIRED; HOWEVER, IF SWALLOWED AND SYMPTOMS DEVELOP, SEEK MEDICAL ATTENTION.

NOTES TO PHYSICIAN:
HIGH-PRESSURE HYDROCARBON INJECTION INJURIES MAY PRODUCE SUBSTANTIAL NECROSIS OF UNDERLYING TISSUE DESPITE AN INNOCUOUS APPEARING EXTERNAL WOUND. OFTEN THESE INJURIES REQUIRE EXTENSIVE EMERGENCY SURGICAL DEBRIDEMENT AND ALL INJURIES SHOULD BE EVALUATED BY A SPECIALIST IN ORDER TO ASSESS THE EXTENT OF INJURY.

ACUTE ASPIRATIONS OF LARGE AMOUNTS OF OIL-LADEN MATERIAL MAY PRODUCE A SERIOUS ASPIRATION PNEUMONIA. PATIENTS WHO ASPIRATE THESE OILS SHOULD BE FOLLOWED FOR THE DEVELOPMENT OF LONG-TERM SEQUELAE. INHALATION EXPOSURE TO OIL MISTS BELOW CURRENT WORKPLACE EXPOSURE LIMITS IS UNLIKELY TO CAUSE PULMONARY ABNORMALITIES.

5. FIRE-FIGHTING MEASURES

FLAMMABLE PROPERTIES:

FLASH POINT: 365 DEG. F/185 DEG. C (PMCC) APPROXIMATELY

OSHA FLAMMABILITY CLASS: NOT REGULATED

NFPA FLAMMABILITY CLASS: NO DATA

LEL%: NO DATA
UEL%: NO DATA

AUTOIGNITION TEMPERATURE: NO DATA

UNUSUAL FIRE & EXPLOSION HAZARDS:
THIS MATERIAL MAY BURN, BUT WILL NOT IGNITE READILY. VAPORS ARE HEAVIER THAN AIR AND CAN ACCUMULATE IN LOW AREAS. IF CONTAINER IS NOT PROPERLY COOLED, IT CAN RUPTURE IN THE HEAT OF A FIRE.

EXTINGUISHING MEDIA:
DRY CHEMICAL, CARBON DIOXIDE, FOAM, OR WATER SPRAY IS RECOMMENDED. WATER OR FOAM MAY CAUSE FROTHING OF MATERIALS HEATED ABOVE 212 DEG. F. CARBON DIOXIDE CAN DISPLACE OXYGEN. USE CAUTION WHEN APPLYING CARBON DIOXIDE IN CONFINED SPACES.

FIRE FIGHTING INSTRUCTIONS:
FOR FIRES BEYOND THE INCIPIENT STAGE, EMERGENCY RESPONDERS IN THE IMMEDIATE HAZARD AREA SHOULD WEAR BUNKER GEAR. WHEN THE POTENTIAL CHEMICAL HAZARD IS UNKNOWN, IN ENCLOSED OR CONFINED SPACES, OR WHEN EXPLICITLY REQUIRED BY DOT, A SELF CONTAINED BREATHING APPARATUS SHOULD BE WORN. IN ADDITION, WEAR OTHER APPROPRIATE PROTECTIVE EQUIPMENT AS CONDITIONS WARRANT (SEE SECTION 8).

ISOLATE IMMEDIATE HAZARD AREA, KEEP UNAUTHORIZED PERSONNEL OUT. STOP SPILL/RELEASE IF IT CAN BE DONE WITH MINIMAL RISK. MOVE UNDAMAGED CONTAINERS FROM IMMEDIATE HAZARD AREA IF IT CAN BE DONE WITH MINIMAL RISK.

WATER SPRAY MAY BE USEFUL IN MINIMIZING OR DISPERSING VAPORS AND TO PROTECT PERSONNEL. COOL EQUIPMENT EXPOSED TO FIRE WITH WATER, IF IT CAN BE DONE WITH

MINIMAL RISK. AVOID SPREADING BURNING LIQUID WITH WATER USED FOR COOLING PURPOSES.

6. ACCIDENTAL RELEASE MEASURES

THIS MATERIAL MAY BURN, BUT WILL NOT IGNITE READILY. KEEP ALL SOURCES OF IGNITION AWAY FROM SPILL/RELEASE.

STAY UPWIND AND AWAY FROM SPILL/RELEASE. NOTIFY PERSONS DOWN WIND OF THE SPILL/RELEASE, ISOLATE IMMEDIATE HAZARD AREA AND KEEP UNAUTHORIZED PERSONNEL OUT. STOP SPILL/RELEASE IF IT CAN BE DONE WITH MINIMAL RISK. WEAR APPROPRIATE PROTECTIVE EQUIPMENT INCLUDING RESPIRATORY PROTECTION AS CONDITIONS WARRANT (SEE SECTION 8).

PREVENT SPILLED MATERIAL FROM ENTERING SEWERS, STORM DRAINS, OTHER UNAUTHORIZED DRAINAGE SYSTEMS, AND NATURAL WATERWAYS. DIKE FAR AHEAD OF SPILL FOR LATER RECOVERY OR DISPOSAL. SPILLED MATERIAL MAY BE ABSORBED INTO AN APPROPRIATE ABSORBENT MATERIAL.

NOTIFY FIRE AUTHORITIES AND APPROPRIATE FEDERAL, STATE, AND LOCAL AGENCIES. IMMEDIATE CLEANUP OF ANY SPILL IS RECOMMENDED. IF SPILL OF ANY AMOUNT IS MADE INTO OR UPON NAVIGABLE WATERS, THE CONTIGUOUS ZONE, OR ADJOINING SHORELINES, NOTIFY THE NATIONAL RESPONSE CENTER (PHONE NUMBER 800-424-8802).

7. HANDLING AND STORAGE

HANDLING:
DO NOT ENTER CONFINED SPACES SUCH AS TANKS OR PITS WITHOUT FOLLOWING PROPER ENTRY PROCEDURES SUCH AS ASTM D-4276 AND 29CFR 1910.146. THE USE OF APPROPRIATE RESPIRATORY PROTECTION IS ADVISED WHEN CONCENTRATIONS EXCEED ANY ESTABLISHED EXPOSURE LIMITS (SEE SECTIONS 2 AND 8).

DO NOT WEAR CONTAMINATED CLOTHING OR SHOES. WASH THOROUGHLY AFTER HANDLING. USE GOOD PERSONAL HYGIENE PRACTICES.

HIGH PRESSURE INJECTION OF HYDROCARBON FUELS, HYDRAULIC OILS OR GREASES UNDER THE SKIN MAY HAVE SERIOUS CONSEQUENCES EVEN THOUGH NO SYMPTOMS OR INJURY MAY BE APPARENT. THIS CAN HAPPEN ACCIDENTALLY WHEN USING HIGH PRESSURE EQUIPMENT SUCH AS HIGH PRESSURE GREASE GUNS, FUEL INJECTION APPARATUS OR FROM PINHOLE LEAKS IN TUBING OF HIGH PRESSURE HYDRAULIC OIL EQUIPMENT.

"EMPTY" CONTAINERS RETAIN RESIDUE AND MAY BE DANGEROUS. DO NOT PRESSURIZE, CUT, WELD, BRAZE, SOLDER, DRILL, GRIND, OR EXPOSE SUCH CONTAINERS TO HEAT, FLAME, SPARKS, OR OTHER SOURCES OF IGNITION. THEY MAY EXPLODE AND CAUSE INJURY OR DEATH. CONTAINERS SHOULD BE DISPOSED OF IN AN ENVIRONMENTALLY SAFE MANNER AND IN ACCORDANCE WITH GOVERNMENTAL REGULATIONS.

BEFORE WORKING ON OR IN TANKS WHICH CONTAIN OR HAVE CONTAINED THIS MATERIAL, REFER TO OSHA REGULATIONS, ANSI Z49.1 AND OTHER REFERENCES PERTAINING TO CLEANING, REPAIRING, WELDING, OR OTHER CONTEMPLATED OPERATIONS.

STORAGE:
KEEP CONTAINER(S) TIGHTLY CLOSED. USE AND STORE THIS MATERIAL IN COOL, DRY, WELL-VENTILATED AREAS AWAY FROM HEAT AND ALL SOURCES OF IGNITION. STORAGE TEMPERATURES ABOVE 113 DEG. F MAY LEAD TO THERMAL DECOMPOSITION, RESULTING IN THE GENERATION OF HYDROGEN SULFIDE AND OTHER SULFUR CONTAINING GASES. STORE ONLY IN APPROVED CONTAINERS. KEEP AWAY FROM ANY INCOMPATIBLE MATERIAL (SEE SECTION 10). PROTECT CONTAINER(S) AGAINST PHYSICAL DAMAGE.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

ENGINEERING CONTROLS:
IF CURRENT VENTILATION PRACTICES ARE NOT ADEQUATE TO MAINTAIN AIRBORNE CONCENTRATIONS BELOW THE ESTABLISHED EXPOSURE LIMITS (SEE SECTION 2), ADDITIONAL ENGINEERING CONTROLS MAY BE REQUIRED.

PERSONAL PROTECTIVE EQUIPMENT (PPE):

RESPIRATORY:
A NIOSH CERTIFIED AIR PURIFYING RESPIRATOR WITH A TYPE 95 (R OR P) PARTICULATE FILTER MAY BE USED UNDER CONDITIONS WHERE AIRBORNE CONCENTRATIONS ARE EXPECTED TO EXCEED EXPOSURE LIMITS (SEE SECTION 2).

PROTECTION PROVIDED BY AIR PURIFYING RESPIRATORS IS LIMITED (SEE MANUFACTURER'S RESPIRATOR SELECTION GUIDE). USE A NIOSH APPROVED SELF-CONTAINED BREATHING APPARATUS (SCBA) OR EQUIVALENT OPERATED IN A PRESSURE DEMAND OR OTHER POSITIVE PRESSURE MODE IF THERE IS POTENTIAL FOR AN UNCONTROLLED RELEASE, EXPOSURE LEVELS ARE NOT KNOWN, OR ANY OTHER CIRCUMSTANCES WHERE AIR PURIFYING RESPIRATORS MAY NOT PROVIDE ADEQUATE PROTECTION. A RESPIRATORY PROTECTION PROGRAM THAT MEETS OSHA'S 29 CFR 1910.134 AND ANSI Z88.2 REQUIREMENTS MUST BE FOLLOWED WHENEVER WORKPLACE CONDITIONS WARRANT A RESPIRATOR'S USE.

SKIN:
THE USE OF GLOVES IMPERVIOUS TO THE SPECIFIC MATERIAL HANDLED IS ADVISED TO PREVENT SKIN CONTACT AND POSSIBLE IRRITATION (SEE MANUFACTURERS LITERATURE FOR INFORMATION ON PERMEABILITY).

EYE/FACE:
APPROVED EYE PROTECTION TO SAFEGUARD AGAINST POTENTIAL EYE CONTACT, IRRITATION, OR INJURY IS RECOMMENDED. DEPENDING ON CONDITIONS OF USE, A FACE SHIELD MAY BE NECESSARY.

OTHER PROTECTIVE EQUIPMENT:
A SOURCE OF CLEAN WATER SHOULD BE AVAILABLE IN THE WORK AREA FOR FLUSHING EYES AND SKIN. IMPERVIOUS CLOTHING SHOULD BE WORN AS NEEDED.

SUGGESTIONS FOR THE USE OF SPECIFIC PROTECTIVE MATERIALS ARE BASED ON READILY AVAILABLE PUBLISHED DATA. USERS SHOULD CHECK WITH SPECIFIC MANUFACTURERS TO CONFIRM THE PERFORMANCE OF THEIR PRODUCTS.

9. PHYSICAL AND CHEMICAL PROPERTIES

NOTE:
UNLESS OTHERWISE STATED, VALUES ARE DETERMINED AT 20 DEG. C (68 DEG. F) AND 760 MM HG (1 ATM).

APPEARANCE: CLEAR AMBER

PHYSICAL FORM: LIQUID

ODOR: CHARACTERISTIC PETROLEUM

ODOR THRESHOLD: NO DATA

pH: NOT APPLICABLE

VAPOR PRESSURE (MM HG): <1

VAPOR DENSITY (AIR=1): >1

BOILING POINT: NO DATA

SOLUBILITY IN WATER: NEGLIGIBLE

PARTITION COEFFICIENT (N-OCTANOL/WATER): NO DATA

SPECIFIC GRAVITY: 0.86-0.89

BULK DENSITY: 7.16-7.41

BULK DENSITY UNITS: LBS/GAL

VISCOSITY CST @ 100 DEG. C: 10.0 - 21.0

VISCOSITY CST @ 40 DEG. C: 67 - 193

PERCENT VOLATILE: NEGLIGIBLE

EVAPORATION RATE (NBUAC=1): <1

FLASH POINT: 365 DEG. F/185 DEG. C
TEST METHOD: (PMCC) APPROXIMATELY

LEL%: NO DATA
UEL%: NO DATA

AUTOIGNITION TEMPERATURE: NO DATA

10. STABILITY AND REACTIVITY

STABILITY:
STABLE UNDER NORMAL AMBIENT AND ANTICIPATED STORAGE AND HANDLING CONDITIONS OF TEMPERATURE AND PRESSURE.

CONDITIONS TO AVOID:
EXTENDED EXPOSURE TO HIGH TEMPERATURES CAN CAUSE DECOMPOSITION.

MATERIALS TO AVOID (INCOMPATIBLE MATERIALS):
AVOID CONTACT WITH STRONG OXIDIZING AGENTS, REDUCING AGENTS.

HAZARDOUS DECOMPOSITION PRODUCTS:
COMBUSTION CAN YIELD CARBON, NITROGEN, SULFUR, PHOSPHORUS, AND ZINC OXIDES. HYDROGEN SULFIDE AND ALKYL MERCAPTANS MAY ALSO BE RELEASED. THERMAL DECOMPOSITION MAY PRODUCE HYDROGEN SULFIDE AND OTHER SULFUR-CONTAINING GASES AT TEMPERATURES GREATER THAN 113 DEG. F. METHACRYLATE MONOMERS MAY ALSO BE FORMED.

HAZARDOUS POLYMERIZATION: WILL NOT OCCUR.

11. TOXICOLOGICAL INFORMATION

CHRONIC DATA:

LUBRICANT BASE OIL (PETROLEUM) - CAS: VARIOUS
CARCINOGENICITY:
THE PETROLEUM BASE OILS CONTAINED IN THIS PRODUCT HAVE BEEN HIGHLY REFINED BY

A VARIETY OF PROCESSES INCLUDING SOLVENT EXTRACTION, HYDROTREATING, AND DEWAXING TO REMOVE AROMATICS AND IMPROVE PERFORMANCE CHARACTERISTICS. ALL OF THE OILS MEET THE IP-346 CRITERIA OF LESS THAN 3 PERCENT PAH'S AND THEREFORE NONE ARE LISTED AS A CARCINOGEN BY NTP, IARC, OR OSHA.

ACUTE DATA:

LUBRICANT BASE OIL (PETROLEUM) - CAS: VARIOUS
DERMAL:
LD50 = >2 G/KG
LC50 = NO INFORMATION AVAILABLE
ORAL:
LD50 = >5 G/KG

ADDITIVES - CAS: PROPRIETARY
DERMAL:
LD50 = NO INFORMATION AVAILABLE
LC50 = NO INFORMATION AVAILABLE
ORAL:
LD50 = NO INFORMATION AVAILABLE

ZINC COMPOUND(S) - CAS: PROPRIETARY
DERMAL:
LD50 = NO INFORMATION AVAILABLE
LC50 = NO INFORMATION AVAILABLE
ORAL:
LD50 = NO INFORMATION AVAILABLE

12. ECOLOGICAL INFORMATION

NOT EVALUATED AT THIS TIME.

13. DISPOSAL CONSIDERATIONS

THIS MATERIAL UNDER MOST INTENDED USES WOULD BECOME USED OIL DUE TO CONTAMINATION BY PHYSICAL OR CHEMICAL IMPURITIES. RECYCLE ALL USED OIL. WHILE BEING RECYCLED, USED OIL IS REGULATED BY 40 CFR 279. USE RESULTING IN CHEMICAL OR PHYSICAL CHANGE OR CONTAMINATION MAY ALSO SUBJECT IT TO REGULATION AS HAZARDOUS WASTE. UNDER FEDERAL REGULATIONS, USED OIL IS A SOLID WASTE MANAGED UNDER 40 CFR 279. HOWEVER, IN CALIFORNIA, USED OIL IS MANAGED AS HAZARDOUS WASTE UNTIL TESTED TO SHOW IT IS NOT HAZARDOUS. CONSULT STATE AND LOCAL REGULATIONS REGARDING THE PROPER HANDLING OF USED OIL. IN THE CASE OF USED OIL, THE INTENT TO DISCARD IT MAY CAUSE THE USED OIL TO BE REGULATED AS HAZARDOUS WASTE.

CONTENTS SHOULD BE COMPLETELY USED AND CONTAINERS EMPTIED PRIOR TO DISCARD. RINSATE MAY BE CONSIDERED A RCRA HAZARDOUS WASTE AND MUST BE DISPOSED OF WITH CARE AND IN COMPLIANCE WITH FEDERAL, STATE AND LOCAL REGULATIONS. LARGE EMPTY CONTAINERS, SUCH AS DRUMS, SHOULD BE RETURNED TO THE DISTRIBUTOR OR A DRUM RECONDITIONER. TO ASSURE PROPER DISPOSAL OF SMALL EMPTY CONTAINERS, CONSULT WITH STATE AND LOCAL REGULATIONS AND DISPOSAL AUTHORITIES.

14. TRANSPORTATION INFORMATION

DOT PROPER SHIPPING NAME: NOT REGULATED
NOTE:

MATERIAL IS UNREGULATED UNLESS IN CONTAINER OF 3500 GALLONS OR MORE, THEN PROVISIONS OF 49 CFR PART 130 APPLY FOR LAND SHIPMENT.

IMDG SHIPPING DESCRIPTION: NOT REGULATED

ICAO/IATA SHIPPING DESCRIPTION: NOT REGULATED

15. REGULATORY INFORMATION

U.S. REGULATIONS:

EPA SARA 311/312 (TITLE III HAZARD CATEGORIES):
ACUTE HEALTH: NO
CHRONIC HEALTH: NO
FIRE HAZARD: NO
PRESSURE HAZARD: NO
REACTIVE HAZARD: NO

SARA - SECTION 313 AND 40 CFR 372:
THIS MATERIAL CONTAINS THE FOLLOWING CHEMICALS SUBJECT TO THE REPORTING REQUIREMENTS OF SARA 313 AND 40 CFR 372:

ZINC COMPOUND(S) PROPRIETARY 0.5-1.5%

EPA (CERCLA) REPORTABLE QUANTITY (IN POUNDS): NONE KNOWN

CERCLA/SARA - SECTION 302 EXTREMELY HAZARDOUS SUBSTANCES AND TPQS (IN POUNDS):
THIS MATERIAL CONTAINS THE FOLLOWING CHEMICALS SUBJECT TO THE REPORTING REQUIREMENTS OF SARA 302 AND 40 CFR 372: NONE KNOWN

CALIFORNIA PROPOSITION 65:
WARNING:
THIS MATERIAL CONTAINS THE FOLLOWING CHEMICALS WHICH ARE KNOWN TO THE STATE OF CALIFORNIA TO CAUSE CANCER, BIRTH DEFECTS OR OTHER REPRODUCTIVE HARM, AND ARE SUBJECT TO THE REQUIREMENTS OF CALIFORNIA PROPOSITION 65 (CA HEALTH & SAFETY CODE SECTION 25249.5): NONE KNOWN

USED ENGINE OILS, WHILE NOT A COMPONENT OF THIS MATERIAL, IS ON THE PROPOSITION 65 LIST OF CHEMICALS KNOWN TO THE STATE OF CALIFORNIA TO CAUSE CANCER.

CARCINOGEN IDENTIFICATION:
THIS MATERIAL HAS NOT BEEN IDENTIFIED AS A CARCINOGEN BY NTP, IARC, OR OSHA. SEE SECTION 11 FOR CARCINOGENICITY INFORMATION OF INDIVIDUAL COMPONENTS, IF ANY.

USED MOTOR OIL HAS BEEN IDENTIFIED AS A POSSIBLE SKIN CARCINOGEN BY IARC.

TSCA: ALL COMPONENTS ARE LISTED ON THE TSCA INVENTORY.

INTERNATIONAL REGULATIONS:

CANADIAN REGULATIONS:
THIS PRODUCT HAS BEEN CLASSIFIED IN ACCORDANCE WITH THE HAZARD CRITERIA OF THE CONTROLLED PRODUCTS REGULATIONS (CPR) AND THE MSDS CONTAINS ALL THE INFORMATION REQUIRED BY THE CPR.

DOMESTIC SUBSTANCES LIST: LISTED

WHMIS CLASSIFICATION: NOT REGULATED

16. OTHER INFORMATION

ISSUE DATE: 15-OCT-2004

PREVIOUS ISSUE DATE: 3/27/2002

PRODUCT CODE: 1043226, 1043286, 1043331, 1043376, 1043401

REASON FOR REVISION:
COMPOSITION INFORMATION MODIFIED - SEE SECTION 2
COMBINED ALL GRADES INTO SINGLE MSDS.

PREVIOUS PRODUCT CODE: 3310052000

MSDS CODE: 721780

DISCLAIMER OF EXPRESSED AND IMPLIED WARRANTIES:
THE INFORMATION PRESENTED IN THIS MATERIAL SAFETY DATA SHEET IS BASED ON DATA BELIEVED TO BE ACCURATE AS OF THE DATE THIS MATERIAL SAFETY DATA SHEET WAS PREPARED. HOWEVER, NO WARRANTY OF MERCHANTABILITY, FITNESS FOR ANY PARTICULAR PURPOSE, OR ANY OTHER WARRANTY IS EXPRESSED OR IS TO BE IMPLIED REGARDING THE ACCURACY OR COMPLETENESS OF THE INFORMATION PROVIDED ABOVE, THE RESULTS TO BE OBTAINED FROM THE USE OF THIS INFORMATION OR THE PRODUCT, THE SAFETY OF THIS PRODUCT, OR THE HAZARDS RELATED TO ITS USE. NO RESPONSIBILITY IS ASSUMED FOR ANY DAMAGE OR INJURY RESULTING FROM ABNORMAL USE OR FROM ANY FAILURE TO ADHERE TO RECOMMENDED PRACTICES. THE INFORMATION PROVIDED ABOVE, AND THE PRODUCT, ARE FURNISHED ON THE CONDITION THAT THE PERSON RECEIVING THEM SHALL MAKE THEIR OWN DETERMINATION AS TO THE SUITABILITY OF THE PRODUCT FOR THEIR PARTICULAR PURPOSE AND ON THE CONDITION THAT THEY ASSUME THE RISK OF THEIR USE. IN ADDITION, NO AUTHORIZATION IS GIVEN NOR IMPLIED TO PRACTICE ANY PATENTED INVENTION WITHOUT A LICENSE.

ALCONOX
LIQUINOX **Revised: 07/14/2006**

MSDS Contents

MSDS_LIQUINOX_ENGLISH_ANSI

LIQUINOX

MSDS

SECTION 1: PRODUCT AND COMPANY IDENTIFICATION

CHEMICAL FAMILY: DETERGENT.

MANUFACTURER:
ALCONOX, INC.
30 GLENN ST.
SUITE 309
WHITE PLAINS, NY 10603.

MANUFACTURER EMERGENCY: 800-255-3924.

PHONE NUMBER: 813-248-0585 (OUTSIDE OF THE UNITED STATES).

SUPPLIER: SAME AS MANUFACTURER.

PRODUCT NAME: LIQUINOX

SECTION 2: INGREDIENT INFORMATION

C.A.S.	CONCENTRATION %	INGREDIENT NAME	T.L.V.	LD/50	LC/50
25155-30-0	10-30	SODIUM DODECYLBENZENE-SULFONATE	NOT AVAILABLE	438 MG/KG RAT ORAL 1330 MG/KG MOUSE ORAL	NOT AVAILABLE

SECTION 3: HAZARD IDENTIFICATION

ROUTE OF ENTRY: SKIN CONTACT, EYE CONTACT, INHALATION AND INGESTION.

EFFECTS OF ACUTE EXPOSURE:

EYE CONTACT: MAY CAUSE IRRITATION.

SKIN CONTACT: PROLONGED AND REPEATED CONTACT MAY CAUSE IRRITATION.

INHALATION: MAY CAUSE HEADACHE AND NAUSEA.

INGESTION:
MAY CAUSE VOMITING AND DIARRHEA.
MAY CAUSE GASTRIC DISTRESS.

EFFECTS OF CHRONIC EXPOSURE: SEE EFFECTS OF ACUTE EXPOSURE

SECTION 4: FIRST AID MEASURES

SKIN CONTACT:
REMOVE CONTAMINATED CLOTHING.
WASH THOROUGHLY WITH SOAP AND WATER.
SEEK MEDICAL ATTENTION IF IRRITATION PERSISTS.

EYE CONTACT:
CHECK FOR AND REMOVE CONTACT LENSES.

FLUSH EYES WITH CLEAR, RUNNING WATER FOR 15 MINUTES WHILE HOLDING EYELIDS
OPEN: IF IRRITATION PERSISTS, CONSULT A PHYSICIAN.

INHALATION:
REMOVE VICTIM TO FRESH AIR.
IF IRRITATION PERSISTS, SEEK MEDICAL ATTENTION.

INGESTION:
DO NOT INDUCE VOMITING, SEEK MEDICAL ATTENTION.
DILUTE WITH TWO GLASSES OF WATER.
NEVER GIVE ANYTHING BY MOUTH TO AN UNCONSCIOUS PERSON.

SECTION 5: FIRE FIGHTING MEASURES

FLAMMABILITY: NOT FLAMMABLE.

CONDITIONS OF FLAMMABILITY: SURROUNDING FIRE.

EXTINGUISHING MEDIA:
CARBON DIOXIDE, DRY CHEMICAL, FOAM.
WATER
WATER FOG.

SPECIAL PROCEDURES:
SELF-CONTAINED BREATHING APPARATUS REQUIRED.
FIREFIGHTERS SHOULD WEAR THE USUAL PROTECTIVE GEAR.
USE WATER SPRAY TO COOL FIRE EXPOSED CONTAINERS.

AUTO-IGNITION TEMPERATURE: NOT AVAILABLE.

FLASH POINT (DEG. C), METHOD: NONE

LOWER FLAMMABILITY LIMIT (% VOL): NOT APPLICABLE.
UPPER FLAMMABILITY LIMIT (% VOL): NOT APPLICABLE.

EXPLOSION DATA:
SENSITIVITY TO STATIC DISCHARGE: NOT AVAILABLE.
SENSITIVITY TO MECHANICAL IMPACT: NOT AVAILABLE.

HAZARDOUS COMBUSTION PRODUCTS:
OXIDES OF CARBON (COx).
HYDROCARBONS.

RATE OF BURNING: NOT AVAILABLE.

EXPLOSIVE POWER: CONTAINERS MAY RUPTURE IF EXPOSED TO HEAT OR FIRE.

SECTION 6: ACCIDENTAL RELEASE MEASURES

LEAK/SPILL:
CONTAIN THE SPILL.
PREVENT ENTRY INTO DRAINS, SEWERS, AND OTHER WATERWAYS.
WEAR APPROPRIATE PROTECTIVE EQUIPMENT.
SMALL AMOUNTS MAY BE FLUSHED TO SEWER WITH WATER.
SOAK UP WITH AN ABSORBENT MATERIAL.
PLACE IN APPROPRIATE CONTAINER FOR DISPOSAL.
NOTIFY THE APPROPRIATE AUTHORITIES AS REQUIRED.

SECTION 7: HANDLING AND STORAGE

HANDLING PROCEDURES AND EQUIPMENT:
PROTECT AGAINST PHYSICAL DAMAGE.
AVOID BREATHING VAPORS/MISTS.
WEAR PERSONAL PROTECTIVE EQUIPMENT APPROPRIATE TO TASK.
WASH THOROUGHLY AFTER HANDLING.
KEEP OUT OF REACH OF CHILDREN.
AVOID CONTACT WITH SKIN, EYES AND CLOTHING.
AVOID EXTREME TEMPERATURES.
LAUNDER CONTAMINATED CLOTHING PRIOR TO REUSE.

STORAGE REQUIREMENTS:
STORE AWAY FROM INCOMPATIBLE MATERIALS.
KEEP CONTAINERS CLOSED WHEN NOT IN USE.

SECTION 8: EXPOSURE CONTROLS / PERSONAL PROTECTION

PRECAUTIONARY MEASURES:

GLOVES/TYPE: WEAR APPROPRIATE GLOVES.

RESPIRATORY/TYPE: NONE REQUIRED UNDER NORMAL USE.

EYE/TYPE: SAFETY GLASSES RECOMMENDED.

FOOTWEAR/TYPE: SAFETY SHOES PER LOCAL REGULATIONS.

CLOTHING/TYPE: AS REQUIRED TO PREVENT SKIN CONTACT.

OTHER/TYPE:
EYE WASH FACILITY SHOULD BE IN CLOSE PROXIMITY.
EMERGENCY SHOWER SHOULD BE IN CLOSE PROXIMITY.

VENTILATION REQUIREMENTS: LOCAL EXHAUST AT POINTS OF EMISSION.

EXPOSURE LIMIT OF MATERIAL: NOT AVAILABLE.

SECTION 9: PHYSICAL AND CHEMICAL PROPERTIES

PHYSICAL STATE: LIQUID.

APPEARANCE & ODOR:
ODORLESS.
PALE YELLOW.

ODOR THRESHOLD (PPM): NOT AVAILABLE.

VAPOR PRESSURE (MMHg): @ 20 DEG. C (68 DEG. F). 17

VAPOR DENSITY (AIR=1): >1

VOLATILES (%) BY VOLUME: NOT AVAILABLE.

EVAPORATION RATE (BUTYL ACETATE = 1): <1.

BOILING POINT (DEG. C): 100 (212F)

FREEZING POINT (DEG. C): NOT AVAILABLE.

pH: 8.5

SPECIFIC GRAVITY @ 20 DEG. C (WATER = 1).: 1.083

SOLUBILITY IN WATER (%): COMPLETE.

COEFFICIENT OF WATER\OIL DIST.: NOT AVAILABLE

VOC: NONE

CHEMICAL FAMILY: DETERGENT.

SECTION 10: STABILITY AND REACTIVITY

CHEMICAL STABILITY:
PRODUCT IS STABLE UNDER NORMAL HANDLING AND STORAGE CONDITIONS.

CONDITIONS OF INSTABILITY: EXTREME TEMPERATURES.

HAZARDOUS POLYMERIZATION: WILL NOT OCCUR.

INCOMPATIBLE SUBSTANCES:
STRONG ACIDS.
STRONG OXIDIZING AGENTS.

HAZARDOUS DECOMPOSITION PRODUCTS: SEE HAZARDOUS COMBUSTION PRODUCTS.

SECTION 11: TOXICOLOGICAL INFORMATION

LD50 OF PRODUCT, SPECIES & ROUTE: >5000 MG/KG RAT ORAL.

LC50 OF PRODUCT, SPECIES & ROUTE: NOT AVAILABLE.

SENSITIZATION TO PRODUCT: NOT AVAILABLE.

CARCINOGENIC EFFECTS: NOT LISTED AS A CARCINOGEN.

REPRODUCTIVE EFFECTS: NOT AVAILABLE.

TERATOGENICITY: NOT AVAILABLE.

MUTAGENICITY: NOT AVAILABLE.

SYNERGISTIC MATERIALS: NOT AVAILABLE.

SECTION 12: ECOLOGICAL INFORMATION

ENVIRONMENTAL TOXICITY: NO DATA AT THIS TIME.

ENVIRONMENTAL FATE: NO DATA AT THIS TIME.

SECTION 13: DISPOSAL CONSIDERATIONS

WASTE DISPOSAL: IN ACCORDANCE WITH LOCAL AND FEDERAL REGULATIONS.

SECTION 14: TRANSPORT INFORMATION

D.O.T. CLASSIFICATION: NOT REGULATED.

SPECIAL SHIPPING INFORMATION: NOT REGULATED.

SECTION 15: REGULATORY INFORMATION

CANADIAN REGULATORY INFORMATION:

WHMIS CLASSIFICATION: NOT CONTROLLED.

DSL STATUS: NOT AVAILABLE.

USA REGULATORY INFORMATION:

SARA HAZARD CATEGORIES SECTIONS 311/312:
IMMEDIATE (ACUTE) HEALTH HAZARD: NO.
DELAYED (CHRONIC) HEALTH HAZARD: NO.
FIRE HAZARD: NO.

SUDDEN RELEASE OF PRESSURE: NO.
REACTIVE: NO.

SARA SECTION 313: NONE

TSCA INVENTORY:
ALL COMPONENTS OF THIS PRODUCT ARE LISTED ON THE TSCA INVENTORY.

NFPA:
HEALTH HAZARD 1
FLAMMABILITY 0
REACTIVITY 0

HMIS:
HEALTH HAZARD 1
FLAMMABILITY 0
PHYSICAL HAZARD 0
PPE A

SECTION 16: OTHER INFORMATION

SUPPLIER MSDS DATE: 2006/07/14

DATA PREPARED BY:
GLOBAL SAFETY MANAGEMENT
3340 PEACHTREE ROAD, #1800
ATLANTA, GA 30326

PHONE: 877-683-7460

FAX: (877) 683-7462

WEB: WWW.GLOBALSAFETYNET.COM

EMAIL: INFO@GLOBALSAFETYNET.COM.

GENERAL NOTE:
THIS MATERIAL SAFETY DATA SHEET WAS PREPARED FROM INFORMATION OBTAINED FROM VARIOUS SOURCES, INCLUDING PRODUCT SUPPLIERS AND THE CANADIAN CENTER FOR OCCUPATIONAL HEALTH AND SAFETY.

MS 01.40.01.01.06.1

AIR PRODUCTS AND CHEMICALS
ISOBUTYLENE Revised: 07/01/1999

MSDS Contents

MATERIAL SAFETY DATA SHEET

SECTION 1. PRODUCT IDENTIFICATION

PRODUCT NAME: ISOBUTYLENE

CHEMICAL NAME:
ISOBUTYLENE, UNSATURATED ALIPHATIC HYDROCARBON, ALKENE, LIQUEFIED PETROLEUM GAS (LPG), LP-GAS

FORMULA: (CH3)2C:CH3 OR C4H8

SYNONYMS: ISOBUTENE, 1,1-DIMETHYL ETHYLENE, 2-METHYL PROPYLENE

MANUFACTURER: AIR PRODUCTS AND CHEMICALS, INC.
7201 HAMILTON BOULEVARD
ALLENTOWN, PA 18195 - 1501

PRODUCT INFORMATION: (800) 752-1597

MSDS NUMBER: 1068

REVISION: 5

REVIEW DATE: JULY 1999

REVISION DATE: JULY 1999

SECTION 2. COMPOSITION / INFORMATION ON INGREDIENTS

ISOBUTYLENE IS PACKAGED AS PURE PRODUCT (>99%).

CAS NUMBER: 115-11-7

EXPOSURE LIMITS:
OSHA: NONE ESTABLISHED
ACGIH: SIMPLE ASPHYXIANT

NIOSH: NONE ESTABLISHED

ACGIH RECOMMENDS 1000 PPM TWA FOR LPG (LIQUEFIED PETROLEUM GAS).

SECTION 3. HAZARD IDENTIFICATION

EMERGENCY OVERVIEW:
ISOBUTYLENE IS A FLAMMABLE, COLORLESS LIQUEFIED COMPRESSED GAS PACKAGED IN CYLINDERS UNDER ITS OWN VAPOR PRESSURE OF 39.4 PSIA AT 70 DEG. F. IT POSES AN IMMEDIATE FIRE AND EXPLOSION HAZARD WHEN MIXED WITH AIR AT CONCENTRATIONS EXCEEDING 1.8%. HIGH CONCENTRATIONS THAT CAN CAUSE RAPID SUFFOCATION ARE ABOVE THE LOWER FLAMMABLE LIMIT AND MUST NOT BE ENTERED. ISOBUTYLENE IS HEAVIER THAN AIR AND MAY COLLECT IN LOW AREAS OR TRAVEL ALONG THE GROUND WHERE THERE MAY BE AN IGNITION SOURCE PRESENT. DIRECT CONTACT WITH LIQUID CAN CAUSE FROSTBITE.

EMERGENCY TELEPHONE NUMBERS:
(800) 523-9374 CONTINENTAL U.S., CANADA AND PUERTO RICO
(610) 481-7711 OTHER LOCATIONS

ACUTE POTENTIAL HEALTH EFFECTS:

ROUTES OF EXPOSURE:

EYE CONTACT:
CONTACT WITH LIQUID (OR RAPIDLY EXPANDING GAS) MAY CAUSE IRRITATION AND FROSTBITE.

INGESTION:
INGESTION IS NOT A LIKELY ROUTE OF EXPOSURE FOR ISOBUTYLENE. LIQUEFIED GAS MAY CAUSE FREEZE BURNS TO THE MUCOUS MEMBRANES AND POSSIBLE CENTRAL NERVOUS SYSTEM DEPRESSION.

INHALATION:
ISOBUTYLENE IS A CENTRAL NERVOUS SYSTEM (CNS) DEPRESSANT AND A MILD ANESTHETIC. IT CAN ALSO REDUCE THE AMOUNT OF OXYGEN IN THE AIR NECESSARY TO SUPPORT LIFE. EXPOSURE TO OXYGEN-DEFICIENT ATMOSPHERES (LESS THAN 19.5%) MAY PRODUCE DIZZINESS, NAUSEA, VOMITING, LOSS OF CONSCIOUSNESS, AND DEATH. AT VERY LOW OXYGEN CONCENTRATIONS (LESS THAN 12%) UNCONSCIOUSNESS AND DEATH MAY OCCUR WITHOUT WARNING. IT SHOULD BE NOTED THAT BEFORE SUFFOCATION COULD OCCUR, THE LOWER FLAMMABLE LIMIT FOR ISOBUTYLENE IN AIR WILL BE EXCEEDED; CAUSING BOTH AN OXYGEN DEFICIENT AND AN EXPLOSIVE ATMOSPHERE.

SKIN CONTACT:
CONTACT WITH LIQUID (OR RAPIDLY EXPANDING GAS) CAN CAUSE IRRITATION AND FROSTBITE.

POTENTIAL HEALTH EFFECTS OF REPEATED EXPOSURE:

ROUTE OF ENTRY: SKIN CONTACT

SYMPTOMS: REPEATED OR PROLONGED CONTACT MAY CAUSE DERMATITIS.

TARGET ORGANS: SKIN

MEDICAL CONDITIONS AGGRAVATED BY OVEREXPOSURE: MAY AGGRAVATE DERMATITIS.

CARCINOGENICITY:
ISOBUTYLENE IS NOT LISTED AS A CARCINOGEN OR POTENTIAL CARCINOGEN BY NTP, IARC, OR OSHA SUBPART Z.

SECTION 4. FIRST AID MEASURES

EYE CONTACT:
FLUSH EYES WITH PLENTY OF LUKEWARM WATER FOR SEVERAL MINUTES. SEEK MEDICAL ATTENTION IMMEDIATELY.

INGESTION:
WASH OUT MOUTH WITH LUKEWARM WATER PROVIDED PERSON IS CONSCIOUS. OBTAIN PROMPT MEDICAL ATTENTION.

INHALATION:
REMOVE PERSON TO FRESH AIR. IF NOT BREATHING, ADMINISTER ARTIFICIAL RESPIRATION. IF BREATHING IS DIFFICULT, ADMINISTER OXYGEN. OBTAIN PROMPT MEDICAL ATTENTION.

SKIN CONTACT:
IF LIQUID ISOBUTYLENE COMES IN CONTACT WITH SKIN, REMOVE CONTAMINATED CLOTHING AND FLUSH WITH PLENTY OF LUKEWARM WATER FOR SEVERAL MINUTES. SEEK MEDICAL ATTENTION IMMEDIATELY.

NOTES TO PHYSICIAN:
TREATMENT OF OVEREXPOSURE SHOULD BE DIRECTED AT THE CONTROL OF SYMPTOMS AND THE CLINICAL CONDITION.

SECTION 5. FIRE FIGHTING MEASURES

FLASH POINT: NOT APPLICABLE

AUTOIGNITION: 869 DEG. F (465 DEG. C)

FLAMMABLE RANGE: 1.8% - 9.6%

EXTINGUISHING MEDIA: CARBON DIOXIDE, DRY CHEMICAL, WATER.

SPECIAL FIRE FIGHTING INSTRUCTIONS:
EVACUATE ALL PERSONNEL FROM AREA. IF POSSIBLE, WITHOUT RISK, SHUT OFF SOURCE OF ISOBUTYLENE, THEN FIGHT FIRE ACCORDING TO TYPES OF MATERIALS BURNING. EXTINGUISH FIRE ONLY IF GAS FLOW CAN BE STOPPED. THIS WILL AVOID POSSIBLE ACCUMULATION AND RE-IGNITION OF A FLAMMABLE GAS MIXTURE. KEEP ADJACENT CYLINDERS COOL BY SPRAYING WITH LARGE AMOUNTS OF WATER UNTIL THE FIRE BURNS ITSELF OUT. SELF-CONTAINED BREATHING APPARATUS (SCBA) MAY BE REQUIRED.

UNUSUAL FIRE AND EXPLOSION HAZARDS:
MOST CYLINDERS ARE DESIGNED TO VENT CONTENTS WHEN EXPOSED TO ELEVATED TEMPERATURES. PRESSURE IN A CYLINDER CAN BUILD UP DUE TO HEAT AND IT MAY RUPTURE IF PRESSURE RELIEF DEVICES SHOULD FAIL TO FUNCTION. ISOBUTYLENE VAPORS ARE HEAVIER THAN AIR AND MAY TRAVEL TO A SOURCE OF IGNITION AND FLASH BACK.

HAZARDOUS COMBUSTION PRODUCTS: CARBON MONOXIDE

SECTION 6. ACCIDENTAL RELEASE MEASURES

STEPS TO BE TAKEN IF MATERIAL IS RELEASED OR SPILLED:
EVACUATE IMMEDIATE AREA. ELIMINATE ANY POSSIBLE SOURCES OF IGNITION, AND PROVIDE MAXIMUM EXPLOSION-PROOF VENTILATION. USE A FLAMMABLE GAS METER (EXPLOSIMETER) CALIBRATED FOR ISOBUTYLENE TO MONITOR CONCENTRATION. NEVER ENTER AN AREA WHERE THE ISOBUTYLENE CONCENTRATION IS GREATER THAN 0.36% (WHICH IS 20% OF THE LOWER

FLAMMABLE LIMIT). AN IMMEDIATE FIRE AND EXPLOSION HAZARD EXISTS WHEN ATMOSPHERIC ISOBUTYLENE CONCENTRATIONS EXCEED 1.8%. USE APPROPRIATE PROTECTIVE EQUIPMENT (SCBA AND FIRE RESISTANT SUIT). SHUT OFF SOURCE OF LEAK IF POSSIBLE. ISOLATE ANY LEAKING CYLINDER. IF LEAK IS FROM CONTAINER, PRESSURE RELIEF DEVICE OR ITS VALVE, CONTACT YOUR SUPPLIER. IF THE LEAK IS IN THE USER'S SYSTEM, CLOSE THE CYLINDER VALVE, SAFELY VENT THE PRESSURE, AND PURGE WITH AN INERT GAS BEFORE ATTEMPTING REPAIRS.

SECTION 7. STORAGE AND HANDLING

STORAGE:
STORE CYLINDERS IN A WELL-VENTILATED, SECURE AREA, PROTECTED FROM THE WEATHER. CYLINDERS SHOULD BE STORED UPRIGHT WITH VALVE OUTLET SEALS AND VALVE PROTECTION CAPS IN PLACE. THERE SHOULD BE NO SOURCES OF IGNITION. ALL ELECTRICAL EQUIPMENT SHOULD BE EXPLOSION-PROOF IN THE STORAGE AREAS. STORAGE AREAS MUST MEET NATIONAL ELECTRICAL CODES FOR CLASS 1 HAZARDOUS AREAS. FLAMMABLE STORAGE AREAS MUST BE SEPARATED FROM OXYGEN AND OTHER OXIDIZERS BY A MINIMUM DISTANCE OF 20 FT. OR BY A BARRIER OF NON-COMBUSTIBLE MATERIAL AT LEAST 5 FT. HIGH HAVING A FIRE RESISTANCE RATING OF AT LEAST 1/2 HOUR. POST "NO SMOKING OR OPEN FLAMES" SIGNS IN THE STORAGE OR USE AREAS. DO NOT ALLOW STORAGE TEMPERATURE TO EXCEED 125 DEG. F (52 DEG. C). STORAGE SHOULD BE AWAY FROM HEAVILY TRAVELED AREAS AND EMERGENCY EXITS. FULL AND EMPTY CYLINDERS SHOULD BE SEGREGATED. USE A FIRST-IN FIRST-OUT INVENTORY SYSTEM TO PREVENT FULL CONTAINERS FROM BEING STORED FOR LONG PERIODS OF TIME.

HANDLING:
DO NOT DRAG, ROLL, SLIDE OR DROP CYLINDER. USE A SUITABLE HAND TRUCK DESIGNED FOR CYLINDER MOVEMENT. NEVER ATTEMPT TO LIFT A CYLINDER BY ITS CAP. SECURE CYLINDERS AT ALL TIMES WHILE IN USE. USE A SEPARATE CONTROL VALVE TO SAFELY DISCHARGE GAS FROM CYLINDER. USE A CHECK VALVE TO PREVENT REVERSE FLOW INTO CYLINDER. NEVER APPLY FLAME OR LOCALIZED HEAT DIRECTLY TO ANY PART OF THE CYLINDER. DO NOT ALLOW ANY PART OF THE CYLINDER TO EXCEED 125 DEG. F (52 DEG. C). ONCE CYLINDER HAS BEEN CONNECTED TO PROPERLY PURGED AND INERTED PROCESS, OPEN CYLINDER VALVE SLOWLY AND CAREFULLY. IF USER EXPERIENCES ANY DIFFICULTY OPERATING CYLINDER VALVE, DISCONTINUE USE AND CONTACT SUPPLIER. NEVER INSERT AN OBJECT (E.G., WRENCH, SCREWDRIVER, ETC.) INTO VALVE CAP OPENINGS. DOING SO MAY DAMAGE VALVE CAUSING A LEAK TO OCCUR. USE AN ADJUSTABLE STRAP-WRENCH TO REMOVE OVER-TIGHT OR RUSTED CAPS. ALL PIPED SYSTEMS AND ASSOCIATED EQUIPMENT MUST BE GROUNDED. ELECTRICAL EQUIPMENT SHOULD BE NON-SPARKING OR EXPLOSION-PROOF.

SPECIAL PRECAUTIONS:
ALWAYS STORE AND HANDLE COMPRESSED GAS CYLINDERS IN ACCORDANCE WITH COMPRESSED GAS ASSOCIATION, INC. (TELEPHONE 703-412-0900) PAMPHLET CGA P-1, SAFE HANDLING OF COMPRESSED GASES IN CONTAINERS. LOCAL REGULATIONS MAY REQUIRE SPECIFIC EQUIPMENT FOR STORAGE OR USE.

SECTION 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

ENGINEERING CONTROLS:

VENTILATION:
PROVIDE ADEQUATE NATURAL OR EXPLOSION-PROOF VENTILATION TO PREVENT ACCUMULATION OF GAS CONCENTRATIONS ABOVE 0.36% (20% OF LEL).

RESPIRATORY PROTECTION:
EMERGENCY USE: DO NOT ENTER AREAS WHERE ISOBUTYLENE CONCENTRATION IS GREATER THAN 0.36% (20% OF LEL). EXPOSURE TO CONCENTRATIONS BELOW THIS CONCENTRATION DO NOT REQUIRE RESPIRATORY PROTECTION.

EYE PROTECTION:
SAFETY GLASSES FOR HANDLING CYLINDERS. CHEMICAL GOGGLES WITH FULL FACESHIELD FOR CONNECTING OR DISCONNECTING CYLINDERS.

SKIN PROTECTION:
LEATHER GLOVES FOR HANDLING CYLINDERS. NEOPRENE GLOVES DURING USE OF PRODUCT. FIRE RESISTANT SUIT AND GLOVES IN EMERGENCY SITUATIONS.

OTHER PROTECTIVE EQUIPMENT:
SAFETY SHOES ARE RECOMMENDED WHEN HANDLING CYLINDERS.

SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

APPEARANCE, ODOR AND STATE:
AT ROOM TEMPERATURE AND ATMOSPHERIC PRESSURE, ISOBUTYLENE IS A COLORLESS, FLAMMABLE GAS WITH A MILD ODOR. IT IS SHIPPED AS A LIQUEFIED GAS UNDER ITS OWN VAPOR PRESSURE.

MOLECULAR WEIGHT: 56.1

BOILING POINT (1 ATM): 20.1 DEG. F (-6.6 DEG. C)

SPECIFIC GRAVITY (AIR = 1): 2.0

FREEZING POINT / MELTING POINT: -220.1 DEG. F (-140.1 DEG. C)

VAPOR PRESSURE (AT 70 DEG. F (21.1 DEG. C)): 39.4 PSIA

GAS DENSITY (AT 70 DEG. F (21.1 DEG. C) AND 1 ATM): 0.15 LB/FT3

SOLUBILITY IN WATER: NEGLIGIBLE

LIQUID DENSITY (AT 70 DEG. F (21.1 DEG. C), SAT.): 37.56 LB/FT3

SECTION 10. STABILITY AND REACTIVITY

CHEMICAL STABILITY: STABLE

CONDITIONS TO AVOID:
CYLINDERS SHOULD NOT BE EXPOSED TO TEMPERATURES IN EXCESS OF 125 DEG. F (52 DEG, C).

INCOMPATIBILITY (MATERIALS TO AVOID): OXYGEN, HALOGENS AND OXIDIZERS

REACTIVITY:
A) HAZARDOUS DECOMPOSITION PRODUCTS: NONE
B) HAZARDOUS POLYMERIZATION: MAY OCCUR AT HIGH TEMPERATURES OR PRESSURES OR IN THE PRESENCE OF A CATALYST.

SECTION 11. TOXICOLOGICAL INFORMATION

LC50 (INHALATION): NOT APPLICABLE. SIMPLE ASPHYXIANT.

LD50 (ORAL): NOT APPLICABLE

LD50 (DERMAL): NOT APPLICABLE

SKIN CORROSIVITY: ISOBUTYLENE IS NOT CORROSIVE TO THE SKIN.

ADDITIONAL NOTES:
ISOBUTYLENE IS A CNS DEPRESSANT AND ACTS AS A SIMPLE ASPHYXIANT AND MILD ANESTHETIC.

SECTION 12. ECOLOGICAL INFORMATION

AQUATIC TOXICITY: NOT DETERMINED

MOBILITY: NOT DETERMINED

PERSISTENCE AND BIODEGRADABILITY: NOT DETERMINED

POTENTIAL TO BIOACCUMULATE: NOT DETERMINED

REMARKS:
THIS PRODUCT DOES NOT CONTAIN ANY CLASS I OR CLASS II OZONE DEPLETING CHEMICALS.

SECTION 13. DISPOSAL CONSIDERATIONS

UNUSED PRODUCT / EMPTY CYLINDER:
RETURN CYLINDER AND UNUSED PRODUCT TO SUPPLIER. DO NOT ATTEMPT TO DISPOSE OF UNUSED PRODUCT.

DISPOSAL:
RESIDUAL PRODUCT IN THE SYSTEM MAY BE BURNED IF A SUITABLE BURNING UNIT (FLAIR INCINERATOR) IS AVAILABLE ON SITE. THIS SHALL BE DONE IN ACCORDANCE WITH FEDERAL, STATE, AND LOCAL REGULATIONS. WASTES CONTAINING THIS MATERIAL MAY BE CLASSIFIED BY EPA AS HAZARDOUS WASTE BY CHARACTERISTIC (I.E., IGNITABILITY, CORROSIVITY, TOXICITY, REACTIVITY). WASTE STREAMS MUST BE CHARACTERIZED BY THE USER TO MEET FEDERAL, STATE, AND LOCAL REQUIREMENTS.

SECTION 14. TRANSPORT INFORMATION

DOT SHIPPING NAME: ISOBUTYLENE

HAZARD CLASS: 2.1

IDENTIFICATION NUMBER: UN1055

SHIPPING LABEL(S): FLAMMABLE GAS

PLACARD (WHEN REQUIRED): FLAMMABLE GAS

SPECIAL SHIPPING INFORMATION:
CYLINDERS SHOULD BE TRANSPORTED IN A SECURE UPRIGHT POSITION IN A WELL-VENTILATED TRUCK. NEVER TRANSPORT IN PASSENGER COMPARTMENT OF A VEHICLE. ENSURE CYLINDER VALVE IS PROPERLY CLOSED, VALVE OUTLET CAP HAS BEEN REINSTALLED, AND VALVE PROTECTION CAP IS SECURED BEFORE SHIPPING CYLINDER.

CAUTION:
COMPRESSED GAS CYLINDERS SHALL NOT BE REFILLED EXCEPT BY QUALIFIED PRODUCERS OF COMPRESSED GASES. SHIPMENT OF A COMPRESSED GAS CYLINDER WHICH HAS NOT BEEN FILLED BY THE OWNER OR WITH THE OWNER'S WRITTEN CONSENT IS A VIOLATION OF

FEDERAL LAW (49 CFR 173.301).

NORTH AMERICAN EMERGENCY RESPONSE GUIDEBOOK NUMBER (NAERG #): 115

SECTION 15. REGULATORY INFORMATION

U.S. FEDERAL REGULATIONS:

EPA - ENVIRONMENTAL PROTECTION AGENCY
CERCLA: COMPREHENSIVE ENVIRONMENTAL RESPONSE, COMPENSATION, AND LIABILITY ACT OF 1980 (40 CFR PARTS 117 AND 302)
 REPORTABLE QUANTITY (RQ): NONE

SARA TITLE III: SUPERFUND AMENDMENT AND REAUTHORIZATION ACT

SECTIONS 302/304: EMERGENCY PLANNING AND NOTIFICATION (40 CFR PART 355)
 EXTREMELY HAZARDOUS SUBSTANCES: ISOBUTYLENE IS NOT LISTED.
 THRESHOLD PLANNING QUANTITY (TPQ): NONE
 REPORTABLE QUANTITY (RQ): NONE

SECTIONS 311/312: HAZARDOUS CHEMICAL REPORTING (40 CFR PART 370)
 IMMEDIATE HEALTH: YES PRESSURE: YES
 DELAYED HEALTH: NO REACTIVITY: NO
 FIRE: YES

SECTION 313: TOXIC CHEMICAL RELEASE REPORTING (40 CFR PART 372)
ISOBUTYLENE DOES NOT REQUIRE REPORTING UNDER SECTION 313.

CLEAN AIR ACT:
SECTION 112 (R): RISK MANAGEMENT PROGRAMS FOR CHEMICAL ACCIDENTAL RELEASE (40 CFR PART 68)
 ISOBUTYLENE IS LISTED AS A REGULATED SUBSTANCE.
 THRESHOLD PLANNING QUANTITY (TPQ): 10,000 LBS

TSCA: TOXIC SUBSTANCE CONTROL ACT
ISOBUTYLENE IS LISTED ON THE TSCA INVENTORY.

OSHA - OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION:
29 CFR PART 1910.119: PROCESS SAFETY MANAGEMENT OF HIGHLY HAZARDOUS CHEMICALS
ISOBUTYLENE IS NOT LISTED IN APPENDIX A AS A HIGHLY HAZARDOUS CHEMICAL. HOWEVER, ANY PROCESS THAT INVOLVES A FLAMMABLE GAS ON SITE IN ONE LOCATION, IN QUANTITIES OF 10,000 POUNDS (4,553 KG) OR GREATER IS COVERED UNDER THIS REGULATION UNLESS IT IS USED AS FUEL.

STATE REGULATIONS:

CALIFORNIA:
PROPOSITION 65: THIS PRODUCT IS NOT A LISTED SUBSTANCE WHICH THE STATE OF CALIFORNIA REQUIRES WARNING UNDER THIS STATUTE.

SECTION 16. OTHER INFORMATION

NFPA RATINGS:
HEALTH: = 1
FLAMMABILITY: = 4
REACTIVITY: = 0
SPECIAL:

HMIS RATINGS:
HEALTH: = 0
FLAMMABILITY: = 4
REACTIVITY: = 0

ALAMO CEMENT
CEMENT, PORTLAND **Revised: 03/04/1991**

MSDS Contents

U.S. DEPARTMENT OF LABOR
OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION

OMB NO 1218-0074
EXPIRATION DATE 05/31/86

MATERIAL SAFETY DATA SHEET

REQUIRED UNDER USDL SAFETY AND HEALTH REGULATIONS FOR SHIPYARD EMPLOYMENT
(29 CFR 1915)

3/4/91

SECTION I

MANUFACTURER'S NAME: ALAMO CEMENT

ADDRESS (NUMBER, STREET, CITY, STATE AND ZIP CODE):
P.O. BOX 34807
SAN ANTONIO, TX 78233

EMERGENCY TELEPHONE NO.

CHEMICAL NAME AND SYNONYMS: CEMENT

TRADE NAME AND SYNONYMS: CEMENT, PORTLAND

CHEMICAL FAMILY: CEMENT, CALCIUM

FORMULA: SILICATES & ALUMINATES

SECTION II - HAZARDOUS INGREDIENTS

PAINTS, PRESERVATIVES AND SOLVENTS	%	TLV (UNITS)
PIGMENTS	N/A	
CATALYST	N/A	
VEHICLE	N/A	
SOLVENTS	N/A	
ADDITIVES	N/A	
OTHERS	N/A	

ALLOYS AND METALLIC COATINGS	%	TLV (UNITS)
BASE METAL	N/A	

ALLOYS	N/A
METALLIC COATINGS	N/A
FILLER METAL PLUS COATING OR CORE FLUX	N/A
OTHERS	N/A

HAZARDOUS MIXTURES OF OTHER LIQUIDS, SOLIDS, OR GASES

	%	TLV (UNITS)
N/A		

SECTION III - PHYSICAL DATA

BOILING POINT (DEG. F):	N/A
SPECIFIC GRAVITY (H2O = 1):	3.17
VAPOR PRESSURE (MM HG.):	N/A
PERCENT VOLATILE BY VOLUME (%):	0.0
VAPOR DENSITY (AIR = 1):	N/A
EVAPORATION RATE (= 1):	0.0
SOLUBILITY IN WATER:	50% - 80%
APPEARANCE AND ODOR:	GREY, NO ODOR

SECTION IV - FIRE AND EXPLOSION HAZARD DATA

FLASHPOINT (METHOD USED): N/A

FLAMMABLE LIMITS: LEL: UEL:

EXTINGUISHING MEDIA: N/A

SPECIAL FIRE FIGHTING PROCEDURES: N/A

UNUSUAL FIRE AND EXPLOSION HAZARDS: NONE

SECTION V - HEALTH HAZARD DATA

THRESHOLD LIMIT VALUE:

EFFECTS OF OVEREXPOSURE: MAY CAUSE SLIGHT SKIN IRRITATION OR DRYING OUT AS A RESULT OF PROLONGED OVEREXPOSURE.

EMERGENCY FIRST AID PROCEDURES: WASH WITH EYE WASH IF DUST GETS IN EYE, SEE PHYSICIAN. WASH HANDS AND SKIN WITH SOAP AND WATER, USE NORMAL HAND MOISTURIZING CREAM IF SKIN IS DRY OR CHAPPED.

SECTION VI - REACTIVITY DATA

STABILITY:
- UNSTABLE ( )
- STABLE (X)

CONDITIONS TO AVOID:

INCOMPATIBILITY (MATERIALS TO AVOID):

HAZARDOUS DECOMPOSITION PRODUCTS: NONE

HAZARDOUS POLYMERIZATION:
MAY OCCUR ( )
WILL NOT OCCUR (X)

CONDITIONS TO AVOID:

SECTION VII - SPILL OR LEAK PROCEDURES

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED: SHOVEL OR SWEEP UP AND RE-USE, IF POSSIBLE; OTHERWISE, DISPOSE OF AS AN AGGREGATE AND AVOID WATER DUE TO CEMENT'S NATURE OF HARDENING IN CONTACT WITH WATER.

WASTE DISPOSAL METHOD: SEE ABOVE

SECTION VIII - SPECIAL PROTECTION INFORMATION

RESPIRATORY PROTECTION (SPECIFY TYPE): OSHA-MSHA APPROVED SILICA DUST RESPIRATOR

VENTILATION: SUBJECT TO LOCAL CODES
LOCAL EXHAUST:
MECHANICAL (GENERAL):
SPECIAL:
OTHER:

PROTECTIVE GLOVES: COTTON OR NORMAL RUBBER GLOVES

EYE PROTECTION: STANDARD SAFETY GLASSES

OTHER PROTECTIVE EQUIPMENT: USE CLOTHING AS NECESSARY TO AVOID SKIN CONTACT

SECTION IX - SPECIAL PRECAUTIONS

PRECAUTIONS TO BE TAKEN IN HANDLING AND STORING: PROTECT FROM MOISTURE

OTHER PRECAUTIONS:

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Material Safety Data Sheet Collection
Genium group inc.
1171 RiverFront Center, Amsterdam, NY 12010
(518) 842-4111

Potassium Permanganate
POT7020

Issue Date: 2006-06

Section 1 - Chemical Product and Company Identification 61

Material Name: Potassium Permanganate **CAS Number:** 7722-64-7
Chemical Formula: $KMnO_4$
Structural Chemical Formula: $KMnO_4$
EINECS Number: 231-760-3
ACX Number: X1000083-0
Synonyms: Potassium Permanganate; POTASSIUM PERMANGANATE; ALGAE-K; ARGUCIDE; C.I. 77755; CAIROX; CHAMELEON MINERAL; CHLORISOL; CONDY'S CRYSTALS; DIVERSEY DIVERSOL CX WITH ARODYNE; DIVERSEY DIVERSOL CXU; EPA PESTICIDE CHEMICAL CODE 068501; HILCO #88; ICC 237 DISINFECTANT,SANITIZER,DESTAINER,AND DEODORIZER; KALIUMPERMANGANAAT; KALIUMPERMANGANAT; PERMANGANATE DE POTASSIUM; PERMANGANATE OF POTASH; PERMANGANATO POTASICO; PERMANGANIC ACID (HMNO4),POTASSIUM SALT; PERMANGANIC ACID POTASSIUM SALT; POTASSIO (PERMANGANATO DI); POTASSIUM (PERMANGANATE DE); PURPLE SALT; SOLO SAN SOO; WALKO TABLETS
General Use: Bleaching resins, waxes, fats, oils, straw, cotton, silk and other fibers and chamois skins; dyeing wood brown; printing fabrics; washing carbon dioxide in manufacture of mineral waters; photography; tanning leathers; purifying water; with formaldehyde solution to expel formaldehyde gas for disinfecting; as an important reagent in analytical and synthetic organic chemistry.

Section 2 - Composition / Information on Ingredients

Name	CAS	%
potassium permanganate	7722-64-7	>99

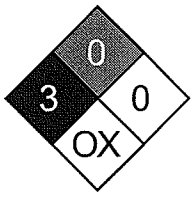
OSHA PEL
Ceiling: 5 mg/m^3; as Mn.

ACGIH TLV
TWA: 0.2 mg/m^3. *Manganese - Elemental & inorganic cmpds (as Mn)*

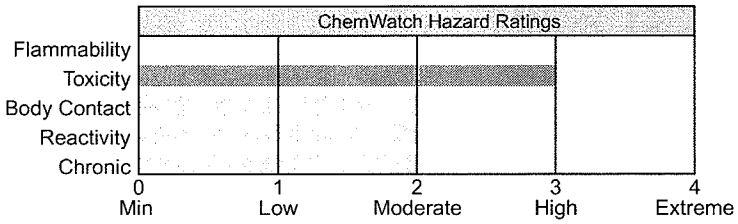
NIOSH REL
TWA: 1 mg/m^3; STEL: 3 mg/m^3; as Mn inorganic.

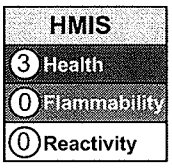
DFG (Germany) MAK
TWA: 0.5 mg/m^3; PEAK: 5 mg/m^3; as Mn inorganic, ceiling, measured as inhalable fraction of the aerosol, substances with systemic effects, onset of effect greater than 2 hours, half-life greater than shift length, strongly cumulative.

Section 3 - Hazards Identification



Fire Diamond





ANSI Signal Word
Danger!


Corrosive

☆☆☆☆☆ Emergency Overview ☆☆☆☆☆
Odorless, dark purple crystals. Corrosive. Other Acute Effects: respiratory tract irritation, blood/kidney damage. Strong oxidizer.

Potential Health Effects

Target Organs: respiratory system, eyes, skin, gastrointestinal (GI) tract
Primary Entry Routes: ingestion, inhalation

Acute Effects

Inhalation: The material is moderately discomforting to the upper respiratory tract and may be harmful if inhaled.
Manganese fume is toxic and produces nervous system effects characterized by tiredness. Acute poisoning is rare although acute inflammation of the lungs may occur. A chemical pneumonia may also result from frequent exposure.
Inhalation of freshly formed metal oxide particles sized below 1.5 microns and generally between 0.02 to 0.05 microns may result in "metal fume fever". Symptoms may be delayed for up to 12 hours and begin with the sudden onset of thirst, and a sweet, metallic or foul taste in the mouth.
Other symptoms include upper respiratory tract irritation accompanied by coughing and a dryness of the mucous membranes, lassitude and a generalized feeling of malaise. Mild to severe headache, nausea, occasional vomiting, fever or chills, exaggerated mental activity, profuse sweating, diarrhea, excessive urination and prostration may also occur. Tolerance to the fumes develops rapidly, but is quickly lost. All symptoms usually subside within 24-36 hours following removal from exposure.
Persons with impaired respiratory function, airway diseases, and conditions such as emphysema or chronic bronchitis, may incur further disability if excessive concentrations of particulate are inhaled.

Eye: The material is corrosive to the eyes and is capable of causing pain and severe conjunctivitis.
Corneal injury may develop, with possible permanent impairment of vision, if not promptly and adequately treated.

Skin: The material is highly discomforting to the skin and is capable of causing skin reactions which may lead to dermatitis.
Open cuts, abraded or irritated skin should not be exposed to this material.
The material may accentuate any pre-existing skin condition.

Ingestion: The material is corrosive to the gastrointestinal tract, may cause severe mucous membrane damage and may be harmful if swallowed.
Poisonings rarely occur after oral administration of manganese salts as they are generally poorly absorbed from the gut (generally less than 4%) and seems to be dependent, in part, on levels of dietary iron and may increase following the consumption of alcohol. A side-effect of oral manganese administration is an increase in losses of calcium in the feces and a subsequent lowering of calcium blood levels. Absorbed manganese tends to be slowly excreted in the bile.
Divalent manganese appears to be 2.5-3 times more toxic than the trivalent form.
Ingestion may cause brown discoloration and burns to the mouth with edema of the glottis, nausea, vomiting and diarrhea.
Over-exposure may result in anemia, swelling of the throat with possibility of suffocation and kidney damage.

Carcinogenicity: NTP - Not listed; IARC - Not listed; OSHA - Not listed; NIOSH - Not listed; ACGIH - Not listed; EPA - Class D, Not classifiable as to human carcinogenicity; MAK - Not listed.

Chronic Effects: Manganese is an essential trace element in all living organisms with the level of tissue manganese remaining remarkably constant throughout life.
Systemic poisoning may result from inhalation or chronic ingestion of manganese containing substances. Chronic exposure has been associated with two major effects; bronchitis/pneumonitis following inhalation of manganese dusts and "manganism", a neuropsychiatric disorder that may also arise from inhalation exposures.
Chronic exposure to low levels may result in the accumulation of toxic concentrations in critical organs. The brain in particular appears to sustain cellular damage to the ganglion. Symptoms appear before any pathology is evident and may include a mask-like facial expression, spastic gait, tremors, slurred speech, sometimes dystonia (disordered muscle tone), fatigue, anorexia, asthenia (loss of strength and energy), apathy and the inability to concentrate. Insomnia may be an early finding.
Rat studies indicate the gradual accumulation of brain manganese to produce lesions mimicking those found in Parkinsonism.
Long term exposures to manganese compounds may effect the central nervous system. Symptoms include muscular weakness and tremors similar to Parkinson's disease. Behavioral changes and handwriting differences may also appear. Other symptoms include sleepiness, weakness in the legs, muscle twitchings and tremors, nocturnal leg cramps, and a typical Parkinsonian slapping gait may appear. These systems may stimulate progressive bulbar paralysis, multiple sclerosis, amyotrophic lateral sclerosis and progressive lenticular degeneration. The blood may show increased erythrocyte formation and increased osmotic fragility.
No known cases of chronic manganese poisoning by potassium permanganate have been reported.

Section 4 - First Aid Measures

Inhalation: Remove to fresh air.
Lay patient down. Keep warm and rested.
If breathing is shallow or has stopped, ensure clear airway and apply resuscitation. Transport to hospital or doctor.

Eye Contact: Immediately hold the eyes open and flush continuously for at least 15 minutes with fresh running water. Ensure irrigation under eyelids by occasionally lifting the upper and lower lids.
Transport to hospital or doctor without delay. Removal of contact lenses after an eye injury should only be undertaken by skilled personnel.

Skin Contact: Immediately remove all contaminated clothing, including footwear (after rinsing with water).
Wash affected areas thoroughly with water (and soap if available).

Seek medical attention in event of irritation.

Ingestion: Contact a Poison Control Center.

Do NOT induce vomiting. Give a glass of water.

After first aid, get appropriate in-plant, paramedic, or community medical support.

Note to Physicians: Both dermal and oral toxicity of manganese salts is low because of limited solubility of manganese. No known permanent pulmonary sequelae develop after acute manganese exposure.

Treatment is supportive.

In clinical trials with miners exposed to manganese-containing dusts, L-dopa relieved extrapyramidal symptoms of both hypokinetic and dystonic patients.

For short periods of time symptoms could also be controlled with scopolamine and amphetamine. BAL and calcium EDTA prove ineffective.

For potassium intoxications:

1.Hyperkalemia, in patients with abnormal renal function, results from reduced renal excretion following intoxication.

2.The presence of electrocardiographic evidence of hyperkalemia or serum potassium levels exceeding 7.5 mE/L indicates a medical emergency requiring an intravenous line and constant cardiac monitoring.

3.The intravenous ingestion of 5-10 mL of 10% calcium gluconate in adults, over a 2 minute period, antagonizes the cardiac and neuromuscular effects.

The duration of action is approximately 1 hour.

Section 5 - Fire-Fighting Measures

Flash Point: Nonflammable

Autoignition Temperature: Not applicable

LEL: Not applicable

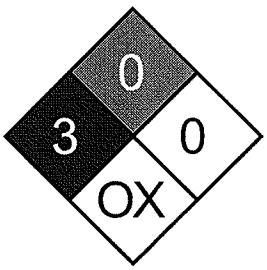
UEL: Not applicable

Extinguishing Media: Jets of water; water spray or fog; foam; dry chemical powder.

BCF (where regulations permit).

Carbon dioxide.

See DOT ERG



Fire Diamond

General Fire Hazards/Hazardous Combustion Products: Will not burn but increases intensity of fire.

Heating may cause expansion or decomposition leading to violent rupture of containers.

Heat affected containers remain hazardous.

Contact with combustibles such as wood, paper, oil or finely divided metal may cause ignition, combustion or violent decomposition.

May emit irritating, poisonous or corrosive fumes.

May cause spontaneous ignition if mixed with glycol, or anti-freeze compounds.

Reacts violently when exposed to sulfuric acid or hydrogens peroxide.

May form explosive compounds with ammonium compounds.

Decomposes on heating and produces oxygen, oxides of manganese and potassium. Reacts with concentrated acids to produce oxygen.

Reacts with hydrochloric acid to produce chlorine.

Fire Incompatibility: Oxidizing agents as a class are not necessarily combustible themselves, but can increase the risk and intensity of fire in many other substances.

Reacts vigorously with metallic powders, ammonium compounds, phosphorous, carbon, arsenates, ethylene glycol, sulfur, hydrazine, metal hydrides, peroxides, alcohol and other combustible materials.

Avoid reaction with acids.

Potassium permanganate is readily decomposed by many reducing substances such as ferrous or mercury salts, iodides, bromides, oxalates, etc., especially in the presence of an acid.

Fire-Fighting Instructions: Contact fire department and tell them location and nature of hazard.

Wear full body protective clothing with breathing apparatus. Prevent, by any means available, spillage from entering drains or waterways.

Fight fire from a safe distance, with adequate cover.

Extinguishers should be used only by trained personnel.

Use water delivered as a fine spray to control fire and cool adjacent area.

Avoid spraying water onto liquid pools.

Do not approach containers suspected to be hot.

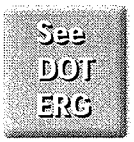
Cool fire-exposed containers with water spray from a protected location.

If safe to do so, remove containers from path of fire.

If fire gets out of control withdraw personnel and warn against entry.

Equipment should be thoroughly decontaminated after used.

Section 6 - Accidental Release Measures



Small Spills: Clean up all spills immediately. No smoking, bare lights, ignition sources.
Avoid all contact with any organic matter including fuel, solvents, sawdust, paper or cloth and other incompatible materials, as ignition may result.
Avoid breathing dust or vapors and all contact with skin and eyes.
Control personal contact by using protective equipment.
Contain and absorb spill with dry sand, earth, inert material or vermiculite. DO NOT use sawdust as fire may result.
Scoop up solid residues and seal in labeled drums for disposal.
Neutralize/decontaminate area.

Large Spills: Pollutant - Clear area of personnel and move upwind. Contact fire department and tell them location and nature of hazard.
May be violently or explosively reactive. Wear full body protective clothing with breathing apparatus. Prevent, by any means available, spillage from entering drains or waterways. Consider evacuation.
No smoking, flames or ignition sources. Increase ventilation.
Contain spill with sand, earth or other clean, inert materials. NEVER use organic absorbents such as sawdust, paper or cloth.
Use spark-free and explosion-proof equipment.
Collect residues and seal in labeled drums for disposal.
Wash area and prevent runoff into drains. Decontaminate equipment and launder all protective clothing before storage and reuse.
If contamination of drains or waterways occurs advise emergency services.
Cover residue with a reducer (hypo, a bisulfate or a ferrous salt, but not carbon, sulfur or a strong reducing agent) mix and spray with water.
To promote rapid reduction, add sulfuric acid with reducer above. Scoop into a metal container of water and neutralize with soda ash. Wash residue with soap solution containing some reducer.

Regulatory Requirements: Follow applicable OSHA regulations (29 CFR 1910.120).

Section 7 - Handling and Storage

Handling Precautions: Avoid personal contact and inhalation of dust, mist or vapors.
Provide adequate ventilation.
Always wear protective equipment and wash off any spillage from clothing.
Keep material away from light, heat, flammables or combustibles. Keep cool, dry and away from incompatible materials.
Avoid physical damage to containers.
Do not repack or return unused portions to original containers. Withdraw only sufficient amounts for immediate use.
Contamination can lead to decomposition leading to possible intense heat and fire. When handling NEVER smoke, eat or drink.
Always wash hands with soap and water after handling.
Use only good occupational work practices. Observe manufacturer's storing and handling directions.

Recommended Storage Methods: Check that containers are clearly labeled.
Packaging as recommended by manufacturer.
Glass container.
Plastic drum.
Polyethylene or polypropylene container.
Polylined drum.

Regulatory Requirements: Follow applicable OSHA regulations.

Section 8 - Exposure Controls / Personal Protection

Engineering Controls: General exhaust is adequate under normal operating conditions.
If risk of overexposure exists, wear NIOSH-approved respirator.
Correct fit is essential to obtain adequate protection.
Provide adequate ventilation in warehouse or closed storage areas.

Personal Protective Clothing/Equipment:

Eyes: Safety glasses with side shields; chemical goggles. Full face shield.
Contact lenses pose a special hazard; soft lenses may absorb irritants and all lenses concentrate them.

Hands/Feet: Impervious gloves; PVC gloves.
Rubber gloves.
Safety footwear.
Rubber boots.

Other: Overalls. Impervious protective clothing.
Eyewash unit.
Ensure there is ready access to a safety shower.

Equipment should be kept clean and in working-order.

Section 9 - Physical and Chemical Properties

Appearance/General Info: Purple-bronze (almost black) odorless, crystals or powder with a metallic luster. Sweet with an astringent after-taste. Decomposed by alcohol and many other organic solvents. Concentrated solutions are alkaline.

Physical State: Divided solid
Formula Weight: 158.04
Specific Gravity (H_2O=1, at 4 °C): 2.7
Evaporation Rate: Not applicable
pH: Not applicable
pH (1% Solution): >7

Boiling Point: Decomposes at 1 atm
Freezing/Melting Point: 240 °C (464 °F)
Volatile Component (% Vol): Not applicable
Decomposition Temperature (°C): <240
Water Solubility: 6.38 g/100 cc at 20 °C water

Section 10 - Stability and Reactivity

Stability/Polymerization/Conditions to Avoid: Presence of heat source and ignition source. Presence of elevated temperatures. Product is considered stable under normal handling conditions. Hazardous polymerization will not occur.

Storage Incompatibilities: Contact with acids produces toxic fumes.
Oxidizing agents as a class are not necessarily combustible themselves but can increase the risk and intensity of fire in many other substances.
Segregate from reducing agents, concentrated acids, tin, sulfur, alcohol, peroxides, bromides, iodides, arsenates, ethylene glycol, ammonium compounds, metallic powders, phosphorous, hydrazine, ferrous or mercury salts, oxalates and combustible materials and organic substances generally.

Section 11 - Toxicological Information

Toxicity
Oral (human) LD_{Lo}: 143 mg/kg
Oral (woman) TD_{Lo}: 2.4 mg/kg/d
Oral (rat) LD_{50}: 1090 mg/kg
Dyspnea, nausea, effects on spermatogenesis and the male fertility index recorded.

Irritation
Nil reported

See *RTECS* SD 6475000, for additional data.

Section 12 - Ecological Information

Environmental Fate: No data found.
Ecotoxicity: LC_{50} Ictalurus punctatus (channel catfish) 0.75 mg/l/96 hr /conditions of bioassay not specified
BCF: no food chain concentration potential
Biochemical Oxygen Demand (BOD): none

Section 13 - Disposal Considerations

Disposal: Recycle wherever possible. Special hazards may exist - specialist advice may be required.
Consult manufacturer for recycling options.
Follow applicable federal, state, and local regulations.
Treat and neutralize at an approved treatment plant.
Decontaminate empty containers. Observe all label safeguards until containers are cleaned and destroyed.
Puncture containers to prevent reuse and bury at an authorized landfill.
For small quantities: Dissolve solid residue in water. Add a reducer (hypo, a bisulfate, or a ferrous salt but not carbon, sulfur or strong reducing agent), and sulphuric acid to promote reduction.
Neutralize with soda ash.
Bury precipitate in an authorized landfill.
Decontaminate empty containers with reducer, acid and soda ash, as above.
Recycle containers wherever possible, otherwise dispose of in an authorized landfill.

Section 14 - Transport Information

DOT Hazardous Materials Table Data (49 CFR 172.101):

Shipping Name and Description: Potassium permanganate
ID: UN1490
Hazard Class: 5.1 - Oxidizer
Packing Group: II - Medium Danger
Symbols:
Label Codes: 5.1 - Oxidizer
Special Provisions: IB8, IP4
Packaging: **Exceptions:** 152 **Non-bulk:** 212 **Bulk:** 240
Quantity Limitations: **Passenger aircraft/rail:** 5 kg **Cargo aircraft only:** 25 kg
Vessel Stowage: **Location:** D **Other:** 56, 58, 69, 106, 107

Section 15 - Regulatory Information

EPA Regulations:
RCRA 40 CFR: Not listed
CERCLA 40 CFR 302.4: Listed per CWA Section 311(b)(4) 100 lb (45.35 kg)
SARA 40 CFR 372.65: Listed as Compound
SARA EHS 40 CFR 355: Not listed
TSCA: Listed

Section 16 - Other Information

Disclaimer: Judgments as to the suitability of information herein for the purchaser's purposes are necessarily the purchaser's responsibility. Although reasonable care has been taken in the preparation of such information, Genium Group, Inc. extends no warranties, makes no representations, and assumes no responsibility as to the accuracy or suitability of such information for application to the purchaser's intended purpose or for consequences of its use.

ANTHRATECH WESTERN CANADA
SILICA SAND Revised: 09/30/2001

MSDS Contents

MATERIAL SAFETY DATA SHEET

SECTION 1 - PRODUCT IDENTIFICATION AND USE

PRODUCT IDENTIFIER: SILICA SAND

VARIOUS SIZES, INCLUDING SILICA FLOUR, PLAY SAND, TRACTION SAND

DESCRIPTION: ODORLESS, GRANULAR SAND

PRODUCT USE: WATER TREATMENT FILTRATION, SAND BLASTING ABRASIVE

MANUFACTURER'S NAME:
AWI(ANTHRATECH WESTERN INC.)
4450-46 AVENUE, SE
CALGARY, ALBERTA T2B 3N7

EMERGENCY PHONE: (403) 255-7377

SUPPLIER'S NAME:
AWI (ANTHRATECH WESTERN INC.)
4450-46 AVENUE, SE
CALGARY, ALBERTA T2B 3N7

EMERGENCY PHONE: (403) 620-4505

SECTION 2 - HAZARDOUS INGREDIENTS

SILICA, CRYSTALLINE QUARTZ
C.A.S. NUMBER: 14808-60-7
LD50: N/A
LC50: N/A

SECTION 3 - PHYSICAL DATA

PHYSICAL STATE: SOLID

ODOR & APPEARANCE: ODORLESS, GRANULAR SAND

ODOR THRESHOLD: N/A

SPECIFIC GRAVITY: 2.6 (APPROXIMATE)

VAPOR PRESSURE: N/A

VAPOR DENSITY: N/A

EVAPORATION RATE: N/A

BOILING POINT: 4000 DEG. F

FREEZING POINT: N/A

pH: 7.3

COEFFICIENT OF WATER/OIL DISTRIBUTION: N/A

SECTION 4 - FIRE AND EXPLOSION DATA

CONDITIONS OF FLAMMABILITY: N/A

MEANS OF EXTINCTION: N/A

FLASH POINT: N/A

UPPER FLAMMABLE LIMIT: N/A
LOWER FLAMMABLE LIMIT: N/A

AUTO-IGNITION TEMPERATURE: N/A

EXPLOSION DATA (MECHANICAL IMPACT): N/A

EXPLOSION DATA (STATIC IMPACT): N/A

SECTION 5 - REACTIVITY DATA

CONDITIONS UNDER WHICH THE PRODUCT IS CHEMICALLY UNSTABLE: N/A

SUBSTANCE OR CLASS OF SUBSTANCE WITH WHICH THE PRODUCT IS INCOMPATIBLE: N/A

CONDITIONS OF REACTIVITY: N/A

HAZARDOUS DECOMPOSITION PRODUCTS: N/A

SECTION 6 - TOXICOLOGICAL PROPERTIES

SKIN CONTACT: NO EFFECT

SKIN ABSORPTION: NO EFFECT

EYE CONTACT: NO LONG-TERM EFFECT OTHER THAN DUST DISCOMFORT

INGESTION: NO EFFECT

INHALATION ACUTE EXPOSURE: NO IMMEDIATE EFFECT

CHRONIC EXPOSURE:
RESPIRATORY DISEASES MAY DEVELOP SUCH AS SILICOSIS, PNEUMOCONIOSIS AND PULMONARY FIBROSIS

EXPOSURE LIMITS:

ACGIH TLV:
CRYSTALLINE QUARTZ
TLV-TWA: 0.1 MG/CUBIC M (RESPIRABLE DUST)

SEE THRESHOLD LIMIT VALUE AND BIOLOGICAL EXPOSURE INDICES FOR 1987-1988 AMERICAN CONFERENCE OF GOVERNMENTAL INDUSTRIAL HYGIENISTS, BE CHANGED TO 50 MICROGRAMS RESPIRABLE FREE SILICA PER CUBIC METER OF AIR (50 (MICRO)G/CUBIC M) AVERAGED OVER A WORK SHIFT OF UP TO 10 HOURS PER DAY, 40 HOURS PER WEEK. THE NIOSH CRITERIA DOCUMENT OF CRYSTALLINE SILICA SHOULD BE CONSULTED FOR MORE DETAILED INFORMATION.

SECTION 7 - PREVENTIVE MEASURES

USE LOCAL EXHAUST TO CONTROL DUST DISPERSION. FOR RESPIRATORY PROTECTION, USE AN AIR-SUPPLIED RESPIRATOR OR OTHER CONVENTIONAL PARTICULATE RESPIRATORY PROTECTION BASED ON CONSIDERATIONS OF AIRBORNE CONCENTRATIONS AND DURATION OF EXPOSURE. FOR MORE INFORMATION CONTACT THE FOLLOWING STANDARDS:

1) AMERICAN NATIONAL STANDARD INSTITUTE (ANSI 2.88.2)
2) OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION (OSHA -29CFR PART 1910.134)
3) MINE SAFETY AND HEALTH ADMINISTRATION (MSHA - CFR PART 56)

SAFETY GLASSES SHOULD BE WORN TO PREVENT DUST IN EYES, IN CASE OF SPILL, VACUUM SPILLAGE AND DISPOSE OF WASTE IN CONTAINERS OF SLURRY TO AVOID REDISPERSION.

STORE IN SILOS OR BAGS.

SECTION 8 - FIRST AID MEASURES

EYE CONTACT:
A WATER WASH WILL REMOVE PARTICLES

INHALATION:
REMOVE FROM CONTAMINATED AREA. IF SHORTNESS OF BREATH OR OTHER BREATHING PROBLEMS PERSIST, CONSULT A PHYSICIAN.

SECTION 9 - PREPARATION OF DATE OF MSDS

PREPARED BY: PRODUCTION & QUALITY CONTROL

TELEPHONE NUMBER: (403) 255-7377

DATE PREPARED: SEPTEMBER 30, 2001

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Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-4

Appendix F
NFPA 70 E – Electrical Safety Tables

NFPA 70 (E) Table 130.7 (C) (9) (a) Hazard/Risk Category Classifications

Task (Assumes Equipment Is Energized, and Work Is Done Within the Flash Protection boundary	Hazard/Risk Category	V-rated Gloves	V-rated Tools
Panel boards Rated 240 V and Below --- Notes 1 and 3			
Circuit breaker (CB) or fused switch operation with covers on	0	N	N
CB or fused switch operation with covers off	0	N	N
Work on energized parts, including voltage testing	1	Y	Y
Remove/install CBs or fused switches	1	Y	Y
Removal of bolted covers (to expose bare, energized parts)	1	N	N
Opening hinged covers (to expose bare, energized parts)	0	N	N
Panel boards or Switchboards Rated >240 V and up to 600 V (with molded case or insulated case circuit breakers) --- Notes 1 and 3			
CB or fused switch operation with covers on	0	N	N
CB or fused switch operation with covers off	1	N	N
Work on energized parts, including voltage testing	2*	Y	Y
600 V Class Motor control Centers (MCCs) --- Notes 2 (except as indicated) and 3			
CB or fused switch or starter operation with enclosure doors closed	0	N	N
Reading a panel meter while operating a meter switch	0	N	N
CB or fused switch or starter operation with enclosure doors open	1	N	N
Work on energized parts, including voltage testing	2*	Y	Y
Work on control circuits with energized parts 120 V or below, exposed	0	Y	Y
Work on control circuits with energized parts > 120 V exposed	2*	Y	Y
Insertion or removal of individual starter "buckets" from MCC - Note 4	3	Y	N
Application of safety grounds, after voltage test	2*	Y	N
Removal of bolted covers (to expose bare, energized parts)	2*	N	N
Opening hinged covers (to expose bare, energized parts)	1	N	N
600 V Class Switchgear (with power circuit breakers or fused switches)-- Notes 5 and 6			
CB or fused switch operation with enclosure door closed	0	N	N
Reading a panel meter while operating a meter switch	0	N	N
CB or fused switch operation with enclosure door open	1	N	N
Work on energized parts, including voltage testing	2*	Y	Y
Work on control circuits with energized parts 120 V or below, exposed	0	Y	Y
Work on control circuits with energized parts > 120 V, exposed	2*	Y	Y
Insertion or removal (racking) of CBs from cubicles, doors open	3	N	N
Insertion or removal (racking) of CBs from cubicles, doors closed	2	N	N
Application of safety grounds, after voltage test	2*	Y	N
Removal of bolted covers (to expose bare, energized parts)	3	N	N
Opening hinged covers (to expose bare, energized parts)	2	N	N

NFPA 70 (E) Table 130.7 (C) (9) (a) Hazard/Risk Category Classifications (Continued)

Task (Assumes Equipment Is Energized, and Work Is Done Within the Flash Protection Boundary)	Hazard/Risk Category	V-rated Gloves	V-rated Tools
Other 600 V Class (277 V through 600 V, nominal) Equipment -- Note 3			
Lighting or small power transformers (600 V, maximum)	--	--	--
Removal of bolted covers (to expose bare, energized parts)	2*	N	N
Opening hinged covers (to expose bare energized parts)	1	N	N
Work on energized parts, including voltage testing	2*	Y	Y
Application of safety grounds, after voltage test	2*	Y	N
Revenue meters (kW-hour, at primary voltage and current)	--	--	--
Insertion or removal	2*	Y	N
Cable trough or tray cover removal or installation	1	N	N
Miscellaneous equipment cover removal or installation	1	N	N
Work on energized parts, including voltage testing	2*	Y	Y
Application of safety grounds, after voltage test	2*	Y	N
NEMA E2 (fused contactor) Motor Starters, 2.3 kV Through 7.2 kV			
Contactor operation with enclosure doors closed	0	N	N
Reading a panel meter while operating a meter switch	0	N	N
Contactor operation with enclosure doors open	2*	N	N
Work on energized parts, including voltage testing	3	Y	Y
Work on control circuits with energized parts 120 V or below, exposed	0	Y	Y
Work on control circuits with energized parts > 120 V, exposed	3	Y	Y
Insertion or removal (racking) of starters from cubicles, doors open	3	N	N
Insertion or removal (racking) of starters from cubicles, doors closed	2	N	N
Application of safety grounds, after voltage test	3	Y	N
Removal of bolted covers (to expose bare, energized parts)	4	N	N
Opening hinged covers (to exposed bare, energized parts)	3	N	N
Metal Clad Switchgear, 1 kV and Above			
CB or fused switch operation with enclosure doors closed	2	N	N
Reading a panel meter while operating a meter switch	0	N	N
CB or fused switch operation with enclosure doors open	4	N	N
Work on energized parts, including voltage testing	4	Y	Y
Work on control circuits with energized parts 120 V or below, exposed	2	Y	Y
Work on control circuits with energized parts > 120 V, exposed	4	Y	Y
Insertion or removal (racking) of CBs from cubicles, doors open	4	N	N
Insertion or removal (racking) of CBs from cubicles, doors closed	2	N	N
Application of safety grounds, after voltage test	4	Y	N
Removal of bolted covers (to expose bare, energized parts)	4	N	N
Opening hinged covers (to expose bare, energized parts)	3	N	N
Opening voltage transformer or control power transformer compartments	4	N	N

NFPA 70 (E) Table 130.7 (C) (9) (a) Hazard/Risk Category Classifications (Continued)

Task (Assumes Equipment Is Energized, and Work Is Done Within the Flash Protection Boundary)	Hazard/Risk Category	V-rated Gloves	V-rated Tools
Other Equipment 1 kV and Above			
Metal clad load interrupter switches, fused or unfused	--	--	--
Switch operation, doors closed	2	N	N
Work on energized parts, including voltage testing	4	Y	Y
Removal of bolted covers (to expose bare, energized parts)	4	N	N
Opening hinged covers (to expose bare, energized parts)	3	N	N
Outdoor disconnect switch operation (hook stick operated)	3	Y	Y
Outdoor disconnect switch operation (gang-operated, from grade)	2	N	N
Insulated cable examination, in manhole or other confined space	4	Y	N
Insulated cable examination, in open area	2	Y	N

Note:
V-rated Gloves are gloves rated and tested for the maximum line-to-line voltage upon which work will be done.
V-rated Tools are tools rated and tested for the maximum line-to-line voltage upon which work will be done.
2* means that a double-layer switching hood and hearing protection are required for this task in addition to the other Hazard/Risk Category 2 requirements of Table 130.7 (C) (10).

Y = yes (required)

N = no (not required)

Notes:
1. 25 kA short circuit current available, 0.03 second (2 cycle) fault clearing time.
2. 65 kA short circuit current available, 0.03 second (2 cycle) fault clearing time.
3. For < 10 kA short circuit current available, the hazard/risk category required may be reduced by one number
4. 65 kA short circuit current available, 0.33 second (20 cycle) fault clearing time.
5. 65k A short circuit current available, up to 1.0 second (60 cycle) fault clearing time.
6. for < 25 kA short circuit current available, the hazard/risk category required may be reduced by one number

NFPA 70 (E) Table 130.7 (C) (10) Protective Clothing and Personal Protective Equipment (PPE) Matrix

Protective Clothing and Equipment	Protective Systems for Hazard/Risk Category					
Hazard/Risk Category Number	**-1** (Note 3)	**0**	**1**	**2**	**3**	**4**
Non-melting (according to ASTM F 1506-00) or Untreated Natural Fiber						
a. T-shirt (short-sleeve)	X			X	X	X
b. Shirt (long-sleeve)		X				
c. Pants (long)	X	X	X (Note 4)	X (Note 6)	X	X
FR Clothing (Note 1)						
a. Long-sleeve shirt			X	X	X (Note 9)	X
b. Pants			X (Note 4)	X (Note 6)	X (Note 9)	X
c. overall			(Note 5)	(Note 7)	X (Note 9)	(Note 5)
d. Jacket, parka, or rainwear			AN	AN	AN	AN
FR Protective Equipment						
a. Flash suit jacket (multilayer)						X
b. Flash suit pants (multilayer)						X
c. Head protection						
1. Hard hat			X	X	X	X
2. FR hard hat liner					AR	AR
d. Eye protection		--	--	--	--	--
1. Safety glasses	X	X	X	AL	AL	AL
2. Safety goggles				AL	AL	AL
e. Face and head area protection		--	--	--	--	--
1. Arc-rated face shield, or flash suit hood				X (Note 8)		
2. Flash suit hood					X	X
3. Hearing protection (car canal inserts)				X (Note 8)	X	X
f. Hand protection			--	--	--	--
Leather gloves (Note 2)			AN	X	X	X
g. Foot protection						
Leather work shoes			AN	X	X	X

AN = As needed
AL = Select one in group
AR = As required
FR = Flame Resistant
X = Minimum required

Notes:
1. See Table 130.7(C) (11). Arc rating for a garment is expressed in cal/cm^2.
2. If voltage-rated gloves are required, the leather protectors worn external to the rubber gloves satisfy this requirement.
3. Hazard/Risk Category Number "-1" is only defined if determined by Notes 3 or 6 of Table 130.7(C) (9) (a).
4. Regular weight (minimum 12 oz/yd^2 fabric weight), untreated, denim cotton blue jeans are acceptable in lieu of FR pants. The FR pants used for Hazard/Risk Category 1 shall have a minimum arc rating of 4.
5. Alternate is to use FR coveralls (minimum arc rating of 4) instead of FR shirt and FR pants.
6. If the FR pants have a minimum arc rating of 8, long pants of non-melting or untreated natural fiber pants and t-shirt.
7. Alternate is to use FR coveralls (minimum arc rating of 4) over non-melting or untreated natural fiber pants and T-shirt.
8. A face shield with a minimum arc rating of 8, with wrap-around guarding to protect not only the face, but also the forehead, ears, and neck (or, alternatively, a flash suit hood), is required.
9. Alternate is to use two sets of FR coveralls (the inner with a minimum arc rating of 4 and outer coverall with a minimum arc rating of 5) over non-melting or untreated natural fiber clothing, instead of FR coveralls over FR shirt and FR pants over non-melting or untreated natural fiber clothing.

NFPA 70 (E) Table 130.7 (C) (11) Protective Clothing Characteristics

Hazard/Risk Category	Clothing Description (Typical number of clothing layers is given in parentheses)	Required Minimum Arc Rating of PPE [J/cm^2(cal/cm^2)]
0	Non-melting, flammable materials (i.e., untreated cotton, wool rayon, or silk, or blends of these materials) with a fabric weight at least 4.5 oz/yd^2 (1)	N/A
1	Flame Resistant (FR) shirt and FR pants or FR coverall (1)	16.74 (4)
2	Cotton underwear -- conventional short sleeve and brief/shorts plus FR shirt and FR pants (1 and 2)	33.47 (8)
3	Cotton underwear plus FR shirt and FR pants plus FR coverall, or cotton underwear plus two FR coveralls (2 or 3)	104.6 (25)
4	Cotton underwear plus FR shirt and FR pants plus multilayer flash suit (3 or more)	167.36 (40)

Note: Arc rating is defined in Article 100 and can be either ATPV or E_{BT}. ATPV is defined in ASTM F 1959-99 as the incident energy on a fabric or material that results in sufficient heat transfer through the fabric or material to cause the onset of a second-degree burn based on the Stoll curve. E_{BT} is defined in ASTM F 1959-99 as the average of the five highest incident energy exposure values below the Stoll curve where the specimens do not exhibit break-open. E_{BT} is reported when ATPV cannot be measured due to FR fabric break-open.

NFPA 70E Table 130.2(C)

Approach Boundaries to Live Parts for Shock Protection

(All dimensions are distance from live part to employee.)

(1)	(2)	(3)	(4)	(5)
	Limited Approach Boundary [1]		Restricted Approach Boundary [1], Includes Inadvertent Movement Adder	Prohibited Approach Boundary [1]
Nominal System Voltage Range, Phase to Phase	Exposed Moveable Conductor	Exposed Fixed Circuit Part		
Less than 50	Not specific	Not specific	Not specific	Not specific
50 to 300	3.05 m (10 ft 0 in.)	1.07 m (3 ft 6 in.)	Avoid contact	Avoid contact
301 to 750	3.05 m (10 ft 0 in.)	1.07 m 3 ft 6 in.)	304.8 mm (1 ft 0 in.)	25.4 mm (0 ft 1 in.)
751 to 15 kV	3.05 m (10 ft 0 in.)	1.53 m (5 ft 0 in.)	660.4 mm (2 ft 2 in.)	177.8 mm (0 ft 7 in.)
15.1 kV to 36 kV	3.05 m (10 ft 0 in.)	1.83 m (6 ft 0 in.)	787.4 mm (2 ft 7 in.)	254 mm (0 ft 10 in.)
36.1 kV to 46 kV	3.05 m (10 ft 0 in.)	2.44 m (8 ft 0 in.)	838.2 mm (2 ft 9 in.)	431.8 mm (1 ft 5 in.)
46.1 kV to 72.5 kV	3.05 m (10 ft 0 in.)	2.44 m (8 ft 0 in.)	965.2 mm (3 ft 2 in.)	635 mm (2 ft 1 in.)
72.6 kV to 121 kV	3.25 m (10 ft 8 in.)	2.44 m (8 ft 0 in.)	991 mm (3 ft 3 in.)	812.8 mm (2 ft 8 in.)
138 kV to 145 kV	3.36 m (11 ft 0 in.)	3.05 m (10 ft 0 in.)	1.093 m (3 ft 7 in.)	939.8 mm (3 ft 1 in.)
161 kV to 169 kV	3.56 m (11 ft 8 in.)	3.56 m (11 ft 8 in.)	1.22 m (4 ft 0 in.)	1.07 m (3 ft 6 in.)
230 kV to 242 kV	3.97 m (13 ft 0 in.)	3.97 m (13 ft 0 in.)	1.6 m (5 ft 3 in.)	1.45 m (4 ft 9 in.)
345 kV to 362 kV	4.68 m (15 ft 4 in.)	4.68 m (15 ft 4 in.)	2.59 m (8 ft 6 in.)	2.44 m (8 ft 0 in.)
500 kV to 550 kV	5.8 m (19 ft 0 in.)	5.8 m (19 ft 0 in.)	3.43 m (11 ft 3 in.)	3.28 m (10 ft 9 in.)
765 kV to 800 kV	7.24 m (23 ft 9 in.)	7.24 m (23 ft 9 in.)	4.55 m (14 ft 11 in.)	4.4 m (14 ft 5 in.)

Note: For Flash Protection Boundary, see NFPA 70E 130.3(A)

1: See definitions in Article 100 and text in NFPA 70E 130.2(D)(2) and Annex C for elaboration

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-4

Appendix G
Guidelines for Standard Safety Disciplinary Actions

Guidelines for Standard Safety Disciplinary Actions Acknowledgment Form

I have read and understand the Shaw Environmental and Infrastructure, Inc. *Guidelines for Standard Safety Disciplinary Actions*.

Printed Name	Signature	Representing	Date

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-4

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-4

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Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-4

Appendix H
Incident Notification, Reporting, and Management Procedure

Incident Notification, Reporting, and Management Procedure

Directions, Notes, and Reminders

- **Follow this procedure step-by-step for all incidents.**
- **This procedure has limited application to subcontractors. Assist subcontractors with medical emergencies (as applicable) and then immediately notify the Program H&S Manager for guidance.**
- **Periodically review this procedure in order to be familiar with the steps - prior to an incident occurring.**
- **For injuries and vehicle accidents, secure the scene to prevent additional injury/incident, administer on-site first aid, and arrange for emergency assistance prior to making any other notifications.**
- **The Site Supervisor is responsible for making all other notifications to:**
  - **CORE Health Networks (must be notified while employee is en route to medical care facility): 877-EHS-Shaw (or 877-347-7429)**
  - **Shaw Help Desk / Hot Line: 866-299-3445**
  - **Project Manager: Kathleen Romalia - (720) 554-8207 Cell**
  - **Marcia Musgrave: 419-425-6160.**
- **A Supervisor (or SSHO) is responsible for notifying the Program H&S Manager or Alternate H&S Manager by telephone prior to making any other notifications (other than calling 911 and CORE).**
- **A Supervisor or the SSHO shall accompany all injured personnel to the CORE clinic or to the hospital emergency room.**
- **The Project Manager shall notify the Program Manager in person or by telephone no later than two hours after the incident.**
- **All incident reports shall be completed by typing (when feasible and applicable).**
- **All incident reports shall be submitted (email or fax) to the Program H&S Manager or Alternate H&S Manager for review and distribution.**
- **Complete all the blanks on the INCIDENT NOTIFICATION AND COMMUNICATION CONTACT LIST (page 6) and post near all site telephones.**

Incident Notification, Reporting, and Management Procedure

Action	Who / When	Under what circumstances	How	Notes
1. Notify Site Superintendent for all incidents (no matter how minor)	Injured person, first person recognizing incident, driver/passenger, or employee causing damage *Immediately*	All incidents no matter how minor (including minor cuts, scratches, minor strains/sprains, and insect bites)	In person or by telephone	Site Superintendent to make note of very minor incidents (such as band-aid over scratch) in field logbook
2. For ***life-threatening injuries / illnesses*** - make scene safe, contact local emergency personnel For ***non life-threatening injuries / illnesses*** - make scene safe, transport injured person to doctor at an occupational medical facility For ***vehicle accidents*** – make scene safe, notify police, aid injured parties For ***equipment / property damage*** - make scene safe, prevent further damage or injuries	Site Superitendent *Immediately (concurrently with next step if injury or illness)* Site Superitendent *Immediately (concurrently with next step if injury or illness)* Driver/passenger *Immediately* Employee causing damage *Immediately*	In case of serious injury or illness requiring off-site medical care	Via ambulance Via vehicle	Site Superitendent or Site Safety Officer must immediately go to emergency care facility. Follow HS101 post accident alcohol and drug testing procedure. Site Superitendent or Site Safety and Health Officer must transport and stay with injured person until released from care. Make medical personnel aware of Shaw's "restricted work will be provided" and "no prescriptions if possible" policies. CORE clinics are the preferred urgent care facilities when possible, unless injury is severe and victim is transported by ambulance.
3. Notify CORE Health Networks (for injuries / illnesses to Shaw employees only)	Site Superitendent *Immediately, prior to transporting the injured employee, unless injuries are life threatening*	• Serious injury requiring off-site medical care • If employee states that he/she has been exposed to any chemical or biological substance • If illness is work related	CORE Medical 877-347-7429 Note: Outside Continental US call: **225-614-9561**	Not required for temporary agency and subcontractor labor Provide name of injured employee, name and phone # of treating medical facility, description of the incident CORE will help with medical facility coordination and follow-up care
4. Notify Program H&S Manager (if unsure, see contact list) Notify Alternate H&S Manager if Program H&S Manager cannot be contacted. (if unsure, see contact list)	Site Superitendent *Immediately (concurrently with providing transportation to occupational medical facility or EMS transport to hospital)*	All incidents except on-site first aid cases	See Incident Notification and Communication Contact List (attached)	Program H&S Manager will notify H&S Director

Incident Notification, Reporting, and Management Procedure

Action	Who / *When*	Under what circumstances	How	Notes
5. Notify Shaw Notification Hotline / Help Desk	Site Superintendent *As soon as possible. Prior to sending an individual for medical treatment*	• Illness and/or injury (doctors cases and above) • Any utility damage • Property damage (damage > $2,500.00) • Vehicle accidents (All) • Criminal activity (i.e. bomb threat, theft) • Natural disaster (all) • Explosion and/or fires (damage > $2,500.00 or result in injury) • Environmental spills/releases (incidents that requires regulatory notification or have an offsite impact) • Regulatory agency visit • Fatalities	Shaw Notification Hotline / Help Desk Phone Number: 866-299-3445 Note - Outside the Continental US call: 225-215-5056	Request name of Hotline / Help Desk operator for future reference and note date/time of notification
6. Complete forms: I*njuries and illnesses*: • Authorization for Release of Protected Medical Information • Authorization for Treatment of Occupational Injury/Illness • Return-To-Work Examination Form ***and*** fax to CORE ***and*** email or fax to Program H&S Manager	Injured employee and medical facility personnel (Site Superintendent or Site Safety and Health Officer is responsible for verifying forms are completed) *Prior to leaving medical facility*	• Serious injury requiring off-site medical care • If employee states that he/she has been exposed to any chemical or biological substance	Fax to CORE: 225.292.8986 Email or fax to Program H&S Manager	Site Superintendent or Site Safety and Health Officer must take these forms with him/her to occupational medical facility or hospital (Contained in HS 020) Contact Program H&S Manager for blank electronic forms or obtain forms from: http://shawnet3.shawgrp.com/sites/eihs/federal/Lists/Announcements/DispForm.aspx?ID=8
7. Call Project Manager and notify of incident (Remind Project Manager of notification responsibilities to Program Manager)	Site Superintendent *As soon as reasonably possible*	If Hot Line / Help Desk notification is required (see # 5 above)	See Incident Notification and Communication Contact List	Project Manager will verbally report incident to upper level of Operations/Business Line Management *As soon as reasonably possible*
8. Notify Marcia Musgrave	Site Superintendent	All incidents involving personnel (injuries, illnesses, vehicle accidents)	419-425-6160	

Incident Notification, Reporting, and Management Procedure

Action	Who / When	Under what circumstances	How	Notes
9. Call back Program H&S Manager to report on status of *injured / ill employee*	Site Superintendent *Prior to employee leaving medical facility*	All injuries and illnesses requiring off-site medical care	See Incident Notification and Communication Contact List (attached)	
10. Complete forms (typed electronically): *OSHA Recordable Cases* • Superintendent's Employee Injury/Illness Report Form • Injured Employee Statement • Witness Statement Form(s) *First Aid Cases (Doctor's)* • Superintendent's Employee Injury/Illness Report • Injured Employee Statement • Witness Statement Form(s) Email or Fax completed forms to Program H&S Manager and CORE	• Site Superintendent • Witnesses *As soon as possible – no later than 24 hours*	All injuries, illnesses, and first aide cases	Email or fax to Program H&S Manager See Incident Notification and Communication Contact List (attached) Fax to CORE 225.292.8986	Site Superintendent should have these forms with him/her at all times (Contained in HS 020) Contact Program H&S Manager for blank electronic forms or obtain forms from: http://shawnet3.shawgrp.com/sites/eihs/federal/Lists/Announcements/DispForm.aspx?ID=8
11. Complete forms (typed electronically): *Chargeable Vehicle Accidents* • Vehicle Accident Report • Witness Statement Form(s) • Driving Record Certification (Procedure HS800) *Non-Chargeable Vehicle Accidents* • Vehicle Accident Report • Witness Statement Form(s) *Equipment, Property Damage and General Liability Incidents* • Equipment, Property Damage and General Liability Loss Report • Witness Statement Form(s) Email or Fax completed forms to Program H&S Manager	• Site Superintendent • Witnesses *As soon as possible – no later than 24 hours*	All vehicle accidents and /or all property damage	Email or fax to Program H&S Manager Health See Incident Notification and Communication Contact List (attached)	Superintendent should have these forms with him/her at all times (Contained in HS 020) Contact Program H&S Manager for blank electronic forms or obtain forms from: http://shawnet3.shawgrp.com/sites/eihs/federal/Lists/Announcements/DispForm.aspx?ID=8

Incident Notification, Reporting, and Management Procedure

Action	Who / When	Under what circumstances	How	Notes
12. Complete these additional forms (typed electronically): *OSHA Recordable Cases* • Incident Investigation Report *First Aid Cases (Doctor's)* • Incident Investigation Report *Chargeable Vehicle Accidents* • Incident Investigation Report *Non-Chargeable Vehicle Accidents* • Incident Investigation Report *Equipment, Property Damage and General Liability Incidents* • Incident Investigation Report *Near Miss* • Incident Investigation Report	Site Superitendent *As soon as possible – no later than 72 hours of incident*	Near Misses as defined by HS020	Email or fax to Program H&S Manager See Incident Notification and Communication Contact List (attached)	Superitendent should have these forms with him/her at all times (Contained in HS 020) Contact Program H&S Manager for blank electronic forms or obtain forms from: http://shawnet3.shawgrp.com/sites/eihs/federal/Lists/Announcements/DispForm.aspx?ID=8
• SharePoint electronic Near Miss Report	*As soon as possible – no later than 96 hours of incident*	All other Near Misses	Contact Program H&S Manager	
Email or Fax completed forms to Program H&S Manager				Do not include any employee or project identification information – *these reports are anonymous*
13. Perform "Accident Review Board" (ARB) as required by HS020 - Coordinate through Program H&S Manager	Program H&S Manager *Within 10 days of incident*	OSHA Recordable Cases Chargeable Vehicle Accidents		
Perform "Incident Review Board" (IRB) to extract lessons learned - Coordinate through Program H&S Manager		Doctor's First Aid Cases Utility damage or significant property damage		An IRB is outside of the HS020 requirements for an ARB.

INCIDENT NOTIFICATION AND COMMUNICATION CONTACT LIST

Project Number: 143253 **Project/Office Name / Location: Holloman AFB, Alamagordo, NM**

Name	Phone Number(s)	Fax Number	E-mail
Shaw Notification Hotline/Helpdesk	866-299-3445 225-215-5056	N/A	N/A
CORE (Must be notified prior to or during transport to medical treatment center)	877-EHS-Shaw-(877-347-7429)	225.292.8986	
Program H&S Manager: Dave Mummert	Office 419.425.6129 Cell 419.348.1544		david.mummert@shawgrp.com
Site Safety and Health Officer (SSHO) - James Vigerust	505-262-8736 Office 505-410-4995 (cell)		james.vigerust@shawgrp.com
Project Manager: Kathleen Romalia	Office (720)554-8207 Cell (720) 989-1154		kathleen.romalia@shawgrp.com
E&I H&S Director – Andrew Johnson	513-782-4972 (office) 859-393-4346 (cell)		andrew.johnson@shawgrp.ocm

Final
Site Safety and Health Plan
Kirtland Air Force Base
Albuquerque, New Mexico

Prepared for U.S. Air Force Center for Engineering and the Environment
2261 Hughes Ave., Suite 163
Lackland Air Force Base, Texas 78236-8196

Prepared by Shaw Environmental & Infrastructure, Inc.
1401 Enclave Parkway, Suite 250
Houston, Texas 77077

Contract No. FA8903-09-D-8580, Task Order 0013
Project No. 144106
Revision 0
January 2012

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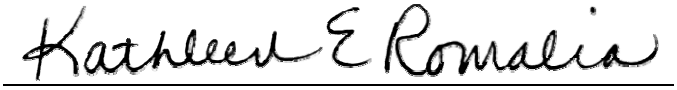
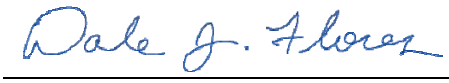
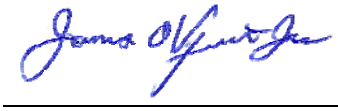
Final
Site Safety and Health Plan
Kirtland Air Force Base
Albuquerque, New Mexico

Midwest Region Performance Based Remediation
Contract No. FA8903-09-D-8580
Task Order 0013

Revision 0
January 2012

Developed by:		January 6, 2012
	David L Mummert, Certified Industrial Hygienist Shaw Program Health and Safety Manager	Date
Reviewed/ Concurred by:		January 6, 2012
	Kathleen Romalia Shaw Project Manager	Date
Reviewed/ Concurred by:		January 6, 2012
	Spencer Patterson, PE Shaw Program Manager	Date
Reviewed/ Concurred by:		January 6, 2012
	Dale Flores Shaw Installation Lead	Date
Reviewed/ Concurred by:		January 6, 2012
	James Vigerust, Jr. Shaw Site Safety Officer	Date

Site Safety and Health Plan Disclaimer

This Base wide Site Safety and Health Plan (SSHP) has been designed for the methods presently contemplated by Shaw Environmental & Infrastructure, Inc. (Shaw) for execution of the proposed work. Therefore, the SSHP may not be appropriate if the work is not performed by or using the methods presently contemplated by Shaw.

In addition, as the work is performed, conditions different from those anticipated may be encountered and the SSHP may have to be modified through SSHP Amendments. Therefore, Shaw makes no representations of warranties as to the adequacy of the SSHP, except for warranties specifically stated in the SSHP itself.

Table of Contents

Contract No. FA8903-09-D-8580, Task Order 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-5

Table of Contents (continued)

Contract No. FA8903-09-D-8580, Task Order 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-5

Table of Contents (continued)

Contract No. FA8903-09-D-8580, Task Order 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-5

Table of Contents (continued)

Contract No. FA8903-09-D-8580, Task Order 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-5

Table of Contents (continued)

Contract No. FA8903-09-D-8580, Task Order 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-5

List of Figures

List of Tables

List of Appendices

Contract No. FA8903-09-D-8580, Task Order 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-5

Acronyms and Abbreviations

°F	degrees Fahrenheit
ACGIH	American Conference of Governmental Industrial Hygienists
ACM	Asbestos Containing Material
AFB	Air Force Base
AFCEE	Air Force Center for Engineering and the Environment
AHA	Activity Hazard Analysis
AIDS	acquired immunodeficiency syndrome
ANSI	American National Standards Institute
APR	air purifying respirator
ATSDR	Agency for Toxic Substances and Disease Registry
bgs	below ground surface
BTEX	benzene, toluene, ethylbenzene, and xylenes
C	ceiling
Ca	carcinogen
CIH	Certified Industrial Hygienist
CM	Construction Manager
CERCLA	Comprehensive Environmental Compensation, Responsibility, and Liability Act
CFR	Code of Federal Regulation
CNS	central nervous system
COR	Contracting Officer's Representative
CPR	cardiopulmonary resuscitation
CRD	Construction Rubble Dump
CRZ	Contamination Reduction Zone
CWM	Chemical Warfare Materials
DEET	N,N-Diethyl-m-toluamide
DEHP	Bis (2-ethylhexyl) phthalate
DNAPL	dense nonaqueous phase liquid
DOD	Department of Defense
DRO	Diesel Range Organics
EHS	environmental, health, and safety
EMS	Emergency Medical Service
EPA	Environmental Protection Agency
EZ	Exclusion Zone
FDTA	Fire Department Training Area
FFA	Federal Facility Agreement
FLRS	Flight Line Refueling System
ft	feet (foot)
GI	Gastrointestinal Tract
HARP	hazard assessment and resolution process
HAZWOPER	Hazardous Waste Operations and Emergency Response
HBV	hepatitis B virus
HIV	human immunodeficiency virus

Contract No. FA8903-09-D-8580, Task Order 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-5

HSM	Health and Safety Manager

Acronyms and Abbreviations (continued)

HTRW	Hazardous, Toxic, and Radioactive Waste
IDLH	immediately dangerous to life and health
IRP	Installation Restoration Program
JSA	Job Safety Analysis
LEL	lower explosive limit
LNAPL	light non-aqueous phase liquid
MD	Medical Doctor
MEC	munitions and explosives of concern
mg/m^3	milligram(s) per cubic meter
MPH	Master of Public Health
MSA	Mine Safety Administration
MSDS	Material Safety Data Sheet
MTBE	Methyl tert-butyl ether
ND	not determined
NFPA	National Fire Protection Association
NIOSH	National Institute for Occupational Safety and Health
OSHA	Occupational Safety and Health Administration
PAH	polyaromatic hydrocarbon
PBR	Performance-Based Remediation
PCB	Polychlorinated biphenyl
PCE	tetrachloroethene
PEL	permissible exposure limit
PFD	personal flotation device
PM	Project Manager
PNS	Peripheral Nervous System
PPE	personal protective equipment
ppm	part(s) per million
PVC	polyvinyl chloride
QC	quality control
RA	Remedial Action
RCRA	Resource Conservation and Recovery Act
RFI	RCRA Facility Investigation
RI/FS	Remedial Investigation/Feasibility Study
ROD	Record of Decision
SAR	supplied air respirator
SEI	Shaw E & I
Shaw	Shaw Environmental & Infrastructure, Inc.
SSHO	Site Safety and Health Officer
SSHP	site safety health plan
STEL	short-term exposure limit
TIC	Toxic Industrial Chemicals
TLV	threshold limit value

Contract No. FA8903-09-D-8580, Task Order 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-5

TWA	time-weighted average
URT	upper respiratory tract
USACE	U.S. Army Corps of Engineers

Acronyms and Abbreviations (continued)

USAF	United States Air Force
U.S.	United States
WERC	Worldwide Environmental Restoration and Construction

Contract No. FA8903-09-D-8580, Task Order 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-5

Contract No. FA8903-09-D-8580, Task Order 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-5

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1.0 INTRODUCTION

This Base wide Site Safety and Health Plan (SSHP) describes the safety and health guidelines developed by Shaw Environmental & Infrastructure, Inc. (Shaw) to protect Shaw personnel, subcontractors, Government personnel, and members of the public involved in the Air Force Center for Engineering and the Environment (AFCEE) project for the Worldwide Environmental Restoration and Construction 2009 (WERC09), performed under Contract No. FA8903-09-D-8580, Task Order 0013, at the Kirtland Air Force Base (AFB) Albuquerque, New Mexico. This SSHP is intended to encompass the general scope of authority, responsibilities for accident and incident prevention and provide basic guidelines for implementing, enforcing, and monitoring safe work practices and procedures.

This SSHP is prepared in accordance with the standards established by the United States Occupational Safety and Health Administration (OSHA) for regulated sites. Specifically, this SSHP complies with the appropriate standards contained in 29 Code of Federal Regulations (CFR) 1910.120; 29 CFR 1926.65; the *Safety and Health Requirements Manual* (U.S. Army Corps of Engineers [USACE], 2008); and *Safety and Occupational Health Requirements for Hazardous, Toxic, and Radioactive Waste (HTRW) Activities* (USACE, 2007). The safety and health measures presented are in effect for the duration of the project. This document is intended for use by Shaw personnel and subcontractors. All personnel working on the project sites are required to abide by these measures. Where not specifically mentioned, all personnel are required to comply with the applicable regulations contained in 29 CFR 1910, 29 CFR 1926, the *Safety and Health Requirements Manual*, and the health and safety rules of the Government installation that concern related activities. Each person working on this project must sign the SSHP Acknowledgment Form (Appendix A). The procedures and guidelines contained herein are based upon the best available information at the time of the plan's preparation. Any revisions to this plan will be made with the knowledge and concurrence of Shaw and AFCEE. Revisions to this SSHP will be included as a SSHP Amendment (Appendix B). This SSHP used in conjunction with the Activity Hazard Analyses (Appendix C) and SSHP Addenda, if applicable (Section 1.1) will also serve as the project's:

- Accident Prevention Plan;
- Emergency Response Plan;
- Emergency Action Plan; and
- Fire Prevention Plan.

1.1 Site Safety and Health Plan Addenda

A SSHP Addendum will be prepared for activities at each of the five Performance-Based Remediation (PBR) sites that are necessary to complete the project, but not covered by this SSHP. The SSHP Addenda will be specific to the work to be accomplished and will provide the following:

- Scope of work.
- Chemical hazards specific to the scope of work.
- Activity Hazard Analyses (AHA) (described in Section 3.14 of this document), which identify the specific hazards associated with the scope of work and the measures required to control those hazards.
- Personal protective equipment (PPE) requirements for the specific activities.
- Monitoring requirements.

All SSHP Addenda will become a component of this SSHP. The SSHP Addenda will be attached to this SSHP as Appendix B.

1.2 Site Background

This section provides background information on the location, history, and environmental setting of the Kirtland AFB.

1.3 Project Site Description

1.3.1 Kirtland AFB

Kirtland AFB occupies approximately 51,558 acres in southeastern Albuquerque, New Mexico, nestled between the Sandia and Manzano mountain ranges. The Base employs over 23,000 people, including more than 4,200 active duty, 1,000 Guard, and 3,200 part-time reservists. Kirtland AFB is home to Air Force Nuclear Weapons Center and its subordinate wings, the 498th Armament Systems Wing and the 377th Air Base Wing. It is also home to the Defense Threat Reduction Agency Albuquerque office, Air Force Safety Center, the Air Force Inspection Agency, the Air Force Operational Test and Evaluation Center, the 58th Special Operations Wing, Space Development and Test Wing, the New Mexico Air National Guard 150th Fighter Wing, the Directed Energy and Space Vehicle Directorates of the Air Force Research Laboratory, the Department of Energy (DOE) Albuquerque Office, the National Nuclear Security Administration, and Sandia National Laboratories. Environmental restoration activities, schedules, and necessary documentation for Kirtland AFB are based on the corrective action requirements of Kirtland AFB's RCRA Part B Hazardous Waste Permit No. NM9570024423 dated July 15, 2010 administered by the New Mexico Environment

Contract No. FA8903-09-D-8580, Task Order 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-5

Department (NMED). None of the five Kirtland sites are currently listed on the RCRA permit. Environmental remediation at Kirtland AFB is being conducted pursuant to the RCRA with regulatory coordination, as appropriate, by the NMED.

1.4 Safety and Health Policy Statement

This section presents Shaw's Safety and Health Policy Statement for all Shaw employees, clients and partners and Shaw's corporate-wide objective of zero accidents for all projects.

"Shaw Environmental & Infrastructure, Inc. expects all of our employees, clients, and partners to uphold the highest environmental, health, and safety (EHS) standards to promote a positive and proactive safety attitude and to exhibit a heightened awareness of their surroundings both on and off the job. We must identify risks and hazards and implement appropriate controls in order to provide an injury-free work environment where people, equipment, and the environment are not placed at unreasonable threat of injury or damage. We will continually strive to be good citizens in our own community, as well as in every community in which we operate.

The Environmental Health and Safety Program and the components of our Occupational Health & Safety Management System have been developed to guide us in our daily activities. We also commit ourselves to continual improvement in EHS management. Further, I ask that you include our EHS process in all aspects of your work, assist in the maintenance of our process, and communicate this policy to all persons working for or on behalf of Shaw with the intent that they are made aware of their individual EHS obligations.

Through compliance with this policy, we will all actively participate in this process and advocate this philosophy. Together, we can accomplish our goals and exceed the minimum requirements provided by applicable laws and regulations, thus resulting in all stakeholders being proud to be a part of a team that truly values the importance of health, safety, and respect for the environment. Accordingly, we will maintain the position as a recognized leader in all of our business endeavors through a stewardship-based approach for our fellow employees, the environment, and the communities in which we live and work.

We are committed to the spirit and intent of this EHS policy statement and the laws, rules, and regulations to which we subscribe at its foundation."

George Bevan
President Shaw Environmental & Infrastructure, Inc.

Contract No. FA8903-09-D-8580, Task Order 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-5

Contract No. FA8903-09-D-8580, Task Order 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-5

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2.0 ORGANIZATION, QUALIFICATIONS, AND RESPONSIBILITIES

There will be numerous personnel required to complete the tasks for this project. The necessary personnel will be on-site Shaw project personnel, various subcontractors, off-site project team members, and government employees. All project personnel share the responsibility for safely completing project activities.

2.1 On-Site Personnel

All on-site personnel are responsible for continuous adherence to safety and health procedures during the performance of assigned work. In no case may work be performed in a manner that conflicts with the inherent safety and environmental precautions outlined in this SSHP. After due warning personnel violating safety procedures will be dismissed from the site and possibly terminated from further work.

Any person who observes unsafe acts or conditions or other safety problems has "Stop Work Authority" and shall immediately report the deficiency to supervisory personnel. If there is any dispute with regard to safety and health, on-site staff will attempt to resolve the issue and if the issue cannot be resolved on-site, they will consult off-site technical staff and supervisors for assistance. The specific task or operation in question shall remain discontinued until the issue is resolved.

2.2 Project Manager

The Project Manager, Kathleen Romalia, shall be the point of contact for AFCEE for the Kirtland AFB project. She has ultimate authority and responsibility for the establishment and maintenance of project administration control procedures. The Project Manager issues communications to AFCEE on the project status. The Project Manager, through the Base Lead, oversees the activities of all Shaw personnel, ensures compliance with the scope of work environmental activities, and controls project consistency. Additionally, the Project Manager is ultimately responsible for the development, implementation, and enforcement of the comprehensive Safety and Health Program.

2.3 Base Lead

The Base Lead, Dale Flores, shall be the point of contact for all field activities and shall report directly to the Project Manager. He will ensure that all activities are conducted in a safe manner and shall communicate all unsafe conditions to the Project Manager. The Base Lead oversees the activities of all Shaw personnel, ensures compliance with the scope of work environmental activities, and controls project consistency.

Contract No. FA8903-09-D-8580, Task Order 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-5

2.4 Construction Manager

The Construction Manager, is responsible for the field implementation and enforcement of this SSHP. The Construction Manager is also responsible for working with the Site Safety and Health Officer (SSHO) on a daily basis and maintaining contact with the Project Manager and Program Health and Safety Manager (HSM) for matters regarding project health and safety. The Construction Manager reports to the Project Manager.

2.5 Program Health and Safety Manager

The Program HSM, David Mummert, Certified Industrial Hygienist (CIH), is responsible for the following actions:

- Develop, maintain, and oversee implementation of this SSHP
- Visit the project as needed to audit the effectiveness of the SSHP
- Remain available for project emergencies
- Develop modifications to this SSHP as needed
- Evaluate occupational exposure monitoring/air sampling data and adjust SSHP requirements as necessary
- Approve this SSHP by signature

2.6 Site Safety and Health Officer

The Site Safety and Health Officer (SSHO) James Vigerust is the primary safety official and emergency response coordinator at the project. On a daily basis will assure operations are conducted in accordance with the SSHP, AFCEE requirements, and OSHA regulations. The SSHO reports, project-wide, to the Project Manager during execution of project activities, but reports directly to the Program HSM with functional issues. The SSHO has the authority to suspend operations at the project due to non-compliance. An alternate SSHO will be assigned by the primary SSHO when is not available on-site.

The SSHO has the overall responsibility to conduct exposure monitoring and/or air sampling and to select and/or adjust PPE use. The SSHO shall have the authority and is responsible for the following actions:

- Be present during operations to implement the SSHP
- Inspect site activities to identify safety and occupational health deficiencies and correct them

Contract No. FA8903-09-D-8580, Task Order 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-5

- Coordinate changes/modifications to the SSHP with the HSM, Construction Manager, Project Manager, and Contracting Officer's Representative (COR)
- Conduct project-specific training

Inspections completed by the SSHO will also be used to determine if operations are being conducted in accordance with the SSHP, AFCEE requirements, and OSHA regulations. These inspections shall be documented – deficiencies to be corrected shall be noted as an action item list and provided to the HSM for follow-up. Daily safety inspections shall be documented on the Daily Safety Inspection Report (Appendix D). Copies of the inspections will be provided to AFCEE, if requested.

Other SSHO responsibilities include the following:

- General Safety and Health Program administration.
- On-site contact for regulatory agencies on matters of safety and health.
- Establish employee exposure monitoring notification programs.
- Investigate significant accidents and illnesses and implement corrective action plans.
- Implement all safety procedures and operations on site.
- Observe work party members for symptoms of on-site exposure or stress.
- Arrange for the availability of on-site emergency medical care and first aid, as necessary.
- Determine evacuation routes, verify that an effective means of emergency communication is always available while workers are on site, establish and post local emergency telephone numbers, and arrange emergency transportation.
- Establish work zones.
- Present tailgate safety meetings and maintain attendance logs and records.
- Verify that the respiratory protection program is implemented, when necessary.
- Verify that decontamination procedures meet established criteria, when necessary.
- Monitor employee work hours and limit those work hours that are excessive.

In addition to having the pre-requisite 40-hour OSHA Hazardous Waste Operations and Emergency Response (HAZWOPER) training and updated 8-hour HAZWOPER Refresher

Contract No. FA8903-09-D-8580, Task Order 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-5

certifications, 8 hour Site Supervisor Certification the SSHO must also have completed the 30-hour OSHA construction safety class.

2.7 Subcontractor Personnel

Both Shaw and subcontractors share the responsibility for the safety and health of their employees. Subcontractors are also responsible for complying with the standards established in this SSHP, the guidelines established in Shaw Procedure No. HS011, "Health & Safety Rules for Contractors"; *Safety and Health Requirements Manual* (USACE, 2008); and all other project safety requirements. Subcontractors shall be pre-qualified according to the requirements of Shaw Procedure No. SOP-T-PR-301, "Qualification of Sources." The following are some of the requirements that apply to subcontractors:

- All subcontractors under the direction of Shaw will report to the Construction Manager.
- An assigned safety representative for each subcontractor shall be present on any day that work is being performed. The name of the assigned safety representative shall be conveyed to the Construction Manager.
- Subcontractors shall submit all training and medical surveillance documents to Shaw prior to mobilization.
- Planned operations for the day shall be verbally conveyed to the Construction Manager at the beginning of each day.
- All subcontractor employees working on site shall sign the Site Entry Log (Appendix D) at the beginning and end of each workday.
- All subcontractor personnel shall attend a project safety orientation prior to beginning work on site.
- All subcontractor personnel shall attend the morning tailgate safety meeting and prepare Job Safety Analyses. If scheduling precludes attendance at the Shaw meeting, then subcontractors shall hold and document their own safety meeting. Safety meeting documentation, using the Safety Meeting/Training Log form (Appendix D), is to be submitted to the SSHO.
- All accidents, fires, injuries, illnesses, and spills shall be immediately reported to the SSHO.
- Heavy equipment is to be inspected prior to use at the project site by a competent mechanic using the USACE Safety Inspection Checklist for Construction Equipment (Appendix D). Heavy equipment shall be inspected daily by the

Contract No. FA8903-09-D-8580, Task Order 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-5

equipment operator using the Daily Equipment Inspection form (Appendix D). Inspection documentation is to be submitted to the SSHO.

- Vehicles, such as trucks and automobiles are to be inspected daily by the individual driving using the Vehicle Inspection form (Appendix D). Inspection documentation is to be submitted to the SSHO weekly.
- Subcontractors are required to frequently inspect work sites for safety deficiencies and correct all deficiencies. Documentation of these inspections, as well as the corrective actions implemented, is to be submitted to the SSHO. The Project Safety Inspection Report (Appendix D), Daily Safety Inspection Report (Appendix D), or equivalent shall be used.

2.8 Visitors and Other On-Site Personnel

Visitors and other on-site personnel shall check in with the SSHO in order to verify that all appropriate entry requirements are met. All visitors will be briefed by the SSHO on the hazards to be expected on the site(s) and the safety and health controls required (i.e., hardhat, foot protection, etc.). The SSHO will verify that all visitors entering the site are properly protected and are wearing or provided with the appropriate PPE. A stock of common PPE (i.e., hard hats, eye protection, hearing protection, reflective vests, etc.) shall be maintained at the project for use by visitors. Visitors are responsible for providing their own respiratory protection, if required, as Shaw cannot provide respiratory protection to visitors. The SSHO will provide an escort for all visitors while on site.

Contract No. FA8903-09-D-8580, Task Order 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-5

Contract No. FA8903-09-D-8580, Task Order 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-5

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3.0 ACCIDENT PREVENTION PLAN

This section addresses general safety areas specified in Appendix A of the *Safety and Health Requirements Manual* (USACE, 2008), as components of the Accident Prevention Plan.

3.1 Project Safety Goal

Safety is Shaw's highest priority. Shaw and project personnel have targeted a goal of zero injuries, illnesses, and environmental incidents for the duration of this project. Additionally, there is a goal in place for experiencing zero vehicle incidents. All activities shall be conducted in a manner that supports these goals.

3.2 Indoctrination of New Employees

Both Shaw and subcontractor personnel are required to attend a safety-orientation meeting prior to commencing work. Safety-orientation meetings shall be documented and kept on file. Refer to Section 9.4 for an outline of the information that is conveyed to all personnel.

3.3 Fire Prevention and Protection

This section details fire prevention and protection procedures/resources to be used at each project.

3.3.1 Workplace Fire Hazards

The primary fire hazards at each project consist of fueling operations, storage of fuels, other flammable liquids at the project sites, and welding and cutting activities.

3.3.2 Potential Ignition Sources

The potential ignition sources at the project include smoking materials, welding/cutting equipment, vehicle/equipment exhaust, catalytic converters, and engine block surfaces. Personnel shall also be alert for other ignition sources such as, static electricity, lightning, and electrical equipment.

Contract No. FA8903-09-D-8580, Task Order 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-5

3.3.3 Fire Control Systems, Equipment, and Procedures

Depending on the nature and extent of any fire, the following fire control systems and equipment shall be evaluated or provided at the project:

- The Kirtland AFB Fire Department shall be contacted prior to beginning new operations at the project site. The Kirtland AFB Fire Department shall also be contacted at the conclusion of operations.
- Fire extinguishers shall be provided at work areas. Project vehicles and heavy equipment shall also be equipped with fire extinguishers.
- A USAF KAFB Hot Work Permit is required before a flame or spark-producing activity is to commence with work on base property.(Section 4.2.3).
- The AHA for fueling operations shall be followed (Appendix C14, "*Fueling Operations*").
- Flammable and oxidizing materials shall be stored in marked (No Smoking, Matches, or Open Flame) flammable materials storage areas with fire extinguishers available.
- Smoking shall only be permitted in designated areas. Personnel shall never discard cigarette butts into the environment while working at the project.
- All fires, no matter how small, shall be reported to the Kirtland AFB Fire Department, immediately.
- Project personnel are only permitted to extinguish small fires in their incipient stages.
- Fighting fires is prohibited by project personnel and shall only be performed by fire department personnel (Section 11.5).

Contract No. FA8903-09-D-8580, Task Order 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-5

3.3.4 Fire Control Equipment Maintenance Responsibilities

The SSHO is responsible for performing the monthly inspections (documented on the Emergency Eyewash Station/Fire Extinguisher Inspection Checklist [Appendix D]) and obtaining annual service for all Shaw fire extinguishers used at the project. Subcontractors are responsible for performing the monthly inspections and obtaining annual service for their fire extinguishers used at the project. Vehicle and heavy equipment operators are responsible for the inspection of fire extinguishers on vehicles/equipment.

3.4 Housekeeping

Housekeeping shall be a priority at each project site. The following provisions are specified to maintain a high standard of housekeeping:

- The importance of housekeeping and the expectations that good housekeeping shall be maintained will be regular topics of the morning safety meetings.
- Job sites and work areas shall be cleaned up on a daily basis.
- Subcontractors are required to maintain good housekeeping practices.
- Dumpsters and adequate waste/trash receptacles shall be provided as necessary in sufficient quantities in active work areas and are to be emptied regularly. Potentially contaminated waste shall be segregated from sanitary waste for proper characterization and/or disposal. Hazardous waste containers shall be labeled according to applicable regulations.
- Housekeeping is an operational/safety item, which shall be regularly considered during routine inspections.
- Nails shall be bent-over or removed from scrap lumber immediately.

3.5 Mechanical Equipment Inspections

Before any machinery or mechanized equipment is placed in use, it shall be inspected and tested in accordance with the manufacturer's recommendations and requirements of the *Safety and Health Requirements Manual* (USACE, 2008) and shall be certified in writing by a competent person to meet the manufacturer's recommendations and requirements of the manual. Subsequent re-inspections will be conducted at least annually thereafter. These inspections shall be documented on the USACE Safety Inspection Checklist for Construction Equipment (Appendix D). All safety deficiencies noted during the inspection shall be corrected prior to the equipment being placed in service at the project. If at any time the machinery or mechanized equipment is removed and subsequently returned to the project (other than equipment removed for routine off-site operations as part of the project), it shall be re-inspected and recertified prior to use. All heavy equipment shall be inspected by each operator prior to use on the project and shall then be inspected on a daily basis. Daily inspections shall be documented on the Daily Equipment Inspection form (Appendix D). Deficiencies in the equipment shall be noted on the form. All inspection documentation shall be submitted to the SSHO prior to using the equipment if safety deficiencies are observed and at the end of the day if no safety deficiencies are observed.

The SSHO shall immediately evaluate the inspection forms and determine if the equipment is in need of immediate repairs and if it should be "red tagged" and taken out of service. If the

Contract No. FA8903-09-D-8580, Task Order 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-5

equipment is taken out of service, then the equipment shall not be used until the SSHO is satisfied that the necessary repairs have been made. For minor deficiencies that do not compromise the safe operation of the equipment, repairs shall be made at the discretion of the equipment owner. All inspection records are to be kept on file in the Shaw field office.

3.6 First Aid and Medical Facilities

The following addresses first aid and medical facilities:

- Effective emergency communication devices must always be available while personnel are present at the site.
- Employees working alone in a remote location or away from other workers shall be provided an effective means of emergency communications. This means of communication could include a cellular phone, two-way radios, hard-line telephones or other acceptable means. The selected communication must be readily available (easily within the immediate reach) of the employee and must be tested prior to the start of work to verify that it effectively operates in the area/environment. An employee check-in/check-out communication procedure shall be developed to assure employee safety (see Section 4.5.1, Lone Worker Procedure).
- Emergency telephone numbers shall be posted at all Shaw-controlled telephones (Section 11.2).
- A large first aid kit shall be provided and maintained at the project. The first aid kit shall be inspected weekly by the SSHO. A seal may be placed on first aid kits to allow for less frequent inspections, such as, if the seal is not broken, then an inspection is not required. There shall be a small first aid kit available in all project vehicles. First aid kits in project vehicles do not need to be inspected if the factory plastic wrapping is intact. First aid kits shall be inspected using the First Aid Kit Inspection Log (Appendix D).
- The nearest hospital for the project is:

  University of NM Hospital Trauma Center
  2211 Lomas Blvd. NE, Albuquerque, New Mexico 87131
  (505) 277-0111

  The distance to the hospital is approximately 3.4 miles from the Kirtland AFB, with a travel time of approximately 11 minutes. The route map to the hospital is depicted in Figure 2.

Contract No. FA8903-09-D-8580, Task Order 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-5

- The nearest CORE Health Networks medical clinic for the project is:

  Center for Occupational Medicine
  5700 Harper Dr. NE, Suite 110
  Albuquerque, NM 87102
  (505) 244-3804

  The distance to the clinic is approximately 7.7 miles from Kirtland AFB, with a travel time of approximately 18 minutes. The route map to the clinic is depicted in Figure 3.

  Shaw employees shall utilize the CORE clinic for injuries that do not require assistance or transport by Emergency Medical Services.

The route maps to the clinic and hospital shall be available in all project vehicles; however, the facility to care for serious medical emergencies shall be determined by the Emergency Medical Services responding to the incident. At a minimum, the SSHO and at least one other on-site employee, including subcontractors, shall be certified in first aid and cardiopulmonary resuscitation (CPR) during intrusive activities. First aid and CPR training/certification must be made by a reputable provider, such as, the American Red Cross or American Heart Association.

3.7 Sanitation

The following provisions shall be made to address sanitation:

- Portable toilets shall be provided, as necessary, at convenient locations at the project site. Arrangements shall be made for the routine servicing and cleaning of these units.
- Safe drinking water is to be provided at each project site and provisions shall be made as necessary to provide safe drinking water at individual field locations. One-serving size individual bottle of water or disposable sanitary cups shall be provided along with receptacles for their disposal. All outlets dispensing non-potable water (under Shaw or subcontractor control) shall be posted with appropriate warning signs. Systems furnishing non-potable water and systems furnishing potable water shall be constructed to remain completely independent of each other.
- Portable washing facilities shall be provided as necessary at project sites and in Contamination Reduction Zones (CRZ). Portable washing facilities shall consist of, at a minimum, soap, water, and paper towels.

Contract No. FA8903-09-D-8580, Task Order 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-5

3.8 Illumination

Adequate lighting shall be provided to perform all activities in a safe manner. Work shall be scheduled, when possible, during daylight hours. When work is performed before sunrise, after sunset, inside buildings, or within other structures, the minimum lighting requirements specified in Table 7-1 of the *Safety and Health Requirements Manual* (USACE, 2008) shall be provided.

3.9 Engineering and Administrative Controls

The use of engineering and administrative controls shall be the preferred method of controlling or eliminating hazards. Only in cases where the use or application of engineering and administrative controls is deemed to be not feasible, then PPE may be used.

3.10 Signs, Labels, and Tags

Hazard warning signs shall be used to define specific hazards of a nature, such that failure to designate them may lead to accidental injury to workers or the public, or both, or to property damage. All new and replacement signs shall be in accordance with the requirements contained in 29 CFR 1910.145.

All containers of hazardous materials shall be labeled as to contents and the associated hazards. Hazard warning labels, whether on containers or equipment, shall not be removed by employees without the permission of the SSHO.

Tags shall be used as a means to prevent accidental injury or illness to employees who are exposed to hazardous or potentially hazardous conditions, equipment, or operations, which are out of the ordinary, unexpected, or not readily apparent. Tags shall be used until the identified hazard is eliminated or the hazardous operation is completed. Tags need not be used where signs, guarding, or other positive means of protection are being used. All equipment that is in need of repair for safety-related reasons shall be tagged as "Out of Service" until the equipment has been satisfactorily repaired.

3.11 Safety Promotions

The following methods for promoting accident prevention will be enacted:

- Accident prevention will be a regular topic discussed at safety meetings.
- All personnel will be encouraged to sign a Zero Accident Pledge poster (Appendix D) that is to be posted at the project.
- A Safety Incentive Award Program shall be implemented to reward safe employee behavior.

Contract No. FA8903-09-D-8580, Task Order 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-5

3.12 Accident Reporting

All accidents, regardless of their severity, shall be reported to the Construction Manager, SSHO, Project Manager, HSM, and COR. Other provisions for accident reporting and investigation are addressed later in this SSHP (Section 13.4).

3.13 Scope of Work

Shaw is responsible for all efforts needed to support the selected remediation efforts at the Kirtland AFB. Activities include, but are not limited to the following:

- Mobilization & Demobilization.
- General Site Activities.
- Collect Surface Soil Samples.
- Collect Subsurface Soil Samples.
- Collect Surface Water and Ground Water Samples.
- Well Drilling and Well Installation.
- Surface Soil Removal.
- Backfill Excavations.
- Surveying.
- Site Restoration.
- Soil Borrow Material Import (Loading, Transportation, & Dumping).
- Equipment Decontamination.

Scopes of work for the individual project sites will be verified prior to fieldwork initiation. If a specific activity is not covered by this SSHP an SSHP Addendum shall be completed, reviewed and approved as stated in Section 1.1, Site Safety and Health Plan Addenda.

3.14 Activity Hazard Analysis

Activity Hazard Analyses (AHAs) identify potential safety, health, and environmental hazards associated with specific tasks and provide protective measures for personnel, the community, and the environment. The AHAs have been developed for all major tasks performed for the project and included in this SSHP as Appendix C. An AHA shall also be prepared when new tasks are added, the job situation changes, or when it becomes necessary to alter safety requirements. Work will not proceed on a particular task/phase until the AHA has been reviewed with the work crews. The AHAs shall be reviewed and modified by the

Contract No. FA8903-09-D-8580, Task Order 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-5

Construction Manager and SSHO (with input from field employees and subcontractors). The AHAs shall be reviewed and modified throughout the workday, as necessary, to address changing site conditions, operations, or changes of competent/qualified person(s). The AHAs shall also be reviewed and modified during the daily tailgate safety meetings and Job Safety Analysis (JSA) meetings. Modifications will be handwritten in ink on the specific AHA. Additions or modifications to the AHAs, which are less conservative or allow for a downgrade in PPE requirements, must have written approval from the HSM.

The names of the competent/qualified person(s) required for a particular activity, (*i.e.*, excavations, scaffolding, fall protection, and other activities) as specified by OSHA shall be identified and included in the AHA. If more than one competent/qualified person will be used on the AHA, a list of names will be included as an attachment to the AHA. Those listed shall be competent and qualified for the type of work involved and familiar with current site safety issues. If a new competent/qualified person (not on the original list) is added, the list shall be updated (this is an administrative action not requiring an updated AHA). The new person shall acknowledge in writing that he/she has reviewed the AHA and is familiar with current site safety issues. Additions or changes to this SSHP must be attached as an SSHP Amendment (Appendix B). Any amendment to this SSHP must have written approval from the HSM.

3.15 Job Safety Analysis

Job Safety Analyses are an effective management technique for identifying hazardous conditions and unsafe acts in the workplace. A JSA is intended to analyze the individual steps or activities, which together create a job or specific work duty, and to detect any actual or potential hazards that may be present. Each crew must complete a JSA for each task that will be accomplished for that day, as required by Shaw Procedure No. HS045, “Job Safety Analysis”. The JSA shall be revised, as necessary, when unforeseen circumstances arise or work site conditions change. Any revisions shall be immediately communicated with the affected site workers. If the need to complete an unplanned task becomes necessary at any point throughout the day, a new JSA shall be prepared to cover that task. The JSAs shall be completed using the JSA Checklist Form and JSA Worksheet Form, both of which can be found in Appendix D.

3.16 Hazard Assessment Resolution Process

Hazard Assessment Resolution Process (HARP) is brief, paperless, general risk assessment made by employees in each work area. The objective of HARP is to identify and eliminate or control potential real-time workplace hazards, which could lead to an accident.

Contract No. FA8903-09-D-8580, Task Order 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-5

HARP requires workers to continuously be aware of the immediate work environment so as to detect conditions unanticipated by our work planning. This involves a three-step process:

1. Assess the hazard(s) and risk(s) to identify what could go wrong and what is the worst thing that could happen.
2. Analyze the situation to determine how to reduce the risks. Evaluate each identified risk and implement the appropriate safeguards to control the hazards.
3. Act to ensure safe operations:
   - Take the necessary steps to complete the job safely.
   - Follow written standards and procedures (SSHP, AHAs, JSAs, etc.).
   - Don't proceed until it's safe.

In performing the HARP, focus attention on surroundings, equipment, tools, PPE, and critical steps prior to focusing on the task; consider the chemical, physical, and environmental hazards associated with the task.

Risk reduction is a critical component of HARP. The following risks shall be avoided:

- Hurrying.
- Presume the job is routine or simple.
- Belief that nothing bad can happen.
- Not talking about precautions with co-workers.
- Not raising a "gut feel."

The appropriate hazard resolution and corrective actions must take place before proceeding with the task:

- Communicate hazards and precautions to take with co-workers and supervisor.
- Eliminate or control the hazards. The implementation of administrative controls is sometimes effective, i.e., marking the hazard with warning tape, signs, or tags.
- If the risk is unacceptable or if a hazard cannot be satisfactorily controlled, then stop work and contact the SSHO or HSM.

Contract No. FA8903-09-D-8580, Task Order 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-5

3.17 Safety Observation Program

Safety observations are behavior-based and provide a systematic feedback process between line personnel and supervision to proactively identify opportunities for safety improvement in work areas.

Employees engaged in work activities are often the most knowledgeable about the hazards of their work and can provide valuable feedback on unsafe conditions and unsafe practices, which may require corrective action.

The Safety Observation Program is a tool for employees to provide information on actual or potential safety hazards that they observe in their workplace, which if left unreported may result in an accident and or injury. This program also provides a mechanism for recommending corrective actions.

The Shaw Safety Observation Program:

- Identifies practices that could cause accidents, injuries, or damage.
- Identifies specific needs for coaching and training.
- Checks the adequacy of the SSHP, AHAs, JSAs, and compliance with general site rules and other procedures.
- Monitors the effectiveness of training.

The SSHO must develop a schedule for conducting safety observations. A general guideline for the number of observations in a week is one observation per 100 work hours on the project. The schedule for observation(s) shall be communicated to site personnel.

The volunteer conducting the safety observation shall record their findings on the Safety Observation Reporting Card, as required by Shaw Procedure No. HS026, “Safety Observation Procedure” (2011). Tasks or items that require follow-up because of serious risk potential must be addressed immediately by the SSHO. Items with lesser risk should be discussed in the next tailgate safety meeting. The action items and corrective actions, including dates and responsible person(s) shall be documented on the Safety and Occupational Health Deficiency Tracking Log (Appendix D), maintained, and available for inspection.

3.18 Safety and Health Bulletin Board

A safety and health bulletin board shall be maintained in an area commonly accessed by workers at the Field Office. The bulletin board shall be maintained current, in clear view of on-site workers, and protected against the elements and unauthorized removals. The SSHO

shall evaluate the content of the bulletin board each week, at a minimum, and update if necessary. It shall contain at least the following safety and health information:

- Map denoting the route to the nearest emergency care facility.
- Emergency telephone numbers.
- Copy of the most up-to-date SSHP shall be mounted on or adjacent to the bulletin board or state the location, which will be accessible on the site by all workers.
- Copy of current SSHP Addenda shall be mounted on or adjacent to the bulletin board or state the location, which will be accessible on the site by all workers.
- Copy of current AHA(s) shall be mounted on or adjacent to the bulletin board or state the location, which will be accessible on the site by all workers.
- Occupational Safety and Health Administration Form 300A shall be posted in accordance with OSHA requirements and mounted on or adjacent to the bulletin board or state the location, which will be accessible on the site by all workers.
- Copy of Safety and Occupational Health Deficiency Tracking Log (Appendix D) shall be mounted on or adjacent to the bulletin board or state the location where it will be accessible by all workers upon request.
- Safety and health promotional posters (includes Environmental, Health, and Safety Mission Vision Poster [Appendix D]).
- Date of last lost workday injury.
- OSHA Safety and Health Poster.

Contract No. FA8903-09-D-8580, Task Order 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-5

Contract No. FA8903-09-D-8580, Task Order 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-5

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4.0 PROJECT HAZARDS AND HAZARD CONTROL MEASURES

There are potential chemical, physical, and environmental hazards present at the project sites. The anticipated hazards at the project sites and the recommended control measures are presented in this section. A site-specific hazard assessment of each remedial area will be performed by the SSHO to assess exposure potential to site workers from contaminants, physical hazards, remedial activities and environmental stressors. Additional information on specific hazards and control measures are outlined in the AHAs and SSHP Addenda when developed.

4.1 Chemical Hazards

Zia Park (CW-C571) is an "L" shaped mound approximately 100 feet (ft) by 150 ft, raised approximately 1 ft over the entire surface near Zia Park. Zia Park is located within the former Kirtland AFB housing area southwest of Louisiana and Pennsylvania in the central part of Kirtland AFB. Various types of debris, including concrete and glass, are present on the surface. Base personnel stated that the site used to be a construction area in the 1970s and 1980. Vegetation on top of the raised mound appears distressed and unhealthy. Kirtland AFB personnel stated that an old map labeled this area as a chemical warfare training area. No previous investigations have been performed at the site and the nature and extent of COCs have not been determined. Zia Park is not identified as a Munitions and Explosives of Concern (MEC) or Chemical Warfare Material (CWM) site .

Building 5700-1 (OT-C572), also known as Building 57001, is located near the border of Kirtland AFB and the Isleta Reservation in the south central portion of the installation and was formerly the location of the civil engineering labs. Features at the site include an old septic tank and associated leach field that exists to the west of the building. Two shock tubes used for detonation and impact testing are located south of the Building 5700-1 (also known as Building 57001). The site consists of slightly rolling, hard-packed to patchy grass-covered soil. The building is unoccupied and no longer in use. No previous NMED-approved investigations have been conducted at the site; however, limited soil sampling was performed by Kirtland AFB in 2009. Two polyaromatic hydrocarbons (PAHs) were found during a previous investigation at concentrations above Kirtland AFB Cleanup levels. Benzo(a)pyrene was found at a depth of 0.5 feet below ground surface (bgs) (adjacent to Building 5700-1) and Benzo(b)fluoranthene was found at 2 ft bgs in a leach field soil sample.

Asphalt Dump Area (**OT-C573)** consists of an area approximately 100 yards by 100 yards, raised vertically 2 feet throughout, located near northwest of the intersection of Wyoming St. and Hardin St. The mound is covered with native vegetation and has scattered debris piles,

Contract No. FA8903-09-D-8580, Task Order 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-5

including asphalt and porcelain, in various locations on the surface of the mound. No previous NMED-approved investigations have been conducted at the site; however, limited soil sampling has been performed by Kirtland AFB in 2009. PAHs were found during a previous investigation at a depth of 2 feet BGS above Kirtland AFB Cleanup levels. The presence of PAHs in soil is well-documented as byproducts of jet fuel combustion. Anthropogenic or manmade PAHs have a different geochemical signature than PAHs present in asphalt.

Building 20676 (SS-C574) is the site of a former diesel spill that occurred in 2002. Site personnel recall that this spill was cleaned up for diesel, but suspect some lingering polychlorinated biphenyls (PCB) contamination exists; they furthermore question the thoroughness of the diesel cleanup activities.

Soil samples collected from the site had concentrations of diesel range organics (DRO) above screening guidelines, but PCBs were not detected. Based on the presence of DRO remaining in the soil, a release at the site has been confirmed but the level of cleanup is questionable.

Transient Alert Pad (SS-C575) Base personnel reported a spill of 50 to 250 gallons of JP-8 fuel on the tarmac near the Transient Alert Pad, (SS-C575) between Building 333 and Building 1000 on Parking Apron D. There is evidence that the sealant between the concrete seams dissolved and base personnel observed fuel floating up between the cracks during periods of heavy rainfall. A fuel line is reportedly buried under the tarmac that is now abandoned and possibly damaged, contributing to contamination.

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These various hazardous inorganic and inorganic chemicals have been identified as potentially being present as contaminants in soils and waters at these 5 sites at Kirtland AFB. The majority of these chemicals are related to past fuel releases, leaking underground storage tanks, and maintenance operations which occurred at the site i.e. solvents. These chemicals are considered toxic and some are identified as being carcinogenic. The chemicals potentially present at the 5 specified sites at Kirtland AFB are summarized below:

- ***Particulates not otherwise regulated/Particulates not otherwise specified.*** Particulates not otherwise regulated target the eyes, skin, and upper respiratory system. Symptoms of exposure include irritation to the eyes, skin, throat and upper respiratory system. (PEL-TWA: 15 mg/m^3 [total]; 5 mg/m^3 – [respirable fraction]; IDLH: not determined; TLV-TWA: 10 mg/m^3 [inhalable particles]; 3 mg/m^3 – [respirable particles]).

Contract No. FA8903-09-D-8580, Task Order 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-5

- ***BTEX.*** The term BTEX refers to a combination of benzene, toluene, ethylbenzene and xylene. The presence of this material is usually indicative of petroleum hydrocarbon contamination. The individual compounds are discussed in this section.

- ***Benzene.*** Benzene targets the eyes, skin, respiratory system, blood, CNS, and bone marrow. Symptoms of exposure include irritation eyes, skin, nose, respiratory system; dizziness; headache, nausea, staggered gait; anorexia, lassitude (weakness, exhaustion); dermatitis; bone marrow depression; (potential occupational carcinogen). Benzene is a confirmed human carcinogen (ACGIH, 2011). (PEL-TWA: 1 part per million [ppm], STEL: 5 ppm; IDLH: Carcinogen [500 ppm]; TLV-TWA: 0.5 ppm, 2.5 ppm TLV-STEL with a skin notation.) TLV Basis: Leukemia (ACGIH, 2011).

- ***Toluene.*** Toluene targets the CNS, skin, eyes, liver, kidneys, and respiratory system. Symptoms of exposure include irritated eyes and nose, headaches, dizziness, lassitude, confusion, euphoria, muscle fatigue, insomnia, anxiety, liver and kidney damage, lacrimation, paresthesia, dermatitis, and dilated pupils (NIOSH, 2007). Toluene is not classifiable as a human carcinogen (ACGIH, 2011). (PEL-TWA: 200 ppm, PEL-C: 300 ppm, PEL-10-minute maximum peak in any 3 hours: 500 ppm, IDLH: 500 ppm; TLV-TWA: 20 ppm) TLV Basis: visual impairment; female reproductive; pregnancy loss (ACGIH, 2011).

- ***Ethylbenzene.*** Ethylbenzene targets the central nervous system, skin, eyes, and respiratory system. Symptoms of exposure include irritated eyes, skin, and mucous membranes; headaches, narcosis, dermatitis, and coma. Ethylbenzene is a confirmed animal carcinogen with unknown relevance to humans (ACGIH, 2011). (PEL-TWA: 100 ppm; IDLH: 800 ppm [10% LEL]; TLV-TWA: 100 ppm, TLV-STEL: 125 ppm.) TLV Basis - Critical Effect(s): upper respiratory tract and eye irritation; CNS impairment (ACGIH, 2011).

- ***Xylenes.*** Xylenes target the eyes, skin, respiratory system, central nervous system, gastrointestinal tract, blood, liver, and kidneys. Symptoms of exposure include irritation to the eyes, skin, nose, throat; dizziness, excitement, drowsiness, in-coordination, staggering gait; corneal vacuolization; anorexia, nausea, vomiting, abdominal pain; dermatitis. Xylenes are not classifiable as human carcinogens (ACGIH, 2011). (PEL-TWA: 100 ppm; IDLH: 900 ppm; TLV-TWA: 100 ppm, TLV-STEL: 150 ppm.) TLV Basis: upper respiratory tract and eye irritation; CNS impairment (ACGIH, 2011).

- ***Polyaromatic Hydrocarbons (PAHs)*** PAHs, also known as coal tar pitch volatiles, are a collection of polycyclic aromatic hydrocarbons associated with burning of

organic material, and coal and petroleum refining. PAHs can cause eye, nose and throat irritation. Skin exposure with concurrent sunlight exposure can cause severe sunburn. Some of the individual constituents are human carcinogens. (PEL-TWA: 0.2 mg/m^3, IDLH: Ca [80 mg/m^3]; TLV-TWA: 20.2 mg/m^{3}5 ppm) TLV Basis: Cancer (ACGIH, 2011).

4.1.1 Hydrogen Sulfide and Methane

There is potential for hydrogen sulfide gas and methane to be present in the landfills or identified remedial areas due to the decomposition of various materials. The hazards of hydrogen sulfide and methane gas are summarized in the following:

- ***Hydrogen sulfide.*** Hydrogen sulfide is a colorless gas with a strong odor of rotten eggs. Note: The sense of smell becomes rapidly fatigued and cannot be relied upon to warn of the continuous presence of hydrogen sulfide. Hydrogen sulfide targets the eyes, respiratory system, and central nervous system. Symptoms of exposure include irritation of the eyes and respiratory system; apnea; coma; convulsions; eye disturbances and damage; dizziness; headache; lassitude; irritability; insomnia; and gastrointestinal disturbances (NIOSH, 2007). (PEL-C: 20 ppm; IDLH: 100 ppm; TLV-TWA: 1 ppm, TLV-STEL: 5 ppm) TLV Basis: upper respiratory tract irritation; CNS impairment (ACGIH, 2011).
- ***Methane.*** Methane is a colorless, odorless gas. The material is highly flammable. It has very low degree of toxicity however is recognized as a simple affixiant i.e. excludes oxygen from the air. No exposure indices have been developed for this material.

4.1.2 Unknown Chemical Containers

If reactive chemicals, chemical containers, gas cylinders, drums, or barrels are encountered, the field crew shall immediately stop work, exit the area, and contact the Construction Manager or SSHO and the HSM. Operations will be resumed only after the appropriate controls have been implemented.

4.1.3 Chemical Warfare Materiel

Chemical Warfare Materials, Evaluating OE/UXO/CWM Hazards in Support of Activities, confirms that the historical records available for the area of CS-C571 Zia Park have been reviewed and that CWM support is not required. Additionally, based on all available information, it has been determined that the potential for encountering chemical agent is unlikely based on the lack of documents or photos. Although it has determined the potential for encountering chemical agent is low, a sweep of the area using a Hazardous Materials Chemical Agent Detector calibrated for CWM will be conduct and a monitor will be used

Contract No. FA8903-09-D-8580, Task Order 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-5

during sampling for protection of employees. Project shall follow the guidelines provided by Shaw HS 317 *Munitions and Explosives of Concern (MEC).* If the monitor alarms or a item is encountered Shaw Stop work, evacuate upwind, protect the site , and notify the EOD and Tech Escort team and Project management.

4.1.4 Asbestos

While there is no mention of asbestos containing materials (ACM), there is potential for ACM to be encountered during project activities. If suspected ACM is identified (brake shoes, insulation, floor tiles, ceiling tiles, siding, shingles, pipes, etc.), the field crew shall immediately stop work, exit the area, and contact the Construction Manager or SSHO and the HSM. Operations will be resumed only after the appropriate controls have been implemented. Normal dust control measures will limit low concentrations of asbestos fibers from becoming an inhalation hazard.

4.1.5 Raw Sewage

The potential for contacting raw sewage during project activities has not been determined. Potential work around or near sewage lines will be evaluated by the Construction Manager and SSHO prior to work beginning in that specific area.

4.1.6 Munitions and Explosives of Concern

The presence of Munitions and Explosives of Concern (MEC) has not been identified in project documents. If suspected or known MEC is encountered, the field crew shall immediately stop work, leave the exclusion zone (EZ), and contact the Construction Manager or SSHO and the HSM (Section 6.1). The MEC shall not be probed, touched, or handled by unauthorized personnel under any circumstance. The basic guidelines for MEC safety are listed below:

- Do not continue to move towards suspected MEC.
- Once you recognize a MEC hazard, do not move any closer.
- Stop all work.
- Make all radio transmissions at least 100 meters away from a MEC hazard.
- Do not try to remove anything that is on or near MEC.
- Do not touch, move, or disturb the MEC.
- Stay away from MEC.
- Mark a MEC hazard area properly so that other personnel will stay away from it.
- Evacuate all non-essential personnel from a MEC hazard area.

Contract No. FA8903-09-D-8580, Task Order 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-5

- Report through your chain of command all MEC hazards that affect operations.

Specific emergency procedures for MEC encounters are included in Section 11.7.

4.1.7 Radiological Hazards

No radiological hazards have been identified with anticipated project activities. If a suspected radiological hazard is identified (radium painted dials, vacuum tubes, trefoil symbols, etc.), the field crew shall immediately stop work, exit the area, and contact the Construction Manager or SSHO and the HSM.

4.1.8 Operational Chemicals/Hazard Communication Program

Hazardous chemicals will be brought to project sites for use in activities supporting the planned work. These chemicals are used as fuels, construction materials, solvents, cements, cleaning solutions, paints, etc. The use of operational chemicals is regulated by OSHA under the Hazard Communication Standard (29 CFR 1910.1200). A written hazard communication program has been established as Shaw Procedure No. HS060, "Hazard Communication Program," which includes the following elements:

- ***Container Labeling***—Project personnel will ensure that all containers are labeled according to their contents. This requirement will apply to containers from manufacturers and those produced on site by operations. The labels on all incoming and outgoing containers will be checked for identity, hazard warning, and the name and address of the responsible party.
- ***Material Data Safety Sheets (MSDS)***—MSDSs will be provided on site for each hazardous chemical used or known to be present at the site.
- ***Employee Information and Training***—Employees will receive annual chemical hazard safety training, supplemented by informal daily safety meetings. Project-specific chemical hazards will be communicated to employees through an initial site orientation meeting and daily safety meetings. Employees may request copies of specific MSDSs by completing the "Employee Request for Material Safety Data Sheet (MSDS)" form provided in Appendix D.

The written hazard communication program will be available at the project site for personnel review and provides requirements for the safe use of operational chemicals. Proper ventilation and PPE shall be used when working with operational chemicals. Air monitoring may be performed as needed to assess and control exposures resulting from the use of operational chemicals. An inventory list of the operational chemicals (Hazardous Chemical Inventory List) used and an MSDS for operational chemicals shall be completed by the SSHO, placed in Appendix E or a stand-alone document, and made available at the project

Contract No. FA8903-09-D-8580, Task Order 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-5

site. A copy of the Inventory and MSDSs shall be provided to Kirtland AFB Fire Department upon request.

4.2 Physical Hazards

There will be numerous physical hazards associated with site operations that require consideration. Some of these physical hazards are as follows:

- Noise and hearing conservation;
- Slips, trips, and falls;
- Fires, explosions, and hot work;
- Use of ladders and scaffolding;
- Use of small tools;
- Use of cutting tools;
- Use of heavy and mechanized equipment;
- Operation of motor vehicles;
- Material handling;
- Hazardous energies (i.e., electrical, mechanical, and pressure);
- Air compressor use;
- Portable generator use;
- Intrusive activities;
- Excavation;
- Confined space entry;
- Dust;
- Use of pressure washers and steam washers;
- Excessive work hours;
- Working over or near water; and
- Workplace reproductive hazards.

4.2.1 Noise and Hearing Conservation

There will be many sources of noise at each project site. Noise may be generated from the use of equipment and tools. Hearing loss, resulting from occupational exposure to noise, can

Contract No. FA8903-09-D-8580, Task Order 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-5

be prevented. Shaw Procedure No. HS402, "Hearing Conservation Program," shall be implemented at each project site whenever there is employee noise exposures equal to or exceeds an eight-hour TWA of 85 decibels, A-scale. As part of the criteria for a hearing conservation program, audiometric testing of personnel must be conducted annually. The SSHO shall conduct noise surveys as necessary to determine if engineering controls should be implemented and/or if hearing protection is adequate. Personnel shall wear hearing protection when working with or around heavy equipment, power tools, as noise monitoring indicates, or in areas posted as such. Warning signs shall be posted in areas where noise (greater than 85 decibels) necessitates the use of hearing protection.

4.2.2 Slips, Trips, and Falls

The following details procedures to prevent slips, trips, and falls:

- Personnel shall keep work areas clean and orderly. Tools, equipment, and materials shall be used and stored in a fashion to minimize tripping hazards.
- Debris shall not be left lying around in any place, particularly in areas where personnel walk.
- Spills shall be cleaned up immediately.
- Personnel are prohibited from walking or working on surfaces or equipment that is not intended as walking or working surfaces.
- Personnel shall take extra precautions, such as establishing firm handholds, wearing suitable footwear, and walking slowly when walking on surfaces during wet, snowy, or icy weather.
- Walking and working surfaces shall be properly maintained during inclement winter weather, as feasible.
- Personnel shall not jump from elevated places or equipment.
- Personnel using hand and mechanical tools shall position themselves properly and consider the events if a tool slips or suddenly moves.
- Electrical extension cords and electrical wiring shall be kept clear of walking and working areas and/or covered, buried, or otherwise secured.
- Running is prohibited on job sites unless under emergency conditions.
- Employees exposed to fall hazards shall be protected by standard guardrail, catch platforms, temporary floors, safety nets, personal fall protection devices, or the equivalent. No employee may be exposed to a fall of over 6 feet without being adequately protected.

Contract No. FA8903-09-D-8580, Task Order 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-5

- Shaw Procedure No. HS301, "Fall Protection," shall be followed when there is a fall hazard of 6 feet or greater.

4.2.3 Hot Work

Hot work (e.g., welding, burning, and cutting) conducted on site shall comply with the following requirements: Kirtland AFB has a Hot Work Program that is independent of Shaw. All hot work done on base shall comply with the base program. Kirtland AFB follows the EM 385.1 Chapter 9 and 10 requirements. The SSHO is the contact with the fire department for hot work permits.

- Shaw Procedure No. HS314, "Hot Work in Hazardous Locations," shall be followed whenever there is spark/ignition producing activities in progress at the project site.
- The SSHO shall establish areas approved for welding, cutting, and other hot work.
- The SSHO is responsible for authorizing welding, cutting, and other hot work in areas not specifically designed or approved for such operations (Hot Work Permit).
- All personnel shall be protected from welding radiation, flashes, sparks, molten metal, and slag.
- All welding, burning, and cutting equipment shall be inspected daily by the operator. Defective equipment shall be tagged and removed from service, replaced or repaired, and re-inspected before again being placed in service.
- All welders, cutters, and their supervisors shall be properly trained in the safe operation of their equipment, safe welding/cutting practices, and welding/cutting respiratory and fire protection.
- The handling of compressed gas cylinders shall comply with the requirements established in Shaw Procedure No. HS304, "Compressed Gas Cylinders."
- Cutting, welding, or other hot work shall be permitted only in areas that are or have been made fire safe.
- Cutting or welding shall not be permitted in the following situations:
  - In areas not authorized by the SSHO.
  - In the presence of explosive atmospheres (i.e., mixtures of flammable gases, vapors, liquids, or dusts with air), or explosive atmospheres that may develop inside un-cleaned or improperly prepared drums, tanks, or other containers, and equipment that has previously contained such materials.

Contract No. FA8903-09-D-8580, Task Order 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-5

  - In any area where combustible gas indicator readings are in excess of 10 percent of the lower explosive limit.
  - On storage or process vessels or lines in service that contain flammable or combustible liquids, gases, vapors, or solids.

- Before any welding, cutting, or other hot work is permitted, the area shall be inspected by the SSHO to verify that the following requirements have been met:
  - Cutting and welding equipment to be used shall be in safe operating condition and in good repair.
  - Where practical, all combustible material shall be relocated at least 35 feet away from the hot work site. Where relocation is impractical, combustibles shall be protected with flameproof covers or otherwise shielded.
  - At a minimum, two fully charged and operable fire extinguishers, appropriate for the type of possible fire (4-A:60-B:C), shall be available at each work area.
  - A fire watch shall be required whenever hot work is performed in hazardous locations.
  - Combustible gas indicator readings shall be taken to verify the work area is free of combustible gases and vapors.
  - The work area is free of toxic contaminants at concentrations in excess of established TLVs or all personnel who will work in the area have been provided respiratory protection and protective apparel appropriate for the degree of exposure.
  - When hot work is to be performed on tanks or other vessels that contain or have contained flammable or combustible liquids, the vessel shall be properly isolated, purged, cleaned, or inerted as appropriate, to reduce the concentrations of flammable/combustible vapors to safe levels.
  - A Hot Work Permit (Appendix D) shall be completed by the SSHO, reviewed with personnel who will perform the hot work, and posted near the job site.
  - A Hot Work Permit is good only for the date issued and valid only for the 8-hour shift for which it is issued. If the work area is completely vacated by personnel, such as, during lunch, a new permit may need to be issued.
  - If at any time during the hot work operation a change in conditions at the work site is suspected, such as a release of flammable gases or vapors in the work area, work shall be stopped immediately and the SSHO shall be notified. Such

work stoppage invalidates the Hot Work Permit, and a new permit shall be completed after inspections and tests have been performed by the SSHO.

– No erasures or changes of dates on Hot Work Permits shall be permitted.

4.2.4 Use of Ladders and Scaffolds

Ladders and scaffolding shall only be used at each project under the following conditions:

- Ladder use shall comply with Shaw Procedure No. HS302, "Ladder Safety."
- Scaffold erection and use shall comply with all applicable OSHA regulations. A trained competent person shall supervise all scaffold erection and use.

4.2.5 Use of Small Tools

Hand and power tools shall be used, inspected, and maintained in accordance with the manufacturer's instructions and recommendations and will be used only for the purpose for which designed. A copy of the manufacturer's instructions and recommendations shall be maintained at the project site. The following requirements shall be adhered to:

- Tools designed to accommodate guards will be equipped with such guards when in use.
- Tools shall be inspected to ascertain safe operating conditions and are to be kept clean and free of accumulated dirt.
- Electric power tools and extension cords shall be used with ground fault circuit interrupter.
- Portable power cords will be designated as hard usage or extra hard usage and shall not be used if damaged, patched, oil-soaked, worn, or frayed.
- Connections on pneumatic lines shall be secured with a safety lashing.
- Explosive-actuated tools will meet the design requirements of American National Standards Institute (ANSI) A10.3 and only be operated by a qualified operator.
- Explosive-actuated tools and charges shall be secured at all times to prevent unauthorized possession or use.
- Explosive-actuated tools shall not be loaded until just prior to the intended firing time; neither loaded nor empty tools are to be pointed at any employees; hands shall be kept clear of the open barrel end.

Contract No. FA8903-09-D-8580, Task Order 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-5

- Hand tools, such as hammers and chisels, shall be inspected and dressed if necessary to remove mushroomed heads, which may separate and become projectile hazards.

4.2.6 Use of Cutting Tools

Proper cutting tools, such as scissors, snips, side cutters, etc., are to be used when possible in lieu of box cutters or knives. Furthermore, if box cutters are determined to be the appropriate tool for the job, the only type that should be used is the design that has a self-retracting blade capability. Employees must utilize appropriate PPE (leather gloves) to allow for further protection. There are many cutting tool manufacturers that offer a variety of safety knives, which are available for all types of cutting. The SSHO shall evaluate each cutting task in order to determine that the safest and most appropriate cutting tool is used. The SSHO shall also provide training in the proper use of the selected cutting tool. The following evaluation shall be made for each cutting task:

- Determine that hand knives are actually the most practical tool for the task. Where possible, use the safest cutting tool for the job (e.g., scissors, snips, or wire strippers).
- If a knife happens to be the correct tool, keep the knife sharp and clean. A dull blade can cause accidents because more force is needed to cut an object. However, a knife or any other unprotected blade tool must be the last resort when choosing a cutting tool.
- Maintain a supply of either replacement knives and/or blades and make them readily available.
- Cut away from yourself, ending the knife stroke away from your body. Hold the item you are cutting firmly, and do not cut downwards and towards your body. Cut into the air or onto hard surface.
- Confirm that appropriate PPE (e.g., gloves) specific to the task is available to employees and used when the possibility of injury exists.
- Personal knives (e.g., pocketknives) shall not be considered as a tool for any type of work-related cutting. Employees are required to ask for a cutting tool from their supervisor, thereby resulting in an additional review of using the right cutting tool for the job.
- The SSHO is to inspect material cutting activities to verify that leather gloves are being used to protect hands.

Contract No. FA8903-09-D-8580, Task Order 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-5

4.2.7 Use of Heavy and Mechanized Equipment

Excavators, front-end loaders, drill rigs, direct-push rigs, and other types of specialized equipment may be used to accomplish the work at the project. The use of this equipment can be dangerous. Extra care shall be exercised in its use and while working in the vicinity of this equipment.

4.2.7.1 Heavy Construction Equipment

Various types of heavy construction equipment will be used for project activities. All operators of this equipment shall be familiar with the requirements for inspection and operation of the equipment that they will be using. Before equipment is placed into use and on a daily basis, the operator is to inspect and verify that it is in safe operating condition, as described in Section 3.5. The following guidelines shall be adhered to while operating heavy construction equipment:

- Equipment shall not be operated in a manner that will endanger persons or property nor will the safe operating speeds or loads be exceeded.
- Getting on or off of equipment while it is in motion is prohibited.
- Equipment shall be operated in accordance with the manufacturer's instructions and recommendations.
- Determinations of road conditions and structures shall be made in advance to verify that clearances and load capacities are safe for the passage of equipment.
- All machinery or equipment shall be shut down and positive means taken to prevent its operation while repairs or manual lubrications are being done. Equipment designed to be serviced while running is exempt from this requirement.
- Buckets, blades, dump bodies, and similar equipment will be either fully lowered or blocked when being repaired or when not in use. All controls shall be in a neutral position, with the engines stopped and brakes set, unless work being performed on the machine requires otherwise, per manufacturer recommendations.
- No guard, safety appliance, or device shall be removed from machinery or equipment, or made ineffective except for making immediate repairs, lubrications, or adjustments, and then only after the power has been shut off. All guards and devices will be replaced immediately after completion of repairs and adjustments and before power is turned on.
- Mechanized equipment shall be shut down prior to and during fueling operations. Closed systems, with automatic shut-off, which prevent spillage if connections are broken, may be used to fuel diesel powered equipment left running.

Contract No. FA8903-09-D-8580, Task Order 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-5

- Each piece of heavy equipment and other similar equipment shall be equipped with at least one dry chemical or carbon dioxide fire extinguisher with a minimum rating of 10-B:C.
- Personnel shall not work, pass under, or ride in the buckets or booms of loaders in operation.
- All self-propelled construction equipment, whether moving alone or in combination, shall be equipped with a reverse signal alarm.
- Seat belt use is required while operating equipment.

Spotters for the operator shall be the only personnel allowed in the vicinity of the heavy equipment. Spotters shall stay out of the boom radius area. Personnel needing to approach heavy equipment while operating shall observe the following protocols:

- Wear Class 2 high visibility vests meeting ANSI specifications
- Make eye contact with the operator (and spotter)
- Signal the operator to cease heavy equipment activity
- Approach the equipment only after the operator has given signal to do so.

4.2.7.2 Mechanized Equipment – Use of Quick Connect/Disconnect Systems

The manufacturer's specifications and operating manuals for hydraulic equipment and attachments utilizing quick connect/disconnect systems shall be followed. After completing a switch in attachments, the equipment operator shall take the actions necessary to verify the quick connect/disconnect system is positively engaged.

4.2.7.3 Hydraulic Excavators, Wheel Loaders, Track Loaders, and Backhoe/Loaders Used to Transport or Hoist Loads with Rigging

When hydraulic excavating equipment is to be used to transport or hoist loads utilizing hooks, eyes, slings, chains, or other rigging, the following requirements shall apply:

- A Lift Plan Worksheet (Hydraulic Equipment) (Appendix D) shall be completed.
- Operations involving the use of hydraulic excavating equipment and rigging to transport or hoist loads require different operator skills and considerations than the standard excavating operations routinely performed with hydraulic excavating equipment. An AHA specific to the transporting or hoisting operation shall be prepared (Appendix C15, "*Rigging and Lifting with Hydraulic Equipment*"). The AHA shall include, but not be limited to the following:

Contract No. FA8903-09-D-8580, Task Order 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-5

  - Written proof of qualifications of equipment operators, riggers, and others involved in the transporting and hoisting operations.
  - Performance of the operational test described in section 16.N.01 (b) of the *Safety and Health Requirements Manual* (USACE, 2008).
  - Proper operating procedures in accordance with the equipment manufacturers operating manual.
  - Proper use and on site availability of manufacturer's load rating capacities or charts.
  - Proper use of rigging, including positive latching devices to secure the load and rigging.
  - Inspection of rigging (complete a "Rigging Inspection Checklist. (Appendix D)
  - Use of tag lines to control the load.
  - Communications.
  - Establishment of a sufficient swing radius (equipment, rigging, and load).
  - Stability of surfaces beneath the hydraulic excavating equipment..

- An operational test with the selected hydraulic excavating equipment will be performed in the presence of the Government Designated Authority, if available. The operational test shall consist of a demonstration that the test load and selected rigging can be safely lifted, maneuvered, controlled, stopped, and landed. The operational test shall be representative of the complete cycle of the proposed transporting or hoisting operation, including configuration, orientation, and positioning of the excavating equipment and the use of identical rigging. The test load shall be equivalent to the maximum anticipated load, but shall not exceed 100 percent of the manufacturer's load rating capacity for the excavating equipment as configured. Written documentation of the performance of the operational test outlining test procedures and results shall be maintained at the on-site project office.
- All rigging and rigging operations shall comply with the requirements of Section 15 of the *Safety and Health Requirements Manual* (USACE, 2008). Hooks, eyes, slings, chains, or other rigging shall not be attached to or hung from the teeth of a bucket during the transporting or hoisting of a load by hydraulic excavating equipment.

- After the completion and acceptance of an operational test described in 16.S.01 (b) (USACE, 2008), if repairs, major maintenance, or reconfiguration are required to be performed on the hydraulic excavating equipment or attachments, another operational test as described in 16.S.01 (b) shall be performed to demonstrate that the completed repairs are satisfactory and that the test load and selected rigging can be safely lifted, maneuvered, controlled, stopped, and landed.
- Loads shall be lifted the minimum height necessary to clear the ground or other obstacles and carried as low as possible when the equipment is traveling.
- Loads shall not be lifted over personnel.
- Adequate clearances shall be maintained from electrical sources.
- Hydraulic excavating equipment shall not be used to hoist personnel. The riding of personnel on loads, hooks, hammers, buckets, or any other hydraulic excavating equipment attachment is prohibited.

4.2.7.4 Drill Rig /Direct-Push Safety

All drilling operations are to comply with Shaw Procedure No. HS316, "Drill Rig Operations." All members of the drill/direct-push crew(s) shall receive site-specific training prior to beginning work. The Shaw Field Team Leader must have successfully completed Shaw's in-house training pertinent to competent person drilling oversight training. The Field Team Leader is required not only to have successfully completed competent person drilling oversight training, but to have an appropriate educational background, coupled with field experience and the authority to make changes to correct deficiencies, or to stop the job if need be. The driller is responsible for the safe operation of the drill/direct-push rig, as well as the crew's adherence to the requirements of this SSHP. The driller is to verify that all safety equipment is in proper condition and is properly used. The members of the crew shall follow all instructions provided by the manufacturer of the drill/direct-push rig, wear the required PPE, and be aware of all hazards and control procedures. The drill/direct-push crews shall participate in the daily tailgate safety meeting and be aware of all emergency procedures.

All drilling/direct-push activities must comply with Shaw Procedure No. HS308, "Underground/Overhead Utility Contact Prevention." After all mark-outs have been completed and documented on the Utility Mark-Out Documentation form (Appendix D), each bore or probe-hole location must be advanced by hand digging, probing, posthole digging, and/or air knifed to 5 feet below ground surface. Should the local geology be prone to refusal or should there be any other reason the above methods cannot be used to ensure the 5 feet clearance, ground-penetrating radar or other methods would then be required to ensure the boring or probe hole is cleared (5 feet minimum). Besides utilization of ground penetrating radar or other methods mentioned above, anytime the 5 feet clearance cannot be

obtained, the SSHO must obtain a written variance from the Regional Vice President (or equivalent level such as Operations Director for Federal Business Line) or designee. This would include a telephone call to both the Regional Vice President and Regional Health and Safety Manager and signed approval by all parties involved. The Pre-drilling/Boring/Geoprobe Checklist and the Direct-Push Rig Inspection Checklist and/or Drill Rig Inspection Checklist (Appendix D) must be completed prior to drilling, boring, or direct-push activity.

4.2.8 Operation of Motor Vehicles

All Shaw owned, leased, or rented vehicle operations shall comply with the requirements of Shaw Procedure No. HS800, "Motor Vehicle Operation: General Requirements" and Shaw Procedure No. HS810, "Commercial Motor Vehicle Operation and Maintenance." Shaw vehicles shall be inspected on a daily basis. Additionally, all Shaw vehicles shall be inspected prior to any trip, which is 50 miles or greater. Vehicle inspections shall be documented on the Vehicle Inspection form (Appendix D).

Subcontractors operating motor vehicles at projects shall comply with all federal, state, and local traffic regulations. Subcontractors shall only use vehicles that are in good condition and safe to operate. Subcontractors shall inspect their vehicles on a daily basis and submit the inspection documentation to the SSHO. Vehicle inspections shall be documented on the Vehicle Inspection form (Appendix D).

All personnel shall drive defensively and wear seat belts while vehicles are in motion. All personnel must observe the maximum-posted speed limits on the base roadways and parking lots. Vehicles must not be parked closer than 15 feet from fire hydrants. Vehicle must pull over to the right side of the road when approached by emergency vehicles – remain stopped until the emergency vehicles have safely passed. All Shaw employees are required to attend a defensive driving training course.

Operators of vehicles may only use cellular telephones with hands-free devices while the vehicle is in motion. Operators of vehicles are not permitted to send text messages while the vehicle is in motion. Prior to using a hand-held cellular telephone, drivers shall find a safe place to bring their vehicle to a stop. This requirement does not preclude passenger(s) from using cellular telephones while the vehicle is in motion. The use of headphones and earphones for music or radio is prohibited while operating a motor vehicle.

Since backing accidents at these types of projects are frequent, the following guidelines shall be observed:

- Backing of vehicles shall be avoided when possible.

Contract No. FA8903-09-D-8580, Task Order 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-5

- Extra care shall be taken to back vehicles when unavoidable.
- Back-up slowly and back-up the shortest distance necessary to accomplish the maneuver.
- When parking vehicles, vehicles shall be backed into the space whenever possible.
- Before entering a vehicle, which has been parked, the driver should first physically perform a 360 degree walk around the vehicle to observe all areas and especially the area behind the vehicle.
- Spotters shall be used to back vehicles whenever possible or necessary.

4.2.9 Material Handling

Various materials and equipment may be handled manually during project operations. Care should be taken when lifting and handling heavy or bulky items to avoid back injuries. The following fundamentals address the proper lifting techniques that are essential in preventing back injuries:

- Size, shape, and weight of the object to be lifted shall first be considered. No individual employee is permitted to lift any object that weighs over 60-pounds. Multiple employees or the use of mechanical lifting devices is required for objects over the 60-pound limit.
- Anticipated path to be taken by the lifter should be inspected for the presence of slip, trip, and fall hazards.
- Feet shall be placed far enough apart for good balance and stability (typically shoulder width).
- Worker shall get as close to the load as possible. Legs shall be bent at the knees.
- Back shall be kept as straight as possible and abdominal muscles should be tightened.
- Twisting motions should be avoided when performing manual lifts.
- To lift the object, the legs are straightened from their bending position.
- Take small turning steps without twisting the knees or the back if it is necessary to turn with the load.
- A worker shall never carry a load that cannot be seen over or around.
- When placing an object down, the stance and position are identical to that for lifting. The legs are bent at the knees and the object lowered.

Contract No. FA8903-09-D-8580, Task Order 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-5

When two or more workers are required to handle the same object, coordination is essential for sharing the weight between the individuals carrying the load and to make a uniform lift. When carrying the object, each worker, if possible, shall face the direction in which the object is being carried. In handling bulky or heavy items, the following guidelines shall be followed to avoid injury to the hands and fingers:

- A firm grip on the object is essential; leather gloves shall be used as necessary.
- Hands and the object shall be free of oil, grease, and water, which might prevent a firm grip. Fingers shall be kept away from any points that could cause them to be pinched or crushed, especially when setting the object down.
- Item shall be inspected for metal slivers, sharp or jagged edges, burrs, and rough or slippery surfaces prior to being lifted.

4.2.10 Hazardous Energies (Electrical, Mechanical, and Pressurized Systems)

All portable electrical equipment and extension cords shall be protected with a ground fault circuit interrupter as part of the circuit. Applicable OSHA standards for electrical power, 29 CFR 1926 Subpart K and Section 11 of the *Safety and Health Requirements Manual* (USACE, 2008) apply.

Only qualified electricians may work on electrical circuits. Qualified personnel shall be trained with the proper use of the special precautionary techniques, PPE, including arc-flash, insulating and shielding materials, and insulated tools and test equipment.

Live parts to which an employee might be exposed shall be put into an electrically safe work condition (de-energized) before an employee works on or near them, unless it can be demonstrated that de-energizing introduces additional or increased hazards or is infeasible due to equipment design or operational limitations. This rule applies to all electrical work, including changing a light bulb.

Where work is performed in locations containing un-insulated energized overhead lines that are not guarded or isolated, precautions shall be taken to prevent employees from contacting such lines directly with any unguarded parts of their body or indirectly through conductive materials, tools, or equipment. Refer to Table 2 when working near overhead power lines. Where the work to be performed is such that contact with un-insulated energized overhead lines is possible, the lines shall be de-energized and visibly grounded at the point of work, or suitably guarded.

Employees working in areas where electrical hazards are present shall be provided with, and shall use PPE that is designed and constructed for the specific part of the body to be

Contract No. FA8903-09-D-8580, Task Order 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-5

protected and for the work to be performed, as required by Section 130.7 of National Fire Protection Association (NFPA) 70 E (2011), *Standard for Electrical Safety in the Workplace*. Refer to Appendix G.

Employees shall use insulated tools and/or handling equipment when working inside the Limited Approach Boundary of exposed live parts where tools or handling equipment might make accidental contact. Insulated tools shall be protected from damage to the insulating material.

Before starting each electrical job, the qualified employee in charge shall conduct a job briefing with the employees involved. The briefing shall cover such subjects as hazards associated with the job, work procedures involved, special precautions, energy source controls, and PPE requirements.

Only hard or extra-hard usage extension cords shall be used. Extension cords, power tools, and lighting equipment shall be inspected before each use, protected from damage, and kept out of wet areas.

The handling of compressed gas cylinders shall comply with the requirements established in Shaw Procedure No. HS304. All pressure vessels shall be designed, inspected, and tested in accordance with ASTM International standards.

Lockout/tagout procedures are to be implemented during servicing or maintenance of machines and equipment to preclude the unexpected release of stored energy or inadvertent energizing. These procedures are contained in Shaw Procedure No. HS315, “Control of Hazardous Energy Sources,” and comply with the requirements established in 29 CFR 1926.417. The appropriate logs and forms found in Appendix D and listed below shall be completed for all lockout/tagout:

- Lockout Log;
- Lockout/Tagout for Compressed Air and Gases;
- Lockout/Tagout for Electrical Equipment;
- Lockout/Tagout for Hydraulic Equipment;
- Lockout/Tagout for Steam, Water, and Fluid Lines; and
- Lockout/Tagout Procedure for Specific Equipment.

Subcontractors may implement their own lockout/tagout procedure if the SSHO has approved its use and verifies that it is no less protective than the Shaw Procedure.

4.2.11 Air Compressor Use

Refer to the air compressor manufacturer's instructions for safe operation. Prior to use, the Checklist – Portable Air Compressor (Appendix D) shall be completed. Never use an air compressor in enclosed or partially enclosed spaces due to the quick build-up of high levels of carbon monoxide. The concentration of carbon monoxide shall be monitored when using air compressors in areas of poor ventilation. The concentration of carbon monoxide in the work area shall not be allowed to exceed 25 ppm.

All air compressors and hoses shall be inspected before use, operated, and maintained by designated, qualified personnel. All air compressors shall be equipped with a pressure gauge and relief-valve, and only be operated at design pressures. Chicago fittings shall be secured together with tie-wire or equivalent and secured with safety lashings.

Before refueling the air compressor, shut it off and let it cool down. Gasoline spilled on hot engine parts could ignite. A 20-B:C fire extinguisher shall be readily available in locations where an air compressor is being used.

Use hearing protection when working near an air compressor.

4.2.12 Portable Generator Use

Refer to the generator manufacturer's instructions for safe operation. Never use a generator in enclosed or partially enclosed spaces due to the quick build-up of high levels of carbon monoxide. The concentration of carbon monoxide shall be monitored when using generators in areas of poor ventilation. The concentration of carbon monoxide in the work area shall not be allowed to exceed 25 ppm.

Keep the generator dry and do not use in rain or wet conditions. To protect from moisture, operate it on a dry surface under an open, canopy-like structure. Dry your hands, if wet, before touching the generator. Use a heavy duty, outdoor-rated extension cord that is rated (in watts or amps) at least equal to the sum of the connected appliance loads. Check that the entire cord is free of cuts or tears and that the plug has all three prongs, especially a grounding pin. Ground generators by using a hand-inserted ground-rod, if recommended by the manufacturer.

Before refueling the generator, turn it off and let it cool down. Gasoline spilled on hot engine parts could ignite. A 20-B:C fire extinguisher shall be readily available in locations where a generator is being used.

Use hearing protection when working near a generator.

Contract No. FA8903-09-D-8580, Task Order 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-5

4.2.13 Intrusive Activities

Intrusive activities are defined as any activity that produces a man-made cut, cavity, trench, or depression into the earth's surface formed by earth removal or any activity that results in an object placed into the earth below the surface. These activities include excavating, drilling, augering, boring, shoveling, fence post driving, driving stakes, etc. Intrusive activities can be dangerous and can result in severe personal injury or death. Intrusive activities can also cause significant property damage to utilities, structures, and operational equipment. Breaching underground utilities can result in electrocution from damaged electrical lines, fires from broken fuel/gas lines, and disruption of telephone service. All intrusive activities must comply with Shaw Procedure No. HS308.

Before any intrusive activity begins, positive steps shall be taken to determine if the area contains underground utilities or overhead hazards. It is important to understand that underground utilities may be found in areas that have been properly investigated and thought not to have utilities present. Personnel shall always be alert for marking tape, wires, pipes, previously disturbed soils, crushed stone or sand bedding/backfill, containers, discolored soil, MEC, or anything else unusual.

The Intrusive Activities Clearance Procedure shall be followed. The procedure is designed to identify and protect underground installations or indicate that none exists. Intrusive activity shall not begin until the SSHO has signed off on the Intrusive Activities Permit form (Appendix D).

Intrusive Activities Clearance Procedure. The SSHO will:

- Prepare a map indicating the area(s) where intrusive activity is planned to occur.
- Perform the necessary reviews.
- Contact Cugach, the base utility locating service, at least 3 business days prior to intrusive activities.
- Verify that all underground installations have been located, physically marked, and then noted on the map.
- Mark all overhead utilities with kilovolts rating on the map. Refer to Table 2 and Section 4.2.10 when working near overhead power lines.
- Notify the appropriate agencies, such as the COR and property owners (when applicable)
- Complete the Utility Mark-Out Documentation form (Appendix D)
- Issue the Intrusive Activities Permit.

Contract No. FA8903-09-D-8580, Task Order 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-5

A safety meeting shall be held and a JSA completed by all personnel involved in the intrusive activities prior to initiating work.

4.2.14 Excavation

When performing excavation activities, Shaw Procedure No. HS307, "Excavation and Trenching" and Shaw Procedure No. HS308, "Underground/Overhead Utility Contact Prevention" shall be followed. Any excavation 5 feet deep or greater, into which persons will enter and perform work, shall be shored, sloped, or otherwise made safe for entry. Excavations less than 5 feet in depth in which a competent person, as defined in 29 CFR 1926.650, examines and determines there to be no potential for cave-in, do not require protective systems. Certain excavations and trenches are considered confined spaces that require a confined space entry permit (Section 4.2.15).

Contract No. FA8903-09-D-8580, Task Order 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-5

Daily inspections of the excavation shall be made using an Excavation Inspection form (Appendix D) and a Soils Classification Worksheet (Appendix D) completed by a competent person as defined in 29 CFR 1926.650. All excavated materials shall be placed at least 2 feet from the edge of the excavation. Perimeter protection shall be provided for unattended excavations as specified in Section 25.B of the *Safety and Health Requirements Manual* (USACE, 2008). Open excavations shall be lighted at night, although, Shaw will attempt to minimize the need to perform intrusive activities at night. The SSHO shall evaluate the exposure of the excavation to employees, the public, vehicles, and equipment. This evaluation shall be used in determining the class of perimeter protection.

All project personnel shall participate in the site-specific training session and be instructed on the following requirements:

- Before commencing intrusive activities such as excavating, etc., the existence and location of underground pipes, electrical equipment, communication lines, gas lines, etc. shall be determined and documented. Only hand digging is permitted within 3 feet of underground high voltage, product, or gas lines. Once the line is exposed, heavy equipment can be used but must remain at least 3 feet from the exposed line.
- Operations shall be suspended, ignition sources eliminated, and the area shall be ventilated if the concentration of flammable/combustible vapors reach or exceed 10 percent of the lower explosive limit. A combustible gas indicator shall be used to make this determination.
- If excavating equipment is being operated in the vicinity of overhead power lines, Table 2 will be used to determine safe working distances.

- Personnel entry into any excavation 5 feet deep or greater is only permitted if the necessary protective systems are in place. Employees shall wear a harness with a lifeline securely attached to it when entering excavations classified as confined spaces or that otherwise present the potential for emergency rescue.
- Employees shall not work in excavations in which there is accumulated water, or in excavations in which water is accumulating, unless adequate precautions have been taken to protect employees against the hazards posed by water accumulation. If water is controlled or prevented from accumulating by the use of water removal equipment, the process shall be monitored by a competent person to ensure proper operation.
- Excavations greater than 4 feet in depth, which require personnel to enter, shall have sufficient means of entry and egress (e.g., stairs, ladders, and ramps). Ladders will be provided and secured as necessary. Ladders shall extend at least 3 feet above grade. Means of entry/egress shall not require personnel to travel laterally more than 25 feet.

4.2.15 Confined Space Entry

A confined space is defined as a space large enough and so configured that an employee can bodily enter and perform assigned work, has limited means for entry or exit, and is not designed for continuous employee occupancy. Confined space work may pose additional hazards such as chemical exposures, flammable/explosive atmospheres, electrocution, oxygen deficiency, etc. Shaw Environmental, Inc. has detailed training for confined space entry: only properly trained personnel shall supervise and participate in confined space entry procedures or serve as standby attendants.

Entering a trench greater than 5 feet deep, entering a sewer, or entering a tank may be potential confined space entries. Personnel shall never enter a confined space without a permit issued by the SSHO. If personnel are uncertain about whether their activity involves a confined space entry, they shall stop work and notify their supervisor or the SSHO. Shaw Procedure No. HS300, “Confined Spaces,” shall be followed for all confined space entries, if such an activity is needed.

All confined spaces are initially considered permit required. Under certain conditions, a space may be re-classified as a non-permit, confined space provided the SSHO approves the reclassification and the space meets the criteria outlined in Shaw Procedure No. HS300.

Shaw Procedure No. HS300 identifies the tug signals that may be used during entry as referenced on the Entry Permit for Permit-Required Confined Space (Appendix D).

Contract No. FA8903-09-D-8580, Task Order 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-5

4.2.15.1 Rescue and Emergency Services

Shaw recommends the use of non-company rescue services whenever possible. In certain instances, such as unavailability of a qualified outside provider, Shaw employees can participate in rescues if they have been provided the required equipment and training.

4.2.15.2 Outside Rescue Services

Prior to designating a non-company rescue service, an evaluation of their capabilities must be conducted. This documented evaluation can be conducted by an entry supervisor or a health and safety representative. The Rescue Service Evaluation form (Appendix D) can be used to document this evaluation. The rescue service must be certified by the evaluator as capable of performing rescues prior to being identified as the rescue service provider.

Each selected rescue service will be informed of the hazards they may encounter at the location. They will also be provided access to all Permit-Required Confined Spaces from which a rescue may be necessary.

4.2.15.3 Shaw Rescue Services

Shaw personnel assigned to provide emergency entry and rescue services will be trained annually in the proper use of personal protective and rescue equipment. Such training will include a simulated rescue exercise. Shaw rescue services will be evaluated using the Rescue Service Evaluation form (Appendix D) and must be certified by the evaluator as capable of performing rescues prior to being identified as the rescue service provider.

4.2.16 Dust

The generation of dust and fugitive emissions shall be prevented when possible and controlled when necessary. Work practices shall be adjusted in a manner to minimize dust generation, such as lowering excavation rates, not letting soils free-fall from equipment buckets, and traveling slow on dirt roads. Personnel shall avoid working in dust by positioning themselves upwind of dust generating activities. Excessive dust shall be controlled by suppression with water from an AFCEE-approved source. Dust that is not controlled may necessitate the use of respiratory protection.

4.2.17 Use of Pressure Washers or Steam Washers

The use of steam/pressure washers shall comply with Shaw Procedure No. HS303, “Pressurized Water Cleaning and Cutting Equipment.” All personnel using steam/pressure washers shall wear Level D – Modified PPE, at a minimum. Eye, face, and shin/metatarsal protection is mandatory.

The pressure/steam washer shall be inspected before each use. The manufacturer’s instruction manual shall be used to guide the inspection process.

Contract No. FA8903-09-D-8580, Task Order 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-5

Personnel shall be trained in the use of the washing equipment. All personnel working in the equipment decontamination area shall be trained in the emergency shut-off procedures for the equipment being used. The minimum amount of steam/pressure that will complete the job should be used. Pressure washers exceeding 3,000 pounds per square inch shall not be used without the approval of the HSM.

The spray from such equipment shall only be directed at surfaces to be cleaned and never at body parts or other personnel; high-pressure water can easily cut through skin and flesh! Personnel working in the immediate area shall also use eye, face, and shin/metatarsal protection.

Personnel shall keep a firm grip on the wand and not point it at anything that is not being washed. Pressure washer operators must maintain good footing. The trigger on the wand shall never be wired/fixed open. Operators are to take adequate breaks to avoid fatigue.

Hot surfaces shall be avoided. Pressure or steam washing equipment shall be shut off and allowed to cool prior to re-fueling.

Contract No. FA8903-09-D-8580, Task Order 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-5

4.2.18 Excessive Work Hours

The following workday duration limitations for hours worked on the projects are in effect:

- Personnel working on projects, including those who are operating hoisting equipment or mobile construction equipment, may work up to 12 hours at the site, which includes travel time to housing, but excludes non-compensated time. This workday duration is subject to reduction by the other requirements and factors described below. The 12-hour limit is primarily due to motor vehicle driving restrictions.
- Personnel shall not operate motor vehicles after being in a duty status (regardless of their role or function) for more than 12 hours during any 24-hour period without at least eight consecutive hours of rest. A minimum of eight consecutive hours shall be provided for rest in each 24-hour period.
- No employee may drive continuously for more than 10 hours in any single on-duty period. (Continuous period of more than 10 hours in any 24-hour period without at least eight consecutive hours of rest.)

For each project effort, the SSHO is responsible for adjusting the workday duration within the limits set above.

The following factors will be considered by the SSHO for adjusting the workday duration:

- Time of year (e.g., reduce workday duration because there is less daylight in winter).
- Temperature/weather (e.g., reduce workday duration when the temperature is very cold, very hot, or very windy).
- Type of work (e.g., reduce workday duration for personnel involved in physically demanding phases of work).
- Individual personnel limitations (e.g., reduce workday duration for personnel with minor head colds or suffering from temporary effects of allergies).

For any questions regarding the implementation of this policy, contact the HSM.

4.2.19 Transportation

Many of the individual sites are located in areas of high vehicle, equipment, and pedestrian traffic. When working in these areas extra caution should be used because of the unpredictable nature of vehicular traffic. Barriers should be placed around work areas, shielding workers from vehicular traffic and blocking pedestrian traffic from entering the work area. Flaggers should always be used if any portion of the roadway is blocked or if barriers are inadequate or unfeasible. Flaggers are required to be trained on proper hand signals, signage, state regulations, and U.S. Department of Transportation regulations as applicable.

4.2.20 Working Over or Near Water

Working over or near water is not anticipated for proposed activities under the WERC09 contract.

4.3 General Work Rules

While all the procedures outlined in this SSHP are required, the following list presents general work rules that must be strictly enforced by the Construction Manager and Subcontractor Supervisors:

- Loose jewelry, clothing, or long hair is not permitted on or near equipment with moving parts.
- Personnel shall not enter a restricted area unless authorized.
- All work zones, as established on the site, shall be observed. All required PPE shall be worn prior to entering these zones.

Contract No. FA8903-09-D-8580, Task Order 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-5

- Legible and understandable labels shall be affixed prominently to the containers of waste materials.
- An emergency eyewash unit shall be located immediately adjacent to employees who handle hazardous or corrosive materials, such as battery acid, etc. All operations involving the potential for eye injury, splash, etc. shall have eyewash units locally available and capable of delivering at least 0.4 gallons per minute for at least 15 minutes. The eyewash unit maintenance shall be documented on the Emergency Eyewash Station/Fire Extinguisher Inspection Checklist (Appendix D)
- If on-site activities continue later than dusk, adequate lighting shall be provided.
- Field activities shall be suspended during severe weather such as thunderstorms, lightning, and winter storm warnings.
- Damaged PPE shall be immediately repaired or replaced, as appropriate.
- Personnel shall thoroughly wash their hands and face before eating, smoking, or drinking.
- Unauthorized removal of materials from the project is prohibited.
- Possession of controlled substances and prohibited items, such as alcohol, illicit drugs, firearms, and weapons while working on site is strictly prohibited.
- Operations involving the potential for fire hazards shall be conducted in a manner as to minimize the risk of fire.
- Overhead and underground utility hazards shall be identified and/or located prior to conducting operations.

Contract No. FA8903-09-D-8580, Task Order 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-5

4.3.1 Disciplinary Actions

A successful safety program is achieved by assigning qualified personnel, providing the necessary training and orientation, adequately planning for the work and following the plans, adhering to the policies and procedures, reinforcing positive behavior, and rewarding safe performance. A mechanism is also necessary to consistently apply disciplinary action to employees who jeopardize the safety of themselves and their coworkers by not following the established plans, policies, and procedures. Therefore, Shaw Guide – 004, “Guidelines for Standard Safety Disciplinary Actions”, is applicable and in effect for this project (Appendix G).

4.4 Buddy System

The “buddy system” will be used at all times while working on-site – this requires that personnel maintain visual, voice, cellular telephone, or radio communication.

4.4.1 Lone Worker Procedure

Occasionally, only one worker may be present at the project to perform routine operations such as performing paperwork in the office. During these routine operations, there will be no "buddy" present on site. Even though there will be no buddy present on site at these times, communications must still be maintained. The lone field worker shall carry a cellular telephone or two-way radio on their person, at all times, while working at the project site (a landline telephone will suffice if the worker is in an office). Arrangements shall be made by the lone field workers, with at least one other person (monitor), and the SSHO to affect hourly communications. This hourly communication shall convey the following information:

- Present location.
- Present status.
- Anticipated activities and location of anticipated activities (include routes of expected travel).
- Estimated duration of anticipated activities.
- Identify other anticipated activities, projected travel routes, and activity locations if the lone field worker will complete the initial task prior to making the next scheduled contact with the other employee.

The lone field worker should initiate the hourly communication to the monitor at a pre-designated time (e.g., the top of the hour). If the monitor does not receive the status call at the pre-designated time, then the monitor shall try to establish communications with the lone employee. If the lone field employee answers, then the update shall be made and the schedule of calls shall continue. If the lone field employee does not answer, the monitor shall try again in five minutes. If contact is not made on the second try, then the monitor shall notify the local emergency services, such as police. All information provided from the last communication (see above) shall be provided to the emergency services. Additionally, the telephone number of the monitor (or other means of contact) shall be provided to the emergency services.

Upon mobilization to the project, the SSHO shall verify that emergency communications are established for all activities.

Important: This procedure applies to routine tasks only. Non-routine tasks require the buddy system to be in effect.

Contract No. FA8903-09-D-8580, Task Order 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-5

4.5 Environmental Hazards

In addition to chemical and physical hazards, there are environmental hazards that may be present. For the purposes of this SSHP, the environmental hazards are comprised of extreme ambient temperatures, insects, spiders, rodents, poisonous plants, and sunburn. Since some people are more sensitive or allergic to various biological hazards, the Allergy/Sensitivity Questionnaire (Appendix D) may be voluntarily completed by personnel during site orientation training. This form is used to alert the SSHO of these sensitivities so that additional precautions may be made.

4.5.1 Heat Stress

Heat stress is of concern for worker safety during the summer months or when working in areas containing steam lines or other heat generating equipment. Heat stress is caused by a number of interacting factors, including environmental conditions, clothing, PPE, workload, and individual characteristics. Heat stress can cause physical discomfort, loss of efficiency, or personal illness/injury.

Individuals vary in their susceptibility to heat stress. Factors that may predispose individuals to heat stress include the following:

- Lack of physical fitness and/or obesity.
- Insufficient acclimation.
- Age.
- Dehydration.
- Alcohol and/or drug use.
- Infection.
- Sunburn.
- Diarrhea.
- Chronic disease.
- Medical conditions and/or the use of some medications, such as beta-blockers for high blood pressure.

The amount and type of PPE worn, directly influences reduced work tolerance and the increased risk of heat stress. Personal protective equipment adds weight, bulk, reduces the body's capability for physiological thermoregulation (i.e., evaporation, convection, and radiation), and increases energy expenditure.

Contract No. FA8903-09-D-8580, Task Order 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-5

4.5.1.1 Signs and Symptoms of Heat Stress

If the body's physiological processes fail to maintain a normal body temperature because of excessive heat, a number of physical reactions can occur – ranging from mild to fatal.

These physical reactions to excessive heat include the following:

- Heat rash is caused by continuous exposure to heat and humidity and aggravated by chafing clothes. Heat rash decreases the body's ability to tolerate heat in addition to being a nuisance.
- Heat cramps are caused by profuse perspiration with inadequate electrolytic fluid replacement. Heat cramps cause painful muscle spasms and pain in the extremities and abdomen.
- Heat exhaustion is caused by increased stress on various organs to meet increased demand to cool the body. Heat exhaustion causes shallow breathing; pale, cool, moist skin; profuse sweating; and dizziness.
- Heat stroke is the most severe form of heat stress. Heat stroke symptoms include hot, dry skin; no perspiration; nausea; dizziness; confusion; strong, rapid pulse; coma; and sometimes death. Heat stroke is a serious medical emergency. The affected person shall be cooled down rapidly and medical attention must be given immediately (Section 4.5.1.4 for heat stroke first aid treatment).

The ACGIH states that excessive heat stress may be marked by one or more of the following symptoms, and an individual's exposure to heat stress should be discontinued when any of the following occur (2011):

- Sustained (several minutes) heart rate is in excess of 180 beats per minute minus the individual's age in years (180 minus age) for individuals with assessed normal cardiac performance; or
- Body core temperature is greater than 101.3 degrees Fahrenheit (°F) for medically selected and acclimatized personnel; or greater than 100.4°F in unselected, un-acclimatized workers; or
- Recovery heart rate at 1 minute after a peak work effort is greater than 120 beats per minute; or
- There are symptoms of sudden and severe fatigue, nausea, dizziness, or lightheadedness.

Contract No. FA8903-09-D-8580, Task Order 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-5

An individual may be at greater risk of heat stress if the following symptoms occur:

- Profuse sweating is sustained over several hours.
- Weight loss over a shift is greater than 1.5 percent of body weight.
- 24-hour urinary sodium excretion is less than 50 millimoles (ACGIH, 2011).

4.5.1.2 Heat Stress Prevention

The following practices will help prevent heat stress:

- Acclimatize workers to hot working conditions.
- Provide plenty of liquids to replace the body fluids lost by perspiration. Fluid intake should be forced because, under conditions of heat stress, the normal thirst mechanism is not adequate to bring about a voluntary replacement of lost fluids.
- Provide personal cooling devices.
- Conduct strenuous field operations in the early morning and provide shade when possible.
- Train personnel to recognize the signs and symptoms of heat stress, its prevention, and treatment.
- Rotate personnel to various job duties and establish adequate work/rest cycles.
- Provide shade or shelter during rest periods.

4.5.1.3 Heat Stress Treatment

Workers expressing the symptoms of heat stress shall notify the SSHO immediately. At the onset of heat related illness, activities must be halted and treatment initiated. Early detection and treatment of heat stress helps to prevent further serious illness or injury. Individuals that have experienced heat related illness could become more sensitive and predisposed to additional future heat stress related problems.

Heat exhaustion can be alleviated by having the affected person rest in a cool, shaded location and have them drink cool water. To cool down the affected person's body:

- Remove impermeable PPE.
- Remove worker from direct sunshine.
- Apply copious amounts of cool, not cold, water on them.
- Have them drink cool water, not cold, if conscious.

Contract No. FA8903-09-D-8580, Task Order 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-5

4.5.1.4 Heat Stroke Treatment

Heat stroke is a true medical emergency. In a heat stroke situation, the body must be cooled immediately to prevent severe injury or death – medical attention must be immediately obtained. The following shall be performed if heat stroke is suspected:

- Transportation of the victim to a medical facility must not be delayed – seek immediate medical attention.
- Apply cold packs, if available; place under the arms, around the neck, or any other place where they can cool large surface blood vessels.
- If transportation to a medical facility is delayed, reduce body temperature by immersing victim in a cool water bath (however, be careful not to over-chill the victim once body temperature is reduced below 102°F). If this is not possible, continuously douse victim with cool water and fan for evaporative cooling.

4.5.1.5 Acclimatization

Physiologically adjusting or acclimatizing personnel to hot conditions is extremely important. Supervisors shall provide the necessary time for adequate worker acclimatization, due to each individual's physical condition and his or her ability to work in hot and humid environments.

4.5.1.6 Physiological Monitoring

Adequate work/rest periods shall be implemented as necessary to prevent heat stress on personnel. However, since individuals vary in their susceptibility to heat stress, Shaw will also utilize physiological monitoring to aid in measuring each individual's response to heat stress. The initiation of physiological monitoring will be required when employees are working in environments exceeding 90°F ambient air temperatures. Physiological monitoring is also required when ambient temperatures exceed 70°F and impermeable garments are worn. Ambient air temperatures shall be recorded on the Ambient Air Temperature Log (Appendix D) when ambient temperatures exceed 70°F. The two physiological parameters that each individual will monitor are as follows:

- Heart Rate—Each individual will count his/her radial (wrist) pulse as early as possible during each rest period. If the heart rate of any individual exceeds 75 percent of their calculated maximum heart rate (maximum heart rate equals 200 minus age) at the beginning of the rest period, then the work cycle will be decreased by one-third. The rest period will remain the same. An individual is not permitted to return to work until his/her sustained heart rate is below 75 percent of their calculated maximum heart rate.

Contract No. FA8903-09-D-8580, Task Order 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-5

- Body Temperature—Each individual will measure his/her body temperature with an intra-aural (ear) thermometer, as directed by the thermometer manufacturer's instructions, as early as possible in the first rest period. If the temperature exceeds 99.6°F at the beginning of the rest period, then the work cycle shall be decreased by one-third. The rest period will remain the same.

An individual is not permitted to return to work if his/her temperature exceeds 100.4°F. Physiological monitoring data will be recorded on the Employee Physiological Monitoring Record for Heat Stress (Appendix D).

4.5.1.7 Training

Personnel, including subcontractor employees, who may be exposed to hot working environments shall be trained on the following:

- Employees:
  - Sources of heat stress, influence of protective clothing, and importance of acclimatization.
  - How the body handles heat.
  - Heat-related illnesses and their recognition (signs and symptoms).
  - Preventive/corrective measures.
  - Individual factors, such as age, weight, gender, level of acclimatization, etc. that may predispose some workers to heat stress.
  - Medical conditions and use of prescription drugs, such as beta blockers, that may modify a worker's ability to adapt physiologically to heat stress.
  - Physiological monitoring, record keeping of oral temperature/pulse, and establishment of work-rest regimes.
  - First aid procedures.
- Supervisors:
  - Physiological monitoring, record keeping of oral temperature/pulse, and establishment of work-rest regimes.
  - First aid procedures.

Contract No. FA8903-09-D-8580, Task Order 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-5

4.5.2 Ticks and Tick-Borne Diseases

Working in tall grass, especially in or at the edge of wooded areas, increases the potential for ticks to bite workers. Ticks can be particularly numerous in the spring and fall. Ticks are vectors of many different diseases including Rocky Mountain spotted fever, Q fever, ehrlichiosis, tularemia, Colorado tick fever, Lyme, and Lyme like disease. Ticks attach to the skin and intravenously feed on blood, creating an opportunity for disease transmission.

The symptoms of tick-borne diseases are high fever, head and joint aches, nausea, and vomiting. Additionally, persons infected with Rocky Mountain spotted fever may develop a red, spotty rash. Symptoms of tularemia may also include occasional cough, chest pain, swollen lymph glands, and severe pneumonia. Lyme disease usually (60 to 80 percent of the cases) presents a distinctive bull's eye rash at the site of the bite in addition to flu-like symptoms and swollen lymph nodes. If tick-borne diseases are not properly treated with the appropriate antibiotic(s), then arthritis, heart disease, brain/nerve disorders, liver damage, and kidney damage are possible.

Wearing long-sleeved, light-colored shirts, light-colored trousers tucked into the socks, and the use of insect repellent containing N,N-Diethyl-m-toluamide (DEET) help prevent tick bites.

Periodically during the workday, employees should inspect themselves for the presence of ticks. If a tick is discovered, the following procedure should be used to remove it:

- Do not try to detach a tick with your bare fingers; bacteria from a crushed tick may be able to penetrate even unbroken skin. Fine-tipped tweezers should be used.
- Grip the tick as close to your skin as possible and gently pull it straight away from you until it releases its hold.
- Do not twist the tick as you pull and do not squeeze its body. That may actually inject bacteria into your skin.
- Thoroughly wash your hands and the bite area with soap and water, and then apply an antiseptic to the bite area.
- Save the tick in a small container noting the date and the location on the body of the bite.
- Notify the SSHO and HSM of any tick bites as soon as possible.

All personnel sustaining a tick bite should consult a physician. Consult http://www.osha.gov for more information concerning ticks and tick-borne illnesses.

Contract No. FA8903-09-D-8580, Task Order 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-5

4.5.3 Chiggers

Chiggers may be a problem while working at some project locations. Chiggers, also known as "red-bugs" or "harvest mites," are the immature stages of a tiny red mite. They inhabit areas of tall grass, associated with low, wet spots, ponds and stream banks, wild berry patches, and forest underbrush. The larvae attach themselves to the clothing of people or to the fur of passing animals. Before settling down to feed, chiggers move to a constriction, such as sock tops, waistbands, or armpits. Feeding chiggers inject a salivary fluid, which dissolves the host's cells, and then they suck up the liquefied tissue. Within a few hours, small, reddish, intensely itching welts appear. These bites may continue to itch for several days up to two weeks after the chigger is dislodged. Following are suggestions that should provide some protection from chiggers:

- Stay out of areas where chiggers are likely to be present including wood lots, pastures, roadside ditches, or other areas with tall grasses and weeds. Chiggers are especially common in moist low-lying areas.
- Wear loose-fitting clothing (if possible) when working outdoors. Vehicles should be frequently vacuumed to reduce the number of chiggers that may have been deposited.
- Apply a repellent containing DEET to shoes, socks, and trousers before entering chigger-infested areas. Caution: some individuals may be sensitive to DEET – always read and follow label directions.
- Immediately after possible exposure to chiggers, take a bath, thoroughly scrubbing the body with hot soapy water. This will kill or dislodge many of the chiggers. The clothes that were worn when the bite(s) occurred should be placed in a plastic bag for temporary storage until they can be laundered.
- When bites begin to itch, one course of treatment is to apply rubbing alcohol, followed by one of the nonprescription local anesthetics. A baking soda paste, calamine lotion, or product such as "After-Bite" or "Chigarid" also will help reduce discomfort. Avoid scratching bites since this only increases irritation and may lead to a secondary infection of the bite.

4.5.4 Rodents

Potential exists for exposure to microbiological hazards such as viruses that may be present in rodent feces. Hantavirus pulmonary syndrome is a deadly disease transmitted by infected rodents through urine, droppings, or saliva. Humans can contract the disease when they breathe in the aerosolized virus. Hantavirus pulmonary syndrome was first recognized in 1993, and has since been identified throughout the United States. The Hantavirus is known to

Contract No. FA8903-09-D-8580, Task Order 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-5

be present in New Mexico. The HSM shall be contacted prior to working in areas where rodent droppings have been observed and may be disturbed. No work shall be performed in areas where rodent droppings are observed until the appropriate precautions have been taken.

4.5.5 Poisonous Plants

Three or five leaves radiating from a stem identify poison ivy, poison oak, and poison sumac. Poison ivy is in the form of a vine (and sometimes low-lying) while oak and sumac are bush-like. All of these plants can produce a delayed allergic reaction. The plant tissues have an oleoresin, urushiol, which is active in live, dead, and dried parts. The urushiol may be carried through smoke, dust, contaminated articles, and the hair of animals. Additionally, when operating a chain saw to clear brush in the winter or early spring, saw dust may be contaminated with enough urushiol to cause a severe rash. Symptoms usually occur 24 to 48 hours after exposure resulting in rashes that itch and blister. Should exposure to any of these plants occur, perform the following:

- First, cleanse exposed skin with generous amounts of isopropyl (rubbing) alcohol. (Avoid returning to the area of the poison ivy on the same day. Alcohol removes your skin's protection along with the urushiol and any new contact will cause the urushiol to penetrate twice as fast.)
- Second, wash skin with water. (Water temperature does not matter; if you're outside, it's likely only cold water will be available.)
- Third, take a regular shower with soap and warm water. Do not use soap before this point because "soap will tend to pick up some of the urushiol from the surface of the skin and move it around."
- Clothes, shoes, tools, and anything else that may have been in contact with the urushiol should be wiped off with alcohol and water. Be sure to wear gloves or otherwise cover your hands while doing this and then discard the hand covering.

The Food and Drug Administration considers over-the-counter topical corticosteroids (commonly called hydrocortisones under brand names such as Cortaid and Lanacort) safe and effective for temporary relief of itching associated with poison ivy. The best preventative measure for poisonous plants is recognition and avoidance. The use of disposable gloves and Tyvek® coveralls is recommended to help prevent skin contact with these plants.

4.5.6 Flying Insects

Flying insects such as mosquitoes, wasps, hornets, and bees may be encountered while working at project sites. Personnel who are allergic to bee stings should notify their supervisor and the SSHO. A voluntary Allergy/Sensitivity Questionnaire (Appendix D) may

Contract No. FA8903-09-D-8580, Task Order 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-5

be completed by employees to help identify personnel who are allergic or sensitive to insect bites or stings. Mosquito bites can be effectively prevented by the use of insect repellants containing DEET. Insect repellant containing DEET shall be available to personnel while working on site. Additionally, special insecticide preparations, such as Repel Permanone, shall be available for treating worker's clothing. Commercially prepared ointments for treatment of insect bites and bee stings shall be available on site. All personnel shall immediately report any bee stings to their supervisor and the SSHO.

4.5.7 Spiders

Personnel shall be alert to the potential for spider bites. Spiders sometimes establish residence in dark places, stored clothing, and PPE. It is advisable for personnel to inspect clothing and PPE for spiders prior to donning. If a spider bite is sustained, personnel shall report it to the SSHO.

4.5.8 Snakes

In North America the venomous snakes are rattlesnakes, copperheads, water moccasins and coral snakes. In Texas, rattlesnakes and copperheads are the most prevalent venomous snakes. Snakes typically are found in underbrush and tall grassy areas. Do not attempt to catch a snake.

If a person is bitten by a snake, wash and immobilize the injured area, keeping it lower than the heart if possible. Seek medical attention immediately and notify the SSHO.

4.5.9 Sunburn

Personnel working in direct sunlight, are encouraged to wear wide-brim hats (where hard hats are not a requirement) and apply sunscreen to all unprotected skin surfaces. The benefits of preventing sunburn and skin cancer are self-evident. Sunscreen will be provided for use by project personnel while working on site.

4.5.10 Inclement Weather

Inclement weather can pose hazards to project personnel. The Construction Manger or SSHO will evaluate weather conditions each day and take the appropriate precautions to minimize the hazards associated with the weather. Additional information on severe weather is provided in Section 11.9.

4.5.11 High Winds

If high winds are anticipated or underway, the following precautions shall be taken:

- Secure lightweight or loose items.

Contract No. FA8903-09-D-8580, Task Order 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-5

- Avoid handling items with large surface areas, such as plywood and polyethylene sheeting.
- Use caution and keep a firm grip when opening doors.
- Wear dust proof goggles if dust and soil particles are airborne.
- If cranes are being used, follow manufacturer recommendations for operating in wind.

4.5.12 Heavy Rain

Most outdoor activities will be suspended during heavy rain. Personnel shall not work outdoors if heavy rain is accompanied by lightning (Section 11.9.2). Personnel shall exit all excavations until inspected by a competent person; excavations shall be inspected with a higher frequency during periods of heavy rain. Electric tools and equipment shall not be used outdoors while raining, unless designed for use under wet conditions.

Contract No. FA8903-09-D-8580, Task Order 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-5

5.0 PERSONAL PROTECTIVE EQUIPMENT

When engineering and administrative controls are not feasible or adequate to protect personnel from the hazards associated with project activities, PPE use will be required.

5.1 Levels of Protection

The following are general and typical descriptions of the PPE that will be required during project activities. The EPA terminology for levels of PPE is used: Levels A, B, C, and D.

5.1.1 Level A Protection

Level A protection use is not anticipated during this project.

5.1.2 Level B Protection

Level B protection use is not anticipated during this project; however, Level B protection use may be required during activities when engineering controls are necessary but ineffective at maintaining the concentration of hazardous substances to below action levels in the work area and/or breathing zone of personnel. Level B protection use may also be required for Confined Space Entries. The HSM shall be contacted prior to all Confined Space Entries.

Level B PPE, in general, consists of the following:

- Supplied air respirator (SAR): airline respirators with 5-minute egress bottles or self-contained breathing apparatus.
- Work clothing as prescribed by weather.
- Hard hats meeting ANSI Z89.1 specifications.
- Safety-toed work boots meeting ANSI Z41 specifications.
- Nitrile surgical gloves (inner or double layer).
- Chemical gloves (outer, as necessary).
- Disposable Tyvek® coveralls with hoods, elastic wrists, and ankles (as necessary).
- Tychem® SL coveralls with hoods, elastic wrists, and ankles (if contact with light non-aqueous phase liquid [LNAPL] or dense nonaqueous phase liquid [DNAPL] is possible).
- Tychem® QC coveralls with hoods, elastic wrists, and ankles (if contact with slightly contaminated groundwater or slightly contaminated wet soil is possible).

Contract No. FA8903-09-D-8580, Task Order 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-5

- Chemical resistant boot covers and/or outer boots (polyvinyl chloride [PVC]/latex/neoprene when there is potential for shoe/boot contact with contaminated soil or water).
- Hearing protection (if necessary or required).
- High visibility vests (when working near vehicular traffic).
- Splash shield (if necessary).
- Type III or Type V personal flotation device (PFD) (when working next to or over water and a drowning hazard exists).
- Work gloves, such as leather, cotton, or other material that provides cut/abrasion resistance (as necessary).

5.1.3 Level C Personal Protective Equipment

Level C PPE shall be worn by personnel if air monitoring action levels are exceeded, or as directed by the SSHO. Level C protection generally consists of the following PPE:

- Full-face air purifying respirator (APR) with NIOSH-approved combination high efficiency particulate air/organic vapor cartridges.
- Work clothing as prescribed by weather.
- Hard hats meeting ANSI Z89.1 specifications.
- Safety-toed work boots meeting ANSI Z41 specifications.
- Nitrile surgical gloves (inner or double layer).
- Chemical gloves (outer, as necessary).
- Disposable Tyvek® coveralls with hoods, elastic wrists, and ankles (as necessary).
- Tychem® SL coveralls with hoods, elastic wrists, and ankles (if contact with LNAPL or DNAPL is possible).
- Tychem® QC coveralls with hoods, elastic wrists, and ankles (if contact with slightly contaminated groundwater or slightly contaminated wet soil is possible).
- Chemical resistant boot covers and/or outer boots (PVC/latex/neoprene when there is potential for shoe/boot contact with contaminated soil or water).
- Hearing protection (if necessary or required).
- High visibility vests (when working near vehicular traffic).
- Splash shield (if necessary).

Contract No. FA8903-09-D-8580, Task Order 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-5

- Type III or Type V PFD (when working next to or over water and a drowning hazard exists).
- Work gloves, such as leather, cotton, or other material that provides cut/abrasion resistance (as necessary).

5.1.4 Level D – Modified Protection

Level D – modified PPE shall be worn by personnel for certain tasks or as directed by the SSHO. Level D – modified protection generally consists of the following PPE:

- Work clothing as prescribed by weather.
- Hard hats meeting ANSI Z89.1 specifications.
- Safety-toed work boots meeting ANSI Z41 specifications.
- Safety glasses with side shields meeting ANSI Z87.1 specifications.
- Nitrile surgical gloves (inner or double layer).
- Chemical gloves (outer, as necessary).
- Disposable Tyvek® coveralls with hoods, elastic wrists, and ankles (as necessary).
- Tychem® SL coveralls with hoods, elastic wrists, and ankles (if contact with LNAPL or DNAPL is possible).
- Tychem® QC coveralls with hoods, elastic wrists, and ankles (if contact with slightly contaminated groundwater or slightly contaminated wet soil is possible).
- Chemical resistant boot covers and/or outer boots (PVC/latex/neoprene when there is potential for shoe/boot contact with contaminated soil or water).
- Hearing protection (if necessary or required).
- High visibility vests (when working near vehicular traffic).
- Splash shield (if necessary).
- Type III or Type V PFD (when working next to or over water and a drowning hazard exists).
- Work gloves, such as leather, cotton, or other material that provides cut/abrasion resistance (as necessary).

Contract No. FA8903-09-D-8580, Task Order 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-5

Employees working in areas where electrical hazards are present shall be provided with, and shall use, protective equipment as required by Section 130.7 of NFPA 70 E (2004) that is designed and constructed for the specific part of the body to be protected and for the work to be performed.

5.1.5 Level D Protection

Level D protection is the minimum level of protection that will be used for activities at the project. Level D PPE shall, at a minimum, consist of:

- Safety-toed work boots meeting ANSI Z41 specifications.
- Safety glasses with side shields meeting ANSI Z87.1 specifications.
- Hard hats meeting ANSI Z89.1 specifications.
- Hearing protection (if necessary or required).
- High visibility vests (when working near vehicular traffic).
- Type III or Type V PFD (when working next to or over water and a drowning hazard exists).
- Work gloves, such as leather, cotton, or other material that provides cut/abrasion resistance (as necessary).

5.2 Respiratory Protection

Respiratory protection equipment shall be NIOSH-approved and respirator use will conform to ANSI Z88.2 and OSHA 29 CFR 1910.134 requirements. Shaw Procedure No. HS601, "Respiratory Protection Program," details the medical qualification and training requirements, as well as the selection, use, inspection, cleaning, maintenance, storage, and fit testing of respiratory protection equipment. This procedure complies with the requirements contained within 29 CFR 1910.134.

All personnel (including visitors) using respiratory protection, shall possess a written opinion by the medical examiner of the person's ability to use the necessary respiratory protective equipment and shall have successfully passed a respirator fit test (Section 5.2.3) in accordance with Shaw Procedure No. HS601 within the last 12 months. Fit testing and any training related to respiratory protection for site personnel will be documented on the Training Acknowledgment Form (Appendix D).

5.2.1 Respirator Cartridge Change-out Schedule

The cartridge change-out schedule is largely based on the concentrations of the site contaminants. The cartridge change-out schedule shall be determined for each task by the

Contract No. FA8903-09-D-8580, Task Order 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-5

HSM or SSHO and documented on the Job Safety Analysis. In general, workers will change the filter cartridges when breathing resistance is noted or when workers notice any odor, irritation, or discomfort. Cartridges shall be changed at a minimum of once per day.

5.2.2 Respirator Inspection and Cleaning

Respirators shall be checked periodically by a qualified individual and inspected before each use by the wearer. All respirators and associated equipment will be decontaminated and hygienically cleaned after each use.

5.2.3 Respirator Fit Testing

Annual respirator fit tests are required of all personnel wearing negative-pressure respirators. The test will use isoamyl acetate or irritant smoke. The fit test must be for the style and size of the respirator to be used. Quantitative fit-testing is required for use of respirators in chemical environments where the respirator effective use limit exceeds 10 (exposure of 1 ppm inside the respirator for 10 ppm outside the respirator). Therefore, quantitative fit-testing is dependent on the PEL/TLV of the chemical substance involved. Quantitative fit-testing is required for potential exposure to airborne particulate levels that exceed 10 times the established PEL/TLV.

5.2.4 Facial Hair

No personnel who have facial hair, which interferes with the respirator's sealing surface, will be permitted to wear a respirator and will not be permitted to work in areas requiring respirator use.

5.2.5 Corrective Lenses

Normal eyeglasses cannot be worn under full-face respirators because the temple bars interfere with the respirator's sealing surfaces. For workers requiring corrective lenses, special spectacles designed for use with respirators will be provided.

5.2.6 Medical Certification

Only workers who have been certified by a physician as being physically capable of respirator usage will be issued a respirator. Personnel unable to pass a respiratory fit test or without medical clearance for respirator use will not be permitted to enter or work in areas on site that require respiratory protection. Employees will receive a written physicians opinion that they are fit for general hazardous waste operations as per 29 CFR 1910.120(f)(7).

5.3 Activity-Specific Levels of Protection

The required level of personal protection is specific to the activity being conducted and are outlined in Table 3. Levels of PPE are subject to change or to modification. Upgrading of

Contract No. FA8903-09-D-8580, Task Order 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-5

PPE may occur when air monitoring action levels are exceeded or when specified by the SSHO. Levels of PPE shall not be downgraded without prior approval from the HSM.

6.0 SITE CONTROL AND WORK ZONES

The purpose of site control is to minimize chemical exposures to workers, protect the public from hazards due to site activities, and prevent vandalism. The work areas that pose chemical and physical hazards to personnel may be regarded as regulated or restricted. To prevent both exposures to unprotected personnel and migration of contamination due to tracking by personnel or equipment, work areas known to contain contamination will be clearly identified.

Shaw Environmental, Inc. will designate work zones at the project as suggested in *Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities* (NIOSH et al., 1985). Regulated work areas are divided into the following three zones:

- EZ;
- CRZ; and
- Support Zone

6.1 Exclusion Zone

The EZ is, in general, the area where chemical, physical, or other hazards occur/exist during project work. All employees are required to follow the established procedures when working in these areas. Fencing, banner tape, signs, or other appropriate means will identify the location of each EZ. An Exclusion Zone Entry log shall be maintained by the SSHO.

6.2 Contamination Reduction Zone

Personnel and equipment decontamination will be performed in the CRZ. All personnel and equipment entering or leaving an EZ will pass through the CRZ in order to prevent cross contamination and for the purpose of accountability. Personal protective equipment will be removed in the CRZ, cleaned, and properly stored or disposed of. All water generated from equipment and personal decontamination will be contained on site and disposed of in an appropriate manner.

6.3 Support Zone

The Support Zone, or clean zone, will be the area outside the EZ and CRZ and within the geographic perimeters of the site. The Support Zone is used for staging of materials, parking of vehicles, office facilities, sanitation facilities, and receipt of deliveries. Eating, drinking, and smoking will only be allowed in this area.

Contract No. FA8903-09-D-8580, Task Order 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-5

6.4 Project Site Security

All equipment shall be locked when project personnel are not present.

6.5 Site Entry Requirements

In order to allow an individual into regulated areas of the site (i.e., EZ and CRZ) he/she must meet the following requirements:

- Documentation of completing training requirements as described in Section 9.0 (including review of this SSHP and signing off as such).
- Documentation of completing medical surveillance requirements as described in Section 10.0.
- Respiratory fit testing, as necessary (Section 5.2.3).
- Attend the site-specific safety orientation training session (Section 9.4).
- Review the specific AHA(s) (Appendix C).
- Obtain authorization from SSHO.
- Don the appropriate PPE.
- Sign the site entry log.

6.6 Posting Site

Appropriate warning signs shall be strategically placed to give adequate warning and caution of hazards, instructions, and directions to workers and non-project personnel.

Contract No. FA8903-09-D-8580, Task Order 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-5

7.0 PERSONAL HYGIENE AND DECONTAMINATION

Decontamination of equipment and personnel will be performed to limit the migration of contaminants off site and between work zones. Decontamination will generally occur at the edge of an EZ. This section describes the necessary procedures for personnel and equipment decontamination. In general, everything that enters the EZ at the site shall either be decontaminated or properly discarded upon exit from the EZ. All personnel shall enter and exit an EZ through a CRZ.

7.1 Personnel Decontamination

Personnel decontamination consists of discarding disposable PPE, cleaning reusable PPE, and washing the hands and face. All personnel shall wash hand and face prior to eating, drinking, or using tobacco products.

7.1.1 Decontamination Procedures for Level D – Modified Personal Protective Equipment

In general, the personnel decontamination procedure for activities conducted in Level D – modified consists of personnel discarding disposable PPE, washing reusable PPE, then washing hands and face. In some circumstances, disposable wet napkins may be used in the field to wash hands and face until personnel have access to potable water.

7.1.2 Decontamination Procedures for Level C Personal Protective Equipment

The general decontamination sequence for activities conducted at Level C is as follows:

- Wash and rinse outer gloves and boots;
- Remove and rinse hard hat;
- Remove tape at wrist, boot, and hood interface;
- Remove outer gloves and boot covers;
- Remove APR, discard cartridges (if necessary), clean APR;
- Remove coveralls;
- Remove inner gloves; and
- Wash hands and face.

Disposable gloves and coveralls will be removed by turning inside out. Ground cloths, gloves, boot covers, coveralls, and APR cartridges will be placed into plastic trash bags and

Contract No. FA8903-09-D-8580, Task Order 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-5

stored at the CRZ for disposal. Respirators shall be cleaned with potable water in the field after each use and shall be washed at the end of the day using a soap and water wash followed by disinfecting. Respirators shall be inspected before each use for damage, missing parts, and proper function. Other reusable protective equipment worn by personnel performing field activities will be rinsed with potable water after each use and will be cleaned at the end of each day in the manner described by the manufacturer. Reusable PPE items will be air dried and properly stored. Air purifying respirators shall be thoroughly dried and placed in plastic bags for storage.

7.1.3 Decontamination Procedures for Level B Personal Protective Equipment

The general decontamination sequence for activities conducted at Level B is as follows:

- Remove SAR;
- Stage mask and/or harness and bottle for cleaning;
- Wash outer gloves and boots;
- Rinse outer gloves and boots;
- Remove tape at wrist, boot, and hood interface;
- Remove outer gloves and boot covers;
- Remove and rinse hard hat;
- Remove coveralls;
- Move to respirator wash area; wash mask and other respirator components;
- Remove inner surgical gloves and discard; and
- Wash hands and face.

Disposable gloves and coveralls will be removed by turning inside out. Ground cloths, gloves, coveralls, and gloves will be placed into plastic trash bags and stored at the CRZ for disposal. Respirators shall be cleaned with potable water in the field after each use and shall be washed at the end of the day using a soap and water wash followed by disinfecting and rinsing. Respirators shall be inspected before each use for damage, missing parts, and proper function. Other reusable PPE worn by personnel performing field activities will be rinsed with potable water after each use and will be cleaned at the end of each day in the manner described by the manufacturer. Reusable PPE items will be air dried and properly stored. All SAR masks shall be thoroughly dried and placed in plastic bags for storage.

Contract No. FA8903-09-D-8580, Task Order 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-5

7.2 Suspected Contamination

Any employee suspected of experiencing skin or clothing contact with a hazardous chemical is to remove affected clothing (as modesty permits and exposure warrants), thoroughly wash the affected area(s), and don clean clothes. Following this, he/she shall report to the SSHO.

7.3 Procedures for Equipment Decontamination

Equipment contacting contaminated soil or water will be pressure washed, dry brushed, wet-wiped, or washed with detergent and water. All wash waters will be collected for treatment or disposal, as required. Equipment decontamination will be conducted prior to removing equipment from the work area. The SSHO (or designee) will inspect all equipment leaving the site for adequacy of decontamination (visually clean unless otherwise specified).

7.4 Decontamination Equipment and Supplies

Decontamination equipment and supplies may consist of, but are not limited to, the following:

- Potable water;
- Washtubs;
- Non-phosphate detergent, such as Alconox;
- Brushes, hand sprayers;
- Pressure or steam washer;
- Paper towels;
- Plastic sheeting;
- 5-gallon buckets with lids;
- Garbage bags;
- 55-gallon drums or similar container for collection of decontamination fluids; and
- Labels or paint sticks for marking contents of containers.

7.5 Procedures for Emergency Decontamination

In the event of an accident and if immediate medical treatment is required to save a life, decontamination should be delayed until the victim is stabilized. Proceed with decontamination if it can be performed without interfering with essential life-saving techniques or first aid. If a worker has been exposed to corrosive materials such as sample preservative or battery acid, decontamination must be performed immediately. If an

Contract No. FA8903-09-D-8580, Task Order 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-5

emergency due to a heat related illness develops, protective clothing should be removed from the victim as soon as possible to reduce further stress.

If decontamination can be done:

- Wash, rinse, and/or remove protective clothing and equipment.

  Note: In the event that corrosive materials get in the eyes, first aid personnel should begin to administer a 15-minute eye irrigation with water while Emergency Medical Service (EMS) personnel are responding to the incident. Similarly, if a corrosive material is on an injured employee's skin, first aid personnel should flush the material off of the skin in conjunction with other first aid procedures being administered. Emergency Medical Service personnel should always be summoned as quickly as possible so as not to delay professional medical treatment.

If decontamination cannot be done:

- Alert medical personnel to potential contamination and instruct them about specific decontamination procedures, if necessary.
- Provide site personnel familiar with the incident at the medical facility.

Contract No. FA8903-09-D-8580, Task Order 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-5

8.0 ENVIRONMENTAL AND AMBIENT AIR MONITORING PROGRAM

Environmental and ambient air monitoring shall be conducted to determine the concentrations of toxic/flammable/combustible vapors and gases, oxygen, noise levels, and meteorological conditions. Ambient air monitoring is primarily used to verify that administrative controls, engineering controls, and PPE are effectively preventing harmful exposures to project personnel. Meteorological data shall be obtained as necessary for determining if physiological monitoring should be activated. The results of monitoring shall be conveyed to project personnel.

8.1 Types of Monitoring

The following monitoring will be performed as necessary:

- Real-time air monitoring
- Time-integrated personal air sampling
- Noise surveys/noise dosimetry

Refer to Table 4, “Direct Reading Air Monitoring Requirements.”.

8.1.1 Real-Time Air Monitoring

Real-time air monitoring will be conducted during intrusive work (drilling and excavation) in areas that are known or suspected to have chemical contamination or in areas where dust is generated. This type of monitoring will also be performed for soil and waste handling, and in special circumstances such as confined space entry, hot work (permitting), or during spills. The SSHO may use the following real-time instrumentation during the project:

- Photoionization detector for volatile organic compounds monitoring.
- Oxygen meter to measure for oxygen deficient/enriched atmospheres.
- Combustible gas indicator for flammable/combustible atmospheres.
- Hydrogen sulfide meter for measuring hydrogen sulfide concentrations.
- Carbon monoxide meter when internal combustion engines are operated near confined spaces while personnel are working in those spaces and in or near other poorly ventilated areas.
- Colorimetric tubes when working in areas that may potentially contain vinyl chloride and/or benzene.

Contract No. FA8903-09-D-8580, Task Order 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-5

- Aerosol monitor for measuring dust concentrations from dust generating activities.
- HazmatCAD with Chemical Agent detectors for site with possible CWM.

8.1.1.1 Photoionization Detector

A Photovac 2020 photoionization detector, or equivalent, shall be used to determine the concentration of volatile organic compounds in the breathing zone of personnel. Lamp strength will be determined based on the primary contaminants of concern at each remedial site. Monitoring using this instrument will be conducted in the breathing zone of personnel who are performing intrusive work or in some instances, prior to and during confined space entry, during hot work or cleanup of chemical or fuel spills.

8.1.1.2 Combustible Gas Indicator/Oxygen Meter/Hydrogen Sulfide Meter/Carbon Monoxide Meter

An MSA Model FiveStar, or equivalent, shall be used to determine the concentration of flammable gases, oxygen, hydrogen sulfide, and carbon monoxide in the breathing zone of personnel prior to and during activities that include confined space entry, hot work and or cleanup of chemicals or fuel spills.

8.1.1.3 Colorimetric Detector Tubes

Colorimetric tubes may be used to characterize acid/base exposure potentials primarily to benzene and vinyl chloride. As appropriate, the HSM will designate the use of these measurement devices. Based on the chemical of concern identified for the Kirtland AFB, monitoring for vinyl chloride and benzene may be required at sites where chlorinated and fuel-related volatile organic compounds are known to exist.

The proposed type of colorimetric tubes will be the Drager Multi Glass Detector Model 21/31or Accuro. Colorimetric indicator tubes (detector tubes) that consist of a glass tube impregnated with an indicating chemical. The tube is connected to a piston or bellow pump to draw a know volume of air through the tube. Contaminant reacts with the indicator chemical in the tube, producing a change in color whose length is proportional to the contaminant concentration. The glass tube has degradations in ppm to match the length of stain. A preconditioning filter may precede the detector tube to remove interfering contaminants.

8.1.1.4 Real-Time Aerosol Monitor

Real-time aerosol monitors (MIE pDR-1000 or equivalent) shall be used to monitor dust emissions during and excavation and soil handling activities or other dust generating activities. The real-time aerosol monitors will be placed in the work area (near areas where ground personnel are working) and at the downwind site perimeter. The selected placement

Contract No. FA8903-09-D-8580, Task Order 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-5

of these instruments may need to be adjusted throughout the workday to compensate for changes of wind direction.

8.1.1.5 MSA HAZMATCAD Plus Chemical Agent Detector

The MSA HAZMATCAD Plus Chemical Agent Detector or equivalent will be used to detect whether any chemical warfare agents (for example, nerve agent, blister agent, hydrogen cyanide, phosgene, halogen gas) is present while sampling and excavation of soils. HAZMATCAD Plus uses a SAW Microsensor array for the detection of nerve and blister agents and electrochemical cells to detect the blood or choking agents and selected TICs.

8.1.2 Real-Time Air Monitoring Action Levels

This section discusses the establishment of action levels of potential vapor and/or gas readings and dust concentrations which are measurable by real-time air monitoring instruments identified above. These action levels are presented in further detail in Table 4, "Direct Reading Air Monitoring Requirements".

Unexpected instrument readings at or above action levels generally warrant the following:

- All personnel will stop work in the area, exit the work area, and assemble upwind.
- Additional monitoring shall be performed to substantiate previous readings
- Implement engineering controls, as feasible.
- Upgrade level of PPE as specified or contact the HSM.

If previous readings are substantiated, engineering controls, such as increasing ventilation, shall be implemented to maintain air quality within specified levels or personnel shall upgrade to the specified level of protection (Table 3, "Task Protection Levels"). If engineering controls, such as increased ventilation, cannot maintain atmospheres to within acceptable qualities, then the HSM shall be contacted prior to continuing work activities.

8.1.2.1 Photoionization Detector Real-Time Action Levels

In general, site-specific volatile organic compound action levels will be established in addendums to this SSHP as the work plans are prepared. The action levels will be based on the most current data available for the media(s) of concern and will be protective of the personnel working at the sites. In the absence of a site-specific addendum for a particular location, the following action levels and response actions for volatile organic compounds will apply:

- Volatile organic chemical concentration greater than 2 ppm but less than 10 ppm sustained for one minute, in the breathing zone. Stop work and evaluate the

Contract No. FA8903-09-D-8580, Task Order 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-5

hazard. Increase the monitoring frequency, provide engineering controls and upgrade PPE.

- Volatile organic chemicals concentration greater than 10 ppm but less than 50 ppm sustained for five seconds, in the breathing zone. Stop work, evaluate the hazard, and contact the HSM.
- Volatile organic chemicals concentration greater than 50 ppm sustained for one second, in the breathing zone. Stop work, evaluate the hazard, and contact the HSM.

8.1.2.2 Combustible Gas Indicator/Oxygen Meter/Hydrogen Sulfide Meter/Carbon Monoxide Meter

The following action levels are established for the collected air monitoring data:

- ***Combustible Gas.*** Greater than 10 percent of LEL, confirmed instantaneous reading requires personnel to evacuate work area, eliminate ignitions sources, and provide engineering controls such as increasing ventilation.
- ***Carbon Monoxide (work area).*** Sustained carbon monoxide readings exceeding 15 ppm requires personnel to evacuate work area and provide engineering controls such as increasing ventilation or re-positioning internal combustion engine exhausts downwind from work area.
- ***Hydrogen Sulfide (work area).*** Sustained hydrogen sulfide instrument readings exceeding 1 ppm requires personnel to evacuate work area and provide engineering controls such as increasing ventilation.
- ***Carbon Monoxide (work area).*** greater than 15 ppm, confirmed instantaneous reading requires personnel to evacuate work area and provide engineering controls such as increasing ventilation.

8.1.2.3 Colorimetric Detector Tubes

The following action levels are established for the collected air monitoring data:

- ***Vinyl Chloride (work area).*** Greater than 1 PPM, confirmed instantaneous reading requires personnel to evacuate work area and provide engineering controls such as increasing ventilation.
- ***Benzene (work area).*** Greater than 0,25 PPM, confirmed instantaneous reading requires personnel to evacuate work area and provide engineering controls such as increasing ventilation.

Contract No. FA8903-09-D-8580, Task Order 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-5

8.1.2.4 Real-Time Aerosol Monitor

The real-time aerosol monitors will be set to alarm when the instantaneous aerosol concentration reaches 1 mg/m^3. The alarm will be used to indicate that additional dust control is necessary.

The real-time aerosol monitors are capable of collecting and integrating the aerosol concentrations throughout the workday into a TWA. Aerosol monitors shall be visually checked on an hourly basis during soil excavation, soil handling, and other dust generating activities to verify that the TWA remains below 1 mg/m^3. Aerosol monitors registering TWA aerosol concentrations at or above 2.5 mg/m^3 require that workers upgrade to Level C PPE and indicate that additional dust control measures are necessary. Failure to control workday TWA dust concentrations to below 2.5 mg/m^3 shall necessitate ceasing dust generating activities and contacting the Project Manager and HSM for implementing alternate work practices.

The full work-shift time-integrated concentrations will be evaluated at the conclusion of each workday to verify aerosol concentrations are maintained below action levels.

8.1.2.5 MSA HAZMATCAD Plus Chemical Detector Action Levels

The following action levels are established for the collected air monitoring data:

- ***Hydrogen Cyanide.*** Blood agent – 5.0 ppm.
- ***Phosgene.*** Choke agent – 0.3 ppm.
- ***Hydride Gases.*** 0.5 ppm.
- ***Halogen Gases.*** 10.0 ppm.
- ***Nerve Agent (G).*** 0.01 to 0.3 ppm.
- ***Blister Agent.*** 0.04 ppm.

8.1.3 Personal Air Sampling (Time-Integrated)

Time-integrated air sampling may be performed at the discretion of the HSM, if air-monitoring action levels are exceeded (Section 8.1.2). Air samples will be collected and analyzed following OSHA or NIOSH methods. An American Industrial Hygiene Association accredited laboratory shall be used to analyze all personal air samples. The analytical results shall be reported as a TWA concentration for comparison against the OSHA PEL and ACGIH TLV.

8.1.4 Noise Surveys/Noise Dosimetry

The SSHO shall conduct noise monitoring with a Sound Level Meter when it is suspected that equipment is producing noise at sound pressure levels greater than 80 decibels. Areas that are surveyed at sound pressure levels greater than 85 decibels shall be posted as a noise hazard area. Actual employee exposures for personnel working in noise hazard areas shall then be determined with a noise dosimeter. The equipment/area shall then be evaluated to determine if it is feasible to implement engineering controls.

8.2 Calibration, Handling, and Maintenance

All monitoring equipment will be maintained and calibrated by according to the manufacturer's recommendations. Care shall be given by the operator to the handling of instruments so that the accuracy and fitness for use are maintained. Calibration checks on real-time monitoring instruments shall be performed using standards, which are National Institute of Standards and Testing traceable. Calibration for all instruments will be performed and documented before and after each use. Only properly functioning instrumentation shall be used. Instrument maintenance shall be tracked on the Master List of Measuring and Test Equipment form (Appendix D).

8.3 Record Keeping

The SSHO is responsible for maintaining all air and noise monitoring records. The SSHO shall also obtain copies of air and noise monitoring records generated by subcontractors for inclusion into project files. The following records shall be maintained:

- Date, time, location, and operations performed.
- Meteorological data.
- Equipment identification, calibration data.
- Monitoring/sampling data.
- Engineering controls used to reduce exposure.
- Description of PPE worn.

Specifically, the following air and noise monitoring data and calibration records (Appendix D) shall be maintained, controlled, and retrievable at all times by the SSHO:

- Air Monitoring Data Record.
- Air Sampling Data Record.
- Colorimetric Detector Tube Log.

Contract No. FA8903-09-D-8580, Task Order 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-5

- Employee Notification of Industrial Hygiene Monitoring Results.
- Real Time Aerosol Monitoring Log.
- Noise Dosimeter Field Data Log.
- Noise Survey Field Data Log.
- Sound Level Meter/Noise Dosimeter Calibration Log.

These records shall be maintained in the field office files by the SSHO and stored in the permanent project files. Any Employee Notification of Industrial Hygiene Monitoring Results records for Shaw personnel will be forwarded to the Shaw HSM for inclusion in personnel files when appropriate. Any Employee Notification of Industrial Hygiene Monitoring Results records for subcontractor personnel will be forwarded to the Subcontractor Human Resources Department (or equivalent safety records personnel) for inclusion in personnel files when appropriate.

8.4 Quality Assurance/Quality Control

Monitoring instruments shall be properly maintained and calibrated before and after use. The calibration and field maintenance of monitoring instruments shall be performed against known standards and manufacturer specifications. Instruments shall be calibrated to plus or minus 5 percent against the known standards. If instruments cannot be calibrated within this tolerance or if operation becomes erratic, then the instruments shall not be used and dispatched for maintenance by qualified and authorized technicians.

Contract No. FA8903-09-D-8580, Task Order 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-5

Contract No. FA8903-09-D-8580, Task Order 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-5

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9.0 TRAINING REQUIREMENTS

This section describes general training, safety meetings, site-specific training, hazard communication, first aid and CPR, and other additional training, certification, and licenses needed to work on the project sites.

9.1 General Training

The SSHO is responsible for informing all site personnel and all visitors of the contents of this SSHP and ensuring that each person signs off on the Site Safety and Health Plan Acknowledgment Form (Appendix A). Documentation of certification of training requirements will be reviewed by the SSHO, placed in the project files, and submitted to AFCEE (as required).

9.2 Hazardous Waste Operations Training

All site personnel working in regulated areas at this project will meet the minimum training requirements as specified in 29 CFR 1926.65 and 29 CFR 1910.120. The following criteria are used to determine the level of training required:

- Personnel engaged in hazardous substance removal or other activities, which expose or potentially expose them to hazardous substances and health hazards shall receive a minimum of 40 hours of instruction off site and three days of supervised field experience.
- Personnel who perform limited activities at the site and are not potentially exposed to contaminant levels above the PEL shall receive a minimum of 24 hours of instruction off site, and one day of supervised field experience.

9.2.1 40-Hour Training

The following is a general list of topics covered in the 40-hour course:

- General site safety.
- Chemical, physical, and environmental hazards.
- Key management positions responsible for site safety and health.
- Safety, health, and other hazards (including noise).
- PPE.
- Work practices by which employees can minimize risks from hazards.
- Safe use of engineering controls and equipment on site.

Contract No. FA8903-09-D-8580, Task Order 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-5

- Medical surveillance requirements including recognition of signs and symptoms of exposure.
- Hazard communication (Worker Right-to-Know).
- Engineering controls and safe work practices.
- Components of the site Safety and Health Program.
- Decontamination practices for personnel and equipment.
- Confined space entry procedures.
- Emergency response procedures.

9.2.2 24-Hour Training

The same topics presented in the 40-hour course are reviewed in the 24-hour course but with less time and detail spent on each topic.

9.2.3 Supervisory Training

Field supervisory personnel including the SSHO will receive eight additional hours of specialized training. The following topics are discussed:

- Overall safety and health program.
- PPE program.
- Spill containment program.
- Health hazard monitoring procedures and techniques.

9.2.4 Refresher Training

Personnel covered by Sections 9.2.1 and 9.2.2 are required to complete 8 hours of refresher training annually on the following topics:

- Safe work practices.
- Chemical hazard awareness.
- Hearing conservation.
- Hazard communication.
- Respirator refresher.
- Confined space entry refresher.

Contract No. FA8903-09-D-8580, Task Order 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-5

9.2.5 Supervised Field Experience

Personnel covered by Section 9.2.1 will receive a minimum of 3 days actual field experience under the direct supervision of a trained, experienced supervisor. A minimum of 1 day is required for personnel who fall under the requirements of Section 9.2.2.

9.2.6 Visitor Training

Site access by personnel making deliveries or performing repairs to utilities, public or government officials, visitors, or local residents will be limited to support areas only. These persons will not be required to comply with the medical and training requirements as defined in this SSHP. Support Zone access will be limited to designated work, delivery, or observation areas to minimize any potential exposure to site contaminants. Site observation areas will be located upwind from the EZ. Weather conditions or other site activities may restrict access to these areas. Authorization for limited site access will be determined on a case-by-case basis by the SSHO in consultation with the HSM, Project Manager, the PDA, and the AFCEE. These personnel will be escorted on-site and will be strictly prohibited from entering the EZ or CRZ.

9.3 Safety Meetings

Employees shall be provided continuing safety and health training to enable them to perform their work in a safe manner.

9.3.1 Morning Safety Meetings

The SSHO shall conduct a safety meeting at the beginning of each shift. The topics discussed at this daily "tailgate" safety meeting shall include safety and health considerations for the day's activities, pertinent aspects of JSAs, necessary PPE, problems encountered, and new operations. Attendance records and meeting notes shall be documented on the Safety Meeting/Training Log form (Appendix D) and are maintained with the project files. At the conclusion of each shift, a debriefing for site employees will be held, if necessary.

9.4 Site-Specific Training

All personnel, including subcontractors, working at the project sites and falling within the scope and application of 29 CFR 1926.65 and 29 CFR 1910.120 shall attend a site-specific orientation covering the following topics:

- Purpose and review of this SSHP including emergency response procedures as outlined in Section 11.0.
- The pertinent provisions for safety and health contained in *Safety and Health Requirements Manual* (USACE, 2008).

Contract No. FA8903-09-D-8580, Task Order 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-5

- Review of applicable AHAs (Appendix C).
- MEC awareness as appropriate.
- Names of personnel responsible for site safety.
- The provisions for medical care and facilities and the names of CPR and first aid trained personnel assigned to the project.
- Morning safety and preparatory meeting procedures.
- Safety and health hazards on site and the means to control/eliminate those hazards.
- Responsibilities for accident prevention and maintaining safe and healthful work environments.
- Stop Work authority.
- Procedures for reporting and correcting unsafe conditions or practices.
- Responsibilities for reporting all accidents and illnesses.
- PPE (use and care).
- Location of safety equipment (i.e., fire extinguishers, first aid kits, eyewash stations, etc.).
- Standard operating procedures, safety rules, and safe work practices for the project.
- Work zones and site control measures.
- Hazard Communication Program (includes discussion of MSDSs on site).
- Lead or asbestos awareness training (as appropriate).
- Hot work procedures.
- Lockout/tagout procedures.
- Fall protection.
- Fire prevention.
- Housekeeping.

The content of the training will be derived from information contained within this SSHP.

9.5 Hazard Communication

All personnel performing field activities involving hazardous operational chemicals shall receive basic hazard communication training, which involves a review of the Shaw written

hazard communication program, MSDSs, container labeling, chemical health hazards, and chemical hazard control procedures. Personnel shall be notified of the hazards of chemical contamination on site (if present) by a review of Section 4.1 of this SSHP. Material Safety Data Sheets for additional materials brought on site shall be reviewed with personnel prior to the use.

9.6 First Aid and Cardiopulmonary Resuscitation

There shall be at least two persons trained and certified in both American Red Cross first aid techniques and CPR on site whenever there are two or more employees working at the project. Those Shaw employees who are trained in first aid techniques and CPR will meet both the training and vaccination requirements of Shaw Procedure No. HS512, "Handling of Blood or Other Potentially Infectious Material."

9.7 Additional Training, Certification, and Licenses

In addition to the training, certification, and licensing previously detailed, the following shall also be required:

- All personnel operating motor vehicles shall hold a valid operator's license.
- All crane operators shall be designated as qualified meeting the specifications in the *Safety and Health Requirements Manual* (USACE, 2008). Qualification is to be renewed every 3 years.
- Personnel operating powered industrial trucks (forklifts) shall have a certificate designating them as a qualified operator.
- Any employee operating a power-actuated tool shall be qualified as an operator of that tool as specified by the manufacturer. Recertification, if any, shall be obtained as specified by the manufacturer.
- Confined space entry, attendant, and supervisory personnel shall be trained and certified as specified in 29 CFR 1910.146. Confined space rescue personnel shall be trained and certified as specified in 29 CFR 1910.146 and shall practice rescues (from similar types of confined spaces) on an annual basis.
- The certification and recertification requirements for first aid (3 years) and CPR (1 year) are applicable. First aid and CPR training/certification must be made by a reputable provider.
- Personnel working from ladders shall be initially trained as specified in Shaw Procedure No. HS302, "Portable Ladder Safety".

Contract No. FA8903-09-D-8580, Task Order 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-5

- Personnel inspecting cranes shall have a certificate designating them as a competent person.
- Personnel inspecting excavations shall have a certificate designating them as a competent person.
- Personnel supervising scaffold erection shall have a certificate designating them as a competent person.
- Personnel operating arc-welding equipment shall have a certificate designating them as a qualified operator.
- Personnel operating gas welding and cutting equipment shall have a certificate designating them as a qualified operator.
- Personnel may only use portable fire extinguishers to extinguish small fires, if the employee has been trained and the employee is confident that the small fire can be safely extinguished.

Contract No. FA8903-09-D-8580, Task Order 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-5

10.0 MEDICAL SURVEILLANCE

Shaw utilizes the services of an Occupational Medicine physician for the medical surveillance requirements of all projects. Dr. William Nassetta (below) reviews all Shaw medical examinations and is available for medical consultation on an "as-needed" basis.

Dr. William Nassetta, MD, MPH
CORE Health Networks
12091 Bricksome Avenue, Suite B
Baton Rouge, Louisiana 70816
1-(877) EHS-SHAW (1-877-347-7429)
(225) 614-9561 (office)
(225) 295-4846 (fax)

Subcontractors should also utilize the services of an occupational medicine physician of their choice to meet any medical surveillance requirements.

10.1 Medical Examination

As required by Shaw Procedure No. HS100, "Medical Policies and Procedures," all personnel on site with the potential for exposure to contamination will have successfully completed a pre-placement or periodic/updated physical examination, as required by OSHA regulations.

10.1.1 Pre-Placement Examination

On-site personnel with the potential for exposure to contamination shall undergo a pre-placement examination that complies with 29 CFR 1926.65, 29 CFR 1910.120, and *Safety and Health Requirements Manual* (USACE, 2008) requirements for hazardous waste site operations and hazardous, toxic, and radioactive waste activities. Specifically, the following on-site personnel shall be required to participate in this medical surveillance program:

- All employees who are or may be exposed to hazardous substances or health hazards at or above the established PEL, above the published exposure levels for these substances, without regard to the use of respirators, for 30 days or more than a year.
- All employees who wear a respirator for 30 days or more a year or as required by 29 CFR 1910.134.

Contract No. FA8903-09-D-8580, Task Order 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-5

- All employees who are injured, become ill, or develop signs or symptoms due to possible overexposure involving hazardous substances or health hazards from an emergency response or hazardous waste operation.
- Members of HAZMAT teams.

Pre-placement medical examinations consist of the following:

- Medical and occupational history questionnaire, which includes information on past gastrointestinal, hematological, renal, cardiovascular, reproductive, immunological, and neurological problems.
- Physical examination.
- Chest X-ray (no more frequently than every 4 years).
- Blood pressure.
- Complete blood count and differential to include hemoglobin and hematocrit determinations, red cell indices, and smear of peripheral morphology.
- Blood urea nitrogen and serum creatinine.
- Sequential Multiple Analyzer Computer Profile (SMAC 24).
- Pulmonary function test.
- Audiogram.
- Electrocardiogram for employees over 35 years old or when other complications indicate the necessity.
- Stress test (as directed by the occupational physician based on electrocardiogram/pulmonary function testing).
- Visual acuity.
- Urinalysis, as necessary, for metals.

The medical surveillance provided to the employee includes a written opinion by the medical examiner of the employee's ability to use the necessary respiratory protective equipment. Any employee found to have a medical condition, which could directly or indirectly be aggravated by exposure to any chemical substance present, or by the use of respiratory equipment will not be employed for the project. A copy of the medical examination shall be provided at the employee's request.

Contract No. FA8903-09-D-8580, Task Order 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-5

The employee will be informed of any medical conditions that would result in work restriction or that would prevent them from working at hazardous waste sites.

10.1.2 Annual Exam

Site personnel may be required to receive an annual, updated exam meeting the requirements of 29 CFR 1926.65 and 29 CFR 1910.120. The results of these exams are compared to previous results and the baseline physical to determine if any medical effects due to exposure have occurred. Appropriate actions shall be taken as recommended by the physician should the results indicate an exposure; otherwise, employees are cleared for continued work.

In general, an annual exam is required when the employee meets at least one of the following criteria:

- All employees who are or may be exposed to hazardous substances or health hazards at or above the established PEL, above the published exposure levels for these substances, without regard to the use of respirators, for 30 days or more than a year.
- All employees who wear a respirator for 30 days or more than a year or as required by 29 CFR 1910.134.
- All employees who are injured, become ill or develop signs or symptoms due to possible overexposure involving hazardous substances or health hazards from an emergency response or hazardous waste operation.
- Members of HAZMAT teams.

When an annual examination is required, the frequency shall be at least once every 12 months unless the attending physician believes a longer interval (not greater than biennially) is appropriate.

10.1.3 Exit Exam

Shaw offers exit physical exams (optional) for all employees involved in the medical surveillance program who are leaving the company for any reason.

10.1.4 Other Exams

Periodically, the need arises to conduct medical examinations at times other than those previously discussed. These include reassignment in accordance with 29 CFR 1910.120 (f)(3)(i)(C) and 29 CFR 1926.65 (f)(3)(i)(C), if an employee develops signs or symptoms of illnesses relating to work place exposure, if the physician determines examinations needing to be conducted more often than once a year, and whenever an employee sustains a lost time injury or develops a lost time illness.

Contract No. FA8903-09-D-8580, Task Order 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-5

10.1.5 Hearing Conservation Program

Personnel, including subcontractors, shall participate in a continuing, effective hearing conservation program, as described in 29 CFR 1910.95 (c), whenever employee noise exposures equal or exceed an 8-hour TWA sound level of 85 decibels measured on the A scale (slow response) or, equivalently, a dose of 50 percent.

10.2 Subcontractor Requirements

Subcontractors shall certify that their employees have successfully completed a physical examination by a qualified physician on the Training Acknowledgment Form (Appendix D), when applicable. The physical examinations shall meet the requirements of 29 CFR 1926.65 and 29 CFR 1926.103. The subcontractor requirements for physical examination are the same as for Shaw employees (Section 10.1).

10.3 Medical Records

Medical and personal exposure monitoring records will be maintained according to the requirements of 29 CFR 1926.65 and 29 CFR 1910.120 and will be kept for a minimum of 30 years. The confidentiality of employee medical records shall be maintained. The written medical opinion from the occupational physician is kept in site files.

10.4 Medical Restrictions

When a medical care provider identifies a need to restrict work activity, the employee's home office will communicate the restriction to the employee SSHO and HSM. The terms of the restriction will be discussed with the employee and the SSHO. Every attempt will be made to keep the employee working, while not violating the terms of the medical restriction.

10.5 Drug and Alcohol Testing

Shaw is firmly committed to providing employees a safe and healthful workplace, and to providing clients and the public safe and efficient services. Employee involvement with the use, possession, or sale of alcohol, illegal drugs, or any substance represented as a controlled substance creates an impediment toward meeting these commitments and is prohibited.

At no time while on duty may employees use or be under the influence of alcohol, narcotics, intoxicants, or similar mind-altering substances. Employees found under the influence of or consuming such substances will be immediately removed from the job site, as specified in the *Safety and Health Requirements Manual* (Section 01.C.02) (USACE, 2008).

All employees of Shaw and its subcontractors are subject to drug and alcohol testing as described in Shaw Procedure No. HS101, "Drug and Alcohol Testing."

Contract No. FA8903-09-D-8580, Task Order 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-5

11.0 EMERGENCY RESPONSE PLAN AND CONTINGENCY PROCEDURES

An emergency is defined as a sudden, generally unexpected occurrence demanding immediate action. Emergencies at project sites include accidents, injuries requiring medical care, fires, explosions, spills and significant releases of hazardous substances to the environment, and extreme weather events. Upon mobilization to the project, the Construction Manager shall provide a means for effective emergency communications (landline telephone, cellular phone) prior to commencing site activities.

In the event that an emergency arises, the appropriate immediate response must be taken by the first person to recognize the situation. The field crew shall immediately notify the Construction Manager or SSHO of the incident, and the appropriate emergency service organization shall be contacted. A list of emergency contacts is provided in Table 5. A copy of the emergency telephone numbers and directions to the nearest selected CORE Health Networks network clinic and hospital shall be posted at the project site.

The Project Manager, HSM, and the COR shall be notified of any accident, injury, or illness.

In the case of injury or illness, a trained person will render the proper emergency first aid care. First aid equipment shall be available at the area of fieldwork. Personnel will be notified as to the locations of first aid equipment during the initial safety briefing session.

If the injury or illness is from exposure to a hazardous substance, the MSDS shall be provided to the medical personnel. Material Safety Data Sheets are provided for operational chemicals. The MSDS details first aid procedures to follow in the event an exposure occurs.

Unless the emergency event is extreme and obvious, the decision to cease all field activities and evacuate the site shall be made by the Construction Manager or SSHO. Field personnel will report to the pre-designated area, if possible.

11.1 Personnel Roles/Lines of Authority

The responsibilities of specific project individuals and the coordination of emergency service personnel are defined in the following subsections.

Contract No. FA8903-09-D-8580, Task Order 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-5

11.1.1 Construction Manager

At all times during scheduled work activities, a Construction Manager or SSHO will be present on site. This individual will be responsible for implementing these procedures and determining appropriate response actions. Specific responsibilities for the Construction Manager include the following:

- Evaluating and assessing emergency incidents or situations.
- Coordinating response activities on site.
- Informing field personnel of the potential hazards associated with the site.
- Summoning emergency response personnel.
- Notifying the Project Manager and HSM of an emergency situation.
- Verifying that all emergency equipment is routinely inspected and functional.
- Informing the appropriate emergency response agencies of the provisions made herein.
- Evaluating the safety of site personnel in the event of an emergency and providing evacuation coordination if necessary.

The Construction Manager or SSHO will direct all emergency response activities conducted or managed by Shaw.

11.2 List of Emergency Contacts and Notification

Emergency and non-emergency numbers are listed in Table 5. The Kirtland AFB Fire Department shall be contacted prior to initiating site activities. They shall be frequently advised and notified about upcoming site activities and potential emergencies. This shall be done to ascertain response capabilities and to obtain a response commitment.

The Construction Manager and SSHO will be notified immediately in the event of an emergency. The Construction Manager or SSHO will immediately evaluate the incident and, if necessary, notify emergency response personnel. If not previously notified, the COR will be advised of the situation. Telephone numbers for emergency contact personnel are listed in Table 5 of this SSHP. The list will be maintained with current contacts and telephone numbers, and provided in all project vehicles.

Contract No. FA8903-09-D-8580, Task Order 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-5

The information provided to the emergency contact should include the nature of the incident and the exact location. Specifically, the information should include the following:

- Name and telephone number of the individual reporting the incident.
- Location and type of incident.
- Nature of the incident.
- Number and nature of medical injuries.
- Potential for additional risks or dangers.
- Potential off-site risks or dangers.
- Movement or direction of spill/vapor/smoke.
- Response actions currently in progress.
- Estimate of quantity of any released materials.
- Status of incident.
- Other pertinent information.

When reporting spills only (Kirtland AFB Fire Department), the following information is to be provided:

- Name and telephone number of person making notification.
- Exact location, cause and time of spill or emergency.
- Type and description of emergency.
- Estimate of amount and type of material spilled.
- Extent of actual or potential environmental damage.
- Injuries or property damage, if any.
- Possible hazards to off-post human health and environment.
- Immediate response actions taken.

11.3 Medical Emergency Response

Minor injuries will be treated on site by qualified first aid/CPR providers. Injuries and illnesses that do not require immediate medical care shall be treated at the selected medical care facilities. The EMS shall be summoned in the event of moderate to severe physical injury, which requires immediate emergency care. In all cases, the Construction Manager or

Contract No. FA8903-09-D-8580, Task Order 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-5

SSHO shall accompany the injured worker to the appropriate medical care facility. Figure 2 indicates the location of the nearest hospital. Figure 3 indicates the location of the nearest CORE Health Networks network clinic. The route to the selected CORE Health Networks network clinic and the hospital shall be available in all project vehicles.

11.4 Personal Exposure or Injury

The following procedures will be implemented in the event of a personal injury (other than first aid only).

11.4.1 Serious Injuries Requiring Transport by Ambulance

The Construction Manager or SSHO will provide any necessary support to emergency responders.

Upon the realization that an individual(s) needs medical care with transport by ambulance, the following procedure will be used when applicable:

- Administer first aid and contact the Construction Manager or SSHO to arrange for dispatch of the EMS.
- Notify the HSM.
- Provide an individual to meet the EMS at the project site entrance, to minimize time in locating the injured worker(s).
- Wait for emergency care, document the event, and maintain communication with the Construction Manager or SSHO.

In the event of a chemical exposure, the following procedures shall be followed after summoning the EMS:

- **Skin Contact:**
  - Flush with water
  - Remove clothing, flush skin
  - Obtain prompt medical attention, as necessary
- **Inhalation:**
  - Remove the person from the area
  - Administer first aid/CPR, as needed
  - Obtain immediate medical attention

- **Ingestion:**
  - Contact the Poison Center for immediate treatment, then obtain immediate medical attention
  - Inducing vomiting may cause further injury to the victim; follow instructions from the MSDS and/or Poison Center
- **Eye Contact:**
  - Flush eyes immediately with water for a minimum of 15 minutes
  - Obtain immediate medical attention

11.5 Fire Control

In the event of a fire or explosion at the site, the following actions shall be implemented:

- Evacuate all personnel to a safe location upwind or crosswind of the incident. Contact the Construction Manager or SSHO.
- Concurrently with the above, contact the Kirtland AFB Fire Department.
- If personnel are present who have had training in the use of fire extinguishers, use available fire extinguishers to extinguish small fires, if the fire can be safely extinguished.
- Alert EMS about the possibility of fire victims, as appropriate.
- Document the incident in the field logbook and follow the procedures for incident reporting in Section 13.4.

11.6 Spill Prevention and Control

This spill prevention and control section sets forth the procedures for the coordination of and response to potential spills/discharges of hazardous materials or wastes.

11.6.1 Preemptive Measures

The following measures shall be taken to minimize the possibility of spills/discharges:

- Site controls are to be maintained so that only authorized personnel have access to work areas.
- Site personnel will be advised of appropriate spill/discharge control measures.

Contract No. FA8903-09-D-8580, Task Order 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-5

- Appropriate secondary containment structures will be used for storage of hazardous materials and wastes on site.
- Storage containment shall be examined daily.

11.6.2 Spill Response

If a hazardous material or waste release is observed at the site, the Construction Manager or SSHO will be immediately notified. The Kirtland AFB Fire Department shall then be notified by the Construction Manager or SSHO. An assessment will be made of the magnitude and potential impact of the release. If it is safe to do so, trained site personnel will attempt to locate the source of the release, prevent further release, and contain the spilled and/or affected materials as follows:

- The spill or release area will be approached from upwind.
- Hazards will be identified based on available information from witnesses or material identification documents. The potential hazards will be evaluated to determine the proper personal protection levels, methods, and equipment necessary for response.
- Eliminate possible ignition sources for flammable material spills (e.g., turn power off, no smoking).
- As necessary, the release area will be evacuated, isolated, and secured.
- Eliminate routes to water by closing/blocking floor drains and storm drains.
- Work zones, including a decontamination station, shall be set up.
- If possible, spill containment will initially be made without entering the immediate hazard area.
- Entry to the release area will be made by personnel with the PPE, training, methods, and equipment necessary to perform the work. Hazardous spill containment and collection will be performed as follows:
  - Contain the spill with absorbent socks, booms, granules, or construction of temporary dikes.
  - Control the spill at the source by closing valves, plugging leaks, up righting containers, over packing containers, or transferring contents of a leaking container.
  - Collect the spilled material with shovels, pumps, or heavy equipment as necessary.

Contract No. FA8903-09-D-8580, Task Order 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-5

  - Contaminated soil or gravel shall be cleaned up as directed by AFCEE. If the determination is made to drum the contaminated media, the spill will be dug out until no further contamination is visible and placed in 55-gallon open head steel drums. The drum then must be marked for proper disposal.

- The decontamination procedures established in Section 7.0 shall be used after the response is complete. Refer to Section 7.5 for information on procedures for emergency decontamination.

If site personnel cannot safely respond to an environmental release, evacuation of the area may be warranted. Upon their arrival at the site, the Construction Manager or SSHO will brief emergency responders of the status and any potential hazards.

11.7 Munitions and Explosives of Concern Discovery

In the event known or suspected MEC is encountered, the following procedures shall be implemented:

- Workers shall flag visibly, for example, up in a tree, next to where the MEC find is located by means of a rag or surveyors flagging. This will enable a MEC Specialist to locate the ordnance/explosive find later.
- Evacuate all personnel to a safe location upwind of the MEC. Contact the Construction Manager or SSHO.
- Secure area against trespassers.
- The Construction Manager or SSHO will notify the Project Manager.
- The Project Manager will notify the COR to determine the appropriate course of action.
- The work area will remain evacuated until clearance has been given from the Project Manager and COR.

11.8 Site Evacuation Procedures

Voice, radio, or cellular telephone communication may be used to alert site workers and provide special instructions on site evacuation. Personnel shall evacuate to a designated safe, upwind location and perform a “head count.” The Construction Manager or SSHO is to remain in frequent contact for proper execution of the evacuation procedures.

Situations requiring evacuation may include unusually severe weather conditions or fires. In the event of project evacuation, other than weather related, the Kirtland AFB Fire Department will be notified immediately. A site emergency map that delineates evacuation

Contract No. FA8903-09-D-8580, Task Order 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-5

routes, emergency air horn locations, first aid kit locations, and rally point(s) shall be included in each site-specific addendum once the or SSHO has physically evaluated the site.

11.9 Adverse Weather Conditions

Personnel should be aware of the possibility for the occurrence of severe weather such as lightning, thunderstorms, high winds, or winter storms/blizzards. Necessary precautions or response, directed by the Construction Manager or SSHO, will be taken in the event of severe weather. Personnel may be advised to leave the project site and take refuge at home or a motel when high winds, heavy rain, or snowstorms are predicted and imminent. Outdoor operations will be suspended when the potential for lightning occurs.

Local weather broadcasts will be monitored by the Construction Manager or SSHO, when the likelihood for severe weather exists. Generally, cellular telephone communication will be utilized to alert crews to threatening weather. A severe weather shelter shall be identified and the location communicated with the crew(s) upon project mobilization.

11.9.1 Tornado Safety

In the event of a tornado, personnel should take cover in a basement, ditch, culvert, or interior room of a strong building. Personnel shall identify the nearest tornado shelter at each active remote work location prior to beginning operations. When a tornado has been sighted, go to your shelter immediately. Stay away from windows, doors, and outside walls.

- In a small building, go to the basement or storm cellar. If there is no basement, go to an interior room on the lower level (bathrooms, closets, interior hallways).
- Interior hallways on the lowest floor are usually safest. Stay away from open spaces and windows.
- Get under a piece of sturdy furniture such as a workbench or heavy table or desk and hold on to it.
- Use arms to protect head and neck.
- If in a trailer or vehicle, get out immediately and go to a more substantial structure.
- If there is no shelter nearby, lie flat in the nearest ditch, ravine, or culvert with your hands shielding your head.
- If in a car, get out and take shelter in a nearby building. Do not attempt to out-drive a tornado since they are erratic and move swiftly.
- Personnel should be aware that ditches and culverts may fill up with water quickly and should only use these as shelters as a last resort.

Contract No. FA8903-09-D-8580, Task Order 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-5

11.9.2 Lightning Safety

Outdoor activities will be suspended when the potential for lightning occurs. The following measures, offered by the National Lightning Safety Institute of Louisville, Colorado shall be taken to minimize the possibility of injury to personnel by lightning:

- The Construction Manager or SSHO is responsible to monitor weather conditions.
- Upon seeing lightning or hearing thunder, outdoor activities shall be suspended and personnel shall be evacuated to safe areas (i.e., inside vehicles or buildings). When clouds with dark bases and wind speeds pick up, anticipate thunderstorms. Those who have been struck by lightning did not seek cover in a timely fashion.
- The Construction Manager or SSHO will continue to monitor weather conditions.
- Outdoor activities may resume 30-minutes after the last bolt of lightning was observed and the last clap of thunder was heard.

People who have been struck by lightning do not carry an electrical charge and are safe to handle. Apply first aid immediately, if you are qualified to do so. Get emergency help promptly.

SAFE AREAS INCLUDE:

- Fully enclosed metal-topped vehicles with windows up.
- Substantial and permanent buildings.

UNSAFE AREAS INCLUDE:

- Small structures including huts and rain shelters.
- Nearby metallic objects like fences, gates, instrumentation and electrical equipment, wires, and power poles.

The following shall be avoided when lightning is in the area:

- Trees.
- Water.
- Open fields.
- Using hard-wired telephones and headsets.

Contract No. FA8903-09-D-8580, Task Order 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-5

If hopelessly isolated from shelter during close-in lightning, adopt a low crouching position with feet together (up on toes, if possible) and hands on ears. If hair stands on end or rises on back of neck, a lightning strike is imminent.

Remember the warning phrase from the National Lightning Safety Institute: "If you can see it (lightning), flee it; if you can hear it (thunder), clear it."

11.10 Emergency Equipment

At a minimum, the following emergency equipment shall be maintained at the project site(s):

- Fire extinguishers.
- First aid kits.
- Blood-borne pathogen control supplies or kit.
- Emergency eyewash, if corrosive materials are being used.
- Spill control.
- Communication devices.

This equipment is to be inspected by the SSHO on a monthly basis to verify that they are in good condition, ready to use, and easily accessible. Note: a seal may be maintained on first aid kits to indicate if the kit has been accessed within the preceding week. The weekly inspection of the first aid kit will only be necessary if the seal has been broken.

11.11 Critique and Follow-up of Emergency Procedures

The COR shall be verbally notified immediately and receive a written notification within 24 hours of all accidents or incidents including releases, fires, or explosions. The report shall include the following items:

- Name, organization, telephone number, and location of the contractor.
- Name and title of the person(s) reporting.
- Date and time of accident/incident.
- Location of accident/incident.
- Brief summary of accident/incident including pertinent details, such as, type of operation ongoing at time of accident.
- Cause of accident/incident, if known.
- Casualties.

Contract No. FA8903-09-D-8580, Task Order 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-5

- Details of any contamination.
- Estimated property damage, if applicable.
- Nature of damage, effect on contract schedule.
- Action taken by Shaw to maximize safety and security.
- Other damage or injuries sustained (public or private).

The Construction Manager and/or SSHO will investigate the cause of the incident to prevent its re-occurrence. The investigation should begin as soon as practical after the incident is under control but not later than the first workday after the incident. Investigations will follow the procedures described below:

- Interview witnesses and participants as soon as possible or practical.
- Determine the chronological sequence of events (opinions as to cause should not be solicited at this time).
- Note any movement, sounds, noises, or other sensory perceptions experienced by the participants or witnesses.
- Obtain weather data.
- Ascertain the location and position of all switches, controls, etc.
- Verify the condition of all safeguards.
- Determine if a revision to emergency procedures is warranted.

After the facts have been collected, causal factors should be identified and controlled/eliminated.

11.12 Hospital Information

The nearest local hospital for the project is:

University of NM Hospital Trauma Center
2211 Lomas Blvd. NE,
Albuquerque, NM 87131
(505) 277-011184.212

The distance to the hospital is approximately 3.4 miles from the Kirtland AFB, with a travel time of approximately 11 minutes. The route map to the hospital is depicted in Figure 2.

11.13 Medical Services Clinic Information

The CORE Health Networks network clinic for the project is:

Center for Occupational Medicine
5700 Harper Dr. NE, Suite 110
Albuquerque, NM 87102
(505) 244-3804

The distance to the clinic is approximately 7.7 miles from the Kirtland AFB, with a travel time of approximately 18 minutes. The route map to the clinic is depicted on Figure 3.

Contract No. FA8903-09-D-8580, Task Order 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-5

12.0 BLOOD-BORNE PATHOGEN EXPOSURE CONTROL PLAN

Blood-borne pathogens are microorganisms (i.e., bacteria, virus) sometimes present in blood and certain body fluids, which are capable of causing human disease or death. These pathogens can also be present on objects and surfaces that have had contact with infected blood or certain body fluids. Blood-borne pathogens are also capable of causing human disease or death to unprotected people who are exposed to infected blood or body fluids. Diseases caused by blood-borne pathogens include, but are not limited to, hepatitis A, hepatitis B, hepatitis C, malaria, acquired immunodeficiency syndrome (AIDS), and other sexually transmitted diseases. The most significant of these and of greatest concern are hepatitis B and AIDS.

Hepatitis B is a serious disease caused by the hepatitis B virus (HBV), which attacks the liver. The virus can cause lifelong infection, cirrhosis (scarring) of the liver, liver cancer, liver failure, and death. Exposure symptoms include fever, fatigue, nausea, vomiting, muscle aches, loss of appetite, and jaundice (yellowing of the eyes or skin). Hepatitis diagnosis is difficult because some symptoms are similar to the flu and may remain mild for an extended period. The HBV can remain infectious for up to 10 days, even in dried blood. Hepatitis B vaccine is available for all age groups to prevent HBV infection.

Human immunodeficiency virus (HIV) is the virus that causes AIDS. People with HIV have what is called HIV infection. Some of these people will develop AIDS because of their HIV infection. Humans may be infected with HIV for many years without experiencing any symptoms. Upon development of AIDS, symptoms may include weight loss, skin lesions, dry cough, fever, fatigue, diarrhea, swelling of the lymph glands, and death. Presently, no cure exists for HIV or AIDS, and no vaccination is currently available.

A hazard exists for blood and other bodily fluids to be infected with dangerous, infectious pathogens. Employees could become infected if they are exposed to these blood-borne pathogens.

The purpose of this Blood-borne Pathogen Exposure Control Plan is to provide the information, procedures, and requirements necessary to prevent employee exposure to blood-borne pathogens.

Contract No. FA8903-09-D-8580, Task Order 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-5

12.1 Regulatory, Requirement, and Policy Compliance

This Blood-borne Pathogen Exposure Control Plan has been prepared in compliance with:

- 29 CFR 1910.1030, Blood-borne Pathogens.
- *Safety and Health Requirements Manual*, Section A.03.06 (USACE, 2008).
- Shaw Procedure No. HS512, "Handling of Blood or other Infectious Material".

12.2 Exposure Determination

The OSHA requires employers to perform an exposure determination, identifying employees who may incur occupational exposure to blood or other potentially infectious materials. The exposure determination is made without regard to the use of PPE. For exposure determination purposes, employees are considered to be exposed, even if they wear PPE.

In general, it is anticipated that project activities will not present a high risk of employee exposure to blood or other body fluids. An exception to this would be under circumstances when personnel administer first aid care or CPR to injured workers and when personnel clean-up areas and equipment that may have been exposed to blood because of the incident. In these cases, there is reasonable potential for employee skin, eye, mucous membrane, or potential contact with blood or other bodily fluids.

The OSHA requires a listing of job classifications with identification of tasks performed in which some employees may have potential for occupational exposure. This requirement is for employees to clearly understand the tasks that they may perform have a potential for occupational exposure to infectious materials. The job classifications and associated tasks with an exposure potential are as follows:

- Construction Manager—Administer first aid or CPR; decontaminate or disinfect surfaces and articles that have contacted infectious materials, and prepare biohazard waste for temporary storage and subsequent disposal.
- Site Safety and Health Officer—Administer first aid or CPR; decontaminate or disinfect surfaces and articles that have contacted infectious materials, and prepare biohazard waste for temporary storage and subsequent disposal.
- Subcontractor Supervisors—Administer first aid or CPR; decontaminate or disinfect surfaces and articles that have contacted infectious materials, and prepare biohazard waste for temporary storage and subsequent disposal.

Contract No. FA8903-09-D-8580, Task Order 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-5

- Laborer—Administer first aid or CPR; decontaminate or disinfect surfaces and articles that have contacted infectious materials, and prepare biohazard waste for temporary storage and subsequent disposal.

These employees have potential for exposure to blood-borne pathogens when administering first aid or CPR and when performing post-accident clean-up operations due to the following:

- Contact or absorption of blood or blood-contaminated objects through open or broken skin (i.e., cuts, scratches, and rashes).
- Blood splashes to their eyes, nose, or mouth, or other mucous membranes.
- Punctures through the skin with a contaminated sharp object (i.e., scissors).

Workers can reduce their risk of contacting blood-borne pathogens by implementing the recommended work practices (outlined in this plan) before, during, and after responding to emergency medical incidents primarily involving personal injuries.

12.3 Schedule of Implementation

The procedures in this Blood-borne Pathogen Exposure Control Plan are to be implemented immediately.

Implementation includes:

- Verifying personnel who are available to voluntarily provide first aid care and CPR hold a valid training certificate from a reputable training provider (American Red Cross or American Heart Association).

  The Construction Manager or SSHO is responsible for verifying that an appropriate number of personnel have been trained in and hold valid certification to perform first aid and CPR.

- Verifying that personnel voluntarily providing first aid care, CPR, post-accident clean-up operations, and biohazard waste handling have received the specialized training meeting the requirements of 29 CFR 1910.1030; *Safety and Health Requirements Manual*, Section A.03.06 (USACE, 2008); and Shaw Procedure No. HS512, “Handling of Blood or other Infectious Material”. This training is required for applicable personnel prior to the commencement of work and at least annually thereafter. This training shall cover the following elements:

Contract No. FA8903-09-D-8580, Task Order 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-5

- Copy of 29 CFR 1910.1030 and this procedure including an explanation of the contents.
- General explanation of the epidemiology and symptoms of blood-borne diseases.
- Explanation of the modes of transmission of blood-borne pathogens.
- Explanation of the appropriate methods for recognizing tasks and other activities that may involve exposure to blood and other potentially infectious materials.
- Explanation of the use and limitations of practices that will prevent or reduce exposure including appropriate engineering controls, work practices, and PPE.
- Information of the types, proper use, location, removal, handling, decontamination, and/or disposal of PPE.
- Explanation of the basis for selection of PPE.
- Information on the hepatitis B vaccine, including information on its efficacy, safety, and the benefits of being vaccinated.
- Information on the appropriate actions to take and persons to contact in an emergency
- Explanation of the procedure to follow if an exposure incident occurs including the method of reporting the incident and the medical follow-up that will be made available
- Information on the medical counseling that is provided for exposed individuals
- Explanation of required signs and labels

The Construction Manager or SSHO is responsible for verifying that this blood-borne pathogen training has occurred.

- Verifying that engineering controls are readily available at the project for use in an emergency. Engineering controls for this project include the following:
  - Red-bags for temporary storage of contaminated PPE and cleaning materials.
  - Appropriately labeled, 30-gallon hard-plastic container for the temporary storage of red-bagged waste.
  - Whisk-broom and dust pan for cleaning up contaminated broken glass.
  - Gallon container of Clorox® household bleach.

- Large utility sponge.
- Rolls of paper towels.
- Container of liquid disinfectant hand soap.
- "Biohazard" warning labels.
- Individually packaged disinfectant towelettes.
- CPR barriers.

The Construction Manager or SSHO is responsible for verifying that this inventory of engineering controls is readily available at the project site for emergency use.

Personal protective equipment is necessary to prevent employee exposures to infectious materials. The necessary PPE, which shall be maintained separately for use in an emergency include the following:

- P-100 Particulate filtering face-piece respirator (3-M 8293 or equivalent).
- Face-shields with ratcheting head-suspension.
- Safety glasses with clear lens.
- Disposable nitrile examination gloves.
- PVC Monkey Grip work gloves.
- Poly-coated or Saran-coated disposable Tyvek® coveralls with attached hood.
- Vinyl or latex disposable boot covers.
- Fluid-resistant surgical hoods.

The Construction Manager or SSHO is responsible for verifying that the above inventory of PPE is readily available at the project site for emergency use.

12.4 Work Practice Controls

Work practice controls reduce the likelihood of exposure by altering the manner in which a task is performed. The work practice controls outlined in this section are applicable to the administration of first aid and the subsequent clean-up operations.

Work practice controls shall be instituted whenever there is potential for employee contact with blood and bodily fluid. Situational examples where these controls are to be implemented include, but are not limited to:

- The voluntary administration of first aid care, such as application of bandages to minor or major cuts and abrasions of another person. This care may allow for contact with sores, wounds, broken skin, blood, or other bodily fluids.
- The voluntary administration of first aid care, such as providing CPR.
- Clean-up activities involving handling soiled articles (e.g., gauze, bandages, compresses, etc.) and the decontamination or disinfecting of surfaces and articles that have contacted potentially infectious materials, such as blood or other bodily fluids.
- Prepare biohazard waste for temporary storage and subsequent disposal.

Based upon professional judgment, an employee may choose to temporarily forego the use of PPE if the employee determines that the use of the PPE will further jeopardize his well-being or that of the injured worker. This limited application must be carefully evaluated and considered by the employee. If this situation does occur, Shaw will investigate and document the circumstances in an effort to provide alternative means to avoid further occurrence.

The following are specific work practice controls that shall be implemented in the above noted situations or whenever an employee determines that the implementation of these work practices is prudent or necessary:

- The appropriate PPE shall be donned prior to engaging in any activities that have the potential for employee contact with potentially infectious materials, such as blood or other bodily fluids.
- Hands and face will be washed as soon as possible after engaging in any activities that have the potential for employee contact with potentially infectious materials, such as blood or other bodily fluids. If wash facilities are not readily available, individually packaged disinfectant towelettes may be used in the interim.
- Eating, drinking, or smoking is not allowed in any work area where a potential exists for occupational exposure to blood-borne pathogens.
- Open wounds or cuts shall be promptly bandaged.
- Work surfaces and areas shall be cleaned and disinfected immediately after being contacted by potentially infectious materials. A 10 percent bleach solution (one part bleach added to nine parts water) shall be applied and allowed to have a

Contract No. FA8903-09-D-8580, Task Order 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-5

contact time of 15 minutes. Non-disposable articles, equipment, or materials contaminated with potentially infectious materials shall be similarly cleaned/disinfected prior to reuse.

- All bins, pails, cans, and similar receptacles intended for reuse, which have become contaminated with blood or other potentially infectious materials shall be cleaned and disinfected immediately after use.
- Broken glassware, which may be contaminated, shall not be picked up directly by hand. Broken glass shall be picked-up using mechanical means, such as by using a whiskbroom and dustpan.
- All PPE shall be immediately removed upon leaving the potentially contaminated work area, or as soon as possible if visibly contaminated. The contaminated PPE shall be placed in a labeled "red-bag" and then placed in the 30-gallon container for temporary storage and subsequent disposal.
- Any clothing that has contacted blood or other potentially infectious fluids shall be removed as soon as possible.
- Any clothing that has contacted blood or infectious fluids shall be placed in a labeled "red-bag" and then placed in the 30-gallon container for temporary storage and subsequent disposal.

12.4.1 Universal Precautions

Universal precautions is a method of infection control, which operates on the assumption that all human blood and bodily fluids are to be treated as if they are known to be infectious for HIV, HBV, or other blood-borne pathogens. Universal precautions shall be observed to prevent contact with blood or other potentially infectious materials. Universal precautions consist of the following practices:

- All workers shall routinely use appropriate barrier precautions to prevent skin and mucous-membrane exposure when contact with blood or other bodily fluids is anticipated. Gloves should be worn for touching blood and bodily fluids, mucous membranes, or non-intact skin and for handling items or surfaces contaminated with blood or body fluids. Masks and protective eyewear or face shields shall be worn during procedures that are likely to generate droplets of blood or other body fluids to prevent exposure of mucous membranes of the mouth, nose, and eyes. Protective suits shall be worn during procedures that are likely to generate splashes of blood or other bodily fluids.

Contract No. FA8903-09-D-8580, Task Order 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-5

- Hands and other skin surfaces shall be washed immediately and thoroughly if contaminated with blood or other bodily fluids. Hands shall be washed immediately after gloves are removed, using a disinfectant soap.
- Cardiopulmonary resuscitation barriers or other ventilation devices should be available for use in areas in which the need for resuscitation is foreseeable.
- Workers who have exudative lesions or weeping dermatitis shall be excluded from handling potentially infectious materials until the condition resolves.
- Pregnant workers should be especially familiar with and strictly adhere to precautions to minimize the risk of transmission.

12.4.2 Personal Protective Equipment

The proper use of PPE is an effective work practice control. The following requirements for PPE are mandatory whenever there is potential for employee contact with blood and bodily fluid:

- Inspect PPE prior to use to verify it is in good working order and without defects.
- Blood or other potentially infectious materials.
- Disposable (single use) gloves, such as surgical or examination gloves shall be replaced when visibly soiled, torn, punctured, or when their ability to function as a barrier is compromised. Gloves should be changed as soon as possible after contact with blood or bodily fluids. After use, remove gloves from top to bottom inside out, not allowing unprotected skin to contact the exterior of the gloves. Hands and other skin surfaces shall be washed with disinfectant soap immediately after care has been rendered or clean up has been completed. Gloves reduce the incidence of blood contamination of hands, but they cannot prevent penetrating injuries caused by sharp objects. Do not reuse gloves once removed. A CPR barrier shall be used when administering CPR.
- Protection for the eyes, face, hands, body, feet, and against inhalation hazards shall be provided as appropriate for each job.
- Gloves shall be worn when employees have the potential for direct skin contact with or when handling items or surfaces soiled with blood, other potentially infectious materials, mucous membranes, and non-intact skin.
- Polyvinyl chloride work gloves may be disinfected for immediate reuse if the integrity of the glove is not compromised; however, gloves must be discarded if they are cracked, peeling, discolored, torn, punctured, or exhibit other signs of

Contract No. FA8903-09-D-8580, Task Order 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-5

deterioration. All gloves shall be discarded at the conclusion of the activity or at the end of the shift – whichever comes first.

- Masks and eye protection or chin-length face shields shall be worn whenever splashes, spray, splatter, droplets, or aerosols of blood or other potentially infectious materials may be generated and there is a potential for eye, nose, or mouth contamination.
- Fluid-resistant clothing (e.g., coated Tyvek® suits) shall be worn if there is a potential for splashing or spraying of blood or potentially infectious materials. Coated Tyvek® coveralls shall also be worn during clean-up activities involving decontamination or disinfecting of surfaces and articles that have contacted potentially infectious materials, and when preparing biohazard waste for temporary storage and subsequent disposal.
- Fluid-resistant clothing (e.g., coated Tyvek® suits) shall be worn if there is a potential for clothing becoming soaked with blood or other potentially infectious materials.
- Surgical caps or hoods shall be worn if there is a potential for splashing or splattering of blood or potentially infectious materials on the head.
- Fluid-proof coverings shall be worn if there is a potential for shoes or boots to contact blood or other potentially infectious materials.
- Disposable nitrile or vinyl gloves shall be worn for touching blood and bodily fluids requiring universal precautions, mucous membranes, or non-intact skin and for handling items or surfaces soiled with blood or bodily fluids to which universal precautions apply.

Contract No. FA8903-09-D-8580, Task Order 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-5

12.4.3 Waste Handling

All wastes generated because of administering emergency first aid care and the subsequent clean-up activities shall be placed in red-bags, labeled as a biohazard, and kept separately from other trash. Wastes used in medical emergency treatment (i.e., gloves, towels, and gauze) shall also be bagged and stored in an identical manner. Red-bagged, biohazard waste shall be placed in the 30-gallon collection container, labeled, and secured for temporary storage and disposal. Additional containers shall be obtained as needed and containers shall not be overfilled.

12.5 Biohazard Waste Disposal

A Shaw Transportation and Disposal Coordinator shall be contacted to arrange for proper disposal of biohazard wastes. The waste shall remain secured on site in labeled container(s)

until disposal arrangements have been made at an approved disposal facility. Disposal of the infectious waste container(s) shall be in accordance with applicable local, state, and federal regulations.

12.6 Medical Requirements

Employees receive medical evaluations in accordance with Shaw Procedure No. HS100, "Medical Policies and Procedures". The medical requirements of this exposure control plan include provisions for vaccinations to all exposed employees as well as for post-exposure procedures and evaluations. All employees with potential for occupational exposure to blood-borne pathogens shall receive the hepatitis B vaccination and tetanus vaccination prior to workplace exposure, unless they read and sign the Hepatitis B and Tetanus Vaccination Declination form (Appendix D).

Contract No. FA8903-09-D-8580, Task Order 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-5

12.6.1 Hepatitis B Vaccination

All potentially exposed employees will have made available to them, at no cost, a hepatitis B vaccination. Recombivax or Accelerated Recombivax vaccines shall be utilized. If the employee has previously received the hepatitis B vaccination and/or antibody testing reveals that the employee is immune, a new vaccination is not required. Employees may be subjected to occupational exposure immediately after receiving the first shot in the hepatitis B vaccination series. Antibody testing shall be performed 30-days after completing the hepatitis B vaccination series. Employees unable to develop immunity shall be precluded from further occupational exposure. If a physician recommends a booster dose(s), the doses shall be provided according to standard recommendations for medical practice. The employee will also receive training as to the vaccine's efficacy, safety, benefits, and consequences prior to administration. The vaccination series may also be initiated within 24-hours of an incident with exposure potential.

12.6.2 Tetanus Vaccination

All employees subject to this policy shall maintain current status documentation of their tetanus vaccination (current status for tetanus vaccination is within 5 years). All potentially exposed employees shall be offered a tetanus vaccination at no cost.

12.6.3 Post-Exposure Procedures and Evaluation

All exposure incidents shall be reported as required by Shaw Procedure No. HS020, "Accident Prevention Program: Reporting, Investigation and Review." The occupational medicine physician shall be advised in addition to standard notification procedures.

Following a report of an exposure incident, each involved employee shall be offered a confidential medical evaluation and follow-up, which includes at least the following elements:

- Documentation of the route(s) of exposure.
- Hepatitis B virus and HIV antibody status of the source patient(s) (if known), and how the exposure occurred.
- The medical confidentiality rights of the source patient shall be preserved at all times.
- If the source patient can be determined and permission is obtained, collection of and testing of the source patient's blood to determine the presence of HIV or HBV infection shall be conducted under the direction of the attending physician.
- Collection of blood from the exposed employee as soon as possible after the exposure incident for the determination of HIV and/or HBV status. Actual core antibody and surface antigen testing of the blood or serum sample may be done at that time or later if the employee so requests. If the test is deferred, arrangements shall be made through the attending physician to properly archive the specimen.
- Follow-up of the exposed employee including antibody and antigen testing, counseling, illness reporting, and safe and effective post-exposure prophylaxis, according to standard recommendations for medical practice as defined by the occupational medicine physician.

Where applicable laws require employee consent, documented consent shall be obtained prior to testing. If an employee refuses the blood test, documentation of the refusal will be made. Documentation of the test results shall be made available to the exposed employee(s). All test results shall be kept confidential.

12.6.4 Physician Information

The following information shall be provided to the evaluating physician:

- Copy of 29 CFR 1910.1030 and its appendices.
- Description of the affected employee's duties as they relate to the employee's occupational exposure.

12.6.5 Physician Opinion

For each potentially exposed employee evaluation, the employee shall receive a copy of the evaluating physician's written opinion within 15 working days of the completion of the evaluation. The written opinion shall be limited to the following information:

- The physician's recommended limitations upon the employee's ability to receive the hepatitis B vaccination.
- A statement that the employee has been informed of the results of the medical evaluation and that the employee has been told about any medical conditions resulting from exposure to blood or other potentially infectious materials, which require further evaluation or treatment.
- Specific findings or diagnoses, which are related to the employee's ability to receive the HBV vaccination. Any other findings and diagnoses shall remain confidential.

12.6.6 Hazard Communication

There are regulatory requirements for labels, signs, and training. The provisions and exceptions for these are contained in the subsections below.

12.6.7 Warning Labels

Containers used for disposal of blood-contaminated supplies and waste will be labeled in accordance with the word "biohazard." The following symbol shall be an integral part of the label:

12.6.8 Warning Signs

There will be no designated areas for medical treatment on project sites, because first aid is provided on an emergency basis only; therefore, warning signs are not applicable. In cases of potential exposure, observers and nonessential personnel should be verbally warned to keep a safe distance from injured personnel.

12.6.9 Employee Training Program

All employees who are first aid/CPR trained and may provide assistance shall be trained in the requirements for voluntary providers as described in Shaw Procedure No. HS512,

"Handling of Blood or other Infectious Material", this SSHP, and the general provisions of this procedure.

12.7 Recordkeeping

There are federal record-keeping requirements for training, medical, and incident reporting documentation. The provisions for keeping these records are contained in the subsections below.

12.7.1 Training Records

All employees covered under this exposure plan shall be trained as required. A record of the training shall be appropriately generated. The training record will contain the date of the training session(s), the contents or a summary of the training session(s), the names of persons conducting the training, and the names of all persons attending the training sessions. The training records will be maintained by the Shaw Training Department for at least 5 years from the training date.

12.7.2 Medical Records

Medical records necessary for Shaw employees will include documentation of HBV vaccination status, medical follow-up, post-exposure testing, and a medical professional's written evaluation. The employee medical records will be forwarded to and maintained by CORE Health Networks, 12091 Bricksome Avenue, Suite B, Baton Rouge, Louisiana 70816 for inclusion in the employee's medical file. Confidentiality of all medical records shall be maintained.

Shaw maintains employee medical records for the duration of the employee's employment plus 30 years thereafter. If, for whatever reason, Shaw no longer does business and no successor exists, Shaw will notify the director of NIOSH in writing 3 months prior to the disposal of records. If so directed, the records shall be transferred to the director of NIOSH.

12.7.3 Incident Recording

An incident that occurs because of rendering emergency medical care will be recorded on the OSHA 300 log as OSHA defines work-related injuries and illnesses. All injuries involving the release of blood or bodily fluids must be immediately reported to the HSM for proper reporting and follow-up.

12.8 Plan Review and Update

This Blood-borne Pathogen Exposure Control Plan shall be reviewed and updated on an annual basis.

Contract No. FA8903-09-D-8580, Task Order 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-5

Contract No. FA8903-09-D-8580, Task Order 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-5

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13.0 LOGS, REPORTS, AND RECORD KEEPING

Proper record keeping and data management are essential in the implementation of this SSHP. The forms associated with the record keeping and data management requirements shall be completed in an accurate, timely fashion and appropriately filed. The proper completion of forms is the responsibility of the Construction Manager or SSHO. Completed forms will be kept and maintained by Shaw for a 5-year period. Subcontractors will also be responsible for keeping a copy of the forms pertaining to their activities.

Copies of all pertinent site safety and health forms and logs are provided in Appendix D.

13.1 Employee Training and Medical Certification Records

Before personnel are allowed to work in regulated areas on site, the Construction Manager or SSHO shall verify that the following training documentation is current and available in the project Health and Safety file:

- Respiratory protection training certificate (all personnel required to wear respiratory protection).
- Portable fire extinguisher training (two workers per crew).
- First aid/CPR training (at least two workers on site).
- Site Safety Orientation documentation indicating that employees have received the following training:
  - Review of SSHP (Site Safety and Health Plan Acknowledgment Form [Appendix A]).
  - Site-specific Hazard Communication training (Hazard Communication and Right-To-Know Standards Employee Training Record [Appendix D]).
  - Other training as applicable, such as base procedures and rules.

The SSHO shall also verify that the following medical surveillance documentation is current and available in the project Health and Safety file:

- Annual audiogram evidence for workers who may be exposed to noise greater than 85 decibels.
- Positive physician's medical determination regarding the employee's ability to use respiratory protection for personnel required to wear respiratory protection.

Contract No. FA8903-09-D-8580, Task Order 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-5

All personnel (including visitors) using respiratory protection, shall have successfully passed a respirator fit test in accordance with Shaw Procedure No. HS601, "Respiratory Protection Program," within the last 12 months. A document providing proof of a fit test for the specific respirator used shall be available in the project Health and Safety file.

13.2 Daily Safety Log

The SSHO will maintain and complete a daily log for each day's work. The daily log will document each day's safety and health activities in sufficient detail for future reference as needed.

The following items will be developed as applicable and maintained on site by the SSHO as part of the daily safety log:

- Daily safety meeting logs.
- Noise survey data.
- Personnel training and medical certificates.
- Hot Work Permits.
- Air monitoring/sampling data forms.
- Project safety inspections (daily and monthly).
- Subcontractor safety inspections.
- Hazard Communication Program audits.
- Warnings given related to safety infractions.
- AHAs.
- JSAs.
- Accident investigation reports.
- First aid log.
- Confined space entry permits.

13.3 Safety Inspections/Audits

Shaw's accident prevention program is centered on the following key procedures:

- Investigating, reporting, and reviewing of all near misses, incidents, and accidents.
- Managing reviews of all incident/accident reports, corrective action, and project safety concerns.

Contract No. FA8903-09-D-8580, Task Order 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-5

- Reviewing of project, operations, and construction activities by safety and health professionals and supervisory personnel.

Safety reviews and inspections are conducted by all tiers of the management structure and are documented. A list of all corrective action items shall be maintained showing the corrective action, responsible person, and the date the action is to be completed. Follow-up inspections are conducted by safety and health personnel to verify that corrective actions or measures have been implemented.

The Construction Manager will inspect the site daily and identify areas of safety concerns or ideas for safety improvement. Crew leaders will also inspect site conditions and activities daily to identify changing conditions or potential hazards. Daily safety inspections shall be documented on the Daily Safety Inspection Report (Appendix D). Identified safety and occupational health deficiencies and suggested corrective measures will be brought to the attention of the Project Manager and HSM.

Safety and occupational health deficiencies shall be tracked on the Safety and Occupational Health Deficiency Tracking Log (Appendix D), which provides the following information:

- Date deficiency identified.
- Description of deficiency.
- Name of person responsible for correcting deficiency.
- Projected resolution date.
- Date actually resolved.

The Construction Manager will immediately notify the HSM of any OSHA or other regulatory agency inspections. (The inspection will not be delayed due to the Government Designated Authority being unavailable.) The Construction Manager shall provide the HSM a copy of any citations or reports issued by the inspector and any corrective action responses to the citation(s) or report(s).

Contract No. FA8903-09-D-8580, Task Order 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-5

13.4 Accident Investigation and Reporting

Project personnel are required to report all near misses, injuries, illnesses, and accidents to their immediate supervisor. The Construction Manager or SSHO shall immediately arrange appropriate medical care as required. Once immediate medical care for the injured personnel or other critical emergency procedures has been accomplished, the Construction Manager shall follow the Incident Notification, Reporting, and Management Procedure (Appendix H). The appropriate form(s) to be completed are in Appendix D and include the following:

- Supervisor's Employee Injury/Illness Report Form.
- Authorization for Release of Protected Medical Information.
- Authorization for Treatment for Occupational Injury/Illness.
- Vehicle Accident Report.
- Equipment, Property Damage and General Liability Loss Report.
- Underground Utility Hits Tip Sheet for Incident Investigations.
- Incident Investigation Report.
- Injured Employee Statement.
- Employee Witness Statement.
- Accident Review Board.

All incidents shall be immediately reported to the Project Manager and HSM.

The Construction Manager shall immediately investigate all near misses, injuries, illnesses, and accidents. Corrective actions will be determined and implemented to prevent the recurrence of the accident, and responsibility for implementation of corrective actions will be assigned. The final report and required forms will be submitted within five days of the incident to the HSM.

In the event that an accident results in an employee being sent to a doctor, the Return-to-Work Examination Form (Appendix D) shall be completed by the attending physician, on the date of treatment stating that either:

- Employee may return to full duty work.
- Employee may return to limited duty (with type of limitations).
- Employee is unable to return to work.

Contract No. FA8903-09-D-8580, Task Order 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-5

A copy of this release shall accompany the accident report. In addition to the requirement for maintaining a log of OSHA recordable injuries/illnesses, a separate log will be maintained for all first aid treatments not otherwise recordable/reportable.

Contract No. FA8903-09-D-8580, Task Order 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-5

Contract No. FA8903-09-D-8580, Task Order 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-5

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Contract No. FA8903-09-D-8580, Task Order 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-5

Contract No. FA8903-09-D-8580, Task Order 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-5

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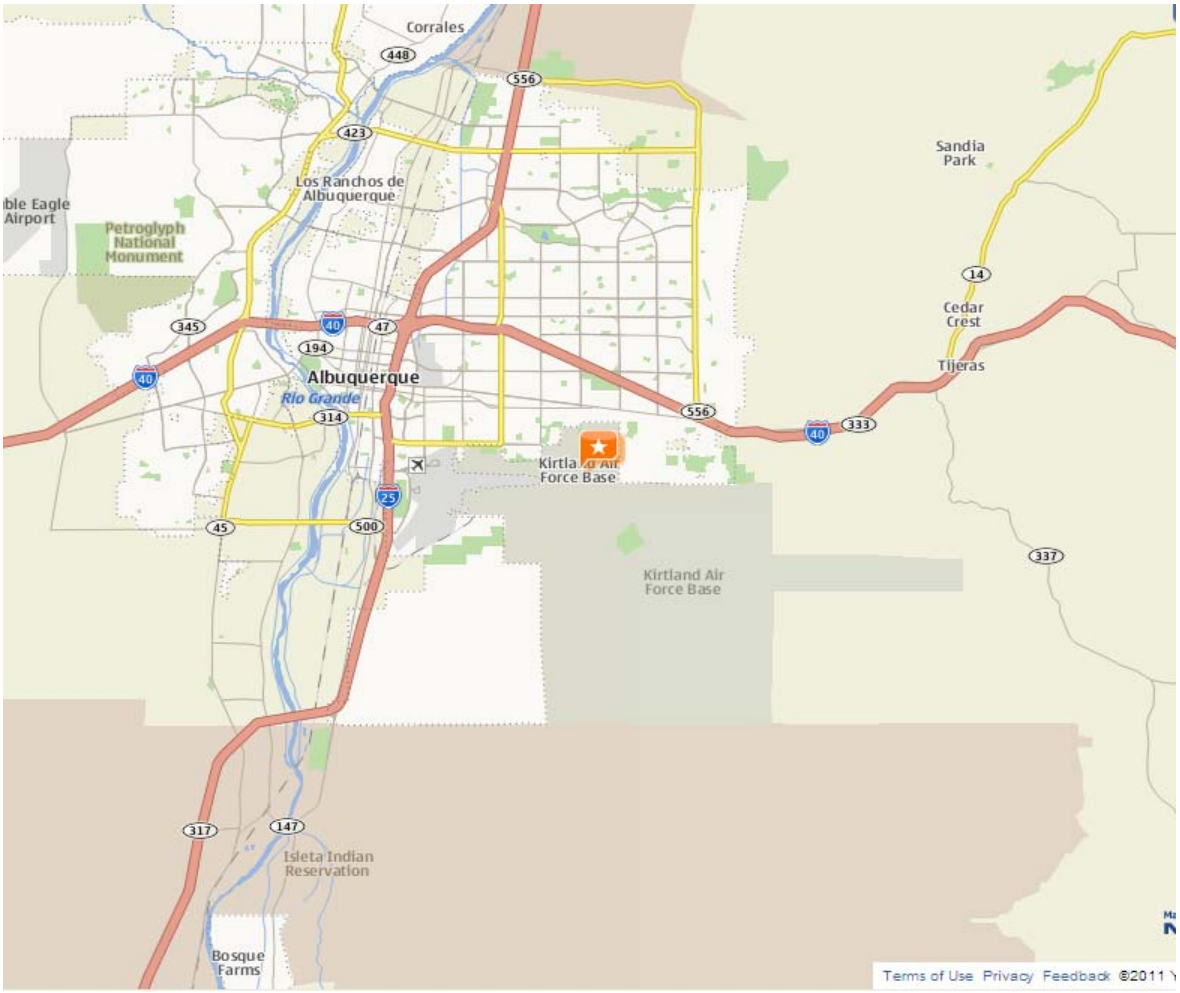
Figures

Figure 1
Site Location Map



Contract No. FA8903-09-D-8580, Task Order 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-5

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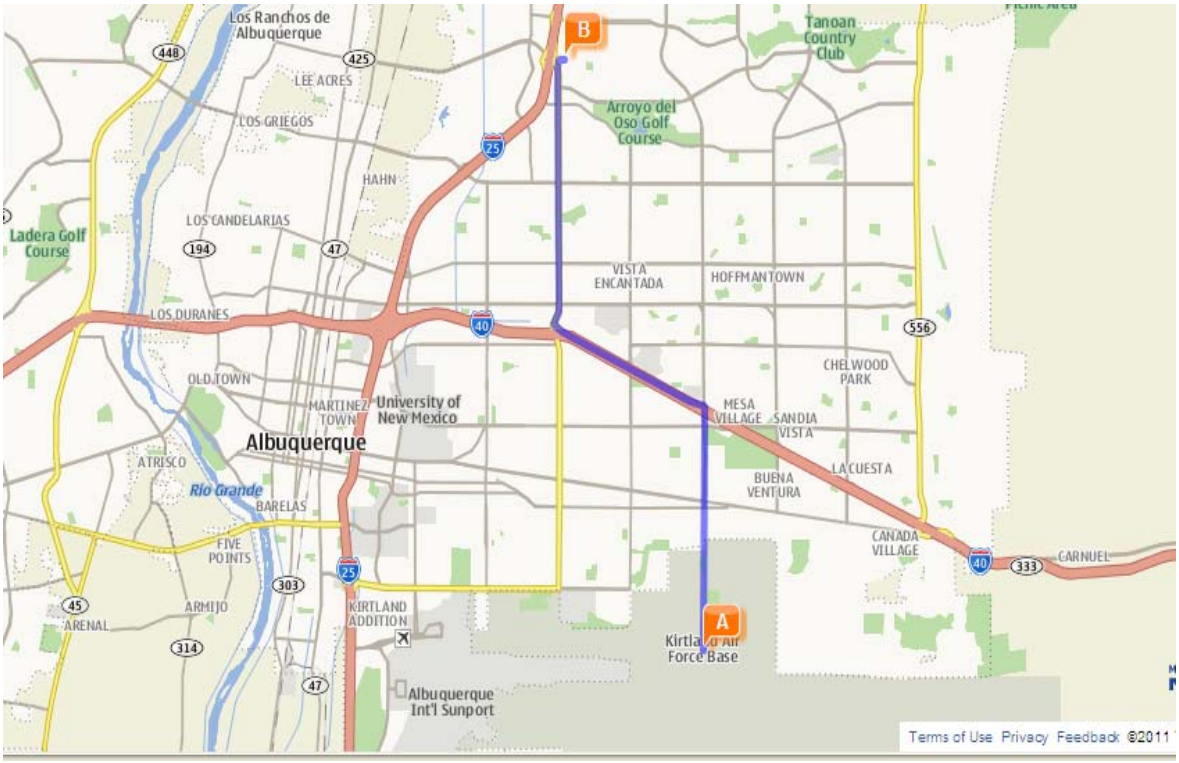
Figure 2
Hospital Route Map



Hospital Route Map from Kirtland AFB (A) to
University of NM Hospital Trauma Center (B)

2211 Lomas Blvd. NE
Albuquerque, New Mexico 87131
(505) 277-0111

From Kirtland AFB, go:

1. 3.0 mi Head toward M Ave SE on Wyoming Blvd SE.
2. 2.1 mi Turn left and take ramp onto I-40 W.
3. 0.3 mi Take exit #161/San Mateo Blvd.
4. 3.2 mi Turn right onto San Mateo Blvd NE.
5. 0.1 mi Turn right onto Pan American East Fwy NE.
6. 462 ft Turn right onto Harper Dr NE.
7. Your destination at 5700 Harper Dr NE is on the right.

The trip takes 8.8 mi/14.1 km and 19 mins. (Note: Map will be revised when site trailers are established.)

Contract No. FA8903-09-D-8580, Task Order 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-5

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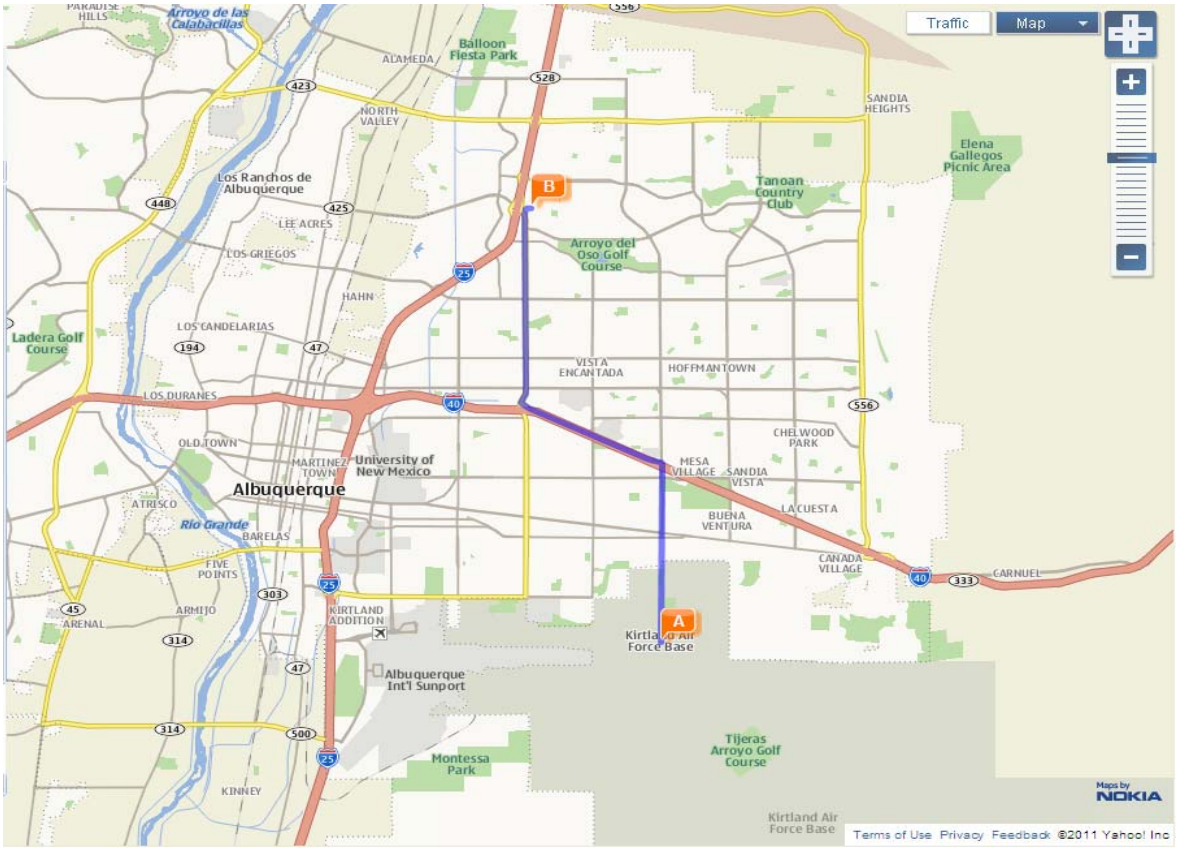
Figure 3
CORE Health Networks Medical Facility Route Map



CORE Health Networks Medical Facility Route Map from Kirtland AFB (A) to Center for Occupational Medicine (B)

5700 Harper Dr. NE, Suite 110
Albuquerque, New Mexico 87102
(505) 244-3804

From Kirtland AFB, go:

1. 3.0 mi Head toward M Ave SE on Wyoming Blvd SE.
2. 2.1 mi Turn left and take ramp onto I-40 W.
3. 0.3 mi Take exit #161/San Mateo Blvd.
4. 3.2 mi Turn right onto San Mateo Blvd NE.
5. 0.1 mi Turn right onto Pan American East Fwy NE.
6. 462 ft Turn right onto Harper Dr NE.
7. Your destination at 5700 Harper Dr NE is on the right.
8. .

(Note: Map will be revised went site trailers are established.)

Contract No. FA8903-09-D-8580, Task Order 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-5

Contract No. FA8903-09-D-8580, Task Order 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-5

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Tables

Table 1
Summary Table of Sites, Technical Approach, Performance Objectives, and Site Closure Dates

Compliance Clean-up Sites	Site Name	Perf. Obj.	Brief Description of the Technical Approach	Projected Closure
CS-C571	Zia Park	ISM and Draft RFI	Shaw will perform ISM to ensure impacted soil is excavated and disposed. Excavated soil will be replaced with clean backfill (up to 40 CY).	Within 15 months from date of award
OT-C572	Bldg 5700-1 (also known as Building 57001)	ISM and Draft RFI	Shaw will use the Accelerated Cleanup Process allowed by the Kirtland AFB RCRA permit and the Midwest PBR Task Order to complete the ISM.	Within 15 months from date of award
OT-C573	Asphalt Dump Area	ISM and Draft RFI	Shaw will implement the Accelerated Cleanup Process as allowed in the Kirtland AFB RCRA permit (NMED, 2010).	180 days of the commencement of field activities
SS-C574	Bldg 20676 Spill	SC	Shaw will use the Accelerated Cleanup Process allowed by the Kirtland AFB permit to achieve site closure.	Within 24 months from date of award
SS-C575	Site SC Transient Alert Pad	ISM and Draft RFI	Shaw will use the accelerated cleanup process allowed for in the Kirtland AFB permit and in accordance with the Midwest PBR SOO to complete the ISM.	Within 15 months from date of award

AFB denotes Air Force Base.

CY denotes cubic yards.

ISM denotes interim stabilization measures.

NMED denotes New Mexico Environment Department.

PBR denotes performance based remediation.

SOO denotes Statement of Objective.

Contract No. FA8903-09-D-8580, Task Order 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-5

Contract No. FA8903-09-D-8580, Task Order 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-5

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Table 2
Minimum Clearance from Energized Overhead Electric Lines

Nominal System Voltage	Minimum Required Clearance
0 to 50 kilovolts	3 meters (10 feet)
51 to 200 kilovolts	4.5 meters (15 feet)
201 to 300 kilovolts	6 meters (20 feet)
301 to 500 kilovolts	7.5 meters (25 feet)
501 to 750 kilovolts	10.5 meters (35 feet)
751 to 1,000 kilovolts	13.5 meters (45 feet)

Contract No. FA8903-09-D-8580, Task Order 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-5

Contract No. FA8903-09-D-8580, Task Order 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-5

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Table 3
Task Protection Levels

Task	Initial PPE Level	Upgrade PPE Level	Skin Protection	Respiratory Protection	Other PPE
Mobilization and general site activities	Level D	Level D – Modified	Generally none: some activities may require Tyvek® coveralls to prevent insect bites / contact with poisonous plants	Initial – None	Hearing protection >85 dBA, leather work-gloves.
Collect surface soil samples	Level D	Level D – Modified	Sample gloves; disposable boot covers if walking in areas with potential contamination; some activities may require Tyvek® coveralls to prevent insect bites / contact with poisonous plants	Initial – None	Hearing protection >85 dBA, leather work-gloves.
Collect subsurface soil samples	Level D	Level D – Modified	Sample gloves; disposable boot covers if walking in areas with potential contamination; some activities may require Tyvek® coveralls to prevent insect bites / contact with poisonous plants	Initial – None	Hearing protection >85 dBA, leather work-gloves.
Collect surface water and ground water samples	Level D	Level D – Modified	Sample gloves; disposable boot covers if walking in areas with potential contamination; some activities may require Tyvek® coveralls to prevent insect bites / contact with poisonous plants	Initial – None	Hearing protection >85 dBA, leather work-gloves.
Well drilling and well installation	Level D – Modified	Level B	See Section 5.1.4 and Section 5.1.2	Initial – None Upgrade - Level B: if VOCs exceeds action level	Hearing protection >85 dBA, leather work-gloves. 100% fall protection when working at height greater than 6 feet
Surface soil removal	Level D – Modified	Level B Level C	See Section 5.1.4, Section 5.1.2, and Section 5.1.3	Initial – None Upgrade - Level B: if VOCs exceeds action level Upgrade – Level C if dusts exceed action level	Hearing protection >85 dBA, leather work-gloves.

Table 3 (continued)
Task Protection Levels

Task	Initial PPE Level	Upgrade PPE Level	Skin Protection	Respiratory Protection	Other PPE
Backfill excavations	Level D	NA	See Section 5.1.5	Initial - None	Hearing protection >85 dBA, leather work-gloves.
Surveying	Level D	NA	See Section 5.1.5	Initial - None	Hearing protection >85 dBA, leather work-gloves.
Site restoration	Level D	NA	See Section 5.1.5	Initial - None	Hearing protection >85 dBA, leather work-gloves.
Soil borrow material import (loading, transportation, and dumping	Level D	NA	See Section 5.1.5	Initial - None	Hearing protection >85 dBA, leather work-gloves.
Equipment decontamination	Level D – Modified	Level C	See Section 5.1.4 and Section 5.1.3	Initial - None Upgrade - Level C: Full-face air-purifying respirator.	Hearing protection >85 dBA, face-shield, shin/metatarsal protection.

dBA denotes decibels, A-scale.

NA denotes not applicable.

PPE denotes personal protective equipment.

VOC denotes volatile organic compound.

Table 4
Direct Reading Air Monitoring Requirements

Monitoring Device / Contaminant	Monitoring Location / Personnel	Monitoring Frequency	Action Level	Action
Combustible Gas Indicator/Oxygen Meter (Lower Explosive Limit [LEL]/ oxygen [O_2])	In the work area and near the breathing zone of personnel. In the work area and breathing zone of personnel during well drilling activities. In the work area prior to hot work activities. In the confined space prior to entry. In the work area during fuel spill clean-up activities.	A minimum of twice per hour (LEL) at each well installation location when free-phase LNAPL is expected or observed until activity at that location has been completed. A minimum of once per sampling event (LEL) at each sampling location when free-phase LNAPL is expected or observed (groundwater and subsurface soil/sediment). At any time in any work location where personnel observe odors. Prior to issuing a hot work permit or confined space entry permit. Continuous during fuel spill clean-up activities. At the discretion of the SSHO.	<10% LEL 20 - 22% O_2	Continue work with caution.
			>10% LEL <20% O_2 or >22% O_2	Stop work, evacuate area, and contact HSM.
Carbon Monoxide (CO)	In the work area near the breathing zone of personnel.	A minimum of once per hour when internal combustion engines are being operated in poorly ventilated areas. At the discretion of the SSHO.	<15 ppm CO	Continue work with caution.
			>15 ppm CO	Stop work, evacuate area, and contact HSM.
Hydrogen Sulfide (H_2S)	In the work area near the breathing zone of personnel.	Continuous at each well installation location within 500 feet of a landfill until activity at that location has been completed. At any time in any work locations where personnel observe rotten egg odors. At the discretion of the SSHO.	<1 ppm H_2S	Continue work with caution.
			>1 ppm H_2S	Stop work, evacuate area, and contact HSM.

Contract No. FA8903-09-D-8580, Task Order 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-5

Table 4 (continued)
Direct Reading Air Monitoring Requirements

Monitoring Device / Contaminant	Monitoring Location / Personnel	Monitoring Frequency	Action Level	Action
Vinyl Chloride (VC) Colorimetric Detector Tube	In the work area near the breathing zone of personnel.	Collected at each well if PID Action Level is exceeded	<1 ppm VC	Continue Work With Caution
			>1 ppm VC	Stop work, evacuate area, and contact HSM.
Benzene Colorimetric Detector Tube	In the work area near the breathing zone of personnel.	Collected at each well if PID Action Level is exceeded	<0.25 ppm	Continue Work With Caution
			>0.25 ppm	Stop work, evacuate area, and contact HSM.
Photoionization Detector (volatile organic compounds)	In the breathing zone of personnel during well drilling, well installation, well abandonment, and soil excavation activities. In the breathing zone of personnel during groundwater and subsurface soil/sediment sampling. In the breathing zone of personnel during fuel spill clean-up activities.	A minimum of twice per hour at each well drilling/installation location or soil excavation area where VOC are known or suspected until activity at that location has been completed (continuous when free-phase LNAPL or DNAPL is expected or observed). Hourly at each well abandonment location A minimum of once per sampling event at each sampling location (groundwater and subsurface soil/sediment)/continuous. A minimum of twice per hour at each soil removal location until activity at that location has been completed). Continuous during fuel spill clean-up activities. At any time in any work location where personnel observe odors. At the discretion of the SSHO.	> 2 ppm but < 10 ppm above background, sustained for one minute in the breathing zone	Stop work: evaluate hazard, increase monitoring frequency, provide engineering controls, and upgrade PPE.
			> 10 ppm but < 50 ppm above background, sustained for five seconds in the breathing zone	Stop work, evacuate area, and contact HSM.
			> 50 ppm above background, sustained for one second in the breathing zone	Stop work, evacuate area, and contact HSM.

Table 4 (continued)
Direct Reading Air Monitoring Requirements

Monitoring Device / Contaminant	Monitoring Location / Personnel	Monitoring Frequency	Action Level	Action
HazMatCAD Plus with Chemical Agent detectors	In the breathing zone of personnel during Sampling and soil excavation activities at Zia Park Site. In the zone of subsurface soil/sediment sampling.	Continuous at each sample location or soil excavation area At each sampling location of subsurface soil/sediment continuous At the discretion of the SSHO.	Any alarm requires personnel to evacuate to an upwind position, secure the site and wait for further instruction. Hydrogen Cyanide- blood agent -5.0 ppm Phosgene – Choke agent- 0.3 ppm Hydride gases- 0.5 ppm Halogen gases- 10.0 ppm Nerve agent (G) – 0.01 to 0.3ppm Blister Agent – 0.04ppm	STOP WORK and evacuate the area upwind Contact SSHO and Base Lead and HSM

Contract No. FA8903-09-D-8580, Task Order 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-5

Table 4 (continued)
Direct Reading Air Monitoring Requirements

Monitoring Device / Contaminant	Monitoring Location / Personnel	Monitoring Frequency	Action Level	Action
Real-time Aerosol Monitor (dust)	In the work zone approximating worker breathing zone area during soil excavation, soil removal, soil loading, and other dust generating activities.	Continuous during soil excavation, soil removal, soil loading, and other dust generating activities. At the discretion of the SSHO.	> 1 mg/m^3 instantaneous	Continue work, apply more engineering controls.
			> 2.5 mg/m^3 time-weighted average	Evacuate area, apply engineering controls, upgrade level of PPE, and contact HSM.

CWM denotes Chemical Warfare Material.

DNAPL denotes dense nonaqueous phase liquid.

HSM denotes Health and Safety Manager. HSM may indicate more prescriptive Action Levels in the SSHP Addenda.

LNAPL denotes light nonaqueous phase liquid.

mg/m^3 denotes milligram(s) per cubic meter.

PPE denotes personal protective equipment.

ppm denotes part(s) per million.

SSHO denotes Site Safety and Health Officer.

Table 5
Emergency Telephone Numbers

Name/Organization	Telephone Numbers
Ambulance Emergency/EMS	911
Kirtland AFB Fire Department	Emergency: 846-9111 Non Emergency: 846-8069
Albuquerque Police Department	Emergency 911 Non Emergency (505) 242-2677
Bernalillo County Sheriff's Department	Emergency 911
Kirtland underground utility locator service (Chugash)	(505) 846-8222
Center for Occupational Medicine (Occupational Health Clinic)	(505) 244-3804
University of NM Hospital Trauma Center (Hospital)	(505) 277-0111
CORE HEALTH (Baton Rouge , LA)	877-347-7429
Agency for Toxic Substances and Disease Registry	(404) 639-0615 (24-hour)
Chemtrec	(888) 344-7233
Poison Control Center	(800) 562-8236
National Response Center	(800) 424-8802
Daniel Cevallos, Jr. AFCEE Contracting Officer (KO)	(210)395-8722
Stephanie Ramon AFCEE/EXW COR	(210)395-8628
Kathleen Romalia (Shaw Project Manager)	(720) 554-8207
Spencer Patterson (Shaw Program Manager)	(720) 377-8806
Dave Mummert, CIH (Shaw CIH)	(419) 425-6129 (office) (419) 348-1544 (cell)
James Vigerust (SSHO Lead)	(505) 262-8736(office) (505) 410-4995 (cell)
Dale Flores (Base Lead)	(505) 262-8948 (office) (505) 401-2416 (cell)
Shaw Notification Hotline	(866) 299-3445

AFCEE denotes Air Force Center for Engineering and the Environment.

CIH denotes Certified Industrial Hygienist.

COR denotes Contracting Officer's Representative.

EMS denotes Emergency Medical Service

Contract No. FA8903-09-D-8580, Task Order 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-5

Contract No. FA8903-09-D-8580, Task Order 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-5

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Contract No. FA8903-09-D-8580, Task Order 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-5

Appendix A
Site Safety and Health Plan Acknowledgement

Holloman AFB Project
Site-Specific Health & Safety Acknowledgment Form

I understand and agree to follow the Site-Specific Health & Safety Plan (SSHP) for the Holloman AFB Project. I understand that there may be additional safety and health requirements, which may be presented in task-specific Activity Hazard Analyses and Tailgate Safety Meetings. I agree to abide by the requirements of the SSHP and Activity Hazard Analyses for the work that I will perform.

Printed Name	Signature	Representing	Date

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Contract No. FA8903-09-D-8580, Task Order 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-5

Appendix B
Site Safety and Health Plan Amendments and Addenda

Site Specific Health & Safety Plan Amendment Documentation

Project Name: Holloman AFB **Project No. 144106**

Amendment No. __ Date: _____

Amendment Address: _____

Reason For Amendment: _____

Amendment: _____

Scope of Work: _____

Chemical Hazards Specific To The Scope of Work:
_____

Specific AHA Identified: _____

PPE Required: _____

Monitoring Requirements: _____

_____
Completed by:

_____
Approved by:

_____
Approved by:

_____
Approved by:

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Appendix C
Activity Hazard Analyses

APPENDIX C1 ACTIVITY HAZARD ANALYSIS FOR MOBILIZATION/SITE SETUP				
Task Breakdown	**Potential Hazards**	**Critical Safety Practices**	**Personal Protective Clothing and Equipment**	**Monitoring Devices**
Mobilization/ Site Setup	Slips, Trips, Falls	• Clear walkways work areas of equipment, tools, vegetation, excavated material and debris • Mark, identify, or barricade other obstructions		
	Spills	• Clean up spills before initiating maintenance • Review maintenance procedures for safety practices		
	Electrical Shock	• De-energize or shut off utility lines at their source before work begins • Use double insulated or properly grounded electric power-operated tools • Provide an equipment-grounding conductor program or employ ground-fault circuit interrupters • Use qualified electricians to hook up electrical circuits • Inspect all extension cords daily for structural integrity, ground continuity, and damaged insulation • Cover or elevate electric wire or flexible cord passing through work areas to protect from damage • Keep all plugs and receptacles out of water • Use approved water-proof, weather-proof type if exposure to moisture is likely • Inspect all electrical power circuits prior to commencing work • Follow Lockout/Tagout procedure HS315 – Control of Hazardous Energy Sources	Lockout/Tagout Devices	Voltage Meter or Tic Tracer

APPENDIX C1 ACTIVITY HAZARD ANALYSIS FOR MOBILIZATION/SITE SETUP				
Task Breakdown	**Potential Hazards**	**Critical Safety Practices**	**Personal Protective Clothing and Equipment**	**Monitoring Devices**
Mobilization/ Site Setup (continued)	Handling Heavy Objects	• Observe proper lifting techniques • Obey sensible lifting limits (60 lb. Maximum per person manual lifting) • Use mechanical lifting equipment (hand carts, trucks) to move large, awkward loads • Avoid carrying heavy objects above shoulder level • Warm up muscles before engaging in manual lifting		
	Sharp Objects	• Wear cut resistant work gloves when the possibility of lacerations or other injury may be caused by sharp edges or objects • Maintain all hand and power tools in a safe condition	Leather gloves	
	High Noise Levels	• Use hearing protection when exposed to excessive noise levels (greater than 85 dBA over an 8-hour work period) • Do not attempt verbal communication in high noise backgrounds	Ear plugs	
	Struck By/ Against Heavy Equipment	• Wear reflective warning vests when exposed to vehicular traffic • Isolate equipment swing areas • Make eye contact with operators before approaching equipment • Understand and review hand signals • Follow hand signals of ground workers for equipment manipulation when placing/loading equipment into bucket. • Step away from equipment when bucket adjustments are made • Do not attempt verbal communication in high noise backgrounds.	Warning vests, Hard hat, Safety glasses, and Steel toe work boots	

APPENDIX C1 ACTIVITY HAZARD ANALYSIS FOR MOBILIZATION/SITE SETUP				
Task Breakdown	**Potential Hazards**	**Critical Safety Practices**	**Personal Protective Clothing and Equipment**	**Monitoring Devices**
Mobilization/ Site Setup (continued)	Struck-by/Against (Vehicle-traffic)	• Wear reflective warning vests when exposed to vehicular traffic • Barricade or enclose the work areas • Restrict entry to the work areas to authorized personnel during work activities • Wear hard hats, safety glasses with side shields, and steel-toe safety boots at all times • Follow FDOT roadway and traffic design standards manual • Personnel will perform all work tasks and remain inside barriered work zones • Spotters to be utilized as necessary	Warning vests, Hard hat, Safety glasses, and steel toe work boots	
	Pinch Points	• Review equipment adjustment procedures, identify pinch points • Isolate/block pinch points to limit motion when inserting pins, fasteners, closing tackles	Leather gloves	
	Burns associated with loading/unloading equipment on trucks	• Identify heavy objects for loading that may have hot surfaces • Allow objects to cool or cover hot surfaces with non-combustible material to protect workers from burns		
	Ladders	• Inspect ladders before use for mud buildup on treads • Clean mud from boots before climbing on ladders • Follow the three point of contact rule		
	High/Low Ambient Temperature	• Monitor for Heat Stress in accordance with Health and Safety Procedures HS400, HS401 • Provide fluids to prevent worker dehydration		
EQUIPMENT REQUIRED		**INSPECTION REQUIREMENTS**	**TRAINING REQUIREMENTS**	
• Vehicles • Hand tools • Ladders • Forklift/Hand carts		• Daily equipment inspections as per manufacturers requirements • Inspection of all emergency equipment (i.e. first aid kits, fire extinguishers)	• Review AHA with all task personnel • Review Site Specific Safety and Occupational Health Program • Review operations/safety manuals for all equipment utilized	

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APPENDIX C2 ACTIVITY HAZARD ANALYSIS FOR GENERAL SITE ACTIVITIES				
Task Breakdown	**Potential Hazards**	**Critical Safety Practices**	**Personal Protective Clothing and Equipment**	**Monitoring Devices**
Travel to/at project site	Operation of motor vehicles and trucks	All company owned, leased, or rented vehicle operations shall comply with the requirements of Shaw Procedure HS800, *Motor Vehicle Operation: General Requirements*. All company owned, leased, or rented commercial vehicle operations shall comply with the requirements of Shaw Procedure HS810, *Commercial Motor Vehicle Operation And Maintenance*. Subcontractors operating motor vehicles at the site shall comply with all federal, state, and local traffic regulations. Subcontractors shall only use vehicles that are in good condition and safe to operate. Subcontractors shall inspect vehicles routinely used at the site on a weekly basis and submit the inspection documentation to the SSHO. All personnel shall drive defensively and wear seat belts while vehicles are in motion. Backing of vehicles shall be avoided when possible. Extra care shall be taken to back vehicles when unavoidable. When parking vehicles into head in parking spaces, vehicles shall be backed into the space whenever possible. Before backing a vehicle that has been parked, the driver shall physically walk to the back of the vehicle to observe the area before entering the vehicle. Spotters shall be used to back vehicles whenever possible.	Seatbelts	

APPENDIX C2 ACTIVITY HAZARD ANALYSIS FOR GENERAL SITE ACTIVITIES				
Task Breakdown	**Potential Hazards**	**Critical Safety Practices**	**Personal Protective Clothing and Equipment**	**Monitoring Devices**
Unload equipment	Unfamiliarity with: site, general site hazards, project safety rules, chain of command, emergency procedures. Heavy lifting/strains, sprains; Use of mechanical equipment;	All personnel shall attend the site orientation training. No individual employee is permitted to lift any object that weighs over 60 pounds. Proper lifting techniques shall be used. Multiple employees or the use of mechanical lifting devices are required for lifting objects over the 60-pound limit. Only qualified personnel shall be permitted to operate equipment. Forklifts and mechanical equipment shall be inspected daily. Deficiencies in equipment shall be noted on the inspection form. Equipment found to be unsafe shall not be used. All equipment shall be operated at safe speeds and in a safe manner. Equipment operators shall wear safety belts and hearing protection. Ground personnel shall not position themselves between equipment and stationary objects and only approach equipment after a signal from the operator. Personnel are prohibited from entering the swing radius of booms. Equipment load capacities shall not be exceeded. Personnel shall ensure all mechanical guards are in place and functioning properly. All equipment shall be shut down with energies dissipated prior to performing maintenance activities - lock out/tag out procedures may apply. Only qualified mechanics shall work on or repair heavy equipment.		

APPENDIX C2 ACTIVITY HAZARD ANALYSIS FOR GENERAL SITE ACTIVITIES				
Task Breakdown	**Potential Hazards**	**Critical Safety Practices**	**Personal Protective Clothing and Equipment**	**Monitoring Devices**
Mobilization/ Site Setup	Slips, Trips, Falls	• Clear walkways work areas of equipment, tools, vegetation, excavated material and debris • Mark, identify, or barricade other obstructions		
	Spills	• Clean up spills before initiating maintenance • Review maintenance procedures for safety practices		
	Electrical Shock	• De-energize or shut off utility lines at their source before work begins • Use double insulated or properly grounded electric power-operated tools • Provide an equipment-grounding conductor program or employ ground-fault circuit interrupters • Use qualified electricians to hook up electrical circuits • Inspect all extension cords daily for structural integrity, ground continuity, and damaged insulation • Cover or elevate electric wire or flexible cord passing through work areas to protect from damage • Keep all plugs and receptacles out of water • Use approved water-proof, weather-proof type if exposure to moisture is likely • Inspect all electrical power circuits prior to commencing work • Follow Lockout/Tagout procedure HS315 – Control of Hazardous Energy Sources	Lockout/Tagout Devices	Voltage Meter or Tic Tracer

APPENDIX C2 ACTIVITY HAZARD ANALYSIS FOR GENERAL SITE ACTIVITIES				
Task Breakdown	**Potential Hazards**	**Critical Safety Practices**	**Personal Protective Clothing and Equipment**	**Monitoring Devices**
Mobilization/ Site Setup (continued)	Handling Heavy Objects	• Observe proper lifting techniques • Obey sensible lifting limits (60 lb. Maximum per person manual lifting) • Use mechanical lifting equipment (hand carts, trucks) to move large, awkward loads • Avoid carrying heavy objects above shoulder level • Warm up muscles before engaging in manual lifting		
	Sharp Objects	• Wear cut resistant work gloves when the possibility of lacerations or other injury may be caused by sharp edges or objects • Maintain all hand and power tools in a safe condition	Leather gloves	
	High Noise Levels	• Use hearing protection when exposed to excessive noise levels (greater than 85 dBA over an 8-hour work period) • Do not attempt verbal communication in high noise backgrounds	Ear plugs	
	Struck By/ Against Heavy Equipment	• Wear reflective warning vests when exposed to vehicular traffic • Isolate equipment swing areas • Make eye contact with operators before approaching equipment • Understand and review hand signals • Follow hand signals of ground workers for equipment manipulation when placing/loading equipment into bucket. • Step away from equipment when bucket adjustments are made • Do not attempt verbal communication in high noise backgrounds.	Warning vests, Hard hat, Safety glasses, and Steel toe work boots	

APPENDIX C2 ACTIVITY HAZARD ANALYSIS FOR GENERAL SITE ACTIVITIES				
Task Breakdown	**Potential Hazards**	**Critical Safety Practices**	**Personal Protective Clothing and Equipment**	**Monitoring Devices**
Mobilization/ Site Setup (continued)	Struck-by/Against (Vehicle-traffic)	• Wear reflective warning vests when exposed to vehicular traffic • Barricade or enclose the work areas • Restrict entry to the work areas to authorized personnel during work activities • Wear hard hats, safety glasses with side shields, and steel-toe safety boots at all times • Follow FDOT roadway and traffic design standards manual • Personnel will perform all work tasks and remain inside barriered work zones • Spotters to be utilized as necessary	Warning vests, Hard hat, Safety glasses, and steel toe work boots	
	Pinch Points	• Review equipment adjustment procedures, identify pinch points • Isolate/block pinch points to limit motion when inserting pins, fasteners, closing tackles	Leather gloves	
	Burns associated with loading/unloading equipment on trucks	• Identify heavy objects for loading that may have hot surfaces • Allow objects to cool or cover hot surfaces with non-combustible material to protect workers from burns		
	Ladders	• Inspect ladders before use for mud buildup on treads • Clean mud from boots before climbing on ladders • Follow the three point of contact rule		
	High/Low Ambient Temperature	• Monitor for Heat Stress in accordance with Health and Safety Procedures HS400, HS401 • Provide fluids to prevent worker dehydration		

EQUIPMENT REQUIRED	**INSPECTION REQUIREMENTS**	**TRAINING REQUIREMENTS**
• Vehicles • Hand tools • Ladders • Forklift/Hand carts	• Daily equipment inspections as per manufacturers requirements • Inspection of all emergency equipment (i.e. first aid kits, fire extinguishers)	• Review AHA with all task personnel • Review Site Specific Safety and Occupational Health Program • Review operations/safety manuals for all equipment utilized

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APPENDIX C3 ACTIVITY HAZARD ANALYSIS FOR COLLECT SURFACE SOIL SAMPLES				
Task Breakdown	**Potential Hazards**	**Critical Safety Practices**	**Personal Protective Clothing and Equipment**	**Monitoring Devices**
Arrival of new personnel at site.	Unfamiliarity with site, general site hazards, project safety rules, chain of command, and emergency procedures.	All personnel shall attend the site orientation training.		
Unload equipment.	Heavy lifting, strains, and sprains.	No individual employee is permitted to lift any object that weighs over 60 pounds. Proper lifting techniques shall be used. Multiple employees or the use of mechanical lifting devices are required for lifting objects over the 60-pound limit.		
	Intrusive activities.	Follow procedure for Intrusive Activities Permit in the SSHP. Underground utilities shall be located and marked prior to commencing sampling activity.		
	Munitions and Explosives of Concern (MEC).	Personnel shall attend MEC Awareness training.		

APPENDIX C3
ACTIVITY HAZARD ANALYSIS FOR COLLECT SURFACE SOIL SAMPLES

Task Breakdown	Potential Hazards	Critical Safety Practices	Personal Protective Clothing and Equipment	Monitoring Devices
Surface Soil Sampling. (Continued)	Use of sampling tools.	Tools shall be inspected daily and before each use. Damaged tools shall be removed from service.		
	Hazardous atmospheres.	Air monitoring, as described in the SSHP shall be performed in areas where there is the possibility of elevated concentrations of toxic chemicals, flammable vapors, or oxygen-deficient atmospheres. Personnel shall immediately notify the Site Safety and Health Officer (SSHO) if odors are detected.		
	Contaminated air, water, soil, or hazardous chemicals	Physical contact with contaminated media or hazardous chemicals shall be avoided. Personal protective equipment use is required when contact is possible. Personnel who sustain skin contact shall immediately wash the affected area with soap and water (eyes should be irrigated for 15 minutes with potable water) and report the incident to the SSHO.		
	Fire	Smoking shall not be permitted in regulated areas. Vehicles shall not be parked in tall dry grass		
	Miscellaneous site activity.	When possible, personnel shall avoid areas that have hazardous activities in progress. When access must be gained in busy areas, the foremen of the activities in the area shall be notified prior to sampling in the area.	High visibility vests shall be worn when working in areas with high vehicular or heavy equipment traffic.	

EQUIPMENT REQUIRED	INSPECTION REQUIREMENTS	TRAINING REQUIREMENTS
• Vehicles • Hand tools	• Daily equipment inspections as per manufacturers requirements • Inspection of all emergency equipment (i.e. first aid kits, fire extinguishers)	• Review AHA with all task personnel • Review Site Specific Safety and Occupational Health Program • Review operations/safety manuals for all equipment utilized

APPENDIX C4 ACTIVITY HAZARD ANALYSIS FOR COLLECT SUBSURFACE SOIL SAMPLES				
Task Breakdown	**Potential Hazards**	**Critical Safety Practices**	**Personal Protective Clothing and Equipment**	**Monitoring Devices**
Arrival of new personnel at site.	Unfamiliarity with: site, general site hazards, project safety rules, chain of command, and emergency procedures.	All personnel shall attend the site orientation training.		
Location surveys.	Use of hand tools.	Hand tools shall be inspected daily and before each use. Tools, which are damaged, shall be removed from service.		
Materials Handling.	Overexertion	Personnel shall work in a manner and pace to reduce strains and overexertion.		
Soil sampling.	Hazardous atmospheres.	Air monitoring shall be performed in areas where there is the possibility of elevated concentrations of toxic chemicals, flammable vapors, or oxygen deficient atmospheres. Personnel shall immediately notify the SSHO if odors are detected. Engineering controls shall be implemented, when feasible, to control hazardous atmospheres to within acceptable limits. When engineering controls are not adequate, administrative controls or the use of PPE is required.		
	Fire.	Smoking shall not be permitted in regulated areas. Vehicles shall not be parked in tall dry grass.		
	Slips, trips, and falls.	Keep work areas clear and maintain housekeeping. Personnel shall not jump from equipment or elevated surfaces. Personnel shall avoid walking on rough or slippery terrain.		

APPENDIX C4 ACTIVITY HAZARD ANALYSIS FOR COLLECT SUBSURFACE SOIL SAMPLES				
Task Breakdown	**Potential Hazards**	**Critical Safety Practices**	**Personal Protective Clothing and Equipment**	**Monitoring Devices**
Soil sampling (continued).	Contaminated air, water, soil, or hazardous chemicals.	Physical contact with contaminated media or hazardous chemicals shall be avoided. Personal protective equipment use is required when contact is possible/probable. Personnel who sustain skin contact shall immediately wash the affected area with soap and water (eyes should be irrigated for 15 minutes with potable water) and report the incident to the SSHO.		
	Use of acidic preservatives (if required).	Personal protective equipment use, including chemical splash goggles, shall be required. A portable eye wash station shall be readily available in the area where acids are being used. Acids will be used in areas with adequate ventilation. All containers shall be properly labeled.		
	Miscellaneous site activity.	Personnel shall avoid areas, when possible, that have hazardous activities in progress. When access must be gained in busy areas, the foremen of the activities in the area shall be notified - prior to sampling in the area. High visibility vests shall be worn when working in areas with high vehicular or heavy equipment traffic.		
	Heat/cold/severe weather.	Follow procedures outlined in SSHP. Follow procedures outlined in SSHP.		
	Biological.			

EQUIPMENT REQUIRED	**INSPECTION REQUIREMENTS**	**TRAINING REQUIREMENTS**
• Vehicles • Hand tools • Ladders • Forklift/Hand carts	• Daily equipment inspections as per manufacturers requirements • Inspection of all emergency equipment (i.e. first aid kits, fire extinguishers)	• Review AHA with all task personnel • Review SSHP • Review operations/safety manuals for all equipment utilized

APPENDIX C5 ACTIVITY HAZARD ANALYSIS FOR COLLECT SURFACE WATER AND GROUNDWATER SAMPLES				
Task Breakdown	**Potential Hazards**	**Critical Safety Practices**	**Personal Protective Clothing and Equipment**	**Monitoring Devices**
Arrival of new personnel at site.	Unfamiliarity with: site, general site hazards, project safety rules, chain of command, and emergency procedures.	All personnel shall attend the site orientation training.		
Location surveys.	Use of hand tools.	Hand tools shall be inspected daily and before each use. Tools, which are damaged, shall be removed from service.		
Materials Handling.	Overexertion	Personnel shall work in a manner and pace to reduce strains and overexertion.		
Water sampling.	Hazardous atmospheres.	Air monitoring shall be performed in areas where there is the possibility of elevated concentrations of toxic chemicals, flammable vapors, or oxygen deficient atmospheres. Personnel shall immediately notify the SSHO if odors are detected. Engineering controls shall be implemented, when feasible, to control hazardous atmospheres to within acceptable limits. When engineering controls are not adequate, administrative controls or the use of PPE is required.		
	Fire.	Smoking shall not be permitted in regulated areas. Vehicles shall not be parked in tall dry grass.		
	Slips, trips, and falls.	Keep work areas clear and maintain housekeeping. Personnel shall not jump from equipment or elevated surfaces. Personnel shall avoid walking on rough or slippery terrain.		

APPENDIX C5 ACTIVITY HAZARD ANALYSIS FOR COLLECT SURFACE WATER AND GROUNDWATER SAMPLES				
Task Breakdown	**Potential Hazards**	**Critical Safety Practices**	**Personal Protective Clothing and Equipment**	**Monitoring Devices**
Water sampling (continued).	Contaminated air, water, soil, or hazardous chemicals.	Physical contact with contaminated media or hazardous chemicals shall be avoided. Personal protective equipment use is required when contact is possible/probable. Personnel who sustain skin contact shall immediately wash the affected area with soap and water (eyes should be irrigated for 15 minutes with potable water) and report the incident to the SSHO.		
	Use of acidic preservatives (if required).	Personal protective equipment use, including chemical splash goggles, shall be required. A portable eye wash station shall be readily available in the area where acids are being used. Acids will be used in areas with adequate ventilation. All containers shall be properly labeled.		
	Miscellaneous site activity.	Personnel shall avoid areas, when possible, that have hazardous activities in progress. When access must be gained in busy areas, the foremen of the activities in the area shall be notified - prior to sampling in the area. High visibility vests shall be worn when working in areas with high vehicular or heavy equipment traffic.		
	Heat/cold/severe weather.	Follow procedures outlined in SSHP.		
	Biological.	Follow procedures outlined in SSHP.		

EQUIPMENT REQUIRED	**INSPECTION REQUIREMENTS**	**TRAINING REQUIREMENTS**
• Vehicles • Hand tools • Ladders • Forklift/Hand carts	• Daily equipment inspections as per manufacturers requirements • Inspection of all emergency equipment (i.e. first aid kits, fire extinguishers)	• Review AHA with all task personnel • Review SSHP • Review operations/safety manuals for all equipment utilized

APPENDIX C6 ACTIVITY HAZARD ANALYSIS FOR WELL DRILLING				
Task Breakdown	**Potential Hazards**	**Critical Safety Practices**	**Personal Protective Clothing and Equipment**	**Monitoring Devices**
Well Installation	Struck by/ Against Heavy Equipment, Flying Debris, Protruding Objects	• Wear reflective warning vests when exposed to vehicular traffic • Isolate equipment swing areas • Make eye contact with operators before approaching equipment • Barricade or enclose the drilling area • Restrict entry to the work area to authorized personnel during drilling activities • Wear hard hats, safety glasses with side shields, or splash/face shields and goggles, and steel-toe safety boots at all times • Understand and review hand signals	Warning vests, Hard hat, Safety glasses, steel toe work boots	
	Sharp Objects	• Wear cut resistant work gloves when the possibility of lacerations or other injury may be caused by sharp edges or objects • Maintain all hand and power tools in a safe condition • Keep guards in place during use • Observe work area and location of other personnel before lifting or moving objects with sharp edges	Leather gloves	
	Underground/ Overhead Utilities	• Identify all utilities around the site before work commences and cease work immediately if unknown utility markers are uncovered • Use manual excavation within 3 feet of known utilities • Utility clearance shall conform with 29 CFR 1926.955 (high voltage >700 kv) 15 feet phase to ground clearance; 31 feet phase to phase clearance		
	High Noise Levels	• Use hearing protection when exposed to excessive noise levels (greater than 85 dBA over an 8-hour work period) and Assess noise level with sound level meter if possibility exists that level may exceed 85dBA TWA	Ear plugs	Sound Level Meter

APPENDIX C6 ACTIVITY HAZARD ANALYSIS FOR WELL DRILLING				
Task Breakdown	**Potential Hazards**	**Critical Safety Practices**	**Personal Protective Clothing and Equipment**	**Monitoring Devices**
Well Installation (continued)	Handling Heavy Objects	• Observe proper lifting techniques • Obey sensible lifting limits (60 lb. Maximum per person manual lifting) • Use mechanical lifting equipment (hand carts, trucks) to move large, awkward loads • Warm up muscles before engaging in manual lifting activities • Review lifting posture/techniques regularly at safety meetings		
	Caught In/ Between Moving Parts	• Identify and understand parts of equipment which may cause crushing, pinching, rotating or similar injuries • Assure guards are in place to protect from these parts of equipment during operation • Provide and wear proper work gloves when the possibility of crush, pinch, or other injury may be caused by moving/stationary edges or objects • Maintain all equipment in a safe condition • Keep all guards in place during use • De-energize and lock-out machinery before maintenance or service		
	Horseplay	• Prohibit horseplay on all project sites • Review rules about horseplay with subcontract supervisors and workers • Remind workers not to respond/participate in horseplay started by others		

APPENDIX C6 ACTIVITY HAZARD ANALYSIS FOR WELL DRILLING				
Task Breakdown	**Potential Hazards**	**Critical Safety Practices**	**Personal Protective Clothing and Equipment**	**Monitoring Devices**
	Slips, Trips, Falls	• Clear walkways, work areas of equipment, drilling overburden, debris and other materials • Mark, identify, or barricade other obstructions		
	Inhalation and Contact with Hazardous Substances	• Provide workers proper skin, eye and respiratory protection based on the exposure hazards present • Review hazardous properties of site contaminants with workers before operations begin	Tyvek coveralls, nitrile gloves, latex or neoprene boots	
Well Installation (continued)	Fire/ Explosion	• Test well-head atmosphere with combustible gas meter • Eliminate sources of ignition from the work area • Prohibit smoking • Provide ABC (or equivalent) fire extinguishers in all work areas, flammable storage areas, generator and compressor locations • Store flammable liquids in well ventilated areas • Prohibit storage, transfer of flammable liquids in plastic containers • Post "NO SMOKING" signs • Store combustible materials away from flammables • Store all compressed gas cylinders upright, caps in place when not in use • Separate Flammables and Oxidizers by 20 feet minimum	Portable fire extinguishers	LEL/O_2
	High/Low Ambient Temperature	• Monitor for Heat/Cold stress in accordance with Shaw Health and Safety Procedures HS400. HS401 • Provide fluids to prevent worker dehydration		

EQUIPMENT REQUIRED	INSPECTION REQUIREMENTS	TRAINING REQUIREMENTS
• Drill Rig • Hand tools	• Daily equipment inspections as per manufacturers requirements • Inspection of all emergency equipment (i.e. first aid kits, fire extinguishers)	• Review JSA with all task personnel • Review SSHP

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APPENDIX C7 ACTIVITY HAZARD ANALYSIS FOR SOIL EXCAVATION				
Task Breakdown	**Potential Hazards**	**Critical Safety Practices**	**Personal Protective Clothing and Equipment**	**Monitoring Devices**
Excavation of Soil	Underground/ Overhead Utilities	• Identify all utilities around the site before work commences • Cease work immediately if unknown utility markers are uncovered • Use manual excavation within 3 feet of known utilities • Utility clearance shall conform with 29 CFR 1926.955 (high voltage >700 kv) 15 feet phase to ground clearance; 31 feet phase to phase clearance		
	Excavation Wall Collapse	• Construct diversion ditches or dikes to prevent surface water from entering excavation • Provide good drainage of area adjacent to excavation • Collect ground water/rain water from excavation and dispose of properly • Store excavated material at least 2 feet from the edge of the excavation; prevent excessive loading of the excavation face • Provide sufficient stairs, ladders, or ramps when workers enter excavations over 4 feet in depth • Place ladders no more than 25 feet apart laterally • Treat excavations over 4 feet deep as confined spaces • Complete confined space permit entry procedure • Monitor atmosphere for flammable/toxic vapors, and oxygen deficiency • Slope, bench, shore, or sheet excavations over 5 feet deep if worker entry is required • Assign a competent person to inspect, decide soil classification, proper sloping, the correct shoring, or sheeting • Inspect excavations (when personnel entry is required) daily, any time conditions change • Provide at least two means of exit for personnel working in excavations	Hard hat, safety glasses, steel toe work boots	

APPENDIX C7 ACTIVITY HAZARD ANALYSIS FOR SOIL EXCAVATION				
Task Breakdown	**Potential Hazards**	**Critical Safety Practices**	**Personal Protective Clothing and Equipment**	**Monitoring Devices**
Excavation of Soil (Continued)	Struck By/ Against Heavy Equipment	• Wear reflective warning vests when exposed to vehicular traffic • Isolate equipment swing areas • Make eye contact with operators before approaching equipment • Understand and review hand signals	Warning vests, hard hat, safety glasses, steel toe work boots	
	Handling Heavy Objects	• Observe proper lifting techniques • Obey sensible lifting limits (60 lb. maximum per person manual lifting) • Use mechanical lifting equipment (hand carts, trucks) to move large, awkward loads		
	Sharp Objects	• Wear cut resistant work gloves when the possibility of lacerations or other injury may be caused by sharp edges or objects • Maintain all hand and power tools in a safe condition • Keep guards in place during use	Leather gloves	
	Slips, Trips, Falls	• Clear walkways, work areas of equipment, vegetation, excavated material, tools, and debris • Mark, identify, or barricade other obstructions • Evaluate fall hazards above 4 ft.; use fall protection equipment (harness/lanyard), standard guardrails or other fall protection systems when working on elevated platforms above 6 ft. • Use Aheavy duty industrial≅ (type IA) ladders • Install and inspect scaffolds according to manufacturers requirements • Only trained operators are permitted to use aerial lifts • Tie-off all straight/extension ladders or manually hold by co-worker at base • Anchorage points for fall arrest systems must support at least 5,400 pounds for each worker		

APPENDIX C7 ACTIVITY HAZARD ANALYSIS FOR SOIL EXCAVATION				
Task Breakdown	**Potential Hazards**	**Critical Safety Practices**	**Personal Protective Clothing and Equipment**	**Monitoring Devices**
Excavation of Soil (Continued)	High Noise Levels	• Use hearing protection when exposed to excessive noise levels (greater than 85 dBA over an 8-hour work period) • Assess noise level with sound level meter if possibility exists that level may exceed 85dBA TWA	Ear plugs	
	Inhalation and Contact with Hazardous Substances	• Provide workers proper skin, eye and respiratory protection based on the exposure hazards present • Review hazardous properties of site contaminants with workers before operations begin • Monitor breathing zone air to determine levels of contaminants • Dampen soil using light water spray to prevent fugitive dust emissions • Cover stockpiled soil with plastic sheeting to prevent fugitive dust emissions • Conduct air monitoring / sampling to determine exposure levels	Tyvek coveralls, nitrile gloves, neoprene boots	LEL/O_2, PID, Mini-RAM, H_2S Monitor; Air sampling pump
	High/Low Ambient Temperature	• Monitor for Heat/Cold stress in accordance with IT Health and Safety Procedures # HS400, HS401 • Provide fluids to prevent worker dehydration • Follow work/rest schedule	Insulated Clothing (subject to ambient temperature)	Meteorological Equipment
EQUIPMENT REQUIRED		**INSPECTION REQUIREMENTS**	**TRAINING REQUIREMENTS**	
• Vehicles • Hand tools • Ladders • Forklift/Hand carts		• Daily equipment inspections as per manufacturers requirements • Inspection of all emergency equipment (i.e. first aid kits, fire extinguishers)	• Review AHA with all task personnel • Review Site Specific Safety and Occupational Health Program • Review operations/safety manuals for all equipment utilized	

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APPENDIX C8 ACTIVITY HAZARD ANALYSIS FOR BACKFILLING AND COMPACTION				
Task Breakdown	**Potential Hazards**	**Critical Safety Practices**	**Personal Protective Clothing and Equipment**	**Monitoring Devices**
Backfill and Compact Soils	Slips, Trips, Falls	• Clear walkways, work areas of equipment, tools, construction debris and other materials • Mark, identify, or barricade other obstructions • Maintain three point contact when ascending/ descending heavy equipment		
	Handling Heavy Objects	• Observe proper lifting techniques • Obey sensible lifting limits (60 lb. maximum per person manual lifting) • Use mechanical lifting equipment (hand carts, trucks) to move large, awkward loads		
	Struck by/ Against Heavy Equipment, Flying Debris, Protruding Objects	• Wear reflective warning vests when exposed to vehicular traffic • Isolate equipment swing areas • Make eye contact with operators before approaching equipment • Verify proper operation of equipment backup alarms • Barricade or enclose the work area • Restrict work area entry to authorized personnel only during construction activities • Wear hard hats, safety glasses with side shields, and steel-toe safety boots • Understand and review hand signals	Warning vests, Hard hat, Safety glasses, Steel toe work boots	
	Vibration	• Rotate compaction tasks to minimize worker exposure to equipment vibration • Use compactors with vibration dampening devices	leather gloves	
	High Noise Levels	• Use hearing protection when exposed to excessive noise levels (greater than 85 dBA over an 8-hour work period) • Assess noise level with sound level meter if possibility exists that level may exceed 85dBA TWA	Ear plugs	Sound Level Meter

APPENDIX C8 ACTIVITY HAZARD ANALYSIS FOR BACKFILLING AND COMPACTION				
Task Breakdown	**Potential Hazards**	**Critical Safety Practices**	**Personal Protective Clothing and Equipment**	**Monitoring Devices**
Backfill and Compact Soils (Continued)	High/Low Ambient Temperature	• Monitor for Heat/Cold stress in accordance with Shaw Health and Safety Procedures # HS400, HS401 • Provide fluids to prevent worker dehydration	Insulated Clothing (subject to ambient temperature)	Meteorological Equipment

EQUIPMENT REQUIRED	**INSPECTION REQUIREMENTS**	**TRAINING REQUIREMENTS**
• Excavator • Shovels, probes • Dump trucks	• Daily equipment inspections as per manufacturers requirements • Excavation inspection/permit • Inspection of all emergency equipment (i.e.: first aid kits, fire extinguishers)	• Review AHA with all task personnel • Review SSHP. • Review operations/safety manuals for all equipment utilized • Review site specific chemical hazards

APPENDIX C9 AHA FOR SITE SURVEY ACTIVITIES				
Task Breakdown	**Potential Hazards**	**Critical Safety Practices**	**Personal Protective Clothing and Equipment**	**Monitoring Devices**
Survey of Site	Struck By/ Against Motor Vehicles/ Operating Equipment	Wear reflective warning vests when exposed to vehicular traffic Isolate potential equipment swing areas Avoid/isolate survey activities in high traffic areas Make eye contact with vehicle operators before approaching/crossing high traffic areas Understand and review hand signals Emphasize The Buddy System where injury potential exists	Hard hat, safety glasses, steel toe work boots, Safety Vest	
	Slips, Trips, Falls	Clear walkways, work areas of equipment and tools Mark, identify, or barricade other obstructions		
	Handling Heavy Objects	Observe proper lifting techniques Obey sensible lifting limits (60 lb. maximum per person manual lifting) Use mechanical lifting equipment (hand carts, trucks) to move large, awkward loads		
	Sharp Objects	Wear cut resistant work gloves when the possibility of lacerations or other injury may be caused by sharp edges or objects Maintain all hand and power tools in a safe condition Keep guards in place during use Close doors, windows on heavy equipment to prevent injuries from tree branches and other vegetation	Leather gloves	
	Insect/ Animal Bites	Review injury potential with workers Avoid insect nests areas, habitats outside work areas Emphasize The Buddy System where such injury potential exists Use insect repellant to protect against sting injuries		

APPENDIX C9 AHA FOR SITE SURVEY ACTIVITIES				
Task Breakdown	**Potential Hazards**	**Critical Safety Practices**	**Personal Protective Clothing and Equipment**	**Monitoring Devices**
Survey of Site (Continued)	Contact Dermatitis	Wear long sleeve shirts / trousers to avoid skin contact with plants or other skin irritants Identify and review poisonous plants with workers Apply protective cream/lotion to exposed skin to prevent poison ivy or similar reactions	latex boot covers	
	High/Low Ambient Temperature	Monitor for Heat/Cold stress in accordance with Shaw Health and Safety Procedures # HS400, HS401 Provide fluids to prevent worker dehydration	Insulated Clothing (subject to ambient temperature)	Meteorological Equipment
EQUIPMENT REQUIRED		**INSPECTION REQUIREMENTS**	**TRAINING REQUIREMENTS**	
• Hand tools		Daily equipment inspections as per manufacturers requirements Inspection of all emergency equipment (i.e. first aid kits, fire extinguishers)	Review JSA with all task personnel Review SSHP	

APPENDIX C10 AHA FOR SITE RESTORATION				
Task Breakdown	**Potential Hazards**	**Critical Safety Practices**	**Personal Protective Clothing and Equipment**	**Monitoring Devices**
Prepare area, fertilize, and sew grass seed.	Use of tractors/mechanical equipment.	Only qualified personnel shall be permitted to operate equipment. The operator shall read the tractor operator manual prior to use. The operator shall review all safety and operational decals applied to the tractor and implements prior to use. The tractor shall be inspected daily (and documented). Inspection forms are located in Appendix D of the SSHP. Do not use unsafe equipment. Deficiencies in equipment shall be noted on the inspection form. Equipment found to be unsafe shall not be used. Keep all shields and guards in place. Do not operate equipment with missing shields or guards. Shut off engine, remove the key, and be sure implement motion has stopped before dismounting the tractor, performing adjustments, or performing maintenance. Personnel shall not wear loose clothing, and stay clear of moving parts. Be careful of pinch points when coupling and uncoupling equipment. Be careful of power take off (PTO) – make sure guards are in place. Never step over the PTO – walk around the tractor or implement. Avoid tight turns that pinch rotating shafts between the tractor and machine.		

APPENDIX C10 AHA FOR SITE RESTORATION				
Task Breakdown	**Potential Hazards**	**Critical Safety Practices**	**Personal Protective Clothing and Equipment**	**Monitoring Devices**
Prepare area, fertilize, and sew grass seed (continued).	Use of tractors/mechanical equipment (continued).	Wear gloves when manually hooking up equipment. Avoid lateral movement on steep slopes where rollover potential may be high. All equipment shall be operated at safe speeds and in a safe manner. Personnel shall ensure all mechanical guards are in place and functioning properly. All equipment shall be shut down with energies dissipated prior to performing maintenance activities - lock out/tag out procedures may apply. Only qualified mechanics shall work on or repair heavy equipment. All equipment shall have backing alarms. The tractor operator shall wear safety belts. Personnel are only permitted to approach equipment after a signal from the operator. Operate the PTO at the speed recommended for the implement being used.		

APPENDIX C10 AHA FOR SITE RESTORATION				
Task Breakdown	**Potential Hazards**	**Critical Safety Practices**	**Personal Protective Clothing and Equipment**	**Monitoring Devices**
Prepare area, fertilize, and sew grass seed (continued).	Slips, trips, falls. Hand injuries. Bright sun (glare) and eye injuries. Fire.	Personnel shall not jump from equipment. Personnel shall be cautious when walking/working on uneven or slippery surfaces. Heavy equipment operators shall use extra care and maintain three-point contact when climbing into or out of equipment. Items to be handled shall be inspected for sharp edges prior to being handled. Personnel shall wear leather gloves when handling sharp materials. Personnel shall be aware of and avoid pinch point hazards. Eye protection equipment shall be worn as necessary. The tractor shall be shut off before refueling. A 2:A-20B:C fire extinguisher shall be available when re-fueling tractor. Smoking shall not be permitted when fueling. The tractor shall be allowed to cool before refueling. Gasoline shall be stored in safety cans with flash arrestors and spring-loaded vents. The tractor shall be equipped with a 5-B:C fire extinguisher. Vehicle shall not be allowed to idle when parked on grass. A Hudson sprayer, filled with water, shall be available at the work location.		

APPENDIX C10 AHA FOR SITE RESTORATION				
Task Breakdown	**Potential Hazards**	**Critical Safety Practices**	**Personal Protective Clothing and Equipment**	**Monitoring Devices**
Prepare area, fertilize, and sew grass seed (continued).	Noise.	Tractor operator shall wear hearing protection to reduce exposures to below the Occupational Safety and Health Administration limits.		
	Heat stress.	Personnel shall keep hydrated by drinking more water than thirst indicates. The heat stress guidelines in the SSHP shall be followed. Personnel shall pace themselves while performing strenuous work and take adequate breaks in a cool area. Personnel shall take adequate breaks in a cool area.		
	Stinging and biting insects.	Follow procedures outlined in SSHP. Use Deep Woods Off (N,N-Diethyl-m-toluamide [DEET]) and Repel Permanone (permethrins), and/or flowers of sulfur to repel chiggers, mosquitoes, and ticks.		
	Use of fertilizer.	Read material safety data sheet for fertilizer prior to use. The precautionary recommendations by the manufacturer shall be followed. Personnel shall avoid contact with the fertilizer. Personnel shall wash their hands and face immediately after using the fertilizer.		

EQUIPMENT REQUIRED	**INSPECTION REQUIREMENTS**	**TRAINING REQUIREMENTS**
Hearing protection Insect repellant Drinking water	Site inspections (daily)	Site orientation Hazard Communication Heat stress procedures

APPENDIX C11
ACTIVITY HAZARD ANALYSIS FOR SOIL BORROW MATERIAL IMPORT (LOADING, TRANSPORTATION, AND DUMPING

Task Breakdown	Potential Hazards	Critical Safety Practices	Personal Protective Clothing and Equipment	Monitoring Devices
Truck Loading and Equipment Operations	Struck By/ Against Heavy Equipment	• Wear reflective warning vests when exposed to vehicular traffic • Obey posted speed limits • Isolate equipment swing areas • . Make eye contact with operators before approaching equipment . Understand and review hand signals	Warning vests, Hard hat, Safety glasses, Steel toe work boots	
	Slips, Trips, Falls	• Clear walk ways, work areas of equipment, tools and debris • . Mark, identify, or barricade other obstructions		
	Sharp Objects	• Wear cut resistant work gloves when the possibility of lacerations or other injury may be caused by sharp edges or objects • Maintain all hand and power tools in a safe condition • Keep guards in place during use	Leather gloves	
	High Noise Levels	• Use hearing protection when exposed to excessive noise levels (Greater than 85 dBA over an 8-hour work period) • Assess noise level with sound level meter if possibility exists that level may exceed 85dBA TWA • Do not attempt verbal communication in high noise backgrounds	Ear plugs	Sound Level Meter
	Handling Heavy Objects	• Observe proper lifting techniques • Obey sensible lifting limits (60 lb. maximum per person manual lifting) • Use mechanical lifting equipment (hand carts, trucks)to move large, awkward loads		

APPENDIX C11
ACTIVITY HAZARD ANALYSIS FOR SOIL BORROW MATERIAL IMPORT (LOADING, TRANSPORTATION, AND DUMPING

Task Breakdown	Potential Hazards	Critical Safety Practices	Personal Protective Clothing and Equipment	Monitoring Devices
Truck Loading and Equipment Operations (Continued)	Caught In/ Between Moving Parts	• Identify and understand parts of equipment which may cause crushing, pinching, rotating or similar motions • Assure guards are in place to protect from these parts of equipment during operation • Wear proper work gloves when the possibility of pinching, or other injury may be caused by moving/ handling large or heavy objects • Maintain all equipment in a safe condition • Keep all guards in place during use • Avoid moving hydraulic, dump or loading equipment		

EQUIPMENT REQUIRED	INSPECTION REQUIREMENTS	TRAINING REQUIREMENTS
• Excavator • Dump trucks • Shovels	• Daily equipment inspections as per manufacturers requirements • Inspection of all emergency equipment (i.e. first aid kits, fire extinguishers)	• Review AHA with all task personnel • Review operations/safety manuals for all equipment utilized

APPENDIX C12 AHA FOR EQUIPMENT DECONTAMINATION				
Task Breakdown	**Potential Hazards**	**Critical Safety Practices**	**Personal Protective Clothing and Equipment**	**Monitoring Devices**
Arrival of new personnel at site.	Unfamiliarity with site, general site hazards, project safety rules, chain of command, and emergency procedures.	All personnel shall attend the site orientation training.		
Unload equipment.	Heavy lifting, strains, and sprains.	No individual employee is permitted to lift any object that weighs over 60 pounds. Proper lifting techniques shall be used. Multiple employees or the use of mechanical lifting devices are required for lifting objects over the 60-pound limit.		
Equipment decontamination.	Use of pressure or steam washer.	All personnel associated with the use of steam/pressure washers shall wear Level D-Modified personal protective equipment (PPE). Rain gear over Saranex or poly-coated Tyvek® coveralls shall be worn by personnel in addition to Nitrile or polyvinyl chloride (PVC) gloves and PVC or Latex boot covers. Physical contact with contaminated media or hazardous chemicals shall be avoided. Personnel who sustain skin contact shall immediately wash the affected area with soap and report the incident to the Site Safety and Health Officer. Personnel shall wash hands and face at the conclusion of decontamination activities and before breaks.		

APPENDIX C12 AHA FOR EQUIPMENT DECONTAMINATION				
Task Breakdown	**Potential Hazards**	**Critical Safety Practices**	**Personal Protective Clothing and Equipment**	**Monitoring Devices**
Equipment decontamination (continued).	Slips, trips, falls. Pressure/steam washing.	Personnel shall be cautious when walking/working on slippery surfaces. Personnel lifts or scaffolding shall be used to access the tops of large/heavy equipment that must be cleaned. Fall protection shall be used when working at heights greater than six feet. Good house keeping shall be maintained in the decontamination area. Hoses and extension cords shall be kept/used in an orderly fashion. All equipment shall be shut off and a positive means taken to prevent its operation prior to decontamination. All dump beds on trucks shall be blocked if bed is cleaned in raised position. The pressure/steam washer shall be inspected before each use. The manufacturer's instruction manual shall be used to guide the inspection process. Personnel shall be trained in the use of the washing equipment. All personnel working in the equipment decontamination area shall be trained in the emergency shut-off procedures for the equipment being used. The minimum amount of steam/pressure that will complete the job should be used. Pressure washers exceeding 3000 psi shall not be used without the approval of the Certified Industrial Hygienist. The spray from such equipment shall only be directed at surfaces to be cleaned and never at body parts or other personnel. Personnel in the immediate area shall use face shields and metatarsal/shin guards.		

APPENDIX C12 AHA FOR EQUIPMENT DECONTAMINATION				
Task Breakdown	**Potential Hazards**	**Critical Safety Practices**	**Personal Protective Clothing and Equipment**	**Monitoring Devices**
Equipment decontamination (continued).	Pressure/steam washing (continued).	Personnel shall keep a firm grip on the wand and not point it at anything that is not being washed. Pressure washer operators must maintain good footing. The trigger on the wand shall never be wired/fixed open. Operators are to take adequate breaks to avoid fatigue. Hot surfaces shall be avoided. Units shall be shut off and allowed to cool prior to re-fueling.		
	Cold stress.	Personnel shall wear clothing commensurate with the ambient temperature. Personnel shall take breaks as necessary to warm up. Hot beverages shall be provided to personnel during breaks. The additional precautionary measures for cold stress, detailed in the Safety, Health, and Emergency Response Plan, may be applicable.		

APPENDIX C12 AHA FOR EQUIPMENT DECONTAMINATION				
Task Breakdown	**Potential Hazards**	**Critical Safety Practices**	**Personal Protective Clothing and Equipment**	**Monitoring Devices**
Equipment decontamination (continued).	Use of methanol.	Methanol shall be kept in storage cabinets when not in use. Methanol shall only be used in areas where smoking is prohibited and all ignition sources have been removed. Methanol will be used outdoors or in areas with adequate ventilation. Personnel using methanol shall wear safety glasses, Silver Shield gloves, and 100% cotton clothing under Saranex coated Tyvek coveralls. A fire extinguisher and charged water hose shall be available in the immediate area where methanol is being used. Physical contact with methanol shall be avoided. Personnel who sustain skin contact shall immediately wash the affected area with soap and water (eyes should be irrigated for 15 minutes with potable water) and report the incident to the Site Safety and Health Officer. A portable eye wash station shall be readily available in the area where methanol is being used. All containers shall be properly labeled.		
EQUIPMENT REQUIRED		**INSPECTION REQUIREMENTS**	**TRAINING REQUIREMENTS**	
• Hand tools • Pressure Washer		Daily equipment inspections as per manufacturers requirements Inspection of all emergency equipment (i.e. first aid kits, fire extinguishers)	Review JSA with all task personnel Review SSHP Hazard communication	

APPENDIX C13 ACTIVITY HAZARD ANALYSIS FOR DEMOBILIZATION				
Task Breakdown	**Potential Hazards**	**Critical Safety Practices**	**Personal Protective Clothing and Equipment**	**Monitoring Devices**
Demobilization/ Tear Down Site	Slips, Trips, Falls	• Clear walkways work areas of equipment, tools, vegetation, excavated material and debris • Mark, identify, or barricade other obstructions		
	Spills	• Clean up spills before initiating maintenance • Review maintenance procedures for safety practices		
	Electrical Shock	• De-energize or shut off utility lines at their source before work begins • Use double insulated or properly grounded electric power-operated tools • Provide an equipment-grounding conductor program or employ ground-fault circuit interrupters • Use qualified electricians to unhook electrical circuits • Inspect all extension cords daily for structural integrity, ground continuity, and damaged insulation • Cover or elevate electric wire or flexible cord passing through work areas to protect from damage • Keep all plugs and receptacles out of water • Use approved water-proof, weather-proof type if exposure to moisture is likely • Inspect all electrical power circuits prior to commencing work • Follow Lockout/Tagout procedure HS315 – Control of Hazardous Energy Sources	Lockout/Tagout Devices	Voltage Meter or Tic Tracer

APPENDIX C13 ACTIVITY HAZARD ANALYSIS FOR DEMOBILIZATION				
Task Breakdown	**Potential Hazards**	**Critical Safety Practices**	**Personal Protective Clothing and Equipment**	**Monitoring Devices**
Demobilization/ Tear Down Site (continued)	Handling Heavy Objects	• Observe proper lifting techniques • Obey sensible lifting limits (60 lb. Maximum per person manual lifting) • Use mechanical lifting equipment (hand carts, trucks) to move large, awkward loads • Avoid carrying heavy objects above shoulder level • Warm up muscles before engaging in manual lifting		
	Sharp Objects	• Wear cut resistant work gloves when the possibility of lacerations or other injury may be caused by sharp edges or objects • Maintain all hand and power tools in a safe condition	Leather gloves	
	High Noise Levels	• Use hearing protection when exposed to excessive noise levels (greater than 85 dBA over an 8-hour work period) • Do not attempt verbal communication in high noise backgrounds	Ear plugs	
	Struck By/ Against Heavy Equipment	• Wear reflective warning vests when exposed to vehicular traffic • Isolate equipment swing areas • Make eye contact with operators before approaching equipment • Understand and review hand signals • Follow hand signals of ground workers for equipment manipulation when placing/loading equipment into bucket. • Step away from equipment when bucket adjustments are made • Do not attempt verbal communication in high noise backgrounds.	Warning vests, Hard hat, Safety glasses, and Steel toe work boots	

APPENDIX C13 ACTIVITY HAZARD ANALYSIS FOR DEMOBILIZATION				
Task Breakdown	**Potential Hazards**	**Critical Safety Practices**	**Personal Protective Clothing and Equipment**	**Monitoring Devices**
Demobilization/ Tear Down Site (continued)	Struck-by/Against (Vehicle-traffic)	• Wear reflective warning vests when exposed to vehicular traffic • Barricade or enclose the work areas • Restrict entry to the work areas to authorized personnel during work activities • Wear hard hats, safety glasses with side shields, and steel-toe safety boots at all times • Follow FDOT roadway and traffic design standards manual • Personnel will perform all work tasks and remain inside barriered work zones • Spotters to be utilized as necessary	Warning vests, Hard hat, Safety glasses, and steel toe work boots	
	Pinch Points	• Review equipment adjustment procedures, identify pinch points • Isolate/block pinch points to limit motion when inserting pins, fasteners, closing tackles	Leather gloves	
	Burns associated with loading/unloading equipment on trucks	• Identify heavy objects for loading that may have hot surfaces • Allow objects to cool or cover hot surfaces with non-combustible material to protect workers from burns		
	Ladders	• Inspect ladders before use for mud buildup on treads • Clean mud from boots before climbing on ladders • Follow the three point of contact rule		
	High/Low Ambient Temperature	• Monitor for Heat Stress in accordance with Health and Safety Procedures HS400, HS401 • Provide fluids to prevent worker dehydration		

EQUIPMENT REQUIRED	**INSPECTION REQUIREMENTS**	**TRAINING REQUIREMENTS**
• Vehicles • Hand tools • Ladders • Forklift/Hand carts	• Daily equipment inspections as per manufacturers requirements • Inspection of all emergency equipment (i.e. first aid kits, fire extinguishers)	• Review AHA with all task personnel • Review Site Specific Safety and Occupational Health Program • Review operations/safety manuals for all equipment utilized

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APPENDIX C14 AHA FOR REFUELING				
Task Breakdown	**Potential Hazards**	**Critical Safety Practices**	**Personal Protective Clothing and Equipment**	**Monitoring Devices**
Fueling operations with gasoline and diesel	Exposures to fuels. Fire: extinguisher requirements.	Personnel shall periodically review the Material Safety Data Sheets (MSDS) for the fuels that are being used at the project. The handling and use of fuels shall be performed in well-ventilated areas – preferably outside of buildings. Personnel shall avoid skin and eye contact with fuels. Safety glasses and disposable nitrile gloves shall be worn while handling fuels. A small eyewash bottle shall be readily available when fueling equipment. If personnel get fuel in their eyes, then the eyes shall be irrigated with the entire contents of the eye wash bottle and then the employee shall seek medical assistance. If personnel sustain skin contact with fuels, then the affected area shall be immediately washed with soap and water. If fuel contact with clothing is made, then clothing shall be removed and changed immediately. A 2-A:10-B:C fire extinguisher shall be readily available when fueling equipment at any location on site. Personnel who intend to extinguish small fires shall be trained in the use of fire extinguishers. Equipment and property are of secondary concern in a fire situation - personnel shall never try to extinguish a fire if there is any doubt that it can be extinguished safely.		

APPENDIX C14 AHA FOR REFUELING				
Task Breakdown	**Potential Hazards**	**Critical Safety Practices**	**Personal Protective Clothing and Equipment**	**Monitoring Devices**
Fueling operations (continued).	Fire: elimination of ignition sources – hot surfaces.	All vehicles and equipment shall be shut down prior to fueling. Small equipment, such as generators, compressors, light plants, etc. shall be allowed to cool prior to re-fueling. Equipment with the fuel cap near the engine or near other hot surfaces shall also be allowed to cool prior to re-fueling.		
	Fire: elimination of ignition sources – arcs/sparks/open flames.	Smoking shall not be allowed within 50 feet of fueling operations. Personnel shall visually survey the immediate area for open flames and other ignition sources prior to commencing fueling operations. Personnel are prohibited from using cell-phones or two-way radios during all fueling operations.		
	Fire: elimination of ignition sources – static electricity.	Personnel shall never fill portable fuel cans that are in the bed of a pickup truck or in the trunk of an automobile. Filling fuel containers on plastic pickup truck bed-liners can cause static electric discharges, which may ignite the fuel. The fuel can(s) shall be removed from the truck bed or automobile trunk and placed on the ground before adding fuel. Electrical continuity shall be maintained between the portable fuel can and the tank being filled. A bonding cable shall be used to maintain continuity between the metal fuel container and the equipment fuel tank. Allowing free-fall of fuel into the tank is prohibited.		

APPENDIX C14 AHA FOR REFUELING				
Task Breakdown	**Potential Hazards**	**Critical Safety Practices**	**Personal Protective Clothing and Equipment**	**Monitoring Devices**
Fueling operations (continued).	Fire: elimination of ignition sources – static electricity. (continued)	Personnel shall not re-enter vehicles while fueling is underway due to the static electric charge generated between clothing and vehicle seats. If you absolutely have to get in your vehicle while the gas is pumping, make sure you get out, close the door touching the metal, before you pull the nozzle out. This way the static from your body will be discharged before you remove the nozzle.		
	Storage and transportation: saddle tanks in pick-up trucks.	Gasoline shall not be transported in portable saddle tanks – only diesel fuel shall be transported in saddle tanks. All portable saddle tanks mounted in pick-up trucks shall be manufactured to meet U.S. Department of Transportation (DOT) specifications. Portable saddle tanks shall be securely mounted to the pick-up truck, as recommended by the manufacturer. Saddle tanks shall be properly marked (see 49 Code of Federal Regulation 172.101) with the proper shipping name and labeled for "No Smoking." No more than 110 gallons of diesel fuel may be transported in a saddle tank unless all the DOT Hazardous Material Regulations are complied with, such as proper packaging, completing shipping papers, placarding, and the appropriate HM 126 Training (as well as having been provided emergency response information and training.) Caps on saddle tanks shall be securely closed. Saddle tanks shall be inspected weekly to check for leaks. Drivers must be notified that they are transporting hazardous materials.		

APPENDIX C14 AHA FOR REFUELING				
Task Breakdown	**Potential Hazards**	**Critical Safety Practices**	**Personal Protective Clothing and Equipment**	**Monitoring Devices**
Fueling operations (continued).	Storage and transportation: five-gallon cans in pick-up trucks.	Gasoline shall be stored and transported in properly marked/labeled five-gallon safety cans (equipped with self-venting cap and flash arrestor). Gasoline cans shall be secured to prevent movement during transportation. No more than six 5 gallon containers of gasoline may be transported in vehicles (back of pick-up trucks or trailers) at the same time unless all the DOT Hazardous Material Regulations are complied with, such as proper packaging, completing shipping papers, placarding (as required), and the appropriate HM 126 Training (as well as having been provided emergency response information and training.) The total quantity of hazardous materials may never exceed 400 pounds total. Hazardous materials must be secured prior to transporting. Drivers must be notified that they are transporting hazardous materials.		
	Storage of gasoline on-site.	Portable gasoline cans must be stored within the flammable materials storage cabinet.		
Other concerns	Spills.	All spills shall be immediately cleaned-up. All spills shall be reported to the Shaw Project Manager.		

EQUIPMENT REQUIRED	**INSPECTION REQUIREMENTS**	**TRAINING REQUIREMENTS**
Five-gallon safety cans (equipped with self-venting cap and flash arrestor	Verify MSDSs for fuels are available in vehicles transporting fuels	Hazard communication Materials of Trade

APPENDIX C15 AHA FOR RIGGING AND LIFTING WITH HYDRAULIC EQUIPMENT				
Task Breakdown	**Potential Hazards**	**Critical Safety Practices**	**Personal Protective Clothing and Equipment**	**Monitoring Devices**
Travel on and off project site (vehicular).	Vehicle Operation.			
Arrival of new personnel at site. Movement of personnel on-site. Prepare for equipment operations, including inspections. Perform equipment operations. Handle equipment and materials. Equipment maintenance.	Newly hired personnel and visitors. Unfamiliarity with: site, general (chemical, physical, environmental) site hazards, project safety rules and hazard control procedures, chain of command, and emergency procedures.	All personnel working on hazardous, toxic, and radioactive waste (HTRW) shall submit HAZWOPER training certificates (40-hour, 8-hour [if applicable], supervisor [if applicable]) to the Site Safety and Health Officer (SSHO). All personnel shall attend a site safety orientation. All site workers shall receive HAZWOPER three-day OJT. After personnel are trained in the contents of the Site Safety and Health Plan (SSHP), they shall sign the SSHP Acknowledgment Form. All training certifications held by personnel shall also be made available and kept in on-site personnel files. Review emergency procedures and evacuation plans.		
Complete Lift Plan Worksheet (Hydraulic Equipment). Rig materials or equipment.	Medical qualifications.	All personnel working on HTRW shall submit current physician's certificate stating that employee is participating in an appropriate medical surveillance program meeting 29 Code of Federal Regulation (CFR) 1910.120.		
Hold pre-lift meeting. Lift materials or equipment.	Allergies.	All personnel should complete the Known Allergies Questionnaire (voluntary only).		

APPENDIX C15 AHA FOR RIGGING AND LIFTING WITH HYDRAULIC EQUIPMENT				
Task Breakdown	**Potential Hazards**	**Critical Safety Practices**	**Personal Protective Clothing and Equipment**	**Monitoring Devices**
See principal steps above.	Complacency.	All personnel shall attend the daily Plan of the Day meetings to re-focus themselves to hazards, emergency procedures and equipment, operational aspects, and change(s) in site/work conditions. Procedures shall be conveyed to control these hazards.		
	Failure to properly plan daily activities.	A Job Safety Analysis (JSA), as required by Shaw Environmental & Infrastructure, Inc. Procedure No. HS045, "Job Safety Analysis (JSA)," shall be prepared by the crew prior to commencing daily activities. The JSA shall be used as a component of the morning Tailgate Safety Meeting. The JSA shall be revised at any time throughout the workday when new tasks are initiated, unforeseen circumstances arise, or if working conditions change. Personnel shall implement Hazard Assessment Resolution Program.		
	Heavy lifting, strains, and sprains.	No individual employee is permitted to lift any object that weighs over 60 pounds. Proper lifting techniques shall be used. Multiple employees or the use of mechanical lifting devices are required for lifting objects over the 60-pound limit.		
	Slips, trips, and falls.	Keep work areas clear and maintain housekeeping. Do not jump from equipment or elevated surfaces. Daily housekeeping will be implemented at the end of each workday. Use three-point contact rule for entering/exiting trucks and equipment. Use extra caution when walking on wet, muddy, frosty, icy, or snow-covered surfaces. Maintain proper illumination in work areas. Fall protection must be provided and used when personnel are exposed to fall hazards greater than six feet.		

APPENDIX C15 AHA FOR RIGGING AND LIFTING WITH HYDRAULIC EQUIPMENT				
Task Breakdown	**Potential Hazards**	**Critical Safety Practices**	**Personal Protective Clothing and Equipment**	**Monitoring Devices**
	Use of mechanical equipment.	Only qualified personnel shall be permitted to operate equipment. Mechanical equipment shall be inspected daily. Deficiencies in equipment shall be noted on the inspection form. Equipment found to be unsafe shall be taken out of serviced. All equipment shall be operated at safe speeds and in a safe manner. Equipment operators shall wear safety belts and hearing protection (as necessary). Ground personnel shall not position themselves between equipment and stationary objects (stay out of swing radius). Personnel are only permitted to approach equipment after a signal from the operator.		
	Hand injuries.	Items to be handled shall be inspected for sharp edges, splinters, burrs, rough surfaces, etc. prior to being handled. Personnel shall wear leather gloves when handling materials with sharp edges, splinters, burrs, rough surfaces, etc. Personnel shall be aware of and avoid pinch point hazards.		
	Fire.	Fire extinguishers shall be available in work areas. The SSHO shall establish smoking areas. Smoke only in designated areas. Only discard cigarette butts in proper receptacles – never discard cigarette butts onto the ground. Engines shall be shut off before refueling. A 2-A:40-B:C fire extinguisher shall be available when refueling at the project site. Smoking shall not be permitted within 50 feet of fueling operations.		

APPENDIX C15 AHA FOR RIGGING AND LIFTING WITH HYDRAULIC EQUIPMENT				
Task Breakdown	**Potential Hazards**	**Critical Safety Practices**	**Personal Protective Clothing and Equipment**	**Monitoring Devices**
See principal steps above.	Chemical hazards.	Perform decontamination as specified in the HASP. The Exclusion Zones and Contamination Reduction Zones shall be set-up and appropriately marked with signage. Avoid contact with contaminated materials. Wear PPE, as specified in the SSHP. The SSHO will perform chemical air monitoring, as specified in the SSHP. Verify emergency eyewash stations have been inspected, cleaned, filled, and in service. Notify all personnel of the emergency eyewash station locations. Project personnel will follow instructions on specific AHA's or as instructed by the SSHO. Project personnel will use appropriate PPE in accordance with the SSHP and as indicated on specific AHA's or as instructed by the SSHO. Barriers such as fences and ropes will be put in place to limit the access to Controlled Areas as specified in the SSHP. Signs will be used to alert persons of specific hazards as specified in the SSHP. Engineering controls (i.e., spraying material with water, calcium chloride solution) will be used as required by the SSHP or as instructed by the SSHO to reduce dust emission. Notify the SSHO if odors are detected.		

APPENDIX C15 AHA FOR RIGGING AND LIFTING WITH HYDRAULIC EQUIPMENT				
Task Breakdown	**Potential Hazards**	**Critical Safety Practices**	**Personal Protective Clothing and Equipment**	**Monitoring Devices**
See principal steps above.	Insect bites and stings.	Review injury and illness potential with workers. Inspect work areas for bee nests and activity prior to commencing work in that area. Wear PPE, such as disposable coveralls, to keep insects away from the skin. Expect to encounter insects when working in warm weather – especially at locations with vegetation present. Use protective insect repellents containing DEET to prevent insect bites, unless individual allergies and sensitivities prevent its use. Check limbs/body for insects/ insect bites upon removing PPE and again during showering. Consider applying Permethrin (Repel Permanone or equivalent) preparations to clothing to repel ticks, chiggers, mosquitoes, and/or spiders. Immediately notify supervisor or SSHO of insect bites, stings, irritations, rashes, or flu-like symptoms.		
	Contact dermatitis from poisonous and irritating plants (poison ivy, poison oak, and poison sumac).	Learn to identify poisonous and irritating plants. Identify workers who are known especially sensitive to poisonous and irritating plants and plan work accordingly. Check around work areas to identify if poisonous and irritating plants are present. Wear long-sleeve shirts/trousers or Tyvek® coveralls to avoid skin contact with plants or other skin irritants. Apply protective cream/lotion to exposed skin to prevent poison ivy or similar reactions. Immediately notify the SSHO if you suspect you contacted an irritating plant. Avoid unnecessary clearing of plant/vegetation areas. Follow additional procedures outlined in the SSHP.		

APPENDIX C15 AHA FOR RIGGING AND LIFTING WITH HYDRAULIC EQUIPMENT				
Task Breakdown	**Potential Hazards**	**Critical Safety Practices**	**Personal Protective Clothing and Equipment**	**Monitoring Devices**
	Severe weather, heat stress, and cold stress.	The SSHO will monitor weather conditions each day in order to plan and prepare for hazardous conditions. The SSHO will identify a suitable storm shelter at each work location. The SSHO will verify that the tornado shelter is accessible and available. Work activities will be suspended prior to weather conditions becoming hazardous so that workers have ample time to seek shelter. Upon seeing lightning or hearing thunder, outdoor activities shall be suspended and personnel shall be evacuated to safe areas (inside vehicles, buildings, or tornado shelters as appropriate). Follow additional procedures outlined in the SSHP. Monitor for heat stress in accordance with Shaw E & I Procedure No. HS400, "Heat Stress" and the requirements of the SSHP. Monitor for cold stress in accordance with Shaw E & I Procedure No. HS401, "Cold Stress" and the requirements of the SSHP. Drink plenty of water and minimal carbonated or caffeine-containing beverages. Perform physiological monitoring as needed. Personnel shall take required breaks to cool down/warm-up as needed. Personnel shall wear insulated clothing based the ambient temperature and wind chill conditions.		
	Struck by and against: • Vehicles • Equipment • Flying debris/projectiles • Splashes.	Wear PPE with high visibility vests when walking or working near moving equipment or vehicles. Stay off roads and streets unless necessary; walk on left side of roads facing on-coming traffic. Personnel shall not be permitted in the swing radius of the equipment. Personnel shall maintain a safe distance from operations. Do not assume equipment and vehicle operators have seen you unless operator have made eye contact with you and signaled to you. Warning signs and signalmen may be necessary.		

APPENDIX C15 AHA FOR RIGGING AND LIFTING WITH HYDRAULIC EQUIPMENT				
Task Breakdown	**Potential Hazards**	**Critical Safety Practices**	**Personal Protective Clothing and Equipment**	**Monitoring Devices**
See principal steps above.	Use of operational chemicals.	Read and follow MSDS for each chemical used. Do not use any chemical that you have not been trained to safely use. Provide ventilation as necessary. Wear proper PPE. Properly label all containers.		
	Noise.	All personnel shall wear hearing protection when exposed to high noise levels. All personnel shall wear hearing protection when operating powered hand tools or noisy equipment. Personnel working in vicinity of noisy tools or equipment shall wear hearing protection. Noise dosimetry shall be performed to verify hearing protection is adequate.		
	Electrical.	Ground-fault circuit interrupters shall be used on all power tools and extension cords. Extension cords, power tools, and lighting equipment shall be inspected before each use, protected from damage, and kept out of wet areas. Keep extension cords off of ground surface. Only qualified electricians are permitted to work on electrical circuits. Electricians must follow NFPA 70 E (2009) when working on electrical circuits.		

APPENDIX C15 AHA FOR RIGGING AND LIFTING WITH HYDRAULIC EQUIPMENT				
Task Breakdown	**Potential Hazards**	**Critical Safety Practices**	**Personal Protective Clothing and Equipment**	**Monitoring Devices**
	Tools.	Select the proper tool – do not improvise. Inspect all power and hand tools before each use (do not use damaged tools). Tools shall be appropriate for the task and maintained in good condition. Only trained and authorized personnel will use hand and power tools. Check your position, footing, and grip before tool use. Avoid distraction, keep your focus, and concentrate on the job. Personnel shall maintain a steady pace when using tools and take adequate rest periods. Keep electric cords untangled and out of the way of rotating tools. Use double-insulated power tools when possible. Protect electric tools with ground fault circuit interrupters (GFCI). Minimum PPE will include safety glasses with side-shields, hard hat, safety-toed work boots, and cut-resistant gloves. Store tools carefully to prevent damage to them and to make the proper tool easier to locate.		
	Dust.	Control dust by maintaining equipment operation rates. Control dust by applying water and/or calcium chloride. Personnel shall stay out of dust and work from upwind when possible. Perform dust monitoring to verify dust control is effective.		

APPENDIX C15 AHA FOR RIGGING AND LIFTING WITH HYDRAULIC EQUIPMENT				
Task Breakdown	**Potential Hazards**	**Critical Safety Practices**	**Personal Protective Clothing and Equipment**	**Monitoring Devices**
	Rigging and lifting with hydraulic equipment.	Determine weight of object to be lifted; never lift any object if weight is unknown. Calculate lift/load capacities using manuals and load capacity charts. Lift supervisor will complete a Lift Plan Worksheet (Hydraulic Equipment) and hold pre-lift meeting prior to attempting lift. Assign operator, rigger, tagline, and signal man responsibilities as necessary. Review lift hand signals with operator, signaler, supervisor, and workers. Select appropriate rigging equipment for the type of lift. Review rigging techniques, position of load, tag lines with workers involved in rigging activities. Perform required daily inspections, of wire ropes, rigging hardware, and attachments. Rigging shall be inspected before each use. Inspect rigging devices to verify slings, straps are free from defects and rated for the lift weight. Deficiencies shall be noted on the inspection form.		

APPENDIX C15 AHA FOR RIGGING AND LIFTING WITH HYDRAULIC EQUIPMENT				
Task Breakdown	**Potential Hazards**	**Critical Safety Practices**	**Personal Protective Clothing and Equipment**	**Monitoring Devices**
See principal steps above.	Rigging and lifting with hydraulic equipment (continued).	Rigging found to be unsafe shall not be used, tagged, and taken out of service. Prohibit use of rigging equipment with missing documentation tags. Verify inspection and maintenance information for hydraulic equipment. Perform daily inspection of mechanical, hydraulic operations of equipment. Establish and isolate swing radius of equipment, rigging and load. Inspect for stability of surfaces beneath the hydraulic excavating equipment. All personnel shall be kept clear when material is being hoisted Hoisting of materials shall be done by use of a shackle that will prevent accidental disengagement. Taglines shall be used for controlling unguided materials. An operational test of equipment and rigging will be conducted in presence of GDA to verify performance. Re-perform operational test if repairs, major maintenance or reconfiguration is required on hydraulic equipment or attachments. Test lift objects for center of gravity. Ensure tag-lines are free of knots and defects. Prohibit looping / winding tag lines around hands or body. Prohibit positioning or moving load using tag lines. Loads shall be lifted at minimum height and carried as low as possible during traveling. Loads shall not be lifted over personnel. Never stand under a suspended load. Maintain adequate clearances from electrical sources. Do not hoist personnel with hydraulic equipment or ride on hoisted load.		

EQUIPMENT REQUIRED	INSPECTION REQUIREMENTS	TRAINING REQUIREMENTS
Personal Protective Equipment Level D: Hard Hat Safety Glasses Safety-Toed Boots Work Gloves ANSI Class 2 reflective warning vests Modified Level D: Refer to SSHP. Equipment: Air monitoring instruments Fire Extinguishers Emergency Eyewash First Aid Kit Insect repellant with DEET Repel Permanone Fall protection Drinking water Weather radio Water truck Rigging	Competent Person (CP) / Qualified Person (QP): CP/SSHO _____ Alternate SSHO/CP _____ QP/First Aid and CPR _____ QP/First Aid and CPR _____ CP/Rigger _____ Training Requirements:	HAZWOPER 40-Hour Site safety orientation Emergency procedures Hazard communication Applicable AHAs Qualified equipment operators Lifting/back safety Fall protection Fire extinguisher use Biological hazard identification and control Tornado shelter location Lightning safety procedures Daily site safety inspection (SSHO) Check training, and medical certifications against personnel roster Mechanized equipment (daily) Overhead and underground utilities Rigging (before each use) Housekeeping (daily) Fire extinguisher (weekly) Vehicle inspection daily Equipment and tools inspection daily and before use Survey areas for poisonous plants, insects, and animals Check body for ticks Verify tornado shelter is available

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APPENDIX C16 ACTIVITY HAZARD ANALYSIS FOR Visual Site Inspection and Surveys				
Task Breakdown	**Potential Hazards**	**Critical Safety Practices**	**Personal Protective Clothing and Equipment**	**Monitoring Devices**
Arrival of new personnel at site	Unfamiliarity with: site, general site hazards, project safety rules, chain of command, and emergency procedures.	• All personnel shall attend the site orientation training.	Warning vests, Hard hat, Safety glasses, and Steel toe work boots	
Visual site inspections and surveys	Slips, Trips, Falls	• Clear walkways work areas of equipment, tools, vegetation, excavated material and debris • Mark, identify, or barricade other obstructions		
	Electrical Shock	• De-energize or shut off utility lines at their source before work begins • Use double insulated or properly grounded electric power-operated tools • Provide an equipment-grounding conductor program or employ ground-fault circuit interrupters • Use qualified electricians to hook up electrical circuits • Inspect all extension cords daily for structural integrity, ground continuity, and damaged insulation • Cover or elevate electric wire or flexible cord passing through work areas to protect from damage • Keep all plugs and receptacles out of water • Use approved water-proof, weather-proof type if exposure to moisture is likely • Inspect all electrical power circuits prior to commencing work • Follow Lockout/Tagout procedure HS315 – Control of Hazardous Energy Sources		

APPENDIX C16 ACTIVITY HAZARD ANALYSIS FOR Visual Site Inspection and Surveys				
Task Breakdown	**Potential Hazards**	**Critical Safety Practices**	**Personal Protective Clothing and Equipment**	**Monitoring Devices**
Visual site inspections and surveys.	Poor planning.	• Complete Job Safety Analysis for each task, as specified in Shaw Environmental & Infrastructure, Inc. Procedure No. HS045, "Job Safety Analysis (JSA)." Use Hazard Assessment Resolution Program frequently – for each task to be completed.		
	Heavy lifting, strains, and sprains.	• No individual employee is permitted to lift any object that weighs over 60 pounds. Proper lifting techniques shall be used. Multiple employees or the use of mechanical lifting devices are required for lifting objects over the 60-pound limit.		
	Struck-by/against.	• Wear reflective warning vests when exposed to vehicular traffic. Personnel working on or near roads and only remain on road long enough to complete work. Personnel walking along roadway shall stay off roadway as far as possible and walk on the side facing traffic.	Warning vests, Hard hat, Safety glasses, and Steel toe work boots	
	Munitions and Explosives of Concern (MEC) / Unexploded Ordnance (UXO).	Personnel shall attend site-specific MEC Awareness (and recognition) Training prior to the commencement of any site activities.	Warning vests, Hard hat, Safety glasses, and steel toe work boots	

APPENDIX C16 ACTIVITY HAZARD ANALYSIS FOR Visual Site Inspection and Surveys				
Task Breakdown	**Potential Hazards**	**Critical Safety Practices**	**Personal Protective Clothing and Equipment**	**Monitoring Devices**
Visual site inspections and surveys (continued)	Hand injuries	• Review equipment adjustment procedures, identify pinch points • Isolate/block pinch points to limit motion when inserting pins, fasteners, closing tackles	Leather gloves	
	Burns associated with loading/unloading equipment on trucks	• Identify heavy objects for loading that may have hot surfaces • Allow objects to cool or cover hot surfaces with non-combustible material to protect workers from burns		
	Insect bites/West Nile virus.	• Wear PPE and tape joints to keep insects away from the skin. Use protective insect repellents containing N,N-diethyl-m-toluamide, such as, Deep Woods OFF, 3M Ultrathon, or equivalent and clothing insecticide preparations containing permethrins (Repel Permanone or equivalent) to prevent insect bites. Check limbs/body for insects/insect bites before showering. Notify Site Safety and Health Officer (SSHO) of flu-like symptoms.		
	Contact dermatitis and poison ivy.	• Check around work areas to identify if poison ivy is present. Wear long-sleeve shirts/trousers or Tyvek® coveralls to avoid skin contact with plants or other skin irritants. Learn to identify poisonous plants. • Avoid unnecessary clearing of plant/vegetation areas. • Cover vegetation with plastic (visqueen) where sampling position raises exposure potential. Apply protective cream / lotion to exposed skin to prevent poison ivy or similar reactions. Identify workers known to contract poison ivy.		

APPENDIX C16 ACTIVITY HAZARD ANALYSIS FOR Visual Site Inspection and Surveys				
Task Breakdown	**Potential Hazards**	**Critical Safety Practices**	**Personal Protective Clothing and Equipment**	**Monitoring Devices**
	Severe weather.	• The SSHO will monitor weather conditions each day in order to plan and prepare for hazardous conditions. The SSHO will identify a suitable tornado shelter at each work location. Work activities will be suspended prior to weather conditions becoming hazardous so that workers have ample time to seek shelter. Upon seeing lightning or hearing thunder, outdoor activities shall be suspended and personnel shall be evacuated to safe areas (inside vehicles, buildings, or tornado shelters as appropriate). Follow procedures outlined in the APP.		
	Hazardous atmospheres	• Personnel shall immediately notify the SSHO if odors are detected.		
	Ladders	• Inspect ladders before use for mud buildup on treads • Clean mud from boots before climbing on ladders • Follow the three point of contact rule		
	High/Low Ambient Temperature	• Monitor for Heat Stress in accordance with Health and Safety Procedures HS400, HS401 • Provide fluids to prevent worker dehydration		
	Fire	• Smoking shall be permitted in designated areas. Vehicles shall not be parked in tall dry grass. • Engines shall be shut off before refueling. • 2A 20-B:C fire extinguisher shall be available when refueling. • Smoking shall not be permitted near fueling areas. Gasoline shall be stored in safety cans with flash arrestors and spring-loaded vents.		

EQUIPMENT REQUIRED	INSPECTION REQUIREMENTS	TRAINING REQUIREMENTS
Survey instrumentation Fire extinguishers Emergency eyewash First aid kit Deep-Woods Off or Ultrathon Repel Permanone Drinking water Weather radio or AM/FM radio	Daily site safety inspection (SSHO) – James Vigerust Daily site safety inspection (QCO) – Check Known Allergies Questionnaire Housekeeping (daily) Fire extinguisher (weekly) Vehicle inspection daily Equipment and tools inspection daily and before use Survey areas for poisonous plants, insects, and animals Check body for ticks Verify tornado shelter available • Monitor approaching storms	Competent Person (CP) / Qualified Person (QP): James Vigerust – CP/SSHO James Vigerust – QP/First Aid and CPR Training Requirements: Site safety orientation HAZWOPER 40-Hour MEC Awareness Lifting/back safety Fire extinguisher use Emergency procedures Biological hazard identification and control Tornado shelter locations National Lightning Safety Institute Lightning Safety procedures

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Appendix D
Safety & Health Forms

AIR MONITORING DATA RECORD

Location: _____ **Project No.:** _____ **Date:** _____

Instrument: Mfg/Model/Serial No.: _____ **Calibrated by:** _____

COMBUSTIBLE GAS/OXYGEN/CARBON MONOXIDE METER CALIBRATION

Time	Battery Charged (Y/N)	Zero Checked (Y/N)			Calibration Standard	Calibration Standard			Actual Meter Reading			Ambient Air Re-Zero Check		
		LEL (0%)	O_2 (20.8%)	CO (0 ppm)		% LEL	% O_2	ppm CO	% LEL	% O_2	ppm CO	LEL (0%)	O_2 (20.8%)	CO (0 ppm)

PHOTOIONIZATION DETECTER/FLAME IONIZATION DETECTER CALIBRATION

Time	Battery Charged (Y/N)	Calibration Standard	Calibration Standard Concentration (ppm)	Expected Meter Reading (ppm)	Actual Meter Reading (ppm)	Comments

REAL TIME AIR MONITORING RESULTS

Date	Instrument Operator	Time	Monitoring Results		Action Level Exceeded (Y or N)	Location/Activity	Corrective Actions
			Compound	Concentration			

Comments: _____

Calibration Q.C.: Calibrations are to be within 5% for validity.
Abbreviations: CO = carbon monoxide, %LEL = percent of the lower explosive limit, O_2 = oxygen

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AIR SAMPLING DATA RECORD

SAMPLING INFORMATION

Date of Sampling		Project Name	
Type of Sample Personal/Area		Project Number	
Employee Sampled		Operation/Task Monitored	
Employee Number			
Employee Social Security Number		Location of Air Sampling	
Employee Job Title		Person Performing Sampling/Employee #	

SAMPLING & PUMP CALIBRATION DATA

PROJECT SPECIFIC SAMPLE IDENTIFICATION NUMBER:

Air Pump Manufacturer/ Model/Number:								Ambient Air Temperature:		
Pre-sampling Calibration Flow Rate (mL/min)				Post-sampling Calibration Flow Rate (mL/min)				Final Sample Flow Rate (mL/min)		
1st flow rate	2nd flow rate	3rd flow rate	Pre-average flow rate	1st flow rate	2nd flow rate	3rd flow rate	Post-average flow rate	Pre-average flow rate	Post-average flow rate	Final average flow rate

Pump start time:	Pump stop time:	Total pump run-time (minutes):	Final average flow rate (mL/min):	Total sample volume (liters):

Analytes sampled for:	Analyte #1: _____ NIOSH Method # _____	Analyte #2: _____ NIOSH Method # _____	Analyte #3: _____ NIOSH Method # _____
Date Sample Shipped to Laboratory:	Remarks:		

HAZARD CONTROL MEASURES (check all that apply):

Respirator	☐ None	☐ Half-face APR	☐ Full-face APR	☐ PAPR	☐ Supplied-air (specify):	
Coveralls	☐ None	☐ Cotton	☐ Nomex	☐ Tyvek®	☐ Poly-coated Tyvek®	☐ Saranex
Gloves	☐ None	☐ Cotton	☐ Leather	☐ Sample	☐ Nitrile	☐ Other:
Boots	☐ Work	☐ Tyvek®	☐ Latex	☐ PVC	☐ Neoprene	☐ Other:
Engineering	☐ None	☐ Negative Air	☐ Ventilation		☐ Other:	

LABORATORY INFORMATION:

Laboratory Used (Name/Address/Telephone/Contact):

ANALYTICAL RESULTS:

Analyte #1	Analyte #2	Analyte #3

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Project Location: _____
Client: _____
Project Number: _____

OPTIONAL ALLERGY/SENSITIVITY QUESTIONNAIRE

This information is requested so that you may be assigned work duties, which minimize your exposure to elements that may cause you to have a threatening medical reaction and will be used only in case of an emergency. Your voluntary cooperation is appreciated so that we can operate a safe working environment.

Name: _____ Contractor Name: _____

Date: _____ Contract/Project No.: _____

Are you allergic/sensitive to bee stings?	Yes ☐	No ☐
If yes, do you carry a bee sting kit? _____		
Are you allergic/sensitive to other insect bites?	Yes ☐	No ☐
Are you allergic/sensitive to animal/reptile bites?	Yes ☐	No ☐
Are you allergic/sensitive to any plant materials?	Yes ☐	No ☐
Are you allergic/sensitive to any cloths or fibers?	Yes ☐	No ☐
Are you allergic/sensitive to latex?	Yes ☐	No ☐
Are you allergic/sensitive to any powders?	Yes ☐	No ☐
Are you allergic/sensitive to any medications?	Yes ☐	No ☐
If yes, which medications? _____		
Are you allergic/sensitive to any metals?	Yes ☐	No ☐
Are you allergic/sensitive to pollens?	Yes ☐	No ☐
Are you allergic/sensitive to dusts	Yes ☐	No ☐
Are you allergic/sensitive to foods (i.e., peanuts, etc.)	Yes ☐	No ☐
Are you aware of any known chemical or petroleum sensitivities?	Yes ☐	No ☐
Are you allergic/sensitive to smoke?	Yes ☐	No ☐
Are you allergic/sensitive to smog/ozone?	Yes ☐	No ☐
Have you ever had an asthmatic attack?	Yes ☐	No ☐
Have you ever experienced exercise induced asthma?	Yes ☐	No ☐

Please comment on any of the above questions or provide special instructions that we should provide to a physician in the case of an emergency.

_____

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Project Location: _____
Client: _____
Project Number: _____

AMBIENT AIR TEMPERATURE LOG

Thermometer Location: _____ Date: _____

Time (hours)	Temp. (°F)	Time (hours)	Temp. (°F)
0000 (Midnight)	_____	1200 (Noon)	_____
0100	_____	1300	_____
0200	_____	1400	_____
0300	_____	1500	_____
0400	_____	1600	_____
0500	_____	1700	_____
0600	_____	1800	_____
0700	_____	1900	_____
0800	_____	2000	_____
0900	_____	2100	_____
1000	_____	2200	_____
1100	_____	2300	_____

Comments: _____

_____

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AIR COMPRESSOR SAFETY INSPECTION CHECKLIST

Project Name: _____

Project Number: _____

Equipment I.D. No.: _____ Equipment Name: _____

Week of: _____

Portable Air Compressors (29 CFR 1910.94(a)(6), EM 385-1-1 Section 20 (B))	**Yes**	**No**	**N/A**
1. Has inspection and performance test been completed?			
2. Have air tanks been tested and certified?			
3. Are records of inspection and test available?			
4. Does discharge from any valve create a hazard?			
5. Is the air pressure gauge in working order?			
6. Is the tank equipped with a safety relief valve?			
7. Is equipment that is subject to whipping or rotation if released provided with an automatic shut-off?			
8. Are safety lashings provided at connections to tools and hose and all quick make-up connections of hose?			
9. Will the compressor automatically shut off before discharge pressure exceeds the maximum working pressure?			
10. Is the compressor located so that flammable, toxic vapors, gases, or dust will not be drawn into the intakes?			
11.No valve shall be installed on the air intake pipe of a compressor with an atmospheric intake?			
12. Is the discharge piping from the compressor to the receiver as large as the discharge opening on the compressor?			
13. Is there a convenient stop valve between the air tank and each stationary piece of equipment?			
14. Are air receivers properly installed and in the proper locations?			
15. Does the air tank have an accessible drain valve?			
Remarks:			

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COLORIMETRIC DETECTOR TUBE LOG

Project Name: _____ Project Number: _____

Date: _____ Sampled by: _____

Pump Type, Mfg/Model/Serial Number: _____

Time	Detector Tube Type/ (Expiration Date)	Measurable Range	Pump Leak Test (Y/N)	Pump Strokes	Measured Concentration	Comments

This page intentionally left blank.

ENTRY PERMIT FOR
PERMIT-REQUIRED CONFINED SPACE (PRCS)

Project/Location _____ Project No._____

Location of PRCS _____ Identity of PRCS _____

Describe Hazards of PRCS (Chemical and Physical) _____

_____

Purpose This Permit Authorized _____

CHECKLIST	YES	DOES NOT APPLY
All lines leading to and from the space have been blinded or disconnected.		
Electrical service disconnected or locked out.		
All grounding and bonding cables in place.		
All lighting, fittings, power equipment, and extension cords are rated for anticipated atmosphere.		
Ground Fault Circuit Interrupter (GFCI) checked and functioning.		
All ignition sources have been isolated.		
All respiratory equipment and alarms checked and functional.		
All safety harnesses and lifelines checked.		
All required PPE checked and in use.		
Have all entrants, attendants, and entry supervisors received appropriate training?		
Attendant(s) trained in non-entry rescue procedures.		
Rescue service has been identified and will be available for entry rescue.		
Has rescue service passed evaluation?		
Appropriate rescue equipment available and checked.		
Mechanical ventilation system in use and effective.		
All tests have been completed and indicate that entrance requirements have been met.		
Appropriate warning signs have been posted and unauthorized personnel have been excluded from the PRCS.		
IF ANSWER TO ANY OF THE ABOVE QUESTIONS IS *NO*, ENTRY IS NOT PERMITTED.		

PERSONAL PROTECTIVE EQUIPMENT (Circle)

EYE/FACE
Chemical Goggles Face Shield Safety Glasses

EXTREMITIES
Hard Hat Hoods Boot Covers

Gloves (Material _____)

Boots (Material _____)

RESPIRATORY
SCBA Supplied Air Egress System

Air Purifying (Cartridge _____)

Powered Air Purifying (Cartridge _____)

OTHER
Hearing Protection Harness & Lifeline
Chest or Parachute

RESCUE EQUIPMENT
Mechanical Extraction Device
First Aid Kit SCBA
Other (Specify)_____

COMMUNICATION METHOD
Lifeline "Tug" Signals
Air-powered Horn Signals
Other_____

OTHER PERMITS ISSUED FOR WORK IN PRCS: _____

OTHER HAZARD CONTROL PROCEDURES OR INSTRUCTIONS: _____

RESCUE PROCEDURES: _____

TEST DATA
OXYGEN, FLAMMABILITY, AND TOXIC CONTAMINANT(S)

Time	Percent Oxygen	Percent LEL	_____ (Other)	_____ (Other)	_____ (Other)	_____ (Other)	_____ (Other)	Tester's Initials	Comments

TESTER'S SIGNATURE:

AUTHORIZED ENTRANTS

_____ _____
_____ _____
_____ _____
_____ _____
_____ _____
_____ _____
_____ _____

AUTHORIZED ATTENDANT(S)

_____
_____
_____

RESCUE PERSONNEL

_____
_____
_____

Diagram the confined space indicate location of manways and ventilators. Indicate location(s) where tests conducted.

) (Man-way
∞ Ventilator
X Test Location

ACCEPTABLE ENTRY CONDITIONS

1. Entry Permit completely filled out
2. Oxygen between 19.5 and 23.5%
3. Combustible gases below 10% LEL
4. Permissible Levels of toxic gases (list):
5. Other: _____

PRCS SAFE FOR ENTRY _____

Date/Time _____ / _____

Name of Entry Supervisor _____ Signature _____

Current Entry Supervisor (if different) _____

Entry Permit Expires (no longer than 1 shift): Date/Time _____ / _____

ENTRY PERMIT CANCELED

Date/Time _____ / _____ Signature _____

Reason (√) ☐ Work Complete ☐ Authorized Conditions Not Met ☐ Incident

PROBLEMS DURING ENTRY AND RESOLUTION. Please Describe: _____

RECLASSIFICATION TO NON-PERMIT-REQUIRED CONFINED SPACE

Describe hazard removal methods, without use of ventilation. _____

TESTING VERIFICATION SHOWN AT TIME _____ ON TEST DATA CHART ABOVE.

DATE/TIME / ENTRY SUPERVISOR SIGNATURE

REVIEWED BY:

_____ _____

Health and Safety Representative Signature Date

Project Location: _____
Client: _____
Project Number: _____

DAILY SAFETY INSPECTION REPORT

Inspector name: _____ Date: _____

Supervisor: _____ SSHO: _____

General Project Activities Description: _____

_____

_____

Safety conditions and/or deficiencies:	Corrective actions to be completed:

Note: The status of corrective actions is to be tracked through closure on the Safety and Occupational Health Deficiency Tracking Log.

Signature: _____ Signature: _____
(Supervisor) (Safety Representative)

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Direct-Push Rig Inspection Checklist

Project Name/Number: _____
Make/Model Number: _____
Equipment Number: _____
Hours/Mileage: _____

Rig clean and free of soils, oils, and other debris.		Tracks in good condition.	
All hydraulic fittings and hoses free of damage, tightened, and not leaking.		Tires fully inflated and in good condition.	
Rig controls clearly labeled and in working condition.		Back-up alarm working.	
Rig Kill Switch in working order.		First Aid Kit accessible and stocked.	
All of the Rig's connections tightened and leak-free.		Fire Extinguisher accessible and fully charged.	
Parking brake functions properly.		Eye Wash full and accessible.	
Steering controls in working order and clear of obstacles.		Hearing protection available and is being used during hammering.	
Copy of the manual for all drilling equipment available.		All overhead and underground hazards identified.	

√ = OK
N/A = Not Applicable
X = Defective

These items are to be checked each shift before operating this piece of equipment.
Report all items requiring repair to supervisor.

Notes:
Operator/Inspector: Date:

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Drilling Equipment and Operations Inspection Daily	Contractor:
Drill Rig Manufacturer/Model:	Hours/Mileage:
Inspection Completed By:	Equipment No.:
Project Number:	Date:

Answer each question by checking the appropriate column (Yes, No, or NA). If "no" is checked, an explanation should be provided in the space available. This checklist is to be completed daily by the drilling contractor and reviewed by the Site Safety and Health Officer (SSHO).

Daily Drill Rig Inspection	Yes	No	NA
1. Are applicable drilling materials/supplies Material Safety Data Sheets available at the site and attached to the AHA?	☐	☐	☐
Explanation: _____			
2. Are daily safety meetings attended by the crew and are JSAs being completed daily by the crew?	☐	☐	☐
Explanation: _____			
3. Are all warning and control labels on drill rig clean and legible?	☐	☐	☐
Explanation: _____			
4. Are both "kill switches" installed by the manufacturer in operable condition and all workers at the drill site familiar with their location and how to activate them?	☐	☐	☐
Explanation: _____			
5. Are drive shafts, belts, chain drives, and universal joints guarded to prevent accidental insertion of hand, fingers, or tools?	☐	☐	☐
Explanation: _____			
6. Are all hydraulic fittings and hoses free of damage, tightened, and not leaking (including panel)?	☐	☐	☐
Explanation: _____			
7. Do high-pressure hoses have a safety (chain, cable, or strap) at each end of the hose connection to prevent whipping in the event of a failure (safety lashing)?	☐	☐	☐
Explanation: _____			
8. Is the rig clean and free of soils, oils, and other debris?	☐	☐	☐
Explanation: _____			
9. Is the rig free of any miscellaneous leaks?	☐	☐	☐
Explanation: _____			
10. Do controls operate smoothly; cables and lifting devices do not operate erratically to overcome resistance?	☐	☐	☐
Explanation: _____			
11. Do controls have freedom of movement, not blocked, or locked in an action position?	☐	☐	☐
Explanation: _____			
12. Are all safety devices not bypassed or neutralized?	☐	☐	☐
Explanation: _____			
13. Are all cables free of kinks, frayed wires, "bird cages," and worn or missing sections?	☐	☐	☐

Explanation: _____

Daily Drill Rig Inspection (continued)	Yes	No	NA
14. Are wire rope, sockets, splices, thimbles, and clips adequate and properly applied?	☐	☐	☐
Explanation: _____			
15. Are cables terminated on the working end with a proper eye splice, either swaged coupling or using cable clamps?	☐	☐	☐
Explanation: _____			
16. Are cable clamps installed with the saddle on the live or load side? Clamps should not be alternated and should be of the correct size and number for the cable size to which it is installed. Are clamps complete with no missing parts?	☐	☐	☐
Explanation: _____			
17. Are hooks, safety latches, shackles, rings, etc., in good condition?	☐	☐	☐
Explanation: _____			
18. Are safety latches functional and completely span the entire throat of the hook and have a positive action to close the throat except when manually displaced for connecting or disconnecting a load?	☐	☐	☐
Explanation: _____			
19. Are wedge sockets and hoisting plugs in good condition and properly installed?	☐	☐	☐
Explanation: _____			
20. Have all personnel entered their names on the site log today?	☐	☐	☐
Explanation: _____			
21. Is electronic communication effective for the field crews and checked daily?	☐	☐	☐
Explanation: _____			
22. Has the exclusion zone been set-up with a radius equal to or greater than the boom height?	☐	☐	☐
Explanation: _____			
23. Is a 15-minute supply of fresh water available at the work site (eyewash station)?	☐	☐	☐
Explanation: _____			
24. Is an emergency first aid kit immediately available at the work site?	☐	☐	☐
Explanation: _____			
25. Is potable water available to employees?	☐	☐	☐
Explanation: _____			
26. Are 3M Ultrathon or equivalent (DEET preparation) and Repel Permanone available?	☐	☐	☐
Explanation: _____			
27. Are two 2-A:40-B:C fire extinguishers in good working order (i.e., charged, inspected, and serviced up to date) and present at the work site?	☐	☐	☐
Explanation: _____			
28. Are employees on or near drilling equipment complying with the requirement to wear hearing protection?	☐	☐	☐
Explanation: _____			

Drilling Equipment and Operations Inspection Daily	Contractor:
Project Number:	Date:

Daily Drill Rig Inspection (continued)	Yes	No	NA
29. Are personnel being monitored for temperature stress?	☐	☐	☐
Explanation: _____			
30. Are personnel prohibited from drinking, chewing, smoking, taking medications, or other hand-to-mouth contact while in a regulated exclusion zone?	☐	☐	☐
Explanation: _____			
31. Is proper fall protection provided and used for personnel working over 6 feet in height?	☐	☐	☐
Explanation: _____			
32. Are outriggers extended prior to and whenever the mast is raised off its cradle? Hydraulic outriggers must maintain pressure to continuously support and stabilize the drill rig even when unattended.	☐	☐	☐
Explanation: _____			
33. Are outriggers properly supported on the ground surface to prevent settling into the soil?	☐	☐	☐
Explanation: _____			
34. Are slings, chokers, and lifting devices inspected before using and in proper working order? Are rated capacities legible for the type of configuration to be used? Are damaged units removed from service and properly tagged? Is a competent rigger available for all rigging?	☐	☐	☐
Explanation: _____			
35. Are shackles and clevises in proper working order and pins and screws fully inserted before placing under load?	☐	☐	☐
Explanation: _____			
36. Are hoists being used only for their designed intent, are not loaded beyond their rated capacity, and are steps being taken to prevent two-blocking of hoists?	☐	☐	☐
Explanation: _____			
37. Are the rig's manufacturer's procedures being followed if rope becomes caught in, or objects get pulled into, a cathead?	☐	☐	☐
Explanation: _____			
38. Are drill rods not being run or rotated through rod slipping devices? No more than 1 foot (0.3 meter) of drill rod column shall be hoisted above the top of the drill mast. Drill rod tool joints shall not be made up, tightened, or loosened while the rod column is supported by a rod-slipping device.	☐	☐	☐
Explanation: _____			
39. Is there use of side-feed swivel collars on drill rods restricted to those collars that are retained by either a manufacturer-designed stabilizer or a stabilizer approved by a Professional Engineer?	☐	☐	☐
Explanation: _____			
40. Are rotating parts of the drill string, rod, and augers free of sharp projections or hooks that could entrap clothing of foreign objects?	☐	☐	☐
Explanation: _____			

Daily Drill Rig Inspection (continued)	Yes	No	NA
41. Is the work area around the drill rig kept clear of trip hazards?	☐	☐	☐
Explanation: _____			
42. Are walking surfaces kept free of slippery materials?	☐	☐	☐
Explanation: _____			
43. Are open excavations and mud or circulation pit barricaded or fenced? Is the discharge of drilling fluids being channeled away from the work area to prevent the ponding of water?	☐	☐	☐
Explanation: _____			
44. Does the operator verbally alert employees and visually verify employees are clear from dangerous parts of equipment before starting or engaging equipment?	☐	☐	☐
Explanation: _____			
45. Are personnel not wearing loose-fitting clothing, jewelry, or other items that could get caught in moving machinery?	☐	☐	☐
Explanation: _____			
46. Are augers being cleaned only when the rotating mechanism is in neutral and the auger stopped? Are long-handled shovels only being used to remove cutting from the auger?	☐	☐	☐
Explanation: _____			
47. Are open boreholes being capped and flagged?	☐	☐	☐
Explanation: _____			
48. Is a daily inspection of the drilling area being performed and documented by the driller?	☐	☐	☐
Explanation: _____			
49. Is the air hose free of damage, tightened, and not leaking?	☐	☐	☐
Explanation: _____			
Supplemental Inspection Items (from manufacturer's recommendations)			
50. Are hydraulic fluid levels OK according to manufacturer's recommendations?	☐	☐	☐
Explanation: _____			
51. Are motor oil levels OK according to manufacturer's recommendations?	☐	☐	☐
Explanation: _____			
52. Are coolant levels OK according to manufacturer's recommendations?	☐	☐	☐
Explanation: _____			
53. Are air cleaner systems OK according to manufacturer's recommendations?	☐	☐	☐
Explanation: _____			
54. Are belt and pulley systems OK according to manufacturer's recommendations?	☐	☐	☐
Explanation: _____			
55. Are all guards in place and adjusted properly?	☐	☐	☐
Explanation: _____			
56. Is tub oil level OK (if equipped)?	☐	☐	☐
Explanation: _____			

57. Are hydraulic stabilizer pads OK? ☐ ☐ ☐
Explanation: _____

58. Are welder and generator oil levels OK according to manufacturer's recommendations? ☐ ☐ ☐
Explanation: _____

59. Are fuel levels adequate to run a complete shift? ☐ ☐ ☐
Explanation: _____

60. Are pull down cables inspected and in good condition? ☐ ☐ ☐
Explanation: _____

61. Are pull down cables properly adjusted? ☐ ☐ ☐
Explanation: _____

62. Are pull down cables properly lubricated? ☐ ☐ ☐
Explanation: _____

63.
Explanation: _____

64.
Explanation: _____

65.
Explanation: _____

66.
Explanation: _____

67.
Explanation: _____

68.
Explanation: _____

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The Foundation of Our Targeting Zero Environment Mission

Shaw's E&I Group will achieve its goal of "Targeting Zero" accidents and injuries while working as a team to provide a workplace that is free from recognized hazards.

Vision

We will be recognized and respected as the leading company in our industry and as the standard by which our competitors are benchmarked by providing the leadership, guidance and operations excellence necessary to identify and control all recognized hazards in the workplace.

Values

Leadership – provide the necessary tools to identify and control all hazards in the workplace.
Commitment – we will never be satisfied that we have done enough.
Pride – all employees will own the safety process.
Dedication – to strive for continual improvement.
Appreciation – to embrace the safety of our employees.

Operating Principles

- Safety is a core value.
- We plan work to ensure it is done safely.
- We are a safety team.
- We follow good safety practices in all work that we do.
- We will actively demonstrate our commitment to safety.
- All accidents are preventable.
- We will not perform any job that cannot be performed safely.
- We will not compromise safety in the interest of time or comfort.
- We will constantly review our performance to ensure continuous improvement.
- We will encourage employees to commit to safety as a lifestyle and carry the culture of "Targeting Zero" home with them.

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Shaw® Shaw E & I

Medical Forms
Authorization for Treatment of Occupational Injury/Illness

Employee Name: _____

Social Security #: _____ Injury: ☐ Illness: ☐

Job Title: _____ Incident Date: _____

Project/Location: _____ Location of Accident/Exposure: _____

Telephone Number: _____ H&S Representative: _____

Illness/Injury Description: _____

TO TREATING PHYSICIAN:

In the case of occupational injury/illness, please examine the employee and render necessary conservative treatment directly related to the occupational injury/illness.

Light Duty Work: It is the policy of our company to provide work assignments, whenever possible, for employees with physical activity restrictions resulting from an occupational injury/illness. If the employee will be subject to a restriction, please contact **CORE Health Networks** before releasing the employee, so that a light duty assignment may be arranged.

Medically Unfit to Return to Work: It is the policy of our company to assist employees unable to return to work, due to an injury/illness, in obtaining needed medical care and other available benefits. Medical findings are also used to help evaluate unsafe conditions that may have led to the incident. Please help us assist our employees by contacting **CORE Health Networks** with your findings as soon as possible, preferably before the employee leaves your office, but not later than the close of business on the day of initial treatment.

CORE Health Networks:	Telephone: 1-877-347-7429	Fax: (225) 295-4846
Please Send Reports To	**CORE Health Networks *and***	**The Shaw Group, Inc. Corporate Claims Department**
Both of the Following:	12091 Bricksome Ave Suite B Baton Rouge, LA 70816	4171 Essen Lane Baton Rouge, LA 70809

Please Send Bills To: **The Shaw Group, Inc. Corporate Claims Department**
4171 Essen Lane
Baton Rouge, LA 70809

DOCTOR, Please provide:

Medical Diagnosis: _____

Treatment Provided: _____

Recommended Work Limitation/Restriction: _____

Return Visit Needed: No ☐ Yes ☐ Date if Yes _____ First Aid Only ☐

Physician Name: _____ Physician Telephone: _____

Physician Signature: _____ Date: _____

You must call CORE Health Networks for all occupational injuries/illnesses requiring outside medical treatment: 1-877-347-7429.

Fax completed form to CORE Health Networks (225) 295-4846.

Send Bills to Shaw Corporate Claims Department

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Shaw® Shaw E & I

Injured Employee Statement

MUST BE COMPLETED WITHIN 24 HOURS OF THE INCIDENT

This form should be completed by the injured employee involved in the incident. Describe only the facts for which you have personal knowledge. If you have no knowledge of a particular question, write "no knowledge."

Company: _____

Exact Location of Incident/Accident: _____

Name of Injured Employee: _____

Date of Incident/Accident: _____ Time _____ am pm

Date of this Statement: _____ Time _____ am pm

Time your shift begins? _____ am pm Ends? _____ am pm

Name of Known Witnesses:

Name: _____

Name: _____

Name: _____

Name: _____

Your Immediate Supervisor's Name: _____

If not employed by Shaw E&I, enter name of company and phone number: _____

Have you had prior injury similar to this injury? _____

Was it while you were at work? _____

What date did the prior injury occur? _____

Stating only factual information, describe in detail what happened and include any applicable events leading to the Incident/Accident:

_____

_____

_____

_____

I certify that, to the best of my knowledge, all of the above information is complete, accurate and factual. I acknowledge that the intentional falsification or altering of facts or making misleading statements may be grounds for disciplinary action.

_____ _____

Signature/Date Print Name

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Shaw® Shaw E & I

Medical Forms
Authorization for Release of Protected Medical Information

Printed Name: _____ Date of Birth: _____

Address: _____

Social Security #: _____ Home Telephone: _____

Authority to Release Protected Health Information
I hereby authorize the release of medical information, identified in this authorization form, and provide such information to:

CORE Health Networks
12091 Bricksome Ave Suite B
Baton Rouge, LA 70816
Phone: (877) 347-7429
Fax: (225) 295-4846

AND

The Shaw Group Inc.
4171 Essen Lane
Baton Rouge, Louisiana 70809
Phone: 225-932-2500
Fax: 225-932-2636

The information to be released includes the following:

Complete health record	Discharge summary	Progress notes
History and physical exam	Consultation reports	X-ray films / images
Laboratory test results	X-ray & Image reports	Itemized bill
Diagnosis & treatment codes	Complete billing record	

Other (specify) _____

Purpose of the Requested Disclosure of Protected Health Information

I am authorizing the release of my protected health information.

Drug and/or Alcohol Abuse, and/or Psychiatric, and/or HIV/AIDS Records Release

I understand if my medical or billing record contains information in reference to, psychiatric care, sexually transmitted disease, hepatitis B or C testing, previous drug and/or alcohol abuse and/or other sensitive information, I agree to its release.

Check One: ☐ **Yes** ☐ **No**

I understand if my medical or billing record contains information in reference to HIV/AIDS (Human Immunodeficiency Virus/Acquired Immunodeficiency Syndrome) testing and/or treatment I agree to its release.

Check One: ☐ **Yes** ☐ **No**

Right to Revoke Authorization

Except to the extent that action has already been taken in reliance on this authorization, the authorization may be revoked at any time by submitting a written notice to ***The Corporate Claims Dept.*** **at** ***The Shaw Group Inc., 4171 Essen Lane, Baton Rouge, Louisiana, 70809***. Unless revoked, this authorization will expire at which time completion of treatment for the injury or illness has been accomplished.

Re-disclosure

I understand the information disclosed by this authorization may be subject to re-disclosure by the recipient and no longer be protected by the Health Insurance Portability and Accountability Act of 1996.

Signature of Patient or Personal Representative Who May Request Disclosure

I understand that I do not have to sign this authorization. However, if health care services are being provided to me for the purpose of providing information to a third-party (*e.g.,* fitness-for-work test), I understand that services may be denied if I do not authorize the release of information related to such health care services to the third-party. I can inspect or copy the protected health information to be used or disclosed. **I hereby release and discharge.** ***The Shaw Group Inc.*** **of any liability and the undersigned will hold** ***The Shaw Group Inc.*** **harmless for complying with this Authorization.**

Signature: _____ Date: _____

Description of relationship if not patient: _____

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Shaw® Shaw E & I

Medical Forms
Return-to-Work Examination Form

Exam Date: _____ / _____ / _____ **Employee Name:** _____

Birth Date: _____ / _____ / _____ **Social Security #:** _____ - _____ - _____

Job Title: _____ **Sex:** ☐ Male ☐ Female

Examining Provider: **Please complete this form and fax to CORE Health Networks at (225) 295-4846. Please contact CORE Health Networks at (877) 347-7429 to report status of employee post-treatment.**

Diagnosis: _____

Treatment Plan: _____

Medications: _____

Physical Therapy: _____

Other: _____

☐ May return to full duty work effective ___/___/

☐ May return to limited duty from ___/___/___ to ___/___/

☐ Unable to return to work from ___/___/___ to ___/___/

WORK LIMITATIONS:

☐ Restricted lifting/pushing/pulling: maximum weight in lbs: _____ (Company limits all lifting to ≤ 60 lbs).

☐ Work only with right/left hand.

☐ Restricted repetitive motion right/left hand.

☐ Sitting job only.

☐ Restricted operation of moving equipment.

☐ Other: _____

FOLLOW-UP PLAN:

☐ Release from care.

☐ Schedule for follow-up appointment on ___/___/___.

Time _____ AM/PM

☐ Referral to _____

Appointment date ___/___/___ Time _____ AM/PM

Comments: _____

_____ _____ _____

Examiner's Name (*print)* Examiner's Signature Date

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Shaw® Shaw E & I

Supervisor's Employee Injury/Illness Report Form

EMPLOYEE INFORMATION		
Employees Social Security Number	Claim Number	
Employee's Name:	Home Phone Number:	
Home Address:		Business Line Code:
Male ☐ Female ☐	Date of Birth:	Hire Date:
Dependents:	Dependents under 18:	Marital Status:
Occupation:		Department Name:
State Hired:	Currently Weekly Wage:	Hourly Wage:
Hours/Days Worked Per Week:	Days Per Week:	Hours Worked Per Day:
Employment Status:	Employee Report No.: NA	Employee ID No.: NA
Salaried Continued:	Paid for Date of Injury:	Education No. of Years:
Ever injured on the Job:	Supervisors Name and Phone:	

EMPLOYER INFORMATION	
Employer Name: **The Shaw Group, Inc.**	Work Location:
Project Name:	Project Number:
Contract Name:	Contract Number:
Contact Name: **Troy Allen**	Telephone Number: **1-800-747-3322**
Employer SIC:	Employer Location Code:
Employer FED ID:	Employer Code: NA
Nature of Business:	
Policy Number:	

ACCIDENT INFORMATION	
Date and Time of Injury:	
Did the Accident Occur at the Work Location	If no, where did the accident occur? NA
Accident Address:	
Nature of Accident:	
Give a Full Description of the Accident (Be as factually complete as possible):	
Are Other WC Claims Involved" No	Date and Time Reported to Employer:
Person Reported To:	

WITNESS INFORMATION
Were There Any Witnesses?
If Yes, List Names and How to Contact Them:

INJURY INFORMATION	
Which Part of the Body Was Injured? (*e.g.*, Head, Neck, Arm, Leg)	
What was the Nature of the Injury? (*e.g.*, Fracture, Sprain, Laceration)	
Part of the Body Location? (*e.g.*, Left, Right, Upper, Lower)	
Injury Description:	
Source of Injury:	Is Employee Hospitalized?
Lost Time:	If Yes, What was First Full Day Out:
Date Last Day Worked:	Date Disability Began: NA
Date Returned to Work:	Estimated Return Date: NA

MEDICAL INFORMATION		
ER Treated & Released:	Hospitalized:	Phy./Clinic:
Hospital – Name, Address, Phone Number:	Was Employee Transported via Ambulance: Yes No	
NA		
Clinic – Name, Address, Phone Number:		

ADDITIONAL COMMENTS AND INFORMATION

REPORT PREPARED BY	
Name:	Title:
Signature:	Phone Number:

REPORT ALL WORKER'S COMPENSATION INJURIES TO SHAW CLAIMS DEPARTMENT
FAX REPORT WITHIN 24 HOURS OF INCIDENT TO **225-932-2636**.
Phone all injuries/illnesses to **Shaw Notification Hotline/Helpdesk 1-866-299-3445**

Shaw® Shaw E & I

Incident Investigation Report

*** Must Be Completed Within 72 HOURS & Relevant Support Documentation Must Be Attached/ Submitted***

Investigation Date _____ Date of Incident _____

Employee Name _____ Supervisor Name _____

Project Number _____ Project Name _____

Contract Number _____ Contract Name _____

Location of Incident _____

Incident Classification

Injury	☐ First Aid	Vehicle	☐ Chargeable	DOT	☐ DOT Vehicle
	☐ OSHA Recordable		☐ Non-chargeable		☐ DOT Reportable
	☐ Lost Workday				
	☐ Restricted Workday	Near Miss	☐	General Liability	☐

Description (Provide facts, describe how incident occurred, provide diagram [on back] or photos)

_____

_____

_____

Analysis (What unsafe acts or conditions contributed to the incident?)

_____

_____

_____

Corrective Action(s) (List corrective action items, responsible person, scheduled completion date)

_____

_____

_____

Witness Names (Complete Attachment 6 – Employee Witness Statement)

_____

_____

_____

Investigated By: _____ _____ _____

Print Name Signature Date

Project/Location Mgr.: _____ _____ _____

Print Name Signature Date

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Shaw® Shaw E & I

Employee Witness Statement

MUST BE COMPLETED WITHIN 24 HOURS OF THE INCIDENT

This form should be completed by every employee working in the crew of the injured employee and by every other employee with knowledge of events or circumstances involved in the incident.

This information is being solicited from you so that the company can accurately assess the reported incident to avoid similar occurrences in the future. Describe only the facts for which you have personal knowledge. If you have no knowledge of the incident, write "no knowledge."

Company: _____

Exact Location of Incident/Accident: _____

Name of Injured Employee: _____

Date of Incident/Accident: _____ Time _____ am pm

Date of this Statement: _____ Time _____ am pm

Time your shift begins? _____ am pm Ends _____ am pm

Witness Information:

Name: _____

Home Phone No.: _____

Home Address: _____

County: _____ Zip: _____

Witness' Supervisor Name: _____

If not employed by Shaw E&I, enter name of company: _____

Company Phone Number: _____

Did you see the Incident/Accident? _____

How far from you (approx., in feet) did the Incident/Accident occur? _____

Stating only factual information, describe in detail what happened and include any applicable events leading to the Incident/Accident:

_____

_____

_____

_____

I certify that, to the best of my knowledge, all of the above information is complete, accurate, and factual. I acknowledge that the intentional falsification or altering of facts or making misleading statements may be grounds for disciplinary action.

_____ _____

Witness Signature/Date Print Name

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Shaw® Shaw E & I

Accident Review Board

DATE:	LOCATION:
BOARD MEMBERS:	
ACCIDENT DATE:	EMPLOYEE(S) INVOLVED IN INCIDENT:
INVESTIGATION COMPLETE: YES ☐ NO ☐	ACCIDENT CLASSIFICATION:

The following information must be provided by the Accident Review Board for this incident (print):

SUPERVISOR: _____ **PROJECT/LOCATION MGR.:** _____

POTENTIAL CAUSE OF ACCIDENT:

ACTION BY BOARD*:

* All actions by the Accident Review Board are subject to final review by the Human Resources and Legal Departments.

ACCEPTED:

_____ _____

(Employee Signature) (Supervisor Signature)

APPROVED: REJECTED FOR:

_____ _____

(Project/Location Manager)

APPROVED: REJECTED FOR:

_____ _____

(Business Line Health and Safety Manager or Designee)

APPROVED: REJECTED FOR:

_____ _____

(Business Line Vice President)

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Shaw® Shaw E & I

Vehicle Accident Report

ACCIDENT DESCRIPTION

This report is to be initiated by the employee involved in the accident or his/her direct supervisor. Please answer all questions completely. This report must be forwarded to the appropriate health and safety representative within 24 HOURS of the accident. Attach police report.

ACCIDENT DATE _____ TIME _____ ☐ A.M. or ☐ P.M.
LOCATION OF ACCIDENT (CITY, STATE) _____
DESCRIPTION OF ACCIDENT _____
_____
_____
WITNESS _____ PHONE NO. _____
ADDRESS _____ CITY _____ STATE _____ ZIP _____
POLICE OFFICER'S NAME AND BADGE # _____ DEPARTMENT _____

COMPANY VEHICLE

DRIVER _____ DRIVERS LICENSE NO. _____ STATE _____
ADDRESS _____ CITY _____ STATE _____ ZIP _____
WORK PHONE NO. _(_____)_____ S.S. NO. _____ PROJECT NAME/NO. _____
VEHICLE NO. _____ YEAR _____ MAKE _____ MODEL _____ LICENSE PLATE NO. _____
STATE _____ VEHICLE OWNER: ☐ COMPANY ☐ LEASED/RENTED ☐ PRIVATE VEHICLE
VEHICLE TYPE: ☐ COMMERCIAL MOTOR VEHICLE ☐ NON-COMMERCIAL
IF NOT COMPANY-OWNED: OWNER _____ PHONE NO _(____)_____
ADDRESS _____ CITY _____ STATE _____ ZIP _____
VEHICLE DAMAGE _____
NO. OF VEHICLES TOWED FROM SCENE _____ NUMBER OF INJURIES _____ NUMBER OF FATALITIES _____
WERE HAZARDOUS MATERIALS RELEASED? ☐ NO ☐ YES IF YES, DESCRIBE MATERIALS _____
_____

OTHER VEHICLE

DRIVER _____ DRIVERS LICENSE NO. _____ STATE _____
ADDRESS _____ CITY _____ STATE _____ ZIP _____
PHONE NO. _(_____)_____ S.S. NO. _____
OWNER'S NAME (☐ CHECK IF SAME AS DRIVER) _____
ADDRESS _____ CITY _____ STATE _____ ZIP _____
INSURAMCE COMPANY _____ POLICY NO.: _____
AGENT'S NAME _____ PHONE NO.: _(_____)_____
ADDRESS _____ CITY _____ STATE _____ ZIP _____
VEHICLE YEAR. _____ MAKE _____ MODEL _____ PLATE NO. _____ STATE _____
VEHICLE I.D. NO. _____
VEHICLE DAMAGE _____

PASSENGERS ☐ NO ☐ YES INJURIES ☐ NO ☐ YES (If yes, list names and telephone numbers below)

_____
_____
_____

Shaw® Shaw E & I

Vehicle Accident Report

WEATHER: ❑ Clear ❑ Cloudy ❑Fog ❑Rain ❑Sleet ❑Snow Other ___
PAVEMENT: ❑Asphalt ❑Steel ❑Concrete ❑Wood ❑Gravel/Dirt
❑Brick/Stone Other _____
CONDITION: ❑Dry ❑Wet ❑Icy ❑Pot Holes Other _____
TRAFFIC CONTROL: ❑Traffic Light ❑Stop Sign ❑Railroad ❑No Intersection ❑No Control
ROADWAY: No. of Lanes Each Direction: _____ ❑Residential ❑Divided Highway ❑Undivided Highway

Draw and name <u>roadways</u> showing <u>each vehicle</u>, <u>direction of travel</u>, and <u>point of impact</u>. Indicate travel before the accident with a solid line, and post-accident movement with a broken line.

SYMBOLS:

Your Vehicle ①

Other Vehicle(s) ②③

Pedestrian

Stop Sign

Yield

Railroad ‡

ADDITIONAL INFORMATION: _____

Employee _____ (Print) _____ (Signature) _____ (Date)

Supervisor _____ (Print) _____ (Signature) _____ (Date)

H&S Rep. _____ (Print) _____ (Signature) _____ (Date)

<u>Attach police report to vehicle accident report</u>

Report must be faxed to Corporate Claims Department (Fax: 225-932-2636) within <u>24 hours</u>, or not later than next business day.

Report all vehicle accidents to Shaw Notification Hotline/Helpdesk (Phone: 1-866-299-3445)

Shaw® Shaw E & I

Equipment, Property Damage, and General Liability and Loss Report

This report is to be completed for all losses or damage to company property in excess of $2,500.00 and all third party damage, regardless of value, resulting from company activities.

PROJECT/LOCATION: _____ PROJECT NO.: _____ DATE: _____

PROGRAM NAME: _____ TASK ORDER NUMBER: _____

ADDRESS: _____

HOW DID DAMAGE OR LOSS OCCUR: _____

_____

_____

DESCRIPTION AND VALUE ($) OF DAMAGED/LOST/STOLEN PROPERTY: _____

_____

LOCATION OF DAMAGED/LOST/STOLEN PROPERTY (Before Loss): _____

_____

DATE AND TIME OF DAMAGE, LOSS, OR THEFT: Date: _____ Time: _____ a.m./p.m.

OWNER OF DAMAGED/LOST/STOLEN PROPERTY:

Name _____ Phone No. (____) _____

Address _____ City _____

Employer and Address _____

INJURED PARTIES (Also complete a Supervisor's Employee Injury Report if a Company Employee):

Name _____ Phone No. (____) _____

Address _____ City _____

Employer and Address _____

Description of Injury _____

WITNESSES:

1. Name _____ Phone No. (____) _____

   Home Address _____ City _____

   Employer and Address _____

2. Name _____ Phone No. (____) _____

   Home Address _____ City _____

   Employer and Address _____

WERE PICTURES TAKEN? ☐ YES ☐ NO

WERE POLICE NOTIFIED? ☐ YES ☐ NO DEPT. _____ REPORT NO. _____

COMPLETED BY: _____ _____ _____
(Print) (Signature) (Date)

PROJECT/LOCATION MANAGER: _____ _____ _____
(Print) (Signature) (Date)

REPORT MUST BE FAXED TO:
CORPORATE CLAIMS DEPARTMENT (FAX: 225-932-2636)
WITHIN 24 HOURS, OR NOT LATER THAN NEXT BUSINESS DAY

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EMERGENCY EYEWASH STATION/FIRE EXTINGUISHER INSPECTION CHECKLIST

Location: _____ Project Number: _____

Client: _____ Date: _____

Inspected by: _____

EMERGENCY EYEWASH STATIONS

Inspection Points	Unit #1	Unit #2
Is unit in assigned location?		
Is unit full of water?		
Is unit location well marked?		
Is access to unit unobstructed?		
Is unit in sanitary condition?		
Has water been changed with disinfectant added within the last six months?		
Has inspection tag on unit been signed and dated?		

PORTABLE FIRE EXTINGUISHERS

Inspection Points	Unit #	Unit #	Unit #	Unit #	Unit #
Fire extinguisher is in assigned location?					
Access to fire extinguisher is not obstructed?					
Fire extinguisher is fully charged?					
Lock-pin in place?					
Service tag attached and serviced within past year?					
Has inspection tag on unit been signed and dated?					

√ = OK N/A = Not Applicable X = Defective Comments: _____

This page intentionally left blank.

EMPLOYEE NOTIFICATION OF INDUSTRIAL HYGIENE MONITORING RESULTS

Employee Name _____ SS# _____

Project Name _____ Project No. _____

Project Manager _____

Substance Monitored _____ Date Monitored _____ Sample Number _____

Results _____ mg/m^3 _____ ppm Other _____

Exposure Standard _____ mg/m^3 _____ ppm Other _____

Protective Equipment Used _____

For instance where exposures were found to be in excess of an exposure limit, the following corrective action steps (engineer administrative, job techniques, etc.) are being taken to reduce potential future exposures:

H&S Representative: _____ _____ _____

Name Printed Signature Date

Employee monitored: _____ _____ _____

Name Printed Signature Date

This page intentionally left blank.

Employee Physiological Monitoring Record For Heat Stress

Employee Name _____ Date _____ Employee SS# _____

PPE used during performance of work: _____ Shift Start Time _____ Location _____

Shift Stop Time _____ Job Number _____

Site Safety & Health Officer _____ Supervisor _____

Temperatures

A. Initial Reading
- 1. Ambient Air Temp. °F _____
- 2. Baseline Body Temp. °F _____
- 3. Time Temp. Taken _____

B. After First Work Period
- 1. Ambient Air Temp. °F _____
- 2. Body Temp. °F _____
- 3. Length of work period _____

C. After Second Work Period
- 1. Ambient Air Temp. °F _____
- 2. Body Temp. °F _____
- 3. Length of work period _____

D. After Third Work Period
- 1. Ambient Air Temp. °F _____
- 2. Body Temp. °F _____
- 3. Length of work period _____

E. After Fourth Work Period
- 1. Ambient Air Temp. °F _____
- 2. Body Temp. °F _____
- 3. Length of work period _____

Heart Rate

A. Initial Reading
- 1. Baseline Heart Rate _____ Beats per minute

B. After First Work Period
- 1. Heart Rate _____ Beats per minute

C. After Second Work Period
- 1. Heart Rate _____ Beats per minute

D. After Third Work Period
- 1. Heart Rate _____ Beats per minute

E. After Fourth Work Period
- 1. Heart Rate _____ Beats per minute

- Baseline Body Temperature and Heart Rate to be taken at project site location at beginning of shift before engaging in physical activity.
- Heart Rate – Each individual will count his/her radial (wrist) pulse as early as possible during each rest period. If the heart rate of any individual exceeds 75 percent of their calculated maximum heart rate (MHR = 200 – age) at the beginning of the rest period, then the work cycle will be decreased by one-third. The rest period will remain the same. An individual is not permitted to return to work until his/her sustained heart rate is below 75 percent of their calculated MHR.
- Temperature – Each individual will measure his/her temperature with a thermometer for one minute as early as possible in the first rest period. If the temperature exceeds 99.6°F at the beginning of the rest period, then the work cycle will be decreased by one-third. The rest period will remain the same.
  An individual is not permitted to return to work if her/her temperature exceeds 100.4 °F. Note: due to the lack of accuracy in measuring body temperatures, heart rate is probably a better measurement of heat stress and should be weighted accordingly.
- This completed form should be retained in project file.

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EMPLOYEE REQUEST FOR MATERIAL SAFETY DATA SHEET (MSDS)

Project Name: _____ Project Number: _____

Employee Name: (Please Print) _____

Employee Number: _____

Job Title/Location: _____

Department/Work Area: _____

I am requesting a copy of the MSDS(s) for the following chemical(s):

(Chemical name, Common name, Trade name)

1. _____

2. _____

3. _____

_____ _____

Signature Date

I have received a copy of the above MSDS(s) I requested.

_____ _____

Signature Date

cc: Local Health and Safety Representative

This page intentionally left blank.

Equipment No: _____ **Date:** _____

Equipment Type: _____ **Location:** _____

Equipment Hrs: _____ **Supervisor:** _____

Shaw™
Shaw Environmental & Infrastructure, Inc.

DAILY EQUIPMENT INSPECTION

List Quantities And Kinds of Fluids Added In Space At Bottom Of Sheet

ITEM		OK	Add	N/A	Comments
1	Check Engine Oil Level And Engine Compartment For Trash, Debris, etc.	☐	☐	☐	☐
2	Check Hydraulic Oil Level, Cap And Vent.	☐	☐	☐	☐
3	Check Radiator Coolant Level And Radiator Fins For Dirt, Leaves, etc.	☐	☐	☐	☐
4	Check Transmission Oil Level (Dozers) or Swing Case (Excavators).	☐	☐	☐	☐
5	Check Oil Level in Frame Joint Bearing, Consult Manual. (Volvo A-40 only)	☐	☐	☐	☐
6	Check For Oil or Coolant Leaks.	☐	☐	☐	☐
7	Check Wheels / Tires / Tracks For Damage, Cuts And Proper Inflation PSI._____	☐	☐	☐	☐
8	Check Ground Engaging Implements, Cutting Edges, Teeth, Blade, etc.	☐	☐	☐	☐
9	Inspect Visible Hydraulic Hoses / Lines For Scuffs, Wear, Leaks, etc.	☐	☐	☐	☐
10	Inspect ROPS, FOPS, For Any Obvious Signs Of Loose Mounts, etc.	☐	☐	☐	☐
11	Check All Guages, Lights, Controls, Backup Alarms, Horn, etc.	☐	☐	☐	☐
12	Inspect Operators Compartment For Debris And Fire Extinguisher Charge. Check Floor For Build-up Of Dirt Around Pedals. Inspect Seat Belts, Lap Bar, Etc. Clean The Windows And Note Any Cracks.	☐	☐	☐	☐
13	Do a Walk Around Inspection Looking For Obvious Signs Of Future Problem Areas. Check Grab Handles and Step Treads, etc.	☐	☐	☐	☐
14	Check Operation Of All Systems, Boom, Bucket, Dump Bed, Grapple, Shears. Look for Leaks, Damage, Warning Signs, Excess Slack, Obvious Wear, etc.	☐	☐	☐	☐
15	Check Under The Machine For Any Loose Or Hanging Objects, Leaks, Or Anything Out Of The Ordinary.	☐	☐	☐	☐
16	Check Fuel Level And Cap Condition, Fill Tank Prior To Beginning Daily Operation.	☐	☐	☐	☐
17	**Lube All Moving Parts**, Such As Blade, Bucket, Stick, Connecting Links Equalizer bar, Cylinder Pins And Any Point That Is Subject To Grease Being Pushed Or Worn Out Due To Daily Use. Consult Manual For Grease Points.	☐	☐	☐	☐
18	Check Breathing Air Sustem (If Used). Make Sure Bottle Is Full And Mask / Hose Assembly Is Clean And In Good Working Condition Before Each Use.	☐	☐	☐	☐
19	**Verify The Presence Of The Operations / Maintenance Manual.**	☐	☐	☐	☐

Report All Damage To Supervisor Immediately

COMMENTS:

USE LINE NUMBER, BE SPECIFIC, NOTIFY REGIONAL MAINTENANCE COORDINATOR IF IMMEDIATE ATTENTION IS NEEDED.

EMPLOYEE NAME: **EMPLOYEE NUMBER:**

THESE SHEETS ARE TO BE RETAINED ON THE PROJECT FOR REVIEW BY ESG PERSONNEL.

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EXCAVATION INSPECTION

THIS INSPECTION IS TO BE COMPLETED BY THE COMPETENT PERSION EACH DAY THAT EMPLOYEES WILL BE ENTERING AN EXCAVATION

Project Name: _____ Project No.: _____

Date: _____ Time: _____ Competent Person: _____

Soil Classification (see Soil Classification Worksheet): _____

Excavation Depth: _____ Excavation Width: _____

Type of Protective System Used: _____

		√		
		Yes	No	N/A
1.	General:			
	Surface encumbrances removed or supported			
	Employees protected from loose rock or soil that could pose a hazard by falling or rolling into the excavation			
	Hard hats, steel-toed boots, and safety glasses worn by all employees.			
	Spoils, materials, and equipment set back at least two (2) feet from the edge of the excavation.			
	Walkways over excavation 6 feet or more above lower levels are equipped with standard guardrails.			
	Warning vest or other highly visible clothing provided and worn by all employees exposed to public vehicular traffic.			
	Employees required to stand away from vehicles being loaded or unloaded.			
	Warning system established and utilized when mobile equipment is operating near excavation edge.			
	Employees prohibited from going under suspended loads.			
2.	Utilities:			
	Initiate “One-Call Utility Protection” at least 48-hours in advance of intrusive activity.			
	Utility company’s contacted and/or utility locations delineated.			
	Underground installations protected, supported, or removed while excavation is open.			
3.	Means of Access and Egress:			
	Lateral travel to means of egress no greater than 25 feet in trench excavations 4 feet or more in depth.			
	Ladders used in excavations secured and extended three (3) feet above the edge of the trench.			
	Structural ramps used by employees designed by a competent person.			
	Structural ramps used for equipment designed by a registered professional engineer.			

EXCAVATION INSPECTION (Page 2 of 2) Date:

		√		
		Yes	No	N/A
4.	Wet Conditions:			
	Precautions taken to protect from the accumulation of water.			
	Water removal equipment monitored by a competent person.			
	Surface water or runoff diverted or controlled to prevent accumulation in the excavation.			
	Inspections made after every rainstorm or other hazard-increasing occurrence.			
5.	Hazardous Atmosphere			
	Atmosphere within the excavation tested where there is a reasonable possibility of an oxygen deficient, combustible, or otherwise hazardous atmosphere.			
	Adequate precautions taken to protect employee from exposure to a hazardous atmosphere.			
	Testing conducted to ensure that the atmosphere remains safe.			
	Emergency equipment, such as breathing apparatus, safety harness and line, and basket stretcher readily available where hazardous atmosphere does exist.			
6.	Support Systems:			
	Materials and/or equipment for support systems selected based on soil analysis, trench depth, and expected loads.			
	Materials and equipment used for protective systems inspected and in good condition.			
	Damaged materials & equipment used for protective systems inspected by a Registered Professional Engineer after repairs and before being placed back into service.			
	Protective systems installed without exposing employees to the hazards of cave-ins, collapses, or from being struck by materials or equipment.			
	Members of support systems securely fastened to prevent failure.			
	Support systems provided to insure stability of adjacent structures, buildings, roadways, sidewalks, walls, etc.			
	Excavations below the level of the base or footings approved by a registered professional engineer.			
	Removal of support systems progresses from the bottom, and members are released slowly as to note any indication of possible failure.			
	Excavation of material to a level of greater than 2 feet below the bottom of the support system and only if the system is designed to support the loads calculated for the full depth.			
	Shield system placed to prevent lateral movement.			
	Employees are prohibited from remaining in shield system during vertical movement.			
7.	Remarks:			
	_____			
	_____			

FIRST AID KIT INSPECTION LOG
(Inventory Kit)

Location: _____ Project Name: _____

Project Number: _____ Client: _____ Date: _____

Inspected by: _____ SSHO Approval Signature: _____

Contents	Fixed Location Kit		Vehicular Kit*			
				Actual Quantity		
	Minimum Required Quantity	Actual Quantity	Required Quantity	Vehicle 1 ID	Vehicle 2 ID	Vehicle 3 ID
Telfa Bandage Compress, 4"x4"	4		2			
Adhesive Bandages, 1"x3-3/8"	25		25			
Ammonia Inhalants	2		1			
Triangular Bandage 40" x 40" x 56"	1		-			
Eye Covering with Means of Attachment	1		-			
Eye Flush, 1oz.	2		2			
Absorbent Compress 24 sq. in.	1		1			
Antiseptic Wipes 1" x 1"	10		5			
Antiseptic Swabs 0.14 fl. oz.	10		5			
Antiseptic Towelettes 24 sq. in.	10		-			
Sterile Pad 3" x 3"	4		2			
Burn Treatment 0.14 fl. Oz.	6		1			
Roller Bandage 4" x 6 yd.	1		-			
Roller Bandage 2" x 6 yd.	2		-			
Kwik-Kold Ice Pak	2		-			
Adhesive Tape, 1" x 5 yd.	2		1			
Scissors and Forceps Kit	1		-			
Tick Removal Kit	1		-			
Emergency Blanket	1		-			
Disposable Gloves	4 pair		2 pair			
Flashlight	1		-			
Cotton-tip Applicators	10		-			
Disposable mouth-to-mouth Resuscitators	2		1			
Multi-Trauma Dressings 8"x10"	2		-			
2" Bandage Compress 2" x 36"	4		-			
3" Bandage Compress 3" x 60"	2		-			
4" Bandage Compress 4" x 72"	1		-			
Supervisor's Employee Injury Report	1		1			
Inventory Kit	1		-			

* Readily available "vehicle-size" first aid kits may be purchased at the local department store to fulfill vehicle kit stocking requirements. The kit contents do not need to be inspected as long as the shrink-wrap sanitary covering is intact.

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HAZARD COMMUNICATION AND RIGHT-TO-KNOW STANDARDS
EMPLOYEE TRAINING RECORD

Project Name: _____ Project Number: _____

		INITIAL:
1.	I have been informed about the Hazard Communication Program, Material Safety Data Sheets (MSDS), their use and location, and the procedures to obtain copies.	
2.	I have been informed that some of my work may involve exposure to toxic substances, the hazards of which will be reviewed with me in tailgate safety meetings or site-specific training.	
3.	I have been informed about the right of employees to have access to relevant exposure and medical records, and the procedures for requesting access.	
4.	I understand that the company must act upon a request in a reasonable amount of time so as to avoid interruption of normal work operations.	
5.	I have been provided access to the applicable regulations governing hazard communication, and access to employee exposure and medical records.	

PRINT NAME: _____

SIGNATURE: _____

EMPLOYEE NUMBER: _____

DATE: _____

This page intentionally left blank.

HAZCOM PROGRAM ACKNOWLEDGMENT FORM

Project Name: _____ Project Number: _____

1. I have been informed about the Hazard Communication Program, Material Safety Data Sheets (MSDS), their use and location, and the procedures to obtain copies.

2. I have been informed that some of my work may involve exposure to toxic substances, the hazards of which will be reviewed with me in tailgate safety meetings or site-specific training.

3. I have been informed about the right of employees to have access to relevant exposure and medical records, and the procedures for requesting access.

4. I understand that the company must act upon a request in a reasonable amount of time so as to avoid interruption of normal work operations.

5. I have been provided access to the applicable regulations governing hazard communication, and access to employee exposure and medical records.

Printed Name	Signature	Representing	Date

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HEPATITIS B AND TETANUS VACCINATION DECLINATION

Due to the potential for you to have occupational exposure to potentially infectious materials in your work, the company will provide, and encourages you to accept, vaccinations for Hepatitis B and Tetanus. Information to assist you in this decision is provided below.

Tetanus

- Bacterial disease causing muscle spasms, seizures, and "lockjaw"
- Single injection vaccination has few side effects
- Minimal loss in protection if the vaccination is given at the time of an exposure/injury rather than in advance

Hepatitis B

- Viral infection of the liver
- About 9,500 occupational cases occur annually, mostly in health care workers, with about 200 deaths
- Three-injection vaccination has few side effects
- Vaccination is 90 percent effective for at least 7 years when given prior to exposure
- Vaccination is 70 to 88 percent effective when given within 1 week of exposure
- Can survive in the environment for 24 to 48 hours after drying
- Risk of infection from one cut or puncture wound from a contaminated object:
  - Hepatitis B virus 6 to 30 percent
  - Human Immunodeficiency Virus (AIDS) 0.5 percent

If you wish to talk to a company doctor before making your decision, please ask the Health and Safety Manager to make arrangements for you. *If you choose to decline vaccination at this time, you must print and sign your name, and date the bottom of this form.*

I understand that due to my occupational exposure to blood or other potentially infectious materials I may be at risk of acquiring Hepatitis B Virus (HBV) infection.

I have been given the opportunity to receive the Hepatitis B vaccine, at no charge to myself. However, I decline Hepatitis B vaccination at this time. I understand that by declining this vaccine, I continue to be at risk of acquiring Hepatitis B, a serious disease.

If in the future I continue to have occupational exposure to blood or other potentially infectious materials and I want to be vaccinated with the Hepatitis B vaccine, I can receive this vaccination series at no charge to me.

Name (print) _____

Signature _____ Date _____

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HOT WORK PERMIT

Project Name _____ Project # _____

Good for This Date Only ____/____/____ Time From _____ To _____

Hot Work Area _____

Specific Work to be Done _____

Personal Protective Equipment Required: _____

_____

Emergency Equipment Required: _____

_____

CHECKLIST	INITIAL	
	YES	DOES NOT APPLY
Area personnel have been informed of work to be performed.		
All tanks, lines, valves are disconnected, blinded, or blocked out.		
Electrical service has been locked out and tagged.		
Equipment and all attached piping has been cleaned and purged with: (check blank) Water _____ Steam _____ Inert gas _____ Air		
All grounding/bonding wire in place.		
Surrounding equipment and operations are safe for hot work.		
No open vessels, lines or combustible items within 35 feet of hot work area.		
Fully charged and appropriate fire extinguisher easily accessible.		
Fire watch has been provided.		
No flammable gases greater than 10% LEL in hot work area.		
Compressed gas cylinders kept upright and secured.		
Air monitoring required.		

AIR MONITORING (If Required)						
STATE EXACT LOCATION OF TEST	TIME	% LOWER EXPLOSION LIMIT	% OXYGEN	OTHER TEST _____	OTHER TEST _____	INITIAL

Special Instructions: _____

_____

Completed by: _____ _____ _____

Printed Name Signature Date

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INTRUSIVE ACTIVITIES PERMIT	Permit Number

Project Name: _____ Project Number: _____

Clearance is permitted for intrusive activity at: _____

The attached map indicates the limits of the permitted intrusive activity. The area __has __has not been staked or clearly marked.

Utilities Locate Service Reference Number: _____

Limits of Work Permitted		
Description of permitted work:		
Specific location of permitted work:		
Precautions or comments:		
Date Clearance Permitted:	Date Clearance Terminated:	
Request Initiated By:	Phone No.	Organization

Permission to proceed with intrusive activity granted:

_____ _____

Field Supervisor/Project Manager Date

Permission to proceed with intrusive activity granted:

_____ _____

Site Safety and Health Officer Date

I agree to perform work within the limits of this permit:

_____ _____

Supervisor/Foreman/Contractor Date

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LIFT PLAN WORKSHEET

General Information

Date:_____ Project No:_____

Location: _____ Crane Owner:_____

Item to be Lifted:_____ Equipment No:_____

Item Weight:_____(lbs) _____(lbs)
Actual Calculated Weight (from below)

If actual weight is not known, the item weight must be determined by one of the following methods:
Manufacturer Data Sheet
Truck Weigh Ticket (only for single piece loads)
Calculated Weight

Standard weight per cubic foot of this material: _____

Dimension of item/material: L _____ x W _____ x H _____ = _____ cu. ft.

Cubic feet of item _____ x Standard Weight _____ =
Calculated Weight

Lifting Responsibility

Lift Supervisor:_____ Employee No:_____
(Required for lifts over 75% of capacity)

Lift Supervisor:_____ _____
Print Name Signature

Crane Operator:_____ _____
Print Name Signature

Rig:_____ _____
Print Name Signature

Rigging Personnel:_____ _____
Print Name Signature

Tag Line 1: _____ _____
Print Name Signature

Tag Line 2: _____ _____
Print Name Signature

Crane Capacity Determination

Item Weight: _____

Block Weight: + _____

Stowed Jib: + _____

Spreader Bar Weight: + _____

Sling Weight: + _____

Accessories: + _____

Other: + _____

Lift Total: = _____

Anticipated Maximum Boom Extension: _____ feet

Anticipated Minimum Boom Angle: _____ °

Anticipated Maximum Load Radius: _____ feet

Based on the above configuration, this crane can safely lift * _____ lbs.

*The crane capacity must exceed the lift total while also taking the following into account:

- Crane/Boom Lift Point (i.e. main boom or jib)
- Quadrant of Operation (over front or 360°)
- Line Pull & Reeving Requirements (parts of line required)
- Crane is level and on fully extended outriggers; or
- Within "On Rubber" Capacity chart if not fully extended or a pick and carry lift is required.

Rigging Capacity Determination

_____ x _____ = _____

Item weight (from page 1) | Sling angle factor | Implied Sling Load

Sling capacity must be determined based on the following items:

- When using multiple slings, the sling with the least lifting capacity must be capable of lifting the load.
- Hitch (vertical, basket, chock)
- Number of sling legs for calculation purpose; never use more than 3 legs.
- Sling angle

NOTE: Sling angle factors can be found in Attachment 4.

Rigging Accessories

Shackles: Number _____ Size _____ Capacity

Other: Number _____ Size _____ Capacity

Implied Sling Load: _____ Sling Capacity:

NOTE: Implied sling load must not exceed sling capacity.

Pre-Lift Checklist

- ☐ rigger has inspected all rigging
- ☐ equipment operator has inspected equipment
- ☐ wind conditions acceptable
- ☐ other weather conditions acceptable
- ☐ keep all unnecessary personnel clear of the lift area
- ☐ no personnel allowed down slope during operations done safely
- ☐ use all PPE properly (hard hats, boots, etc.)
- ☐ weight of lift remains unchanged
- ☐ pre-lift meeting with all personnel
- ☐ personnel are qualified
- ☐ equipment in accordance with plan
- ☐ no hazardous conditions in lift area
- ☐ equipment is properly set up
- ☐ signal person assigned if necessary
- ☐ Lift Supervisor (LS) to ensure job
- ☐ LS to stop job if unsafe condition
- ☐ LS to stabilize job if accident occurs

Critical lifts require drawings of lift configuration. Use box below or attach drawing to worksheet.

Lifting Approvals

Lifts which exceed 25 tons or greater outlined on this lift planning worksheet require the approval of a competent civil, structural/mechanical engineer.

_____ _____

Print Name Signature

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Project Location: _____
Client: _____
Project Number: _____

LOCKOUT LOG

AUTHORIZED EMPLOYEE	DATE	EQUIPMENT NAME	EQUIPMENT NUMBER	REASON FOR LOCKOUT

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LOCKOUT/TAGOUT FOR COMPRESSED AIR AND GASES

Project Name: _____ Project Number: _____

Job: _____

Device: _____

Location: _____

Authorized Person: _____

Site Supervisors: _____

PREPARATION FOR SHUTDOWN

1. Determine types and shutoff location.
2. Determine if there is more than one energy source.
3. Determine magnitude of compressed air, gas, steam, water, or fluids.
4. Notify affected employees in the area that equipment will be locked out for maintenance.
5. Shutoff main supply to machine.

LOCKOUT/TAGOUT

6. Lock and tag main supply in the OFF position.
7. Bleed line and verify that no air or gases remain in the equipment.
8. Repair equipment.

RETURN TO SERVICE

9. Be sure all connections are made and any unused tools and equipment are removed.
10. Remove lock if necessary to verify proper operations.
11. Remove tag.
12. Notify employees in the area that the equipment is available.

Signature:

Authorized Person: _____

Site Supervisor: _____

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LOCKOUT/TAGOUT FOR ELECTRICAL EQUIPMENT

Project Name: _____ Project Number: _____

Job: _____

Device: _____

Location: _____

Authorized Person: _____

Site Supervisors: _____

PREPARATION FOR SHUTDOWN

1. Determine power type and shutoff location.
2. Determine if there is more than one energy source.
3. Determine magnitude of power (voltage).
4. Notify affected employees in the area that equipment will be locked out for maintenance.
5. Shutoff power sources to machine.

LOCKOUT/TAGOUT

6. Lock and tag main switches in the OFF position, remove fuses.
7. Verify that no power is available to the equipment using a voltmeter, if necessary.
8. Drain devices such as capacitor banks.
9. Verify that these devices have no stored energy by use of the voltmeter.
10. Repair equipment.

RETURN TO SERVICE

11. Be sure all connections are made and any unused tools and equipment are removed.
12. Remove lock if necessary to verify machine is repaired. The maintenance employee, while verifying the machine is repaired cannot leave the immediate area.
13. Remove tag from machine.
14. Notify employees in the area that the equipment is available.

Signature:

Authorized Person: _____

Site Supervisor: _____

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LOCKOUT/TAGOUT FOR HYDRAULIC EQUIPMENT

Project Name: _____ Project Number: _____

Job: _____

Device: _____

Location: _____

Authorized Person: _____

Site Supervisors: _____

PREPARATION FOR SHUTDOWN

1. Determine power type and shutoff location.
2. Determine if there is more than one energy source.
3. Determine magnitude of energy (pressure).
4. Notify affected employees in the area that equipment will be locked out for maintenance.
5. Shutoff main hydraulic to equipment.

LOCKOUT/TAGOUT

6. Lock and tag main supply in the OFF position.
7. Drain fluids from shutoff valves to equipment.
8. Verify that the hydraulic fluid is disconnected.
9. Block ram or items controlled by the hydraulic system using the appropriate blocking.
10. Repair equipment.

RETURN TO SERVICE

11. Be sure all connections are made and any unused tools and equipment are removed.
12. Remove lock if necessary to verify machine is repaired. Maintenance employee cannot leave the immediate area, while verifying the machine is repaired.
13. Remove tag from machine.
14. Notify employees in the area that the equipment is available.

Signature:

Authorized Person: _____

Site Supervisor: _____

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LOCKOUT/TAGOUT FOR STEAM, WATER, AND FLUID LINES

Project Name: _____ Project Number: _____

Job: _____

Device: _____

Location: _____

Authorized Person: _____

Site Supervisors: _____

PREPARATION FOR SHUTDOWN

1. Determine types and shutoff location.
2. Determine if there is more than one energy source.
3. Determine magnitude of compressed air or gas.
4. Notify affected employees in the area that equipment will be locked out for maintenance.
5. Disconnect/shutoff main steam, water, or fluid lines to equipment.

LOCKOUT/TAGOUT

6. Lock and tag main supply (i.e. chaining through valve handle with lock) in the OFF position with a bleeder open on the load side.
7. Drain fluids from shutoff valves to equipment.
8. Repair equipment.

RETURN TO SERVICE

9. Be sure all connections are made and any unused tools and equipment are removed.
10. Remove lock if necessary to verify machine is repaired. The maintenance employee cannot leave the immediate area, while verifying the machine is repaired.
11. Remove tag from machine.
12. Notify employees in the area that the equipment is available.

Signature:

Authorized Person: _____

Site Supervisor: _____

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LOCKOUT/TAGOUT PROCEDURE FOR SPECIFIC EQUIPMENT

Project Name: _____ Project Number: _____

Equipment:		
Cat. No. and Location:		
Serial Number (if available):		
Electrical:	Voltage:	Location:
Describe:		
Air (Type):		Location:
Describe:		
Gases (Type):		Location:
Describe:		
Steam (Type):		Location:
Describe:		
Water:		Location:
Describe:		
Fluids:		Location:
Describe:		
Hydraulic:		Location:
Describe:		
Stored Energy – Capacitors, Springs, Etc.:		
Describe:		

LOG DATA AND RETURN TO SITE-SUPERVISOR

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Near Miss Report

Employee Name (optional): _____

Shaw Location: _____ **Date of Report:** _____

Near Miss

POTENTIAL LOSS		
◉ Injury	◯ Illness	◯ Property Damage
Describe potential loss:		

Incident

EVENTS
Describe event:

Causes

SUBSTANDARD ACTS/PRACTICES	SUBSTANDARD CONDITIONS
◯ Failure to warn	◯ Inclement weather
◯ Failure to secure	◯ Inadequate guards or barriers
◯ Operating at improper speed	◯ Inadequate or improper protective equipment
◯ Making safety devices inoperable	◯ Defective tools, equipment or materials
◯ Removing safety devices	◯ Congestion or restricted action
◯ Using defective equipment	◯ Inadequate warning system
◯ Using equipment improperly	◯ Fire and explosion hazards
◯ Failing to use PPE properly	◯ Poor housekeeping; disorderly workplace
◯ Improper loading	◯ Hazardous environmental conditions: gases,
◯ Improper placement	◯ Dusts, smokes, fumes, vapors
◯ Improper lifting	◯ Noise exposures
◯ Improper position for task	◯ High or low temperature exposures
◯ Servicing equipment in operation	◯ Other
Describe immediate cause(s):	

IMPROVEMENT ACTIONS		
1		
2		
3		
Person responsible for follow-up:	Expected completion date:	Actual completion date:
Verified by:	Validated by:	
Supervisor Name:		
Signature:		

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Noise Dosimeter
Field Data Log

Project Name _____ Project# _____

Date _____ Calibrated by _____

Survey Location _____

Dosimeter Serial No.	Employee Name	Job Description	Calibration dBA (pre)	Dose	Lavg	Lmax	Time	Calibration dBA (post)	Comments

Comments _____

This page intentionally left blank.

Noise Survey
Field Data Log

Project Name _____ Project# _____

Date _____ Calibrated by _____

Survey Location _____

Sound Level Meter Serial No.	Employee Name/ Equipment Name	Job Description/ Equipment Location	Time	Calibration dBA (pre-survey)	dBA/ Distance from Source	dBA/ Distance from Source	dBA/ Distance from Source	Calibration dBA (post-survey)	Comments

Comments _____

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PROJECT SAFETY INSPECTION REPORT

DATE _____

BUSINESS LINE: _____

PROJECT NAME/NUMBER: _____

PROGRAM MANAGER: _____ PROJECT MANAGER: _____

GENERAL PROJECT DESCRIPTION: _____

SITE ACTIVITIES AT TIME OF INSPECTION: _____

_____

_____

INTERVIEWED EMPLOYEE: _____

SAFETY ISSUE: _____

CORRECTIVE ACTION: _____

_____

ASSIGNED TO: _____ FOLLOW-UP DATE: _____

CORRECTION VERIFIED BY: _____ DATE: _____

INTERVIEWED EMPLOYEE: _____

SAFETY ISSUE: _____

CORRECTIVE ACTION: _____

_____

ASSIGNED TO: _____ FOLLOW-UP DATE: _____

CORRECTION VERIFIED BY: _____ DATE: _____

INSPECTION COMPLETED BY: _____ DATE: _____

HEALTH AND SAFETY REVIEW BY: _____ DATE: _____

PROJECT SAFETY INSPECTION REPORT

PROJECT _____ DATE _____

	YES	NO	N/A
FIRST AID			
1. Are first aid kit locations identified and accessible?			
2. Are emergency eye wash/safety showers available and inspected monthly?			
3. Are first aid kits inspected weekly?			
4. Is a qualified first aid/CPR provider on-site?			
PERSONAL PROTECTIVE EQUIPMENT			
1. Have levels of personnel protection been established?			
2. Are respirators decontaminated, inspected, and stored according to standard procedures?			
3. Have employees been fit-tested?			
4. Is defective personal protective equipment tagged and taken out of service?			
5. Does compressed breathing air meet CGA Grade "D" minimum?			
6. Are there sufficient sizes and quantities of protective equipment?			
7. At a minimum, are employees utilizing safety glasses, hard hats, and steel toe boots?			
FIRE PREVENTION			
1. Are employees smoking only in designated outdoor areas?			
2. Are fire lanes established and maintained?			
3. Are flammable liquid dispensing systems bonded?			
4. Are approved safety cans available for storage of flammable liquids?			
5. Has the local fire department been contacted?			
6. Are fire extinguishers available and inspected monthly?			
7. Are flammables and combustibles properly stored?			
8. Are flammable storage cabinets available and used when needed?			
AIR MONITORING			
1. Is required air monitoring being conducted?			
2. Are air monitoring instruments calibrated daily?			
3. Are air monitoring logs up to date?			
4. Are instrument user manuals available?			
5. Are instruments being maintained?			
6. Are employees notified of personal sampling results within 5 days of receipt?			
WELDING AND CUTTING			
1. Are fire extinguishers present at welding and cutting operations?			
2. Are confined spaces evaluated prior to and during cutting and welding operations?			
3. Have Hot Work Permits been completed?			
4. Are proper helmets, goggles, aprons, and gloves available for welding and cutting operations?			
5. Are welding machines properly grounded?			
6. Are oxygen and fuel gas cylinders stored a minimum of 20 feet apart?			
7. Are only trained personnel permitted to operate welding and cutting equipment?			
8. Are gas cylinders transported in a secured vertical position with caps in place?			
HAND AND POWER TOOLS			
1. Are defective hand and power tools tagged and taken out of service?			
2. Is eye protection available and used when operating power tools?			
3. Are guards and safety devices in place on power tools?			
4. Are power tools inspected before each use?			
5. Are nonsparking tools available when necessary?			

PROJECT SAFETY INSPECTION REPORT

PROJECT _____ DATE _____

	YES	NO	N/A
HAND AND POWER TOOLS (continued)			
6. Is the correct tool being used for the job?			
MOTOR VEHICLES			
1. Are vehicles regularly inspected?			
2. Are personnel licensed for the vehicles they operate?			
3. Are unsafe vehicles tagged and reported to supervision?			
4. Is vehicle's safety equipment operating properly?			
5. Are loads secure?			
6. Are vehicle occupants using safety belts?			
7. Are current insurance cards and blank accident report forms located in vehicles?			
EMERGENCY PLANS			
1. Are emergency telephone numbers posted?			
2. Have emergency escape routes been designated?			
3. Are employees familiar with the emergency signal?			
4. Has the emergency route to the hospital been established and posted?			
5. Is a vehicle on site that can transport injured employees to the hospital?			
MATERIALS HANDLING			
1. Are materials stacked and stored to prevent sliding or collapsing?			
2. Are tripping hazards identified?			
3. Are semi-trailers chocked?			
4. Are fixed jacks used under semi-trailers?			
5. Are riders prohibited on materials handling equipment?			
6. Are approved manlifts provided for the lifting of personnel?			
7. Are personnel in manlifts wearing approved fall protection devices?			
FIRE PROTECTION			
1. Has a fire alarm system been established?			
2. Do employees know the location and use of all fire extinguishers?			
3. Are fire extinguisher locations posted?			
4. Are combustible materials segregated from open flames?			
5. Have fire extinguishers been professionally inspected during the last year?			
6. Are fire extinguishers visually inspected monthly?			
ELECTRICAL			
1. Is electrical equipment and wiring properly guarded and maintained in good condition?			
2. Are extension cords kept out of wet areas?			
3. Is damaged electrical equipment tagged and taken out of service?			
4. Have underground electrical lines been identified by proper authorities?			
5. Has a lockout/tagout system been established?			
6. Are GFCIs being used on all temporary electrical systems and as needed?			
7. Are extension cords being inspected daily (i.e., group pin in place, no unapproved splices)?			
8. Are warning signs exhibited on high voltage equipment (250V or greater)?			
9. Is adequate distance maintained from overhead electrical lines?			
10. Are switches, circuit breakers, and switchboards installed in wet locations enclosed in weatherproof enclosures?			

PROJECT SAFETY INSPECTION REPORT

PROJECT _____ DATE _____

	YES	NO	N/A
CRANES AND RIGGING			
1. Are cranes inspected daily prior to use?			
2. Are crane swing areas barricaded or demarked?			
3. Is all rigging equipment tagged with an identification number and rated capacity?			
4. Is rigging equipment inspection documented?			
5. Are slings, chains, and rigging inspected before each use?			
6. Are damaged slings, chains, and rigging tagged and taken out of service?			
7. Are slings padded or protected from sharp corners?			
8. Do employees keep clear of suspended loads?			
9. Are rated load capacities and special hazard warnings posted on crane?			
10. Are the records of annual crane inspection available?			
11. Has accessible areas within the swing radius of the rear of the crane been barricaded?			
12. Do crane operators have required training/certification?			
COMPRESSED GAS CYLINDERS			
1. Are breathing air cylinders charged only to prescribed pressures?			
2. Are like cylinders segregated and stored in well-ventilated areas?			
3. Is smoking prohibited in cylinder storage areas?			
4. Are cylinders stored secure and upright?			
5. Are cylinders protected from snow, rain, etc.?			
6. Are cylinder caps in place before cylinders are moved?			
7. Are fuel gas and oxygen cylinders stored a minimum of 20 feet apart?			
8. Are propane cylinders stored and used only outside of buildings?			
SCAFFOLDING			
1. Is scaffolding placed on a flat, firm surface?			
2. Are scaffold planks free of mud, ice, grease, etc.?			
3. Is scaffolding inspected before each use?			
4. Are defective scaffold parts taken out of service?			
5. Have employees completed scaffold user training?			
6. On scaffolds where platforms are overlapped, is planking overlapped a minimum of 12 inches?			
7. Does scaffold planking extend over end supports between 6 to 18 inches (dependent upon platform length)?			
8. Are employees restricted from working on scaffolds during storms and high winds?			
9. Are all pins in place and wheels locked?			
10. Is required perimeter guarding (top rail, mid rail, and toe board) present?			
11. Has a competent person been designated to oversee scaffold construction?			
12. Are employees prohibited from moving mobile scaffold horizontally while employees are on them?			
13. Are all scaffold components manufactured by the same company?			
WALKING AND WORKING SURFACES			
1. Are ladders regularly inspected?			
2. Are accessways, stairways, ramps, and ladders clean of ice, mud, snow, or debris?			
3. Are ladders being used in a safe manner?			
4. Are ladders kept out of passageways, doors, or driveways?			
5. Are broken or damaged ladders tagged and taken out of service?			
6. Are metal ladders prohibited in electrical service?			

WALKING AND WORKING SURFACES (continued)			
7. Are stairways and floor openings guarded?			
8. Are safety feet installed on straight and extension ladders?			
9. Is general housekeeping being maintained?			
10. Are ladders tied off?			
11. Are handrails and side rails installed along the unprotected sides of stairways having 4 or more risers or rising more than 30 inches?			
SITE SAFETY PLAN			
1. Is a site safety plan available on site or accessible to all employees?			
2. Does the safety plan accurately reflect site conditions and tasks?			
3. Have potential hazards been described to employees on site?			
4. Is there a designated safety official on site?			
5. Have all employees signed the safety plan acknowledgment form?			
SITE POSTERS			
1. Are the following posters displayed in a prominent and accessible area?			
A. Minimum Wage			
B. OSHA Job Protection			
C. Equal Employment Opportunity			
2. Are all required state-specific posters displayed?			
SITE CONTROL			
1. Are work zones clearly marked?			
2. Are support trailers located to minimize exposure from a potential release?			
3. Are support trailers accessible for approach by emergency vehicles?			
4. Is the site properly secured during and after work hours?			
5. Is an exclusion zone sign-in/sign-out log maintained?			
6. Are only employees with current training and physicals permitted in exclusion zone?			
HEAVY EQUIPMENT			
1. Is heavy equipment inspected as prescribed by the manufacturer?			
2. Is defective heavy equipment tagged and taken out of service?			
3. Are project roads and structures inspected for load capacities and proper clearances?			
4. Is heavy equipment shut down for fueling and maintenance?			
5. Are backup alarms installed and working on mobile equipment?			
6. Have qualified equipment operators been designated?			
7. Are riders prohibited on heavy equipment?			
8. Are guards and safety appliances in place and used?			
9. Are operators using the "three point" system when mounting/dismounting equipment?			
EXCAVATION			
1. Has a "competent person" been designated to oversee excavation activities?			
2. Prior to opening excavations, are utilities located and marked?			
3. Has a professional engineer evaluated all excavations greater than 20 feet deep?			
4. Is there rescue equipment on site and accessible to the excavation area?			
5. Is excavated material placed a minimum of 24 inches from the excavation?			
6. Are the sides of excavations sloped or shored to prevent cave ins?			
EXCAVATION (continued)			
7. Have excavations greater than 4 feet deep been monitored for hazardous atmospheres (i.e., LEL/O_2 deficiency)?			
8. Are ladders or ramps used in excavations over 4 feet deep?			
9. Are means of egress available so as to require no more than 25 feet of lateral travel?			

PROJECT SAFETY INSPECTION REPORT

PROJECT _____ DATE _____

	YES	NO	N/A
10. Are barriers, i.e., guardrails or fences, placed around excavations near pedestrian or vehicle thoroughfares?			
11. Is excavation inspected daily by competent persons and documented?			
CONFINED SPACES			
1. Have employees been trained in the hazards of confined spaces?			
2. Are confined space permits posted at entrance to confined space?			
3. Is a copy of the confined space entry procedure available?			
4. Has a rescue plan been established?			
5. Is an entry supervisor present at each permit-required entry?			
6. Are required extraction/fall protection devices being used?			
DECONTAMINATION			
1. Are decontamination stations set up on site?			
2. Is decontamination water properly contained and disposed of?			
3. Are all pieces of equipment inspected for proper decontamination before leaving the site?			
4. Are shin/metatarsal guards being used during power washing activities?			
HAZARD COMMUNICATION			
1. Is there a copy of the HAZCOM procedure on site?			
2. Are their MSDSs for required materials/chemicals present on site?			
3. Are all containers properly labeled, as to content, hazard?			
4. Have employees been trained in accordance with the HAZCOM procedure?			
5. Do employees (including subcontractors) know and understand the effects of exposure from the chemicals on site?			
6. Have all personnel signed the HAZCOM acknowledgment form?			
7. Is there an updated list of chemicals maintained on site?			
TRAINING			
1. Are tailgate safety meetings being conducted daily?			
2. Are current training/medical records maintained on site?			
DOCUMENTATION			
1. Is an OSHA 300 Log maintained on site and posted during the months of February, March, and April?			
2. Are accident report forms available?			
3. Is a copy of health and safety policy and procedures available on site?			

PROJECT SAFETY INSPECTION REPORT

PROJECT _____ DATE _____

ALL NEGATIVE RESPONSES	CORRECTIVE ACTION	ASSIGNED TO	DATE ASSIGNED	DATE COMPLETED	VERIFIED BY

DESCRIBE POSITIVE SAFETY OBSERVATIONS

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REAL TIME AEROSOL MONITORING LOG

Project Name: _____ Project No. _____

Date: _____

Sampled By	Instrument Type (Mfg./Model/Serial No.)	Battery Charged (Y/N)	Zeroed (Y/N)	Sample Time		Sample Readings (mg/m^3)			Comments
				Start	Finish	TWA	Shift Average	Direct	

General Weather Conditions _____

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RESCUE SERVICE EVALUATION

INITIAL EVALUATION

Project/Location _____ Project No. _____

Identity of PRCS _____

Name of Rescue Service _____

Address _____

Contact Person/Phone Number _____

Required Response Time _____ Estimated Response Time _____

Availability of Rescue Service _____

PERFORMANCE EVALUATION (Observe Test Rescue and Answer Following Questions)	YES	NO
Have all members of the service been trained in the potential hazards of the permit space(s), or of a representative permit space(s) from which rescue may be needed?		
Can team members recognize the signs, symptoms, and consequences of exposure to any hazardous atmospheres that may be present in the permit space(s)?		
Is every team member provided with, and properly trained in, the use and need for PPE which may be required to perform permit space rescues?		
Is every team member properly trained to perform his/her functions and make rescues, and to use any rescue equipment, such as ropes and backboards, that may be needed in a rescue attempt?		
Are team members trained in the first aid and medical skills needed to treat victims overcome or injured by the types of hazards that may be encountered in the permit space(s)?		
Do all team members perform their functions safely and efficiently?		
Do rescue service personnel focus on their own safety before considering the safety of the victim?		
Can the rescue service properly test the atmosphere of the identified PRCS?		
Can the rescue personnel identify information pertinent to the rescue from entry permits, hot work permits, and MSDSs?		
Has the rescue service been informed of any hazards to personnel that may arise from outside the space, such as those that may be caused by future work near the space?		
Can the rescue service safely perform rescue(s) from the identified PRCS?		
Does the rescue service have a plan for rescue from the identified PRCS?		
Is the plan adequate for all types of rescue operations that may be needed?		

I certify that the evaluated rescue service is equipped and capable of providing rescue services during entry activities for the identified PRCS.

Evaluator:

_____ _____ _____

Name Signature Date

I acknowledge our responsibility to provide rescue services during entry activities for the identified PRCS.

Rescue Service Representative:

_____ _____ _____

Name Signature Date

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Safety and Occupational Health Deficiency Tracking Log

Section and Item #	Date Deficiency Identified	Description of Deficiency or Comment	Recommended Action	Person Responsible for Correcting Deficiency	Projected Resolution Date	Date Deficiency Actually Resolved

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SAFETY MEETING / TRAINING LOG

- ☐ Tailgate (daily)
- ☐ Activity Hazard Analysis (prior to new task or operation)
- ☐ Job Safety Analysis (prior to new task or operation)
- ☐ Site Safety Orientation (new personnel)
- ☐ Supervisor's (monthly)
- ☐ Supervisor's (weekly)
- ☐ UXO Awareness
- ☐ Asbestos Awareness
- ☐ Health and Safety Plan Addendum: _____
- ☐ Other: _____

Date/Time: _____ Client: _____

Location: _____ Job No.: _____

Meeting/training conducted by: _____

Work Activities: _____

Safety / Training Topics Presented

Chemical Hazards: _____

Physical Hazards: _____

Specific Safety Topic(s): _____

_____

Specific Training Covered: _____

_____

Attendees

Name Printed and Employee Number:	Signature:

SAFETY MEETING / TRAINING LOG
(Continued)

Date: ______________________ Job No.: ______________________

Attendees

Name Printed and Employee Number:	Signature:

SITE ENTRY LOG

Date: _____ Client: _____

Location: _____ Job No.: _____

Name	Representing	Time In	Time Out

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SOILS CLASSIFICATION WORKSHEET

The following worksheet outlines the visual and manual tests that the competent person must perform at least once, and each time soil conditions change. At least one visual and one manual test must be performed; however, performing several tests is recommended so that the condition of the excavation is thoroughly examined.

Project Name: _____ Project Number: _____

Date: _____ Time: _____

Where was the sample taken from? _____

I.	**Visual Tests:** *One or more visual tests are required for each classification and each time conditions change*		
1.	Estimate range of particle sizes:	a. primarily fine-grained = cohesive material b. primarily coarse-grained = granular material	
2.	Observe excavated soil:	a. clumps = cohesive material b. breaks up easily = granular material	
3.	Observe sides and adjacent surface area of opened excavation:	a. crack like openings = fissured material b. soil spills off vertical sides = possible fissured material	
4.	Previous excavation activities:	a. previously disturbed soil	b. not previously disturbed soil
5.	Observe opened side of excavation:	a. layered systems c. estimate degree of slope of layers:	b. layers sloped towards excavation _____
6.	Water condition:	a. evidence of surface water c. depth of water table:	b. water seeping from sides _____
7.	Vibration present:	a. Area adjacent to excavation	b. Area within excavation
II.	**Manual Tests** – *One or more manual tests are required for classification and each time soil conditions change*		
1.	Plastically – soil is cohesive if following is true:	a. mold soil samples into a small ball b. roll ball into thread ___ " diameter c. pick up 2" length of ___ " thread by one end without breaking	
2.	Dry Soil Strength:	a. crumbles on its own or with moderate pressure = granular b. falls into clumps which break into smaller clumps that are only broken with difficulty = clay with gravel, sand, or silt. c. breaks into clumps which do not break into smaller clumps and can only be broken with difficulty with no visual indication of fissures = unfissured.	
3.	Thumb penetration test: *(These tests are to be run on a large clump of material as soon as it is excavated).*	a. can be easily indented by the thumb but penetrated by thumb only with great effort = Type a b. easily penetrated several inches by thumb and molded by light finger pressure = Type c	
4.	Unconfined Compressive Strength: *(Saturated Soil Needed)*	a. Pocket Penetrometer reading (take 10 readings and average) 0 – 0.5 = Type C, 0.5 – 1.5 = Type B, 1.5 – 2.0 – Type A b. Shear Vane reading X2: 0 – 0.5 = Type C, 0.5 – 1.5 = Type B, 1.5 – 2.0 = Type A	
5.	Drying Test: (A dry soil sample 1" thick X 6" diameter is needed)	a. develops cracks = fissured material dries without cracks and breaks by hand with considerable force significant b. cohesive content = unfissured cohesive material c. sample breaks easily by hand = fissured cohesive or granular material d. easily pulverized dry clumps by hand or by stepping on them = granular e. don't pulverize easily = fissured cohesive.	

Soil Classification: Type A Type B Type C Stable Rock Other _____

Competent Person: _____ (Print Name) _____ (Signature) _____ (Date)

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Sound Level Meter/Noise Dosimeter Calibration Log

Project Name _____ Project# _____

Date _____ Calibrated by _____

Instrument: Manufacturer/Model Number _____

Time	Battery Charged (Y/N)	Sound Level Meter/Dosimeter Serial No.	Calibration Standard dBA	Span Setting (if applicable)	Meter Scale Setting (if applicable)	Zeroed (Y/N)	Expected Meter Reading	Actual Meter Reading	Comments

Comments _____

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Project: _____

Project Number: _____

TRAINING ACKNOWLEDGMENT FORM

By signing this certificate, you are acknowledging that you have completed the following formal training courses that meet OSHA's requirements:

Training	Date Completed
24-Hour HAZWOPER	_____
40-Hour HAZWOPER	_____
8-Hour Refresher	_____
8-Hour Supervisor	_____

Site-specific Training: I have been provided and have completed the site-specific training. The Site Safety and Health Officer conducted the training.

_____
Employee/Visitor Initials

Respiratory Protection: I have been trained in accordance with the criteria in Shaw Environmental, Inc.'s/my Employer's Respiratory Protection Program. I have been trained in the proper work procedures and use and limitations of the respirator(s) I will potentially wear. I have been trained in and will abide by the facial hair policy.

_____
Employee/Visitor Initials

Respirator Fit-test Training: I have been trained in the proper selection, fit, use, care, cleaning, and maintenance, and storage of the respirator(s) that I will potentially wear. I have been fit-tested in accordance with the criteria in Shaw Environmental, Inc.'s/my Employer's Respiratory Protection Program and have received a satisfactory fit. I have been assigned my individual respirator. I have been taught how to properly perform positive and negative pressure fit-check upon donning negative pressure respirators each time.

_____
Employee/Visitor Initials

Medical Examination: I have had a medical examination within the last twelve months which was paid for by my employer. The examination included: health history, pulmonary function tests and may have included an evaluation of a chest x-ray. A physician made a determination regarding my physical capacity to perform work tasks on the project while wearing protective equipment including a respirator. I was personally provided a copy and informed of the results of that examination. The Site Safety and Health Officer evaluated the medical certification provided by the physician and signed the appropriate blank below. The physician determined that there:

Were no limitations to performing the required work tasks:

_____
Employee/Visitor Initials

Were identified physical limitations to performing the required work tasks:

_____
Employee/Visitor Initials

[Employee's] [Visitor's] Signature _____

Date _____

Printed Name _____

Site Safety and Health Officer Signature _____

Date _____

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U.S. ARMY CORPS OF ENGINEERS
Safety Inspection Checklist for Construction Equipment
(Including Cranes, Derricks, and Hoisting Equipment)

Project Name:	Project Number:	Client:
Project	Contractor	Contract No.
Type and Make of Equipment	Model	Serial No.

Before any machinery or mechanized equipment is placed in use it shall be inspected and tested by a competent mechanic and certified to be in good operating condition. Records of tests and inspections shall be maintained as part of the active contract File at Project or Resident Office. Checklist set forth herein requires the application of EM 385-1-1, US Army Corps of Engineers Safety and Health Requirements Manual, September 1996. The appropriate EM paragraph to be applied is listed at the end of each testing requirement.

CHECKLIST	Yes	No	N/A
1. Are adequate and serviceable fire extinguishers provided? (09.E.01 through 09.E.03)			
2. Are all wire rope cables in good condition? (15.B.01 and 15.B.02)			
3. Are wire rope, sockets, splices, thimbles, and clips and adequate and properly applied? (15.B.03 through 15.B.08)			
4. Are hooks, safety nooks, shackles, rings, etc., in good condition?			
5. Are necessary platforms, foot-walks, etc., provided? (22.A.01 and 22.A.02)			
6. Are access steps, platforms, etc., provided with non-slip surfaces? (21.A.13)			
7. Is operator protected against the elements, falling or flying objects, swinging loads, and similar hazards? (16.B.10, 16.B.11, and 21.A.11)			
8. Are all glasses in operator's compartment safety glass and in good repair? (16.B.10 and 18.A.07)			
9. Is suitable access provided at lubrication points? (16.B.13)			
10. Do all modifications, extensions, replacement parts, and/or repairs to equipment maintain the same factor of safety as original designed equipment? (16.A.18)			
11. Are drums for load lines equipped with at least one positive holding device, applied directly to the motor shaft or some part of the train gear?			
12. Is there sufficient cable to allow three full wraps of cable on drums at all working positions? (16.C.10)			
13. Are adequate headlights, taillights, and turn signals provided and are they in proper operating condition (16.A.07 and 18.A.02 through 18.A.04)			
14. Are all approved brakes on wheeled equipment and in good operating condition? (16.A.07, 18.A.02, and 18.A.05)			
15. Do windshields have wipers in proper operating condition? (16.A.07, 18.A.02, and 18.A.06)			

This form has been amended by ECC to update the references to the September 1996 edition of EM 385-1-1.

CHECKLIST	Yes	No	N/A
16. Are rear view mirrors provided? (18.A.02 and 18.A.06)			
17. Are operating levers equipped with latch and other devices to prevent accidental starting? (18.A.10)			
18. Is engine equipped with power-operated starting device in operative condition? (18.A.06)			
19. Do all pressure vessels have valid inspection certificates? (20.A.03)			
20. Are reverse signal alarms on equipment? (16.B.01)			
21. Are belts, gears, shafts, electrical contacts, etc., adequately guarded? (16.B.03)			
22. Are all hot pipes and surfaces suitably guarded? (16.B.03)			
23. Are fuel tanks located so that spills or overflows will not come in contact with engine or exhaust? (16.B.04)			
24. Are exhausts and discharges so directed as not to endanger workmen or obstruct view of operator? (16.B.05)			
25. Are guards in place on equipment with drop type skip pans? (16.B.03)			
26. Are adequate seats provided for all riders? (16.A.07 and 18.C.01)			
27. Are tires in serviceable condition? Are testing/inspections documented? (18.A.02)			
28. Are steering linkage and tie rod in good operating condition? Are testing/inspections documented? (18.A.02)			
29. Are dump bodies provided with holding device or other suitable device for locking body in raised position? (18.A.10)			
30. Are tailgate dumping devices so arranged that operator will be in the clear while dumping loads? (18.A.10)			
31. Are trip handles provided on tailgates to facilitate handling? (18.A.10)			
32. Is the air hose free from leaks or defects? (20.B.03)			
33. Are safety lashings for quick make-up type connections provided? (20.A.16)			
34. Is an acceptable spark arrestor installed and working?			
35. Do heating devices comply with references?			
36. Does welding equipment comply with code requirements? (10.A.10 and 10.E.01)			
37. Is equipment adequately grounded? (10.E.04 and 10.E.07)			
38. Do electrical components comply with code? (10.E.01)			
39. Are required pressure, temperature, or relief gages and valves installed and operable? (20.A.10 through 20.A.13 and 20.B.02)			
40. Are approved seat belts and rollover protection provided? (16.B.08, 16.B.12, and 18.B.02)			
41. Is recommended preventive maintenance being followed? (16.A.08 and 18.A.02)			
42. Do helicopter cranes meet construction requirements (16.J.01)			
43. Does hydraulic equipment meet special safety conditions (11.H.08, 11.H.09, and 13.A.09)			
44. Is concrete equipment fitted with adequate safety devices? (27.A.04)			

This form has been amended by ECC to update the references to the September 1996 edition of EM 385-1-1.

CHECKLIST	Yes	No	N/A
45. Are elevating and rotating work platforms in conformance with ANSI A92.2? (22.K.01)			
46. Do conveyors, cableways, and related equipment conform to ANSI 320.01?			
47. Are pile drivers equipped with all appropriate safety devices? (16.L)			
48. Do material hoists conform to ANSI A10.5? (16.K.01)			
49. Do passenger elevators conform to ANSI A10.4? Do temporary hoists conform to ANSI A10.22: (21.H)			
50. Do hand and power tools comply with applicable ANSI standards (13.A through 13.G)			
51. Is high voltage sign posted?			
52. Is equipment fitted with positive stops for rotation when near power lines? (11.E and 16.D.06)			
53. Is there any visible evidence of damage to boom? (16.C.12 and Appendix H)			
54. Is the boom position indicator operating and visible to operator? (16.D.01 and 16.D.04)			
55. Have all operators had a current physical examination? (1.C and 16.C.04)			
56. Is breaking equipment capable of effectively braking, lowering, and safely holding a load of at least the full rated load as required?			

Remarks:

Certification: I hereby certify that this item of equipment is in good operating condition and that it meets all above requirements except as noted in the remarks.

_____ _____

Signature of Competent Mechanic Date

_____ _____

Signature of Superintendent/Quality Control Engineer Date

This form has been amended by ECC to update the references to the September 1996 edition of EM 385-1-1.

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UTILITY MARK-OUT DOCUMENTATION

Project Name: _____ Location: _____
FTL Name: _____ Date: _____
Utility Called: _____ Confirmation #: _____
Subcontractor: _____ Task/Activity: _____
County of work: _____ Municipality of work: _____

Before work is done on any site, contact the appropriate local utility locating service (One Call, Miss Dig, Uloco, etc.) or a local utility contractor to have sub grade utilities marked. NOTE: Boring locations to be placed not in the public right of way are typically not marked out by the public utility mark out, and a private utility locate service must be engaged. Indicate to the utility locator the nearest intersecting street for the site: _____

_____ Confirmation No: _____.

List utility firms (public and private) and the utility they will mark.

Utility Marker Emergency Telephone Numbers Major Utilities Marked by Color Code			
Name of Utility Company	Utility	Color Code	Emergency Telephone Number
	Water	Blue	
	Gas	Yellow	
	Electric	Red	
	Telephone/Cable/ Communication	Orange	
	Sewer	Green	
"ALL UNDERGROUND UTILITIES MAY NOT BE LOCATED BY THE LOCAL UTILITY SERVICE." Accordingly, you must list other known utilities in the area that the "One Call" service will not contact:			

Attach photos of the area prior to placing boreholes.
Take photos of the area indicating minimum 5 feet hand dig, post hole dig, probe, GPR, or other.
NOTE: For any borehole, should 5 feet minimum clearance not be obtained, you must contact Business Line VP or equivalent (Operations Director or other on the Federal Business Line) and obtain a variance.

Completed by:

_____ _____ _____
Name Signature Date

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Equipment Services Group

VEHICLE INSPECTION

UNIT NO: _____ **DATE:** _____
MILEAGE: _____ **CURRENT PROJECT NO:** _____
VEHICLE TYPE: _____ **LICENSE NUMBER:** _____
INSPECTED BY: _____ **FUEL FRONT:** _____
EMPLOYEE NUMBER: _____ **FUEL REAR:** _____

For Authorized Repairs On Donlen Vehicles, Call 1-800-323-1483

RETAIN THIS INSPECTION DOCUMENT IN PROJECT FILES

PRE-TRIP **Yes / No** **DAILY (USACE Project)** **Yes / No**

N / A = NOT APPLICABLE **C** = COMMENTS **O** = OKAY **N** = NEEDS ATTENTION

_____	Exterior / Interior Clean	_____	Engine Oil, Oil Pressure
_____	Lights: Head-Tail-Turn-Stop-Emergency-Backup	_____	Transmission Oil & Drive Line
_____	Operating Controls / Gauges	_____	Radiator / Cooling System
_____	Battery / Starter / Horn	_____	Exhaust / Muffler
_____	Air Conditioner / Heater / Defroster	_____	Front Axle / Steering / Suspension System
_____	Back-up Alarm (Trucks)	_____	Donlen Coupon Book
_____	Windshield, Other Glass, Wipers / Washers	_____	First Aid Kit
_____	Mirrors: Inside-Outside (Convex - trucks)	_____	Fire Extinguisher (mounted/accessible/charged)
_____	Insurance Card & Accident Report Kit	_____	Emergency Flares or Reflective Markers
_____	Emergency Phone Number List	_____	Tires / Wheels / Rims
_____	Map to Urgent Care Facility & Hospital	_____	Spare Tire, Jack, Lug Wrench
_____	Current Registration, Plates	_____	Frame / Bumpers
_____	Service Brakes, Emergency/Parking Brakes	_____	Seat Belts (One for Each Passenger)
_____	Trailer Aux Brake Controller/Electrical Connection	_____	Visible Damage to Body
_____	Coupling Devices/Safety Chain Anchor Point	_____	Driver Safety Notification Sticker
_____	Wheel Chocks (When Equipped With Trailer)	_____	Other, Please Enter Comments Below

Was Unit Serviced? Y / N **DATE** **MILES**

COMMENTS: _____

I am authorized to operate this vehicle. _____ Initials

I am licensed to operate this vehicle. _____ Initials

INSPECTORS SIGNATURE: _____ **DATE:** _____

REPORT ALL DEFICIENCIES TO YOUR SUPERVISOR

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Zero Accident Pledge

Shaw® Shaw Environmental, Inc.

We, the undersigned personnel of the _____ Project are committed to a goal of **ZERO ACCIDENTS** for the duration of the project.

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Contract No. FA8903-09-D-8580, Task Order 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-5

Appendix E
Hazardous Chemical Inventory List and Material Safety Data Sheets

Chemical Inventory
November 1, 2011

Argon
Bentonite
Bleach
Calcium Hydroxide (Hydrated Lime)
Diesel Fuel
Fire extinguisher
Gasoline
Gear lubricant
Grease
Hand cleaner
Hydraulic oil
Hydrochloric Acid
Argon (cryogenic liquified gas)
Hydrogen peroxide (20% - 60% sol)
Isobutylene
Liquinox
Motor oil
Portland cement
Potassium permanganate
Silica sand

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Section 1 - Chemical Product and Company Identification 61

Material Name: Argon
CAS Number: 7440-37-1
Chemical Formula: Ar
Structural Chemical Formula: Ar
EINECS Number: 231-147-0
ACX Number: X1002784-0
Synonyms: Argon; ARGON; ARGON-40
General Use: To provide an inert i.e. non reactive, non oxidizing atmosphere for gas welding; usually TIG and MIG welding.
Used in incandescent and fluorescent tubes, also with mixtures of neon for neon lights. Argon alone produces a bluish-purplish light.
As an inerting gas in rectifier tubes; in thermometers above mercury; in lasers; in chromatography and ionization chambers and particle counters.

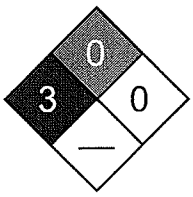
Section 2 - Composition / Information on Ingredients

Name	CAS	%
argon	7440-37-1	>99

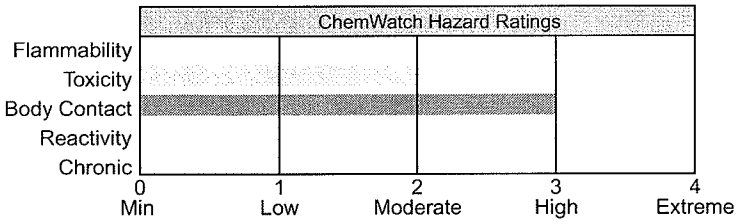
OSHA PEL **NIOSH REL**

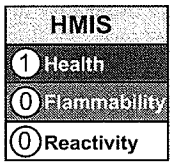
ACGIH TLV

Section 3 - Hazards Identification



Fire Diamond





ANSI Signal Word
Warning!


Compressed Gas

☆☆☆☆☆ Emergency Overview ☆☆☆☆☆

Odorless, colorless gas. Stored as a compressed gas which may cause frostbite. Other Acute Effects: simple asphyxiant.

Potential Health Effects

Target Organs: central nervous system (CNS) (gas as an indirect effect of lack of oxygen), skin (liquid)
Primary Entry Routes: inhalation, skin contact
Acute Effects
Inhalation: The gas is a simple asphyxiant (precludes access to oxygen) and inhalation may cause loss of consciousness.
Material is highly volatile and may quickly form concentrated atmosphere in confined or unventilated area. Vapor is heavier than air and may displace and replace air in breathing zone, acting as a simple asphyxiant. This may happen with little warning of overexposure.
Symptoms of asphyxia (suffocation) may include headache, dizziness, shortness of breath, muscular weakness, drowsiness and ringing in the ears.

If the asphyxia is allowed to progress, there may be nausea and vomiting, further physical weakness and unconsciousness and, finally, convulsions, coma and death. Significant concentrations of the non-toxic gas reduce the oxygen level in the air. As the amount of oxygen is reduced from 21 to 14 volume %, the pulse rate accelerates and the rate and volume of breathing increase. The ability to maintain attention and think clearly is diminished and muscular coordination is somewhat disturbed. As oxygen decreases from 14-10% judgement becomes faulty; severe injuries may cause no pain. Muscular exertion leads to rapid fatigue. Further reduction to 6% may produce nausea and vomiting and the ability to move may be lost.

Permanent brain damage may result even after resuscitation at exposures to this lower oxygen level. Below 6% breathing is in gasps and convulsions may occur. Inhalation of a mixture containing no oxygen may result in unconsciousness from the first breath and death will follow in a few minutes.

Eye: The gas is non-irritating and non-toxic.

The liquid is capable of causing severe cold burns and is capable of causing severe damage with loss of sight.

Skin: The gas is non-irritating and non-toxic.

Vaporizing liquid causes rapid cooling and contact may cause cold burns, frostbite.

Ingestion: Overexposure is unlikely in this form.

Considered an unlikely route of entry in commercial/industrial environments.

Carcinogenicity: NTP - Not listed; IARC - Not listed; OSHA - Not listed; NIOSH - Not listed; ACGIH - Not listed; EPA - Not listed; MAK - Not listed.

Chronic Effects: No data found.

Section 4 - First Aid Measures

Inhalation: Remove to fresh air.

Lay patient down. Keep warm and rested.

If breathing is shallow or has stopped, ensure clear airway and apply resuscitation. Transport to hospital or doctor.

Eye Contact: In case of contact with liquid: promptly flush eyes with tepid water. Seek medical attention immediately.

Skin Contact: In case of cold burns (frost-bite): Bathe the affected area immediately in cold water for 10 to 15 minutes, immersing if possible and without rubbing.

Do not apply hot water or radiant heat. Apply a clean, dry dressing.

Transport to hospital or doctor.

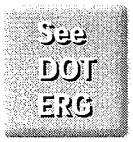
Ingestion: Not applicable.

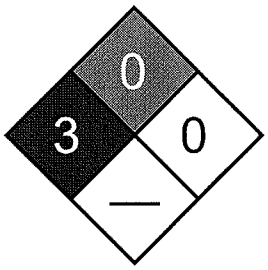
After first aid, get appropriate in-plant, paramedic, or community medical support.

Note to Physicians: Treat symptomatically.

Give oxygen therapy following asphyxiation.

Section 5 - Fire-Fighting Measures





Fire Diamond

Flash Point: Will not burn

Autoignition Temperature: Nonflammable

LEL: Not applicable

UEL: Not applicable

Extinguishing Media: There is no restriction on the type of extinguisher which may be used.

Use fire fighting procedures suitable for surrounding area.

General Fire Hazards/Hazardous Combustion Products: Noncombustible. Heating may cause expansion or decomposition leading to violent rupture of containers.

Fire Incompatibility: Very inert, chemically.

Fire-Fighting Instructions: Contact fire department and tell them location and nature of hazard.

Product is not combustible. No special firefighting procedures required.

Use fire fighting procedures suitable for surrounding area.

Wear breathing apparatus plus protective gloves. May be washed to drain with large quantities of water.

Cool fire-exposed containers with water spray from a protected location.

If safe to do so, remove containers from path of fire.

Section 6 - Accidental Release Measures

Small Spills: Increase ventilation. Avoid breathing vapors and contact with skin and eyes.

Apply leak detection solution to suspected sites in lines and equipment.

Stop leak if safe to do so.

Large Spills: Clear area of personnel.

Wear breathing apparatus plus protective gloves. May be washed to drain with large quantities of water.

Increase ventilation.
Stop leak if safe to do so.
Remove leaking cylinders to a safe place if possible. Release pressure under safe, controlled conditions by opening the valve.
Regulatory Requirements: Follow applicable OSHA regulations (29 CFR 1910.120).

Section 7 - Handling and Storage

Handling Precautions: Avoid breathing vapors and contact with skin and eyes. Avoid sources of heat.
Avoid physical damage to containers.
Use in a well-ventilated area.
Keep containers securely sealed when not in use.
Prevent concentration in hollows and sumps. DO NOT enter confined spaces until atmosphere has been checked.
Recommended Storage Methods: Check that containers are clearly labeled. Cylinder. Ensure the use of equipment rated for cylinder pressure.
Ensure the use of compatible materials of construction.
Valve protection cap to be in place until cylinder is secured, connected.
Cylinder must be properly secured either in use or in storage.
Cylinder valve must be closed when not in use or when empty.
Segregate full from empty cylinders.
WARNING: Suckback into cylinder may result in rupture.
Use back-flow preventive device in piping.
Regulatory Requirements: Follow applicable OSHA regulations.

Section 8 - Exposure Controls / Personal Protection

Engineering Controls: General exhaust is adequate under normal operating conditions. Air-line hood.
If risk of overexposure exists, wear air supplied breathing apparatus.
Provide adequate ventilation in warehouse or closed storage areas.
Personal Protective Clothing/Equipment:
Eyes: Safety glasses with side shields; or as required, chemical goggles.
Contact lenses pose a special hazard; soft lenses may absorb irritants and all lenses concentrate them.
Hands/Feet: Wear chemical protective gloves, eg. PVC. Wear safety footwear.
Other: Overalls. Eyewash unit.

Section 9 - Physical and Chemical Properties

Appearance/General Info: Colorless, odorless compressed gas. Constitutes approximately 0.93% of dry atmospheric air. An element characterized by its extreme lack of chemical reactivity. Permanent gas: Critical temperature; -122.4 °C. Critical pressure: 4864 kPa.

Physical State: Compressed gas
Vapor Density (Air=1): 1.38
Formula Weight: 39.95
Specific Gravity (H_2O=1, at 4 °C): Not applicable
Evaporation Rate: > 1
pH: Not applicable
pH (1% Solution): Not applicable
Boiling Point: -185.8 °C (-302 °F)
Freezing/Melting Point: -192.2 °C (-313.96 °F)
Volatile Component (% Vol): 100
Decomposition Temperature (°C): Not applicable
Water Solubility: Slightly soluble in water

Section 10 - Stability and Reactivity

Stability/Polymerization/Conditions to Avoid: Product is considered stable. Hazardous polymerization will not occur.
Storage Incompatibilities: Very inert, chemically.

Section 11 - Toxicological Information

No relevant toxicological data found at time of research.

See *RTECS* CF 2300000, for additional data.

Section 12 - Ecological Information

Environmental Fate: No data found.
Ecotoxicity: No data found.

Section 13 - Disposal Considerations

Disposal: Return empty containers to supplier.

Section 14 - Transport Information

DOT Hazardous Materials Table Data (49 CFR 172.101):

Shipping Name and Description: Argon, compressed
ID: UN1006
Hazard Class: 2.2 - Non-flammable compressed gas
Packing Group:
Symbols:
Label Codes: 2.2 - Non-Flammable Gas
Special Provisions:
Packaging: **Exceptions:** 306 **Non-bulk:** 302 **Bulk:** 314, 315
Quantity Limitations: **Passenger aircraft/rail:** 75 kg **Cargo aircraft only:** 150 kg
Vessel Stowage: **Location:** A **Other:**

Section 15 - Regulatory Information

EPA Regulations:
RCRA 40 CFR: Not listed
CERCLA 40 CFR 302.4: Not listed
SARA 40 CFR 372.65: Not listed
SARA EHS 40 CFR 355: Not listed
TSCA: Listed

Section 16 - Other Information

Disclaimer: Judgments as to the suitability of information herein for the purchaser's purposes are necessarily the purchaser's responsibility. Although reasonable care has been taken in the preparation of such information, Genium Group, Inc. extends no warranties, makes no representations, and assumes no responsibility as to the accuracy or suitability of such information for application to the purchaser's intended purpose or for consequences of its use.

BAROID DRILLING FLUIDS
BENTONITE PELLETS 3\8 INCH **Revised: 01/03/2008**

MSDS Contents

HALLIBURTON

MATERIAL SAFETY DATA SHEET

PRODUCT TRADE NAME: BENTONITE PELLETS 3\8 INCH

REVISION DATE: 03-JAN-2008

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

PRODUCT TRADE NAME: BENTONITE PELLETS 3\8 INCH

SYNONYMS: NONE

CHEMICAL FAMILY: MINERAL

APPLICATION: WEIGHT ADDITIVE

MANUFACTURER/SUPPLIER:
BAROID FLUID SERVICES
PRODUCT SERVICE LINE OF HALLIBURTON
P.O. BOX 1675
HOUSTON, TX 77251

TELEPHONE: (281) 871-4000

EMERGENCY TELEPHONE: (281) 575-5000

PREPARED BY: CHEMICAL COMPLIANCE

TELEPHONE: 1-580-251-4335

E-MAIL: FDUNEXCHEM@HALLIBURTON.COM

2. COMPOSITION/INFORMATION ON INGREDIENTS

SUBSTANCE	CAS NUMBER	PERCENT

CRYSTALLINE SILICA, CRISTOBALITE	14464-46-1	0 - 1%
CRYSTALLINE SILICA, TRIDYMITE	15468-32-3	0 - 1%
CRYSTALLINE SILICA, QUARTZ	14808-60-7	<3
BENTONITE	1302-78-9	60 - 100%

SUBSTANCE	ACGIH TLV-TWA	OSHA PEL-TWA
CRYSTALLINE SILICA, CRISTOBALITE	0.025 MG/M3	1/2 X 10 MG/M3/ %SiO2 + 2
CRYSTALLINE SILICA, TRIDYMITE	0.05 MG/M3	1/2 X 10 MG/M3/ %SiO2 + 2
CRYSTALLINE SILICA, QUARTZ	0.025 MG/M3	10 MG/M3/ %SiO2 + 2
BENTONITE	NOT APPLICABLE	NOT APPLICABLE

MORE RESTRICTIVE EXPOSURE LIMITS MAY BE ENFORCED BY SOME STATES, AGENCIES, OR OTHER AUTHORITIES.

3. HAZARDS IDENTIFICATION

HAZARD OVERVIEW:

CAUTION!

ACUTE HEALTH HAZARD: MAY CAUSE EYE AND RESPIRATORY IRRITATION.

DANGER!

CHRONIC HEALTH HAZARD:
BREATHING CRYSTALLINE SILICA CAN CAUSE LUNG DISEASE, INCLUDING SILICOSIS AND LUNG CANCER. CRYSTALLINE SILICA HAS ALSO BEEN ASSOCIATED WITH SCLERODERMA AND KIDNEY DISEASE.

THIS PRODUCT CONTAINS QUARTZ, CRISTOBALITE, AND/OR TRIDYMITE WHICH MAY BECOME AIRBORNE WITHOUT A VISIBLE CLOUD. AVOID BREATHING DUST. AVOID CREATING DUSTY CONDITIONS. USE ONLY WITH ADEQUATE VENTILATION TO KEEP EXPOSURES BELOW RECOMMENDED EXPOSURE LIMITS. WEAR A NIOSH CERTIFIED, EUROPEAN STANDARD EN 149, OR EQUIVALENT RESPIRATOR WHEN USING THIS PRODUCT. REVIEW THE MATERIAL SAFETY DATA SHEET (MSDS) FOR THIS PRODUCT, WHICH HAS BEEN PROVIDED TO YOUR EMPLOYER.

4. FIRST AID MEASURES

INHALATION:
IF INHALED, REMOVE FROM AREA TO FRESH AIR. GET MEDICAL ATTENTION IF RESPIRATORY IRRITATION DEVELOPS OR IF BREATHING BECOMES DIFFICULT.

SKIN: WASH WITH SOAP AND WATER. GET MEDICAL ATTENTION IF IRRITATION PERSISTS.

EYES:
IN CASE OF CONTACT, IMMEDIATELY FLUSH EYES WITH PLENTY OF WATER FOR AT LEAST 15 MINUTES AND GET MEDICAL ATTENTION IF IRRITATION PERSISTS.

INGESTION: UNDER NORMAL CONDITIONS, FIRST AID PROCEDURES ARE NOT REQUIRED.

NOTES TO PHYSICIAN: TREAT SYMPTOMATICALLY.

5. FIRE FIGHTING MEASURES

FLASH POINT/RANGE (F): NOT DETERMINED
FLASH POINT/RANGE (C): NOT DETERMINED
FLASH POINT METHOD: NOT DETERMINED

AUTOIGNITION TEMPERATURE (F): NOT DETERMINED

AUTOIGNITION TEMPERATURE (C): NOT DETERMINED

FLAMMABILITY LIMITS IN AIR - LOWER (%): NOT DETERMINED
FLAMMABILITY LIMITS IN AIR - UPPER (%): NOT DETERMINED

FIRE EXTINGUISHING MEDIA: ALL STANDARD FIREFIGHTING MEDIA.

SPECIAL EXPOSURE HAZARDS: NOT APPLICABLE.

SPECIAL PROTECTIVE EQUIPMENT FOR FIRE-FIGHTERS: NOT APPLICABLE.

NFPA RATINGS:
HEALTH 0
FLAMMABILITY 0
REACTIVITY 0

HMIS RATINGS:
HEALTH 0*
FLAMMABILITY 0
REACTIVITY 0

6. ACCIDENTAL RELEASE MEASURES

PERSONAL PRECAUTIONARY MEASURES:
USE APPROPRIATE PROTECTIVE EQUIPMENT. AVOID CREATING AND BREATHING DUST.

ENVIRONMENTAL PRECAUTIONARY MEASURES: NONE KNOWN.

PROCEDURE FOR CLEANING / ABSORPTION:
COLLECT USING DUSTLESS METHOD AND HOLD FOR APPROPRIATE DISPOSAL. CONSIDER POSSIBLE TOXIC OR FIRE HAZARDS ASSOCIATED WITH CONTAMINATING SUBSTANCES AND USE APPROPRIATE METHODS FOR COLLECTION, STORAGE AND DISPOSAL.

7. HANDLING AND STORAGE

HANDLING PRECAUTIONS:
THIS PRODUCT CONTAINS QUARTZ, CRISTOBALITE, AND/OR TRIDYMITE WHICH MAY BECOME AIRBORNE WITHOUT A VISIBLE CLOUD. AVOID BREATHING DUST. AVOID CREATING DUSTY CONDITIONS. USE ONLY WITH ADEQUATE VENTILATION TO KEEP EXPOSURE BELOW RECOMMENDED EXPOSURE LIMITS. WEAR A NIOSH CERTIFIED, EUROPEAN STANDARD EN 149, OR EQUIVALENT RESPIRATOR WHEN USING THIS PRODUCT. MATERIAL IS SLIPPERY WHEN WET.

STORAGE INFORMATION:

USE GOOD HOUSEKEEPING IN STORAGE AND WORK AREAS TO PREVENT ACCUMULATION OF DUST.

CLOSE CONTAINER WHEN NOT IN USE. DO NOT REUSE EMPTY CONTAINER.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

ENGINEERING CONTROLS:
USE APPROVED INDUSTRIAL VENTILATION AND LOCAL EXHAUST AS REQUIRED TO MAINTAIN EXPOSURES BELOW APPLICABLE EXPOSURE LIMITS LISTED IN SECTION 2.

RESPIRATORY PROTECTION:
WEAR A NIOSH CERTIFIED, EUROPEAN STANDARD EN 149, OR EQUIVALENT RESPIRATOR WHEN USING THIS PRODUCT.

HAND PROTECTION: NORMAL WORK GLOVES.

SKIN PROTECTION:
WEAR CLOTHING APPROPRIATE FOR THE WORK ENVIRONMENT. DUSTY CLOTHING SHOULD BE LAUNDERED BEFORE REUSE. USE PRECAUTIONARY MEASURES TO AVOID CREATING DUST WHEN REMOVING OR LAUNDERING CLOTHING.

EYE PROTECTION: WEAR SAFETY GLASSES OR GOGGLES TO PROTECT AGAINST EXPOSURE.

OTHER PRECAUTIONS: NONE KNOWN.

9. PHYSICAL AND CHEMICAL PROPERTIES

PHYSICAL STATE: SOLID

COLOR: VARIOUS

ODOR: ODORLESS

pH: 8 - 10

SPECIFIC GRAVITY @ 20 C (WATER=1): 2.55

DENSITY @ 20 C (LBS./GALLON): 62

BULK DENSITY @ 20 C (LBS/FT3): 71

BOILING POINT/RANGE (F): NOT DETERMINED
BOILING POINT/RANGE (C): NOT DETERMINED

FREEZING POINT/RANGE (F): NOT DETERMINED
FREEZING POINT/RANGE (C): NOT DETERMINED

VAPOR PRESSURE @ 20 C (MMHg): NOT DETERMINED

VAPOR DENSITY (AIR=1): NOT DETERMINED

PERCENT VOLATILES: NOT DETERMINED

EVAPORATION RATE (BUTYL ACETATE=1): NOT DETERMINED

SOLUBILITY IN WATER (G/100 ML): INSOLUBLE

SOLUBILITY IN SOLVENTS (G/100 ML): NOT DETERMINED

VOCS (LBS./GALLON): NOT DETERMINED

VISCOSITY, DYNAMIC @ 20 C (CENTIPOISE): NOT DETERMINED

VISCOSITY, KINEMATIC @ 20 C (CENTISTROKES): NOT DETERMINED

PARTITION COEFFICIENT/n-OCTANOL/WATER: NOT DETERMINED

MOLECULAR WEIGHT (G/MOLE): NOT DETERMINED

10. STABILITY AND REACTIVITY

STABILITY DATA: STABLE

HAZARDOUS POLYMERIZATION: WILL NOT OCCUR

CONDITIONS TO AVOID: NONE ANTICIPATED

INCOMPATIBILITY (MATERIALS TO AVOID): HYDROFLUORIC ACID.

HAZARDOUS DECOMPOSITION PRODUCTS:
AMORPHOUS SILICA MAY TRANSFORM AT ELEVATED TEMPERATURES TO TRIDYMITE (870 C) OR CRISTOBALITE (1470 C).

ADDITIONAL GUIDELINES: NOT APPLICABLE

11. TOXICOLOGICAL INFORMATION

PRINCIPLE ROUTE OF EXPOSURE: EYE OR SKIN CONTACT, INHALATION.

INHALATION:
INHALED CRYSTALLINE SILICA IN THE FORM OF QUARTZ OR CRISTOBALITE FROM OCCUPATIONAL SOURCES IS CARCINOGENIC TO HUMANS (IARC, GROUP 1). THERE IS SUFFICIENT EVIDENCE IN EXPERIMENTAL ANIMALS FOR THE CARCINOGENICITY OF TRIDYMITE (IARC, GROUP 2A).

BREATHING SILICA DUST MAY CAUSE IRRITATION OF THE NOSE, THROAT, AND RESPIRATORY PASSAGES. BREATHING SILICA DUST MAY NOT CAUSE NOTICEABLE INJURY OR ILLNESS EVEN THOUGH PERMANENT LUNG DAMAGE MAY BE OCCURRING. INHALATION OF DUST MAY ALSO HAVE SERIOUS CHRONIC HEALTH EFFECTS (SEE "CHRONIC EFFECTS/CARCINOGENICITY" SUBSECTION BELOW).

SKIN CONTACT: MAY CAUSE MECHANICAL SKIN IRRITATION.

EYE CONTACT: MAY CAUSE EYE IRRITATION.

INGESTION: NONE KNOWN

AGGRAVATED MEDICAL CONDITIONS:
INDIVIDUALS WITH RESPIRATORY DISEASE, INCLUDING BUT NOT LIMITED TO ASTHMA AND BRONCHITIS, OR SUBJECT TO EYE IRRITATION, SHOULD NOT BE EXPOSED TO QUARTZ DUST.

CHRONIC EFFECTS/CARCINOGENICITY:

SILICOSIS:
EXCESSIVE INHALATION OF RESPIRABLE CRYSTALLINE SILICA DUST MAY CAUSE A PROGRESSIVE, DISABLING, AND SOMETIMES-FATAL LUNG DISEASE CALLED SILICOSIS.

SYMPTOMS INCLUDE COUGH, SHORTNESS OF BREATH, WHEEZING, NON-SPECIFIC CHEST ILLNESS, AND REDUCED PULMONARY FUNCTION. THIS DISEASE IS EXACERBATED BY SMOKING. INDIVIDUALS WITH SILICOSIS ARE PREDISPOSED TO DEVELOP TUBERCULOSIS.

CANCER STATUS:
THE INTERNATIONAL AGENCY FOR RESEARCH ON CANCER (IARC) HAS DETERMINED THAT CRYSTALLINE SILICA INHALED IN THE FORM OF QUARTZ OR CRISTOBALITE FROM OCCUPATIONAL SOURCES CAN CAUSE LUNG CANCER IN HUMANS (GROUP 1 - CARCINOGENIC TO HUMANS) AND HAS DETERMINED THAT THERE IS SUFFICIENT EVIDENCE IN EXPERIMENTAL ANIMALS FOR THE CARCINOGENICITY OF TRIDYMITE (GROUP 2A - POSSIBLE CARCINOGEN TO HUMANS). REFER TO IARC MONOGRAPH 68, SILICA, SOME SILICATES AND ORGANIC FIBRES (JUNE 1997) IN CONJUNCTION WITH THE USE OF THESE MINERALS. THE NATIONAL TOXICOLOGY PROGRAM CLASSIFIES RESPIRABLE CRYSTALLINE SILICA AS "KNOWN TO BE A HUMAN CARCINOGEN". REFER TO THE 9TH REPORT ON CARCINOGENS (2000). THE AMERICAN CONFERENCE OF GOVERNMENTAL INDUSTRIAL HYGIENISTS (ACGIH) CLASSIFIES CRYSTALLINE SILICA, QUARTZ, AS A SUSPECTED HUMAN CARCINOGEN (A2).

THERE IS SOME EVIDENCE THAT BREATHING RESPIRABLE CRYSTALLINE SILICA OR THE DISEASE SILICOSIS IS ASSOCIATED WITH AN INCREASED INCIDENCE OF SIGNIFICANT DISEASE ENDPOINTS SUCH AS SCLERODERMA (AN IMMUNE SYSTEM DISORDER MANIFESTED BY SCARRING OF THE LUNGS, SKIN, AND OTHER INTERNAL ORGANS) AND KIDNEY DISEASE.

OTHER INFORMATION:
FOR FURTHER INFORMATION CONSULT "ADVERSE EFFECTS OF CRYSTALLINE SILICA EXPOSURE" PUBLISHED BY THE AMERICAN THORACIC SOCIETY MEDICAL SECTION OF THE AMERICAN LUNG ASSOCIATION, AMERICAN JOURNAL OF RESPIRATORY AND CRITICAL CARE MEDICINE, VOLUME 155, PAGES 761-768 (1997).

TOXICITY TESTS:
ORAL TOXICITY: NOT DETERMINED
DERMAL TOXICITY: NOT DETERMINED
INHALATION TOXICITY: NOT DETERMINED
PRIMARY IRRITATION EFFECT: NOT DETERMINED

CARCINOGENICITY:
REFER TO IARC MONOGRAPH 68, SILICA, SOME SILICATES AND ORGANIC FIBRES (JUNE 1997).

GENOTOXICITY: NOT DETERMINED

REPRODUCTIVE / DEVELOPMENTAL TOXICITY: NOT DETERMINED

12. ECOLOGICAL INFORMATION

MOBILITY (WATER/SOIL/AIR): NOT DETERMINED

PERSISTENCE/DEGRADABILITY: NOT DETERMINED

BIO-ACCUMULATION: NOT DETERMINED

ECOTOXICOLOGICAL INFORMATION:

ACUTE FISH TOXICITY: NOT DETERMINED

ACUTE CRUSTACEANS TOXICITY:NOT DETERMINED

ACUTE ALGAE TOXICITY: NOT DETERMINED

CHEMICAL FATE INFORMATION: NOT DETERMINED

OTHER INFORMATION: NOT APPLICABLE

13. DISPOSAL CONSIDERATIONS

DISPOSAL METHOD:
BURY IN A LICENSED LANDFILL ACCORDING TO FEDERAL, STATE, AND LOCAL REGULATIONS.

CONTAMINATED PACKAGING: FOLLOW ALL APPLICABLE NATIONAL OR LOCAL REGULATIONS.

14. TRANSPORT INFORMATION

LAND TRANSPORTATION:
DOT: NOT RESTRICTED
CANADIAN TDG: NOT RESTRICTED
ADR: NOT RESTRICTED

AIR TRANSPORTATION:
ICAO/IATA: NOT RESTRICTED

SEA TRANSPORTATION:
IMDG: NOT RESTRICTED

OTHER SHIPPING INFORMATION:
LABELS: NONE

15. REGULATORY INFORMATION

US REGULATIONS:

US TSCA INVENTORY: ALL COMPONENTS LISTED ON INVENTORY.

EPA SARA TITLE III EXTREMELY HAZARDOUS SUBSTANCES: NOT APPLICABLE

EPA SARA (311,312) HAZARD CLASS:
ACUTE HEALTH HAZARD
CHRONIC HEALTH HAZARD

EPA SARA (313) CHEMICALS:
THIS PRODUCT DOES NOT CONTAIN A TOXIC CHEMICAL FOR ROUTINE ANNUAL "TOXIC CHEMICAL RELEASE REPORTING" UNDER SECTION 313 (40 CFR 372).

EPA CERCLA/SUPERFUND REPORTABLE SPILL QUANTITY: NOT APPLICABLE.

EPA RCRA HAZARDOUS WASTE CLASSIFICATION:
IF PRODUCT BECOMES A WASTE, IT DOES NOT MEET THE CRITERIA OF A HAZARDOUS WASTE AS DEFINED BY THE US EPA.

CALIFORNIA PROPOSITION 65:
THE CALIFORNIA PROPOSITION 65 REGULATIONS APPLY TO THIS PRODUCT.

MA RIGHT-TO-KNOW LAW: ONE OR MORE COMPONENTS LISTED.

NJ RIGHT-TO-KNOW LAW: ONE OR MORE COMPONENTS LISTED.

PA RIGHT-TO-KNOW LAW: ONE OR MORE COMPONENTS LISTED.

CANADIAN REGULATIONS:

CANADIAN DSL INVENTORY: ALL COMPONENTS LISTED ON INVENTORY.

WHMIS HAZARD CLASS:
D2A: VERY TOXIC MATERIALS CRYSTALLINE SILICA

16. OTHER INFORMATION

THE FOLLOWING SECTIONS HAVE BEEN REVISED SINCE THE LAST ISSUE OF THIS MSDS:
NOT APPLICABLE

ADDITIONAL INFORMATION:
FOR ADDITIONAL INFORMATION ON THE USE OF THIS PRODUCT, CONTACT YOUR LOCAL HALLIBURTON REPRESENTATIVE.

FOR QUESTIONS ABOUT THE MATERIAL SAFETY DATA SHEET FOR THIS OR OTHER HALLIBURTON PRODUCTS, CONTACT CHEMICAL COMPLIANCE AT:
1-580-251-4335.

DISCLAIMER STATEMENT:
THIS INFORMATION IS FURNISHED WITHOUT WARRANTY, EXPRESSED OR IMPLIED, AS TO ACCURACY OR COMPLETENESS. THE INFORMATION IS OBTAINED FROM VARIOUS SOURCES INCLUDING THE MANUFACTURER AND OTHER THIRD PARTY SOURCES. THE INFORMATION MAY NOT BE VALID UNDER ALL CONDITIONS NOR IF THIS MATERIAL IS USED IN COMBINATION WITH OTHER MATERIALS OR IN ANY PROCESS. FINAL DETERMINATION OF SUITABILITY OF ANY MATERIAL IS THE SOLE RESPONSIBILITY OF THE USER.

ADVANCED BLENDING
DETERGENT, BLEACH LAUNDRY FEDERAL STOCK 7930-01-236-7280 **Revised: 07/04/1999**

MSDS Contents

MATERIAL SAFETY DATA SHEET

MAY BE USED TO COMPLY WITH OSHA'S HAZARD COMMUNICATION STANDARD, 29 CFR 1910.1200. STANDARD MUST BE CONSULTED FOR SPECIFIC REQUIREMENTS.

U.S. DEPARTMENT OF LABOR

OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION (NON-MANDATORY FORM)

FORMS APPROVED OMB NO.: 1218-0072

N/A-NOT APPLICABLE
N/D-NOT DETERMINED
N/E-NOT ESTIMATED

IDENTITY (AS USED ON LABEL AND LIST):
DETERGENT, BLEACH LAUNDRY FEDERAL STOCK # 7930-01-236-7280

NOTE:
BLANK SPACES ARE NOT PERMITTED. IF ANY ITEM IS NOT APPLICABLE, OR NO INFORMATION IS AVAILABLE, THE SPACE MUST BE MARKED TO INDICATE THAT.

SECTION 1. COMPANY IDENTIFICATION

MANUFACTURER'S NAME: ADVANCED BLENDING

ADDRESS:
645 TOWER DR.
KENNEDALE, TX 76060

EMERGENCY TELEPHONE NUMBER: 817-572-7722 (8-5 PM EST)

NUMBER FOR INFORMATION: SAME

DATE PREPARED: 7/4/99

CONTRACT NUMBER: TC GS 07F-J0119

SECTION 2. HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

HAZARDOUS COMPONENTS (SPECIFIC CHEMICAL IDENTITY; COMMON NAMES)	OSHA PEL	ACGIH TLV	OTHER LIMITS
NO HAZARDOUS COMPONENTS.			

SECTION 3. HAZARDOUS INFORMATION

THIS PRODUCT IS NOT CLASSIFIED AS A HAZARDOUS MATERIAL BY THE U.S. DEPARTMENT OF TRANSPORTATION.

SECTION 4. PHYSICAL CHARACTERISTICS

BOILING POINT: ND

SPECIFIC GRAVITY (H2O = 1): ND

VAPOR PRESSURE (MMHg.): ND

MELTING POINT: NA

VAPOR DENSITY (AIR = 1): ND

EVAPORATION RATE (BUTYL ACETATE = 1): ND

SOLUBILITY IN WATER: COMPLETE

APPEARANCE & ODOR: WHITE POWDER.

SECTION 5. FIRE & EXPLOSION & HAZARD DATA

FLASH POINT (METHOD USED): NA

FLAMMABLE LIMITS: NA
LEL: NA
UEL: NA

EXTINGUISHING MEDIA:
NOT COMBUSTIBLE. WATER SPRAY, DRY CHEMICAL, CO2 OR FOAM MAY BE USED IN AREAS WHERE PRODUCT IS STORED.

SPECIAL FIRE FIGHTING PROCEDURES:
PRODUCT PRESENTS NO UNUSUAL FIRE HAZARD AND REQUIRES NO SPECIAL PROCEDURES.

UNUSUAL FIRE AND EXPLOSION HAZARDS: NONE KNOWN

SECTION 6. REACTIVITY DATA

STABILITY: STABLE

CONDITIONS TO AVOID: STRONG ACIDS

INCOMPATIBILITY (MATERIALS TO AVOID): STRONG ACIDS

HAZARDOUS DECOMPOSITION OR BYPRODUCTS: NONE

HAZARDOUS POLYMERIZATION: WILL NOT OCCUR

CONDITIONS TO AVOID: N/A

SECTION 7. HEALTH HAZARD DATA

ROUTES OF ENTRY:
EYES (X)
INHALATION (X)
SKIN (X)
INGESTION (X)

HEALTH HAZARD (ACUTE & CHRONIC):
MAY BE IRRITATING TO EYES OR SKIN WITH SOME INDIVIDUALS.

CARCINOGENICITY: NONE
NTP:
IARC MONOGRAPHS:
OSHA REGULATED:

SECTION 8. FIRST AID MEASURES

INGESTION: IF INGESTED IN LARGE QUANTITIES, SEEK MEDICAL ATTENTION.

EYES:
IMMEDIATELY FLUSH WITH A DIRECTED STREAM OF WATER FOR AT LEAST 15 MINUTES
HOLDING THE EYELID APART THE ENSURE COMPLETE IRRIGATION OF THE EYE.

SECTION 9. PRECAUTIONS FOR SAFE HANDLING & USE

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED:
IF SPILLED, STEPS SHOULD BE TAKEN TO CONTAIN SPILL, CLEAN AREA OF SPILL
IMMEDIATELY. FOLLOW PROTECTIVE MEASURES PROVIDED UNDER CONTROL MEASURES IN
SECTION 9.

PRECAUTIONS TO BE TAKEN IN HANDLING OR STORING:
FOR BEST PRODUCT PERFORMANCE STORE IN COOL, DRY AREA.

OTHER PRECAUTIONS: KEEP OUT OF THE REACH OF CHILDREN.

SECTION 10. CONTROL MEASURES

RESPIRATORY PROTECTION (SPECIFY TYPE): NONE

VENTILATION:
LOCAL EXHAUST: NA
SPECIAL: NA
MECHANICAL (GENERAL): NA

OTHER: NA

PROTECTIVE GLOVES: NA

EYE PROTECTION: REQUIRED

OTHER PROTECTIVE CLOTHING OR EQUIPMENT: NONE

WORK/HYGIENIC PRACTICES:
CLEAN ALL SPILLS IMMEDIATELY. OBSERVE PERSONAL HYGIENE.

SECTION 11. TOXICOLOGICAL INFORMATION

PRODUCT MAY BE CONSIDERED ALKALINE.

SECTION 12. ECOLOGICAL INFORMATION

THERE IS LIMITED INFORMATION AVAILABLE ON THE ENVIRONMENTAL FATE AND EFFECTS OF THIS MATERIAL. IT IS MISCIBLE IN WATER. THIS COMPOUND IS ALKALINE AND MAY RAISE THE pH OF SURFACE WATERS WITH LOW BUFFERING CAPACITY IF SPILLED. DUE CAUTION SHOULD BE EXERCISED TO PREVENT THE ACCIDENTAL RELEASE OF THIS MATERIAL TO THE ENVIRONMENT. IN CONCENTRATED FORM THIS PRODUCT MAY SHOW TRACE LEVELS OF TOXICITY TO AQUATIC ORGANISMS.

SECTION 13. DISPOSAL CONSIDERATIONS

DISPOSE OF ALL WASTE AND CONTAMINATED EQUIPMENT IN ACCORDANCE WITH ALL APPLICABLE FEDERAL, STATE AND LOCAL HEALTH AND ENVIRONMENTAL REGULATIONS.

SECTION 14. TRANSPORTATION INFORMATION

THIS PRODUCT IS NOT REGULATED.

SECTION 15. REGULATORY INFORMATION

WE REQUEST THAT YOU MAKE ALL INFORMATION IN THIS MATERIAL SAFETY DATA SHEET AVAILABLE TO ALL EMPLOYEES.

SARA/TITLE III HAZARD CATEGORIES:
IF THE WORD "YES" APPEARS NEXT TO ANY CATEGORY, THIS PRODUCT MAY BE REPORTABLE BY YOU UNDER THE REQUIREMENTS OF 40 CFR 370. PLEASE CONSULT THOSE REGULATIONS FOR DETAILS.
IMMEDIATE (ACUTE) HEALTH: YES
DELAYED (CHRONIC) HEALTH: NO
FIRE HAZARD: NO
REACTIVE HAZARD: NO
SUDDEN RELEASE OF PRESSURE: NO

HMIS HAZARD RATINGS:
HEALTH HAZARD 1

FIRE HAZARD 0
REACTIVITY 0

INTERNATIONAL REGULATIONS: CONSULT THE REGULATIONS OF THE IMPORTING COUNTRY.

SECTION 16. OTHER INFORMATION

MSDS LEGEND:
CAS = CHEMICAL ABSTRACTS SERVICE REGISTRY NUMBER
CEILING LIMIT = CEILING LIMIT (15 MINUTES)
OSHA = OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION
TLV = THRESHOLD LIMIT VALUE (ACGIH)
ACGIH = AMERICAN CONFERENCE OF GOVERNMENTAL INDUSTRIAL HYGIENISTS

IMPORTANT:
THE INFORMATION PRESENTED HEREIN, WHILE NOT GUARANTEED, WAS PREPARED BY COMPETENT TECHNICAL PERSONNEL AND IS TRUE AND ACCURATE TO THE BEST OF OUR KNOWLEDGE. WHILE OUR TECHNICAL PERSONNEL WILL BE HAPPY TO RESPOND TO QUESTIONS REGARDING SAFE HANDLING AND USE PROCEDURES, SAFE HANDLING AND USE REMAINS THE RESPONSIBILITY OF THE USER. NO SUGGESTIONS FOR USE ARE INTENDED AS, AND NOTHING HEREIN SHALL BE CONSTRUED AS A RECOMMENDATION TO INFRINGE ANY EXISTING PATENTS OR VIOLATE ANY FEDERAL, STATE, OR LOCAL LAWS, RULES, REGULATIONS OR ORDINANCES.

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Genium group inc.
1171 RiverFront Center, Amsterdam, NY 12010
(518) 842-4111

Issue Date: 2006-06

Section 1 - Chemical Product and Company Identification 61

Material Name: Calcium Hydroxide **CAS Number:** 1305-62-0
Chemical Formula: CaH_2O_2
Structural Chemical Formula: $Ca(OH)_2$
EINECS Number: 215-137-3
ACX Number: X1000175-3
Synonyms: BELL MINE; BIOCALC; CALCIUM DIHYDROXIDE; CALCIUM HYDRATE; CALCIUM HYDROXIDE; CALVIT; CALVITAL; CARBOXIDE; CAUSTIC LIME; HYDRATED LIME; KALKHYDRATE; KEMIKAL; LIMBUX; LIME; LIME MILK; LIME WATER; MILK OF LIME; SLAKED LIME
General Use: Laboratory reagent. A large volume industrial chemical. Manufacture of calcium salts. A binder in mortar, plaster, cement and in building and paving materials. A component in drilling muds, pesticides, fireproof coatings, water paints. As an acid neutralizing agent in water and sewage treatment. Disinfectant. As a flux in steel production; in manufacture of paper pulp. Depilatory, dehairing hides. Poultry food additive - shell forming agent. In purification of sugar.

Section 2 - Composition / Information on Ingredients

Name	CAS	%
calcium hydroxide	1305-62-0	>95

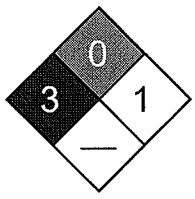
OSHA PEL
TWA: 15 mg/m^3 (total), 5 mg/m^3 (respirable).

NIOSH REL
TWA: 5 mg/m^3.

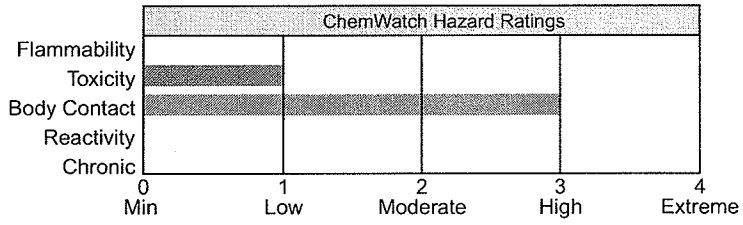
ACGIH TLV
TWA: 5 mg/m^3.

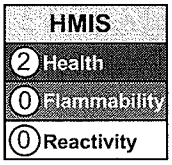
EU OEL
TWA: 5 mg/m^3.

Section 3 - Hazards Identification



Fire Diamond





ANSI Signal Word
Danger!


Corrosive

☆☆☆☆☆ Emergency Overview ☆☆☆☆☆

Odorless, colorless or white crystals or powder. Corrosive, causes severe burns to eyes/skin/respiratory tract.
Chronic Effects: repeated skin contact can cause dermatitis.

Potential Health Effects

Target Organs: eyes, skin, mucous membranes
Primary Entry Routes: inhalation, ingestion, eye contact, skin contact
Acute Effects
Inhalation: The dust may be discomforting if inhaled.
Reactions may not occur on exposure but response may be delayed with symptoms only appearing many hours later.
Minor exposures / slow dissolution in body fluids in the upper respiratory tract and lungs may produce delayed severe irritation or burning sensation.
Severe acute dust inhalation may produce laryngitis and pulmonary edema.

Eye: The dust may be extremely discomforting to the eyes and is capable of causing pain and severe conjunctivitis.
Corneal injury may develop, with possible permanent impairment of vision, if not promptly and adequately treated.
The material may produce severe irritation to the eye causing pronounced inflammation. Repeated or prolonged exposure to irritants may produce conjunctivitis.

Skin: The material is moderately discomforting to the skin and may cause drying of the skin which may lead to dermatitis or if exposure is prolonged may cause blisters or burns.
Solution of material in moisture on the skin or in perspiration may markedly increase skin corrosion and accelerate tissue destruction.
Open cuts, abraded or irritated skin should not be exposed to this material.
The material may accentuate any pre-existing skin condition.

Ingestion: Considered an unlikely route of entry in commercial/industrial environments.
Small amounts or low dose rates are regarded as practically non-harmful.
The material is highly discomforting and may be harmful if swallowed in large quantity.

Carcinogenicity: NTP - Not listed; IARC - Not listed; OSHA - Not listed; NIOSH - Not listed; ACGIH - Not listed; EPA - Not listed; MAK - Not listed.

Chronic Effects: Chronic exposure symptom is narrowing of the esophagus, with difficulty in swallowing. This may happen after weeks, months or years of exposure.

Section 4 - First Aid Measures

Inhalation: Remove to fresh air.
Encourage patient to blow nose to ensure clear breathing passages. Rinse mouth with water. Consider drinking water to remove dust from throat.
Seek medical attention if irritation or discomfort persist.

Eye Contact: Immediately hold the eyes open and flush continuously for at least 15 minutes with fresh running water. Ensure irrigation under eyelids by occasionally lifting the upper and lower lids.
Transport to hospital or doctor without delay. Removal of contact lenses after an eye injury should only be undertaken by skilled personnel.

Skin Contact: Immediately remove all contaminated clothing, including footwear (after rinsing with water).
Wash affected areas thoroughly with water (and soap if available).
Seek medical attention in event of irritation.

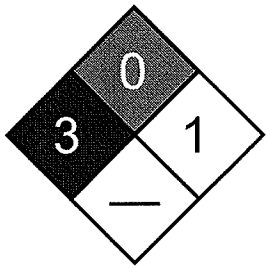
Ingestion: Rinse mouth out with plenty of water. DO NOT induce vomiting.
Observe the patient carefully. Never give liquid to a person showing signs of being sleepy or with reduced awareness; i.e. becoming unconscious.
Give water (or milk) to rinse out mouth. Then provide liquid slowly and as much as casualty can comfortably drink.
Transport to hospital or doctor without delay.

After first aid, get appropriate in-plant, paramedic, or community medical support.

Note to Physicians: For acute or short-term repeated exposures to highly alkaline materials:
1.Respiratory stress is uncommon but presents occasionally because of soft tissue edema.
2.Unless endotracheal intubation can be accomplished under direct vision, cricothyroidotomy or tracheotomy may be necessary.
3.Oxygen is given as indicated.
4.The presence of shock suggests perforation and mandates an intravenous line and fluid administration.
5.Alkali corrosives cause damage by liquefaction necrosis whereby the saponification of fats and solubilization of proteins allow deep penetration into the tissue.
Alkalis continue to cause damage after exposure.
INGESTION:
1.Milk and water are the preferred dilutents. No more than 2 glasses of water should be given to an adult.
2.Neutralizing agents should never be given since exothermic heat reaction may compound injury.
* Catharsis and emesis are absolutely contra-indicated.
* Activated charcoal does not absorb alkali.
* Gastric lavage should not be used.
Supportive care involves the following.
1. Withhold oral feedings initially.
2. If endoscopy confirms transmucosal injury start steroids only within the first 48 hours.
3. Carefully evaluate the amount of tissue necrosis before assessing the need for surgical intervention.
4. Patients should be instructed to seek medical attention whenever they develop difficulty in swallowing (dysphagia).
SKIN AND EYE:
Injury should be irrigated for 20-30 minutes. Eye injuries require saline.

Section 5 - Fire-Fighting Measures

Flash Point: Nonflammable
Autoignition Temperature: Not applicable
LEL: Not applicable
UEL: Not applicable
Extinguishing Media: There is no restriction on the type of extinguisher which may be used.
General Fire Hazards/Hazardous Combustion Products: Noncombustible.
Not considered to be a significant fire risk; however, containers may burn.
In a fire may decompose on heating and produce toxic/corrosive fumes.
Fire Incompatibility: Reacts violently with maleic anhydride, phosphorus, acids.
Reacts with aluminum/zinc producing flammable, explosive hydrogen gas.
Fire-Fighting Instructions: Contact fire department and tell them location and nature of hazard.
Wear breathing apparatus plus protective gloves for fire only. Prevent, by any means available, spillage from entering drains or waterways.
Use fire fighting procedures suitable for surrounding area.
Do not approach containers suspected to be hot.
Cool fire-exposed containers with water spray from a protected location.
If safe to do so, remove containers from path of fire.
Equipment should be thoroughly decontaminated after use.



Fire Diamond

Section 6 - Accidental Release Measures

Small Spills: Clean up all spills immediately. Avoid contact with skin and eyes.
Wear impervious gloves and safety glasses.
Use dry clean-up procedures and avoid generating dust.
Place spilled material in clean, dry, sealable, labeled container.
Large Spills: Clear area of personnel and move upwind.
Contact fire department and tell them location and nature of hazard.
Control personal contact by using protective equipment.
Stop leak if safe to do so.
Use dry clean-up procedures and avoid generating dust.
Collect recoverable product into labeled containers for recycling.
Collect residues and place in labeled polyethylene bag.
Wash area down with large quantity of water and prevent runoff into drains.
After clean-up operations, decontaminate and launder all protective clothing and equipment before storing and reusing.
If contamination of drains or waterways occurs, advise emergency services.
Regulatory Requirements: Follow applicable OSHA regulations (29 CFR 1910.120).

Section 7 - Handling and Storage

Handling Precautions: Use good occupational work practices. Observe manufacturer's storing and handling recommendations.
Atmosphere should be regularly checked against established exposure standards to ensure safe working conditions are maintained.
Avoid all personal contact, including inhalation.
Avoid generating and breathing dust.
Wear personal protective equipment when handling.
Use in a well-ventilated area.
Avoid contact with incompatible materials.
When handling, DO NOT eat, drink or smoke.
Keep containers securely sealed when not in use.
Avoid physical damage to containers.
Always wash hands with soap and water after handling. Work clothes should be laundered separately.
Launder contaminated clothing before reuse.
Recommended Storage Methods: Multi-ply paper bag with sealed plastic liner or heavy gauge plastic bag. Check that all containers are clearly labeled and free from leaks. Packing as recommended by manufacturer.
Regulatory Requirements: Follow applicable OSHA regulations.

Section 8 - Exposure Controls / Personal Protection

Engineering Controls: Use in a well-ventilated area.

General exhaust is adequate under normal operating conditions.
If exposure to workplace dust is not controlled, respiratory protection is required; wear NIOSH-approved dust respirator.
Provide adequate ventilation in warehouse or closed storage areas.

Personal Protective Clothing/Equipment:

Eyes: Safety glasses with side shields; or as required, chemical goggles.
Contact lenses pose a special hazard; soft lenses may absorb irritants and all lenses concentrate them.

Hands/Feet: Barrier cream. Wear physical protective gloves, eg. leather or Cotton gloves or PVC gloves.
Wear safety footwear.

Respiratory Protection:

Exposure Range >5 to 50 mg/m^3: Air Purifying, Negative Pressure, Half Mask
Exposure Range >50 to 500 mg/m^3: Air Purifying, Negative Pressure, Full Face
Exposure Range >500 to 5000 mg/m^3: Supplied Air, Constant Flow/Pressure Demand, Full Face
Exposure Range >5000 to unlimited mg/m^3: Self-contained Breathing Apparatus, Pressure Demand, Full Face
Cartridge Color: dust/mist filter (use P100 or consult supervisor for appropriate dust/mist filter)

Other: Overalls. Eyewash unit. Ensure there is ready access to a safety shower.

Glove Selection Index:

NATURAL RUBBER..... Best selection
NATURAL+NEOPRENE..... Best selection

Section 9 - Physical and Chemical Properties

Appearance/General Info: White or off white amorphous odorless powder with bitter, alkaline taste; insoluble in alcohol. Readily absorbs carbon dioxide from the air to form calcium carbonate; and loses water when heated strongly to form calcium oxide. Soluble in glycerol, sugar or ammonium chloride solutions. Soluble in acids with evolution of heat. Bulk density: 400-500 kg/m^3. Grades available: Builders Lime, technical, Pure, BP sterilized.

Physical State: Divided solid
Vapor Pressure (kPa): Negligible
Vapor Density (Air=1): Not applicable
Formula Weight: 74.10
Specific Gravity (H_2O=1, at 4 °C): 2.2-2.3
Evaporation Rate: Non-volatile
pH: Not applicable
pH (1% Solution): 12.4 (saturated)
Boiling Point: Decomposes
Freezing/Melting Point: 580 °C (1076 °F) (loses water)
Volatile Component (% Vol): Nil
Decomposition Temperature (°C): 580
Water Solubility: 0.185 g/100 cc at 0 °C

Section 10 - Stability and Reactivity

Stability/Polymerization/Conditions to Avoid: Product is considered stable. Hazardous polymerization will not occur.
Storage Incompatibilities: Avoid storage with acids, maleic anhydride, ammonium salts, nitromethane, nitroethane, nitropropane, nitroparaffins, phosphorus.
Forms salts with nitroparaffins in the presence of water which are explosive when dried.
DO NOT use aluminum or galvanized containers.

Section 11 - Toxicological Information

Toxicity
Oral (rat) LD_{50}: 7340 mg/kg

Irritation
Eye (rabbit): 10 mg - SEVERE

See *RTECS* EW 2800000, for additional data.

Section 12 - Ecological Information

Environmental Fate: No data found.
Ecotoxicity: Aquatic toxicity: 92 ppm/7 hr/trout/toxic/fresh water 240 ppm/24 hr/mosquito fish/TL_m/fresh water

Section 13 - Disposal Considerations

Disposal: Recycle wherever possible. Consult manufacturer for recycling options.
Follow applicable federal, state, and local regulations.
Bury residue in an authorized landfill.
Decontaminate empty containers.

Section 14 - Transport Information

DOT Hazardous Materials Table Data (49 CFR 172.101):

Shipping Name and Description: None

Section 15 - Regulatory Information

EPA Regulations:

RCRA 40 CFR: Not listed
CERCLA 40 CFR 302.4: Not listed
SARA 40 CFR 372.65: Not listed
SARA EHS 40 CFR 355: Not listed
TSCA: Listed

Section 16 - Other Information

Disclaimer: Judgments as to the suitability of information herein for the purchaser's purposes are necessarily the purchaser's responsibility. Although reasonable care has been taken in the preparation of such information, Genium Group, Inc. extends no warranties, makes no representations, and assumes no responsibility as to the accuracy or suitability of such information for application to the purchaser's intended purpose or for consequences of its use.

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Material Safety Data Sheet Collection
Genium group inc.
1171 RiverFront Center, Amsterdam, NY 12010
(518) 842-4111

Diesel Fuel Oil No. 2-D
DIE1400

Issue Date: 2006-06

Section 1 - Chemical Product and Company Identification 61

Material Name: Diesel Fuel Oil No. 2-D **CAS Number:** 68334-30-5
Chemical Formula: Un
Structural Chemical Formula: Unspecified; variable
EINECS Number: 269-822-7
ACX Number: X1012054-0
Synonyms: AUTOMOTIVE DIESEL OIL; DIESEL FUEL; DIESEL FUEL OIL NO. 2-D; DIESEL OIL (PETROLEUM); DIESEL OILS; DIESEL TEST FUEL; FUELS,DIESEL; OLEJ NAPEDOWY III; SANTOS MOOMBA DISTILLATE
Derivation: Fuel oil may be a distilled fraction of petroleum, a residuum from refinery operations, a crude petroleum or a blend of two or more of these.
General Use: This medium viscosity residual fuel oil has both light and heavy grades, and is used in furnaces and boilers of utility and industrial power plants, ships, locomotives, and metallurgical operations.

Section 2 - Composition / Information on Ingredients

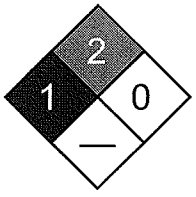
Name	CAS	%
Diesel fuel oil no. 2-D	68334-30-5	ca 100% vol;

diesel fuels consist primarily of aliphatic (64% vol), aromatic (35% vol), and olefinic (1-2% vol) hydrocarbons.
Trace Impurities: May contain sulfur (< 0.5), benzene (<100 ppm), and additives such as sulfurized esters.

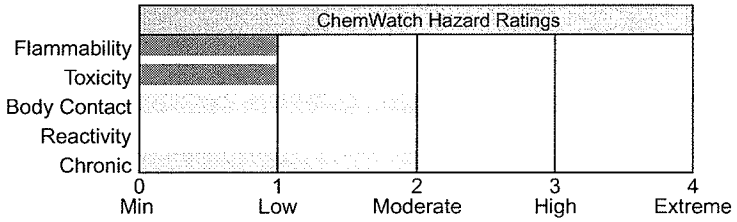
OSHA PEL **NIOSH REL**

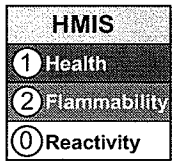
ACGIH TLV
TWA: 100 mg/m^3; skin.

Section 3 - Hazards Identification



Fire Diamond





ANSI Signal Word
Warning!


Flammable

☆☆☆☆☆ Emergency Overview ☆☆☆☆☆

Brown, slightly viscous liquid; kerosene-like odor. Irritating to skin/respiratory tract. Other Acute Effects: headache, nausea, vomiting, diarrhea, CNS depression, tachycardia, cyanosis, pulmonary edema, liver/kidney injury. Flammable.

Potential Health Effects

Target Organs: Skin, CNS, cardiovascular system (CVS), respiratory system, liver, kidneys
Primary Entry Routes: Inhalation, ingestion, skin contact/absorption
Acute Effects
Inhalation: Euphoria, respiratory irritation, cardiac dysrhythmia, increased respiration rates, cyanosis, pulmonary edema, hemoptysis (spitting up blood from the respiratory tract), respiratory arrest, renal (kidney) and liver injury, and CNS toxicity can result from inhalation of diesel fuel oil no. 2-D mist or vapor.
Eye: Contact may result in irritation.
Skin: Contact may cause irritation, systemic effects, and block the sebaceous (oil) glands, resulting in a rash of acne-like pimples and spots, usually on the arms and legs.

Ingestion: Gastrointestinal irritation, vomiting, diarrhea, and in severe cases, CNS depression progressing to coma and death and other systemic effects can result. Aspiration can result in transient CNS depression or excitement, hypoxia, infection, pneumatocele (abnormal cavities in lungs) formation, and chronic lung dysfunction.

Carcinogenicity: NTP - Not listed; IARC - Group 3, Not classifiable as to carcinogenicity to humans; OSHA - Not listed; NIOSH - Not listed; ACGIH - Not listed; EPA - Not listed; MAK - Not listed.

Medical Conditions Aggravated by Long-Term Exposure: None reported.

Chronic Effects: Prolonged or repeated skin contact causes dermatitis and possible systemic toxicity. Prolonged or repeated inhalation can cause CNS and peripheral nervous system damage.

Section 4 - First Aid Measures

See DOT ERG

Inhalation: Remove exposed person to fresh air and support breathing as needed.

Eye Contact: *Do not* allow victim to rub or keep eyes tightly shut. Gently lift eyelids and flush immediately and continuously with flooding amounts of water for at least 15 minutes. Consult a physician or ophthalmologist if pain and/or irritation develops.

Skin Contact: Quickly remove contaminated clothing. Rinse with flooding amounts of water followed by washing the exposed area with soap and water. For reddened or blistered skin, consult a physician.

Ingestion: Never give anything by mouth to an unconscious or convulsing person. Have the *conscious and alert* person drink 1 to 2 glasses of water. Contact a poison control center. Because of aspiration risk, *do not* induce vomiting unless the poison control center advises otherwise.

After first aid, get appropriate in-plant, paramedic, or community medical support.

Note to Physicians: Gastric lavage is contraindicated due to aspiration risk. Instead, consider administration of charcoal or milk. If ingestion amount is large, gastric emptying in the alert patient can be accomplished through administration of Syrup of Ipecac. Treat overexposure symptomatically and supportively.

Section 5 - Fire-Fighting Measures

See DOT ERG

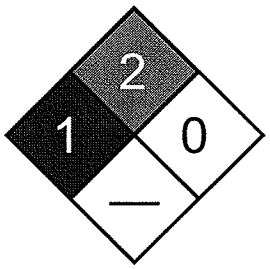
Flash Point: 100.4 °F (38 °C), Closed Cup

Autoignition Temperature: 351-624 °F (177-329 °C)

LEL: 1.3% v/v

UEL: 75% v/v

Flammability Classification: OSHA Class II Combustible Liquid



Fire Diamond

Extinguishing Media: Use dry chemical, carbon dioxide, foam, low velocity water fog or spray. Use a smothering technique to extinguish fire. Water may be ineffective in putting out a fire involving diesel fuel oil no. 2-D, and a solid water stream may spread the flames; however, a water spray may be used to cool fire-exposed containers, and flush spills away from ignition sources.

General Fire Hazards/Hazardous Combustion Products: Heating diesel fuel oil no. 2-D to decomposition can produce acrid smoke and irritating vapors. Vapor or mist can form explosive mixtures in air. In still air, the heavier-than-air vapors of diesel fuel oil no. 2-D from a large source may travel along low-lying surfaces to distant sources of ignition and flash back to the material source. Containers may explode in heat of fire.

Fire-Fighting Instructions: *Do not* release runoff from fire control methods to sewers or waterways. Because fire may produce toxic thermal decomposition products, wear a self-contained breathing apparatus (SCBA) with a full facepiece operated in pressure-demand or positive-pressure mode.

Section 6 - Accidental Release Measures

See DOT ERG

Spill/Leak Procedures: Eliminate all ignition sources (no smoking, flares, sparks or flames in immediate area). Ground all equipment used when handling this product. *Do not* touch or walk through spilled material. Stop leak if you can do it without risk. Prevent entry into waterways, sewers, basements or confined areas. A fire fighting foam may be used to suppress vapors. Absorb or cover with dry earth, sand or other non-combustible material and transfer to containers. Use clean non-sparking tools to collect absorbed material.

Small Spills: Absorb diesel fuel oil no. 2-D with vermiculite, earth, sand or similar material.

Large Spills: For large spills, consider downwind evacuation of at least 1000 ft (300 m). Dike far ahead of liquid spill for later disposal. *Do not* release into sewers or waterways. Ground all equipment. Use non-sparking tools. Spills can be absorbed with materials such as peat, activated carbon, polyurethane foam, or straw. Sinking agents, gelling agents, dispersants, and mechanical systems can also be use to treat oil spills.

Regulatory Requirements: Follow applicable OSHA regulations (29 CFR 1910.120).

Section 7 - Handling and Storage

Handling Precautions: Avoid vapor or mist inhalation, and skin and eye contact. Use only with ventilation sufficient to reduce airborne concentrations to non-hazardous levels (see Sec. 2). Wear protective gloves (or use barrier cream), and clothing (see Sec. 8). Keep away from heat and ignition sources. Ground and bond all containers during transfers to prevent static sparks. Use non-sparking tools to open and close containers. .

Never eat, drink, or smoke in work areas. Practice good personal hygiene after using this material, especially before eating, drinking, smoking, using the toilet, or applying cosmetics.

Recommended Storage Methods: Store in tightly closed container in cool, well-ventilated area, away from heat, ignition sources and incompatibles (see Sec. 10). Periodically inspect stored materials. Equip drums with self-closing valves, pressure vacuum bungs, and flame arrestors.

Regulatory Requirements: Follow applicable OSHA regulations. Also 29 CFR 1910.106 for Class II Combustible Liquid.

Section 8 - Exposure Controls / Personal Protection

Engineering Controls: To prevent static sparks, electrically ground and bond all containers and equipment used in shipping, receiving, or transferring operations. Provide general or local exhaust ventilation systems to maintain airborne concentrations as low as possible. Local exhaust ventilation is preferred because it prevents contaminant dispersion into the work area by controlling it at its source.

Administrative Controls: Enclose operations and/or provide local exhaust ventilation appropriately designed for flammable mist and vapor at the site of chemical release. Where possible, transfer diesel fuel oil no. 2-D from drums or other storage containers directly to process containers. Minimize sources of ignition in surrounding low-lying areas.

Personal Protective Clothing/Equipment: Wear chemically protective gloves, boots, aprons, and gauntlets. Wear protective eyeglasses, per OSHA eye- and face-protection regulations (29 CFR 1910.133). Contact lenses are not eye protective devices. Appropriate eye protection must be worn instead of, or in conjunction with contact lenses.

Respiratory Protection: Seek professional advice prior to respirator selection and use. Follow OSHA respirator regulations (29 CFR 1910.134) and, if necessary, wear a MSHA/NIOSH-approved respirator. Select respirator based on its suitability to provide adequate worker protection for given working conditions, level of airborne contamination, and presence of sufficient oxygen. For emergency or nonroutine operations (cleaning spills, reactor vessels, or storage tanks), use an SCBA. *Warning! Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.* If respirators are used, OSHA requires a written respiratory protection program that includes at least: medical certification, training, fit-testing, periodic environmental monitoring, maintenance, inspection, cleaning, and convenient, sanitary storage areas.

Other: Separate contaminated work clothes from street clothes. Launder before reuse. Remove this material from your shoes and clean personal protective equipment. Make emergency eyewash stations, safety/quick-drench showers, and washing facilities available in work area.

Section 9 - Physical and Chemical Properties

Appearance/General Info: Brown, slightly viscous; kerosene-like odor.

Physical State: Liquid

Odor Threshold: 0.7 ppm

Vapor Pressure (kPa): < 0.1 mm Hg at 68 °F (20 °C)

Vapor Density (Air=1): > 6

Formula Weight: N/A

Specific Gravity (H_2O=1, at 4 °C): < 0.86

Boiling Point: 340-676 °F (171-358 °C)

Freezing/Melting Point: -29.2 °F (-34 °C)

Viscosity: 1.9-4.1 centistoke at 104 °F (40 °C)

Surface Tension: 23-32 dynes/cm at 68 °F (20 °C)

Water Solubility: Insoluble

Section 10 - Stability and Reactivity

Stability/Polymerization/Conditions to Avoid: Diesel fuel oil no. 2-D is stable at room temperature in closed containers under normal storage and handling conditions. Hazardous polymerization cannot occur. Exposure to heat and ignition sources.

Storage Incompatibilities: Include strong oxidizing agents.

Hazardous Decomposition Products: Thermal oxidative decomposition of diesel fuel oil no. 2-D can produce low molecular weight hydrocarbons, hydrocarbon derivatives, carbon oxides (CO_x), and sulfur oxides (SO_x).

Section 11 - Toxicological Information

Acute Oral Effects:
Rat, oral, LD_{50}: 7500 mg/kg.
Acute Skin Effects:
Rabbit, skin, LD: > 5 mL/kg.
Irritation Effects:
Rabbit, skin, standard Draize test: 500 µL/24 hr, resulted in severe reaction.
Other Effects:
Rat, inhalation: 2 g/m^3/6 hr/3 weeks, intermittently, resulted in changes in blood erythrocyte (RBC) count, and focal fibrosis (pneumonoconiosis) and other changes in the lung, thorax or respiration.
Rat, inhalation: 400 $\mu g/m^3$/16 hr/2.5 years, intermittently, caused other changes in the blood, and biochemical effects - transaminases.
Rabbit, skin: 80 mL/kg/12 days, continuously, resulted in other changes in the liver, kidney, ureter, and bladder, and death.

See *RTECS* HZ1800000, for additional data.

Section 12 - Ecological Information

Environmental Fate: Diesel fuel oil no. 2-D will evaporate from water or soil. In surface water, it may partition from the water column to suspended sediments. Biodegradation may occur in soil and water.
Ecotoxicity: Juvenile American shad, salt water TL_m: 204 mg/L/24 hr; mallard duck, LD_{50}=20 mg/kg.

Section 13 - Disposal Considerations

Disposal: Contact your supplier or a licensed contractor for detailed recommendations. Follow applicable Federal, state, and local regulations.

Section 14 - Transport Information

DOT Hazardous Materials Table Data (49 CFR 172.101):

Note: This material has multiple possible HMT entries. Choose the appropriate one based on state and condition of specific material when shipped.

Shipping Name and Description: Diesel fuel
ID: NA1993
Hazard Class: 3 - Flammable and combustible liquid
Packing Group: III - Minor Danger
Symbols: D - Domestic transportation
Label Codes: None
Special Provisions: 144, B1, IB3, T4, TP1, TP29
Packaging: **Exceptions:** 150 **Non-bulk:** 203 **Bulk:** 242
Quantity Limitations: **Passenger aircraft/rail:** 60 L **Cargo aircraft only:** 220 L
Vessel Stowage: **Location:** A **Other:**

Shipping Name and Description: Diesel fuel
ID: UN1202
Hazard Class: 3 - Flammable and combustible liquid
Packing Group: III - Minor Danger
Symbols: I - International transportation
Label Codes: 3 - Flammable Liquid
Special Provisions: 144, B1, IB3, T2, TP1
Packaging: **Exceptions:** 150 **Non-bulk:** 203 **Bulk:** 242
Quantity Limitations: **Passenger aircraft/rail:** 60 L **Cargo aircraft only:** 220 L
Vessel Stowage: **Location:** A **Other:**

Section 15 - Regulatory Information

EPA Regulations:
RCRA 40 CFR: Not listed
CERCLA 40 CFR 302.4: Not listed
SARA 40 CFR 372.65: Not listed
SARA EHS 40 CFR 355: Not listed
TSCA: Listed

Section 16 - Other Information

Disclaimer: Judgments as to the suitability of information herein for the purchaser's purposes are necessarily the purchaser's responsibility. Although reasonable care has been taken in the preparation of such information, Genium Group, Inc. extends no warranties, makes no representations, and assumes no responsibility as to the accuracy or suitability of such information for application to the purchaser's intended purpose or for consequences of its use.

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ANSUL FIRE PROTECTION
ABC FIRE EXTINGUISHER Revised: 11/06/2002

MSDS Contents

CRL ONLINE

MATERIAL SAFETY DATA SHEET

COMPANY NAME: ANSUL FIRE PROTECTION

ADDRESS: ONE STANTON ST.
CITY / STATE / ZIP: MARINETTE / WI / 54143

US-CHEMTREC PHONE (I): (800) 424-9300
US-CHEMTREC PHONE (II): (703) 527-3887
CAN-CANUTEC PHONE: (613) 996-6666

VENDOR UPDATE: 11/6/2002

DATE PREPARED: 11/6/2002

MSDS NUMBER: 2025AV; 2100AH

I. CHEMICAL PRODUCT IDENTIFICATION

PRODUCT NAME: ABC FIRE EXTINGUISHER

HMIS RATINGS:
HEALTH 1 SLIGHT
FLAMMABILITY 0 MINIMAL
INSTABILITY/REACTIVITY 0 MINIMAL

NFPA RATINGS:

II. COMPOSITION, INFORMATION ON INGREDIENTS

CHEMICAL INGREDIENTS	CAS. NUMBER	% BY WEIGHT
MUSCOVITE MICA	12001-26-2	

NOTES:

MAGNESIUM ALUMINUM SILICATE (ATTAPULGITE CLAY)	8031-18-3
MONOAMMONIUM PHOSPHATE	7722-76-1
AMMONIUM SULFATE	7783-20-2
METHYL HYDROGEN POLYSILOXANE	63148-57-2
YELLOW PIGMENT	5468-75-7

NOTES:

CHEMICAL INGREDIENTS	ACGIH TLV TWA/STEL	OSHA PEL TWA/STEL	OTHER TWA/STEL	LD50	LC50
MUSCOVITE MICA	20 MILLION PARTICLES PER CUBIC FOOT			NO DATA AVAILABLE	
MAGNESIUM ALUMINUM SILICATE (ATTAPULGITE CLAY)	10 MG/M3			NO DATA AVAILABLE	
MONOAMMONIUM PHOSPHATE				ORAL (RAT): 5750 MG/KG	
AMMONIUM SULFATE				ORAL (RAT): 3000 MG/KG	
METHYL HYDROGEN POLYSILOXANE				NO DATA AVAILABLE	
YELLOW PIGMENT				NO DATA AVAILABLE	

NOTES:

OTHER:

TLV:
OSHA NUISANCE DUST LIMIT OF 15 MG/M3 OR ACGIH NUISANCE DUST VALUE OF 10 MG/M3 FOR THE EIGHT HOUR TIME-WEIGHTED AVERAGE.

CHEMICAL LISTED AS CARCINOGEN OR POTENTIAL:
NTP: NO
IARC MONOGRAPH: NO

OSHA: NO

III. HAZARDS IDENTIFICATION PRIMARY ROUTE OF ENTRY

EYES: MILDLY IRRITATING FOR A SHORT PERIOD OF TIME.

SKIN: MAY BE MILDLY IRRITATING.

INGESTION: NOT AN EXPECTED ROUTE OF ENTRY.

INHALATION:
TREAT AS A MINERAL DUST, IRRITANT TO THE RESPIRATORY TRACT.

SIGNS AND SYMPTOMS OF EXPOSURE:
ACUTE OVEREXPOSURE: TRANSIENT COUGH, SHORTNESS OF BREATH.
CHRONIC OVEREXPOSURE: CHRONIC FIBROSIS OF THE LUNG, PNEUMOCONIOSIS.

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: REACTIVE AIRWAY.

IV. FIRST AID MEASURES

EYES:
FLUSH WITH LARGE AMOUNTS OF WATER; IF IRRITATION PERSIST, SEEK MEDICAL ATTENTION.

SKIN:
WASH WITH SOAP AND WATER; IF IRRITATION PERSISTS, SEEK MEDICAL ATTENTION.

INGESTION:
IF PATIENT IS CONSCIOUS, GIVE LARGE AMOUNTS OF WATER AND INDUCE VOMITING.
SEEK MEDICAL HELP.

INHALATION:
REMOVE VICTIM TO FRESH AIR. SEEK MEDICAL ATTENTION IF DISCOMFORT CONTINUES.

V. FIRE FIGHTING MEASURES

FLASH POINT: NONE

UNUSUAL FIRE OR EXPLOSION HAZARDS: NONE - THIS IS AN EXTINGUISHING AGENT

FIRE FIGHTING PROCEDURES: NONE

VI. ACCIDENTAL RELEASE MEASURES

CONTAINMENT/CLEANUP: SWEEP UP.

VII. HANDLING AND STORAGE

OTHER:

SHOULD BE STORED IN ORIGINAL CONTAINER OR ANSUL FIRE EXTINGUISHER.

OTHER PRECAUTIONS: DO NOT MIX AGENTS.

VIII. EXPOSURE CONTROLS/PERSONAL PROTECTION

EYES: RECOMMENDED AS MECHANICAL BARRIER FOR PROLONGED EXPOSURE.

SKIN:
N/A
IF IRRITATION OCCURS, LONG SLEEVES AND IMPERVIOUS GLOVES SHOULD BE WORN.

RESPIRATORY:
DUST MASK WHERE DUSTINESS IS PREVALENT, OR TLV EXCEEDED. MECHANICAL FILTER RESPIRATOR IF EXPOSURE IS PROLONGED.

ENGINEERING:
LOCAL EXHAUST: DISCRETIONARY
MECHANICAL (GENERAL): RECOMMENDED.

IX. PHYSICAL AND CHEMICAL PROPERTIES

APPEARANCE: YELLOW COLORED POWDER

BOILING POINT: N/A

SOLUBILITY IN WATER: SLIGHT

SPECIFIC GRAVITY: N/A

VAPOR PRESSURE: N/A

VAPOR DENSITY: N/A

VOLATILE CONTENT: N/A

X. STABILITY AND REACTIVITY

STABILITY: STABLE

HAZARDOUS POLYMERIZATION: WILL NOT OCCUR

HAZARDOUS DECOMPOSITION PRODUCTS: NH3 AND/OR POx MAY BE EVOLVED.

INCOMPATIBLE PRODUCTS:
STRONG ALKALIS, MG, OXIDIZERS THAT CAN RELEASE CHLORINE PER NFPA 43A.

CONDITIONS TO AVOID: N/A

XI. TOXICOLOGICAL INFORMATION

XII. ECOLOGICAL INFORMATION

ECOTOXICITY:

XIII. DISPOSAL CONSIDERATIONS

DISPOSAL METHOD:
DISPOSE OF IN COMPLIANCE WITH LOCAL, STATE, AND FEDERAL REGULATIONS.

XIV. TRANSPORT INFORMATION

XV. REGULATORY INFORMATION

SUPPLEMENTAL STATE COMPLIANCE INFORMATION:

XVI. OTHER INFORMATION

WARRANTY INFORMATION:
THIS INFORMATION IS OFFERED IN GOOD FAITH AS TYPICAL VALUES AND NOT AS A PRODUCT SPECIFICATION. NO WARRANTY, EXPRESSED OR IMPLIED, IS HEREBY MADE. THE RECOMMENDED INDUSTRIAL HYGIENE AND SAFE HANDLING PROCEDURES ARE BELIEVED TO BE GENERALLY APPLICABLE. HOWEVER, EACH USER SHOULD REVIEW THESE RECOMMENDATIONS IN THE SPECIFIC CONTEXT OF THE INTENDED USE AND DETERMINE WHETHER THEY ARE APPROPRIATE.

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Gasoline

Material Safety Data Sheet Collection
Genium group inc.
1171 RiverFront Center, Amsterdam, NY 12010
(518) 842-4111

Issue Date: 2006-06

Unleaded Petrol
AUT5000

Section 1 - Chemical Product and Company Identification 61

Material Name: Unleaded Petrol **CAS Number:** 8006-61-9
Chemical Formula: Mixture of hydrocarbons
EINECS Number: 232-349-1
ACX Number: X1003056-5
Synonyms: AUTOMOTIVE GASOLINE, LEAD-FREE; GASOLINE; MOTOR FUEL; MOTOR SPIRITS; NATURAL GASOLINE; PETROL; UNLEADED PETROL
General Use: Lead free motor fuel for internal combustion engines, 2-stroke and 4-stroke.

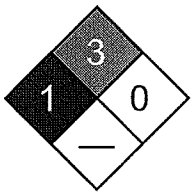
Section 2 - Composition / Information on Ingredients

Name	CAS	%
gasoline	8006-61-9	>90
benzene	71-43-2	5 max.

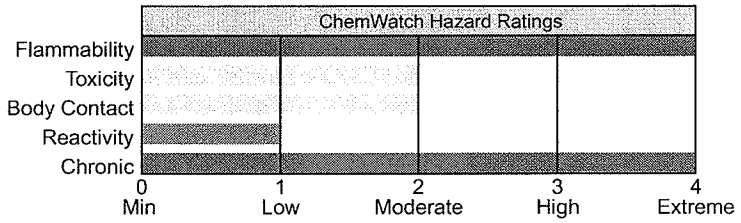
OSHA PEL **NIOSH REL**

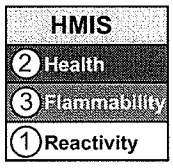
ACGIH TLV
TWA: 300 ppm, 890 mg/m^3;
STEL: 500 ppm, 1480 mg/m^3.

Section 3 - Hazards Identification



Fire Diamond





ANSI Signal Word
Danger!


Flammable

☆☆☆☆☆ Emergency Overview ☆☆☆☆☆

Clear liquid; distinctive odor. Irritating to eyes/skin/respiratory tract. Other Acute Effects: dizziness, drunkenness, unconsciousness. Chronic Effects: dermatitis. Possible cancer hazard. Flammable.

Potential Health Effects

Target Organs: skin, eye, respiratory system, central nervous system (CNS)
Primary Entry Routes: inhalation, ingestion, skin contact

Acute Effects

Inhalation: The vapor is discomforting to the upper respiratory tract and may be harmful if exposure is prolonged. Inhalation hazard is increased at higher temperatures. Acute effects from inhalation of high concentrations of vapor are pulmonary irritation, including coughing, with nausea; central nervous system depression - characterized by headache and dizziness, increased reaction time, fatigue and loss of coordination. If exposure to highly concentrated solvent atmosphere is prolonged this may lead to narcosis, unconsciousness, even coma and possible death. WARNING: Intentional misuse by concentrating/inhaling contents may be lethal. High inhaled concentrations of mixed hydrocarbons may produce narcosis characterized by nausea, vomiting and lightheadedness. Inhalation of aerosols may produce severe pulmonary edema, pneumonitis and pulmonary hemorrhage. Inhalation of petroleum hydrocarbons consisting substantially of low molecular weight species may produce irritation of mucous membranes, incoordination, giddiness, nausea, vertigo, confusion, headache, appetite loss, drowziness, tremors and anesthetic stupor. Massive exposures may produce central nervous system depression with sudden collapse and deep coma; fatalities have been recorded. Irritation of the brain and/or apneic anoxia may produce convulsions. Although recovery following overexposure is generally complete, cerebral micro- hemorrhage of focal post-inflammatory scarring may produce eleptiform seizures some months after the exposure. Pulmonary episodes may include chemical pneumonitis with edema and hemorrhage. The lighter hydrocarbons may produce kidney and neurotoxic effects. Liquid paraffins may produce anesthesia and depressant actions leading to weakness, dizziness, slow and shallow respiration, unconsciousness, convulsions and death. C_{5-7} paraffins may also produce polyneuropathy. Aromatic hydrocarbons accumulate in lipid-rich tissues (typically the brain, spinal cord and peripheral nerves) and may produce functional impairment manifested by nonspecific symptoms such as nausea, weakness, fatigue, vertigo; severe exposures may produce inebriation or unconsciousness. Many of the petroleum hydrocarbons are cardiac sensitizers and may cause ventricular fibrillations.

Eye: The liquid may produce eye discomfort and is capable of causing temporary impairment of vision and/or transient eye inflammation, ulceration. The vapor is discomforting to the eyes. Petroleum hydrocarbons may produce pain after direct contact with the eyes. Slight, but transient, disturbances of the corneal epithelium may also result. The aromatic fraction may produce irritation and lachrymation. The material may produce moderate eye irritation leading to inflammation. Repeated or prolonged exposure to irritants may produce conjunctivitis.

Skin: The material is moderately discomforting to the skin if exposure is prolonged. The material contains a component that may be absorbed through the skin and may cause drying of the skin, which may lead to dermatitis from repeated exposures over long periods. Toxic effects may result from skin absorption. Open cuts, abraded or irritated skin should not be exposed to this material. The material may accentuate any pre-existing dermatitis condition.

Ingestion: Considered an unlikely route of entry in commercial/industrial environments. The liquid may produce gastrointestinal discomfort and may be harmful if swallowed. Ingestion may result in nausea, pain and vomiting. Vomit entering the lungs by aspiration may cause potentially lethal chemical pneumonitis. Ingestion of petroleum hydrocarbons may produce irritation of the pharynx, esophagus, stomach and small intestine with edema and mucosal ulceration. Resulting symptoms include a burning sensation in the mouth and throat. Large amounts may produce narcosis with nausea and vomiting, weakness or dizziness, slow and shallow respiration, swelling of the abdomen, unconsciousness and convulsions. Myocardial injury may produce arrhythmias, ventricular fibrillation and electrocardiographic changes. Central nervous system depression may also occur. Light aromatic hydrocarbons produce a warm, sharp, tingling sensation on contact with taste buds and may anesthetize the tongue. Aspiration into the lungs may produce coughing, gagging, and a chemical pneumonitis with pulmonary edema and hemorrhage.

Carcinogenicity: NTP - Not listed; IARC - Group 2B, Possibly carcinogenic to humans; OSHA - Not listed; NIOSH - Listed as carcinogen; ACGIH - Class A3, Animal carcinogen; EPA - Not listed; MAK - Not listed.

Chronic Effects: Chronic solvent inhalation exposures may result in nervous system impairment and liver and blood changes. Prolonged or continuous skin contact with the liquid may cause defatting with drying, cracking, irritation and dermatitis following. Chronic poisoning may occur from vapor inhalation or skin absorption. The most significant toxic effect is insidious and irreversible injury to the blood-forming tissue by benzene. Leukemia may develop. Chronic exposure may cause headache, fatigue, loss of appetite and lassitude with incipient blood effects including anemia and blood changes. Gasoline "sniffing" has caused severe nerve damage. Repeated or prolonged exposure to mixed hydrocarbons may produce narcosis with dizziness, weakness, irritability, concentration and/or memory loss, tremor in the fingers and tongue, vertigo, olfactory disorders, constriction of visual field, paresthesias of the extremities, weight loss and anemia and degenerative changes in the liver and kidney. Chronic exposure by petroleum workers to the lighter hydrocarbons has been associated with visual disturbances, damage to the central nervous system, peripheral neuropathies (including numbness and paresthesias), psychological and neurophysiological deficits, bone marrow toxicities (including hypoplasia, possibly due to benzene) and hepatic and renal involvement. Chronic dermal exposure to petroleum hydrocarbons may result in defatting which produces localized dermatoses. Surface cracking and erosion may also increase susceptibility to infection by microorganisms.

Section 4 - First Aid Measures

Inhalation: Remove to fresh air. Lay patient down. Keep warm and rested.
If breathing is shallow or has stopped, ensure clear airway and apply resuscitation. Transport to hospital, or doctor.

See DOT ERG

Eye Contact: Immediately hold the eyes open and wash continuously for at least 15 minutes with fresh running water. Ensure irrigation under eyelids by occasionally lifting the upper and lower lids. Transport to hospital or doctor without delay. Removal of contact lenses after an eye injury should only be undertaken by skilled personnel.

Skin Contact: Immediately remove all contaminated clothing, including footwear (after rinsing with water). Wash affected areas thoroughly with water (and soap if available). Seek medical attention in event of irritation.

Ingestion: Contact a Poison Control Center. If swallowed, do NOT induce vomiting. Give a glass of water.

After first aid, get appropriate in-plant, paramedic, or community medical support.

Note to Physicians: For acute or short term repeated exposures to petroleum distillates or related hydrocarbons:

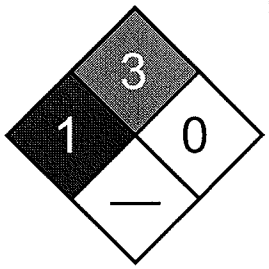
1. Primary threat to life from pure petroleum distillate ingestion and/or inhalation is respiratory failure.
2. Patients should be quickly evaluated for signs of respiratory distress (e.g. cyanosis, tachypnea, intercostal retraction, obtundation) and given oxygen. Patients with inadequate tidal volumes or poor arterial blood gases (pO_2 <50 mm Hg or pCO_2 >50 mm Hg) should be intubated.
3. Arrhythmias complicate some hydrocarbon ingestion and/or inhalation and electrocardiographic evidence of myocardial injury has been reported; intravenous lines and cardiac monitors should be established in obviously symptomatic patients. The lungs excrete inhaled solvents, so that hyperventilation improves clearance.
4. A chest x-ray should be taken immediately after stabilization of breathing and circulation to document aspiration and detect the presence of pneumothorax.
5. Epinephrine (adrenalin) is not recommended for treatment of bronchospasm because of potential myocardial sensitization to catecholamines.
Inhaled cardioselective bronchodilators (e.g. Alupent, Salbutamol) are the preferred agents, with aminophylline a second choice.
6. Lavage is indicated in patients who require decontamination; ensure use of cuffed endotracheal tube in adult patients.

Section 5 - Fire-Fighting Measures

Flash Point: -43 °C
Autoignition Temperature: 280 °C
LEL: 1.4% v/v
UEL: 7.6% v/v

See DOT ERG

Extinguishing Media: Foam. Dry chemical powder.
Bromochlorodifluoromethane (BCF) (where regulations permit). Carbon dioxide.



Fire Diamond

General Fire Hazards/Hazardous Combustion Products: Liquid and vapor are highly flammable. Severe fire hazard when exposed to heat, flame and/or oxidizers. Vapor forms an explosive mixture with air. Severe explosion hazard, in the form of vapor, when exposed to flame or spark. Vapor may travel a considerable distance to source of ignition. Heating may cause expansion/decomposition with violent rupture of containers. On combustion, may emit toxic fumes of carbon monoxide (CO).

Fire Incompatibility: Avoid contamination with oxidizing agents, i.e. nitrates, oxidizing acids, chlorine bleaches, pool chlorine etc., as ignition may result.

Fire-Fighting Instructions: Alert fire department and tell them location and nature of hazard. May be violently or explosively reactive. Wear breathing apparatus plus protective gloves. Prevent, by any means available, spillage from entering drains or water ways. If safe, switch off electrical equipment until vapour fire hazard removed. Use water delivered as a fine spray to control fire and cool adjacent area. Avoid spraying water onto liquid pools. Do not approach containers suspected to be hot. Cool fire exposed containers with water spray from a protected location. If safe to do so, remove containers from path of fire.

Section 6 - Accidental Release Measures

Small Spills: Remove all ignition sources. Clean up all spills immediately. Avoid breathing vapors and contact with skin and eyes. Control personal contact by using protective equipment. Contain and absorb small quantities with vermiculite or other absorbent material. Wipe up. Collect residues in a flammable waste container.

See DOT ERG

Large Spills: Clear area of personnel and move upwind. Alert fire department and tell them location and nature of hazard. May be violently or explosively reactive. Wear breathing apparatus plus protective gloves. Prevent, by any means available, spillage from entering drains or water ways. No smoking, naked lights or ignition sources. Increase ventilation. Stop leak if safe to do so.
Water spray or fog may be used to disperse/absorb vapor. Contain spill with sand, earth or vermiculite. Use only

spark-free shovels and explosion proof equipment. Collect recoverable product into labeled containers for recycling. Absorb remaining product with sand, earth or vermiculite. Collect solid residues and seal in labelled drums for disposal. Wash area and prevent runoff into drains.
If contamination of drains or waterways occurs, advise emergency services.
Regulatory Requirements: Follow applicable OSHA regulations (29 CFR 1910.120).

Section 7 - Handling and Storage

Handling Precautions: Avoid generating and breathing mist. Avoid all personal contact, including inhalation. Wear protective clothing when risk of exposure occurs. Use in a well-ventilated area. Prevent concentration in hollows and sumps. DO NOT enter confined spaces until atmosphere has been checked. Avoid smoking, bare lights, heat or ignition sources. When handling, DO NOT eat, drink or smoke. Vapor may ignite on pumping or pouring due to static electricity. DO NOT use plastic buckets. Ground and secure metal containers when dispensing or pouring product. Use spark-free tools when handling. Avoid contact with incompatible materials. Keep containers securely sealed. Avoid physical damage to containers. Always wash hands with soap and water after handling. Work clothes should be laundered separately. Use good occupational work practices. Observe manufacturer's storing and handling recommendations. Atmosphere should be regularly checked against established exposure standards to ensure safe working conditions.
Recommended Storage Methods: Metal can, metal drum. Packing as recommended by manufacturer. Check all containers are clearly labeled and free from leaks.
Regulatory Requirements: Follow applicable OSHA regulations.

Section 8 - Exposure Controls / Personal Protection

Engineering Controls: CARE: Use of a quantity of this material in confined space or poorly ventilated area, where rapid build-up of concentrated atmosphere may occur, could require increased ventilation and/or protective gear. Use in a well-ventilated area. If inhalation risk of overexposure exists, wear a NIOSH approved organic-vapor respirator. Correct respirator fit is essential to obtain adequate protection. In confined spaces where there is inadequate ventilation, wear full-face air supplied breathing apparatus. Provide adequate ventilation in warehouse or closed storage areas.
Personal Protective Clothing/Equipment:
Eyes: Safety glasses with side shields; or as required, chemical goggles.
Contact lenses pose a special hazard; soft lenses may absorb irritants and all lenses concentrate them.
Hands/Feet: Barrier cream with polyethylene gloves or PVC gloves. Safety footwear. Do NOT use this product to clean the skin.
Respiratory Protection:
Exposure Range >300 to 1000 ppm: Air Purifying, Negative Pressure, Half Mask
Exposure Range >1000 to 15,000 ppm: Air Purifying, Negative Pressure, Full Face
Exposure Range >15,000 to 300,000 ppm: Supplied Air, Constant Flow/Pressure Demand, Full Face
Exposure Range >300,000 to unlimited ppm: Self-contained Breathing Apparatus, Pressure Demand, Full Face
Cartridge Color: black
Other: Overalls. Ensure that there is ready access to eye wash unit. Ensure there is ready access to an emergency shower.

Section 9 - Physical and Chemical Properties

Appearance/General Info: Purple, highly flammable, volatile liquid with characteristic sharp odor. Floats on water. Consists of a complex mixture of hydrocarbons with small amounts of residual benzene from the refining operations.

Physical State: Liquid
Odor Threshold: 0.005 ppm
Vapor Pressure (kPa): 53.33 at 20 °C
Vapor Density (Air=1): > 2
Formula Weight: Not applicable.
Specific Gravity (H_2O=1, at 4 °C): 0.72-0.735 at 15 °C
Evaporation Rate: Fast

pH: Not applicable
pH (1% Solution): Not applicable.
Boiling Point: 38.89 °C (102 °F)
Freezing/Melting Point: Not available
Volatile Component (% Vol): 100
Decomposition Temperature (°C): Not available.
Water Solubility: Insoluble

Section 10 - Stability and Reactivity

Stability/Polymerization/Conditions to Avoid: Presence of incompatible materials. Product is considered stable. Hazardous polymerization will not occur.
Storage Incompatibilities: Avoid storage with oxidizers.

Section 11 - Toxicological Information

Toxicity
Oral (rat) LD_{50}: 18800 mg/kg

Irritation
Skin (rabbit): 500 mg/24h mild

Section 12 - Ecological Information

Environmental Fate: No data found.
Ecotoxicity: No data found.
Biochemical Oxygen Demand (BOD): 8%, 5 days

Section 13 - Disposal Considerations

Disposal: Consult manufacturer for recycling options and recycle where possible. Follow all applicable federal, state, and local laws. Incinerate residue at an approved site. Recycle containers where possible, or dispose of in an authorized landfil.
BEWARE: Empty solvent, paint, lacquer and flammable liquid drums present a severe explosion hazard if cut by flame torch or welded. Even when thoroughly cleaned or reconditioned, the drum seams may retain sufficient solvent to generate an explosive atmosphere in the drum.

Section 14 - Transport Information

DOT Hazardous Materials Table Data (49 CFR 172.101):

Shipping Name and Description: Gasoline
ID: UN1203
Hazard Class: 3 - Flammable and combustible liquid
Packing Group: II - Medium Danger
Symbols:
Label Codes: 3 - Flammable Liquid
Special Provisions: 139, B33, B101, T8
Packaging: **Exceptions:** 150 **Non-bulk:** 202 **Bulk:** 242
Quantity Limitations: **Passenger aircraft/rail:** 5 L **Cargo aircraft only:** 60 L
Vessel Stowage: **Location:** E **Other:**

Section 15 - Regulatory Information

EPA Regulations:
RCRA 40 CFR: Not listed
CERCLA 40 CFR 302.4: Not listed
SARA 40 CFR 372.65: Not listed
SARA EHS 40 CFR 355: Not listed
TSCA: Listed

Section 16 - Other Information

Disclaimer: Judgments as to the suitability of information herein for the purchaser's purposes are necessarily the purchaser's responsibility. Although reasonable care has been taken in the preparation of such information, Genium Group, Inc. extends no warranties, makes no representations, and assumes no responsibility as to the accuracy or suitability of such information for application to the purchaser's intended purpose or for consequences of its use.

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BENCH PRODUCTS
HAND CLEANER DEGREASER **Revised: 01/02/1991**

MSDS Contents

BENCH PRODUCTS INC.

MATERIAL SAFETY DATA SHEET

REVISED 1/2/91

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MANUFACTURER'S NAME: BENCH PRODUCTS

ADDRESS: 4124 SO. 500 W.
SALT LAKE CITY, UT 84123

EMERGENCY PHONE: 801-261-3666
801-268-6320

TRADE NAME: SPARKLENE HAND CLEANER DEGREASER

HAZARDOUS INGREDIENTS

PAINTS, SOLVENTS PRESERVATIVES	(0)	TLV UNITS	ALLOYS AND METALS	(0)	TLV UNITS
PIGMENTS	(0)		BASE METAL	(0)	
CATALYST	(0)		ALLOYS	(0)	
VEHICLE	(0)		METALLIC COATINGS	(0)	
SOLVENTS	(0)		FILLER MATERIAL AND COATINGS	(0)	
ADDITIVES	(0)		OTHERS	(0)	
OTHERS	(0)				

HAZARDOUS MIXTURES OF OTHER LIQUIDS, SOLIDS OR GASES (%) (0) TLV UNITS

CONTAINS:
NONIONIC SURFACTANT & GANTREZ AN119 WHICH CONTAINS BENZENE BUT THIS FORMULA CONTAINS LESS THAN 1/10%

PHYSICAL DATA

BOILING POINT (F): NA

SPECIFIC GRAVITY (WATER = 1): NA

VAPOR PRESSURE (MMHG): NA

VOLATILE (% BY VOLUME): NA

VAPOR DENSITY (AIR=1): NA

EVAPORATION RATE (=1): NA

SOLUBILITY IN WATER: 100%

APPEARANCE AND ODOR: LIGHT BLUE LIQUID WITH LEMON FRAGRANCE.

FIRE AND EXPLOSION

FLASH POINT (METHOD USED):

FLAMMABILITY LIMITS: NOT FLAMMABLE

EXTINGUISHING MEDIA: NOT FLAMMABLE

SPECIAL FIRE PROCEDURES: NONE

UNUSUAL FIRE AND EXPLOSION HAZARDS: NONE

HEALTH HAZARD DATA

THRESHOLD LIMIT VALUE: NOT ESTABLISHED

EFFECTS OF OVER EXPOSURE: NONE

EMERGENCY AND FIRST AID PROCEDURES:

EXTERNAL:
FLUSH WITH WATER FOR 15 MINUTES, CALL PHYSICIAN IF IRRITATION PERSISTS.

INTERNAL:
GIVE LARGE QUANTITIES OF MILK OR WATER, CALL A PHYSICIAN.

REACTIVITY DATA

STABILITY: UNSTABLE ( )
STABLE (X)

CONDITIONS TO AVOID:
MIXING WITH ALKALINE PRODUCTS.

INCOMPATIBILITY: (MATERIALS TO AVOID):
COMPATIBLE WITH MOST OTHER HOUSEHOLD CLEANERS.

HAZARDOUS DECOMPOSITION PRODUCTS: NONE.

HAZARDOUS POLYMERIZATION:
MAY OCCUR ( )
MAY NOT OCCUR (X)

CONDITIONS TO AVOID:
MIXING WITH ALKALINE PRODUCTS.

SPILL OR LEAK PROCEDURES

STEPS TO BE TAKEN IN CASE OF MATERIAL SPILL: RINSE AREA WITH WATER.

WASTE DISPOSAL METHOD:
IN LAND FILL IN ACCORDANCE TO ALL STATE AND LOCAL REGULATIONS.

SPECIAL PROTECTION INFORMATION

RESPIRATORY PROTECTION (SPECIFY TYPE): NOT NORMALLY NEEDED.

VENTILATION: (NA) LOCAL EXHAUST: (NA)
MECHANICAL: (NA)
SPECIAL: (NA)
OTHER: (NA)

PROTECTIVE GLOVES: REGULAR HOUSEHOLD RUBBER GLOVES.

EYE PROTECTION: SIMPLE GOGGLES CAN BE USED.

OTHER PROTECTIVE EQUIPMENT: NONE

SPECIAL PRECAUTIONS

OTHER PRECAUTIONS:
AVOID CONTACT WITH MUCOUS MEMBRANES.

BENCH PRODUCTS INC.

HAND CLEANER DEGREASER

THIS HEAVY DUTY CLEANER HAS BEEN FORMULATED WITH A UNIQUE BLEND OF WETTING AGENTS, DETERGENTS AND GENTLE SURFACTANTS TO HELP REMOVE GROUND IN DIRT AND GREASE. FORTIFIED WITH SPECIAL EMMOLLIENTS TO HELP THE SKIN.

PRODUCT SPECIFICATIONS:

COLOR:	ORANGE
ODOR :	ALMOND
FLASH POINT:	NONE
P.H.	5
DENSITY	8.4 LBS PER GALLON
STORAGE STABILITY:	EXCELLENT. 1 YEAR MINIMUM

FREEZING STABILITY:
WILL FREEZE. USABLE AFTER THAWING WITH NO CHANGE IN PERFORMANCE.
AGITATE AFTER THAWING AND BEFORE USE.

PHOSPHATE FREE	YES
BIODEGRADABLE	YES

DIRECTIONS:

WET HANDS WITH WATER, APPLY A SMALL AMOUNT TO HANDS AND WORK INTO A LATHER; RINSE CLEAN WITH WATER.

CAUTION:
KEEP AWAY FROM CHILDREN, IF SWALLOWED GIVE A GLASSFUL OF WATER, CALL A PHYSICIAN. IF CONTACT WITH EYES, FLUSH WITH WATER FOR 15 MINUTES, CALL A PHYSICIAN.

PACKAGING:	SPARKLENE:	GALLONS (6 PER CASE)
	PRIVATE LABEL:	GALLONS (6 PER CASE)
		5 GALLON PAILS, 55 GALLON DRUMS.

WARRANTY:
CUSTOMER SATISFACTION GUARANTEED. ALL PRODUCTS ARE GUARANTEED FOR ONE YEAR FROM THE DATE OF INVOICE. ANY RETURNED PRODUCT SHOULD BE AVAILABLE AT THE DISTRIBUTORS WAREHOUSE FOR INSPECTION. LIABILITY TO THE MANUFACTURER IS LIMITED TO THE OPTION OF REPLACEMENT OF GOODS OR CREDIT OF INVOICE.

DISCLAIMER:
MANUFACTURER OR SELLER MAKES NO WARRANTY EXPRESS OR IMPLIED CONCERNING THE USE OF THIS PRODUCT OTHER THAN FOR THE PURPOSE INDICATED ON THE LABEL. MANUFACTURER OR SELLER IS NOT LIABLE FOR ANY INJURY OR DAMAGE CAUSED BY THIS PRODUCT DUE TO MISUSE, MISHANDLING OR ANY APPLICATION NOT SPECIFICALLY DESCRIBED AND RECOMMENDED ON THE LABEL.

BENCH PRODUCTS INC., SALT LAKE CITY, UTAH 84123

76 LUBRICANTS
UNOBA MOLY XD GREASE 2 Revised: 01/01/2002

MSDS Contents

76 UNOBA MOLY XD GREASE 2

(MSDS #5477020000)

MATERIAL SAFETY DATA SHEET

76 LUBRICANTS COMPANY
A DIVISION OF TOSCO CORPORATION

76 UNOBA MOLY XD GREASE 2

1. PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME: 76 UNOBA MOLY XD GREASE 2

PRODUCT CODE: 5477020000

SAP CODE:

INTENDED USE: GREASE

CHEMICAL FAMILY: PETROLEUM HYDROCARBON

RESPONSIBLE PARTY:
PHILLIPS 66 COMPANY
LUBRICANTS DIVISION
P.O. BOX 25376
SANTA ANA, CA 92799-5376

FOR ADDITIONAL MSDSS: 800-762-0942

TECHNICAL INFORMATION:
THE INTENDED USE OF THIS PRODUCT IS INDICATED ABOVE. IF ANY ADDITIONAL USE IS KNOWN, PLEASE CONTACT US AT THE TECHNICAL INFORMATION NUMBER LISTED.

EMERGENCY OVERVIEW:

24 HOUR EMERGENCY TELEPHONE NUMBERS:
SPILL, LEAK, FIRE OR ACCIDENT:
CALL CHEMTREC:
NORTH AMERICA: (800) 424-9300

OTHERS: (703) 527-3887 (COLLECT)

CALIFORNIA POISON CONTROL SYSTEM: (800) 356-3129

HEALTH HAZARDS/PRECAUTIONARY MEASURES:
AVOID CONTACT WITH EYES, SKIN AND CLOTHING. WASH THOROUGHLY AFTER HANDLING.

PHYSICAL HAZARDS/PRECAUTIONARY MEASURES:
KEEP AWAY FROM ALL SOURCES OF IGNITION.

APPEARANCE: BLACK

PHYSICAL FORM: SEMI-SOLID

ODOR: CHARACTERISTIC PETROLEUM

NFPA HAZARD CLASS:
HEALTH 1 (SLIGHT)
FLAMMABILITY 1 (SLIGHT)
REACTIVITY 0 (LEAST)

HMIS HAZARD CLASS: NOT EVALUATED

2. COMPOSITION/INFORMATION ON INGREDIENTS

HAZARDOUS COMPONENTS	% WEIGHT	EXPOSURE GUIDELINE LIMITS	AGENCY	TYPE
DEASPHALTED RESIDUUM C24 CAS#: 64741-95-3	30-50	(SEE: OIL MIST, IF GENERATED)		
MOLYBDENUM DISULFIDE CAS#: 1317-33-5	1-5	(SEE: MOLYBDENUM, INSOLUBLE COMPOUNDS (AS Mo))		
ZINC COMPOUND CAS#: PROPRIETARY	<1	NOT ESTABLISHED		

OTHER COMPONENTS	% WEIGHT	EXPOSURE GUIDELINE LIMITS	AGENCY	TYPE
LUBRICANT BASE OIL (PETROLEUM) CAS#: VARIOUS	50-70	(SEE: OIL MIST, IF GENERATED)		
ADDITIVES CAS#: PROPRIETARY	5-13	NOT ESTABLISHED		

REFERENCE	EXPOSURE GUIDELINE LIMITS	AGENCY	TYPE
MOLYBDENUM, INSOLUBLE COMPOUNDS (AS Mo) CAS#: NONE	10 MG/M3	ACGIH	TWA
	3 MG/M3	ACGIH	TWA-RESP.
	15 MG/M3	OSHA	TWA-TOT.
OIL MIST, IF GENERATED CAS#: NONE	5 MG/M3	ACGIH	TWA
	10 MG/M3	ACGIH	STEL
	5 MG/M3	OSHA	TWA
	2500 MG/M3	NIOSH	IDLH

ALL COMPONENTS ARE LISTED ON THE TSCA INVENTORY

THE BASE OIL FOR THIS PRODUCT CAN BE A MIXTURE OF ANY OF THE FOLLOWING HIGHLY REFINED PETROLEUM STREAMS:
CAS 64741-88-4; CAS 64741-89-5; CAS 64741-96-4; CAS 64741-97-5;
CAS 64742-01-4; CAS 64742-52-5; CAS 64742-53-6; CAS 64742-54-7;
CAS 64742-55-8; CAS 64742-56-9; CAS 64742-57-0; CAS 64742-62-7;
CAS 64742-63-8; CAS 64742-65-0; CAS 72623-85-9; CAS 72623-86-0;
CAS 72623-87-1

NOTE:
STATE, LOCAL OR OTHER AGENCIES OR ADVISORY GROUPS MAY HAVE ESTABLISHED MORE STRINGENT LIMITS. CONSULT AN INDUSTRIAL HYGIENIST OR SIMILAR PROFESSIONAL, OR YOUR LOCAL AGENCIES, FOR FURTHER INFORMATION.

3. HAZARDS IDENTIFICATION

POTENTIAL HEALTH EFFECTS:

EYE:
CONTACT MAY CAUSE MILD EYE IRRITATION INCLUDING STINGING, WATERING, AND REDNESS.

SKIN:
CONTACT MAY CAUSE MILD SKIN IRRITATION INCLUDING REDNESS, AND A BURNING SENSATION. PROLONGED OR REPEATED CONTACT CAN WORSEN IRRITATION BY CAUSING DRYING AND CRACKING OF THE SKIN LEADING TO DERMATITIS (INFLAMMATION). NO HARMFUL EFFECTS FROM SKIN ABSORPTION ARE EXPECTED.

INHALATION (BREATHING):
NO DATA AVAILABLE. HOWEVER, INHALATION IS NOT AN EXPECTED ROUTE OF EXPOSURE.

INGESTION (SWALLOWING): LOW DEGREE OF TOXICITY BY INGESTION.

SIGNS AND SYMPTOMS:
EFFECTS OF OVEREXPOSURE MAY INCLUDE IRRITATION OF THE NOSE AND THROAT, IRRITATION OF THE DIGESTIVE TRACT, IRRITATION OF THE RESPIRATORY TRACT, NAUSEA AND DIARRHEA.

CANCER:
INADEQUATE EVIDENCE AVAILABLE TO EVALUATE THE CANCER HAZARD OF THIS MATERIAL. SEE SECTION 11 FOR CARCINOGENICITY INFORMATION OF INDIVIDUAL COMPONENTS, IF ANY.

TARGET ORGANS: NO DATA AVAILABLE FOR THIS MATERIAL.

DEVELOPMENTAL: NO DATA AVAILABLE FOR THIS MATERIAL.

PRE-EXISTING MEDICAL CONDITIONS:
CONDITIONS AGGRAVATED BY EXPOSURE MAY INCLUDE SKIN DISORDERS.

4. FIRST AND MEASURES

EYE:
IF IRRITATION OR REDNESS DEVELOPS, MOVE VICTIM AWAY FROM EXPOSURE AND INTO FRESH AIR. FLUSH EYES WITH CLEAN WATER. IF SYMPTOMS PERSIST, SEEK MEDICAL ATTENTION.

SKIN:
WIPE MATERIAL FROM SKIN AND REMOVE CONTAMINATED SHOES AND CLOTHING. CLEANSE

AFFECTED AREA(S) THOROUGHLY BY WASHING WITH MILD SOAP AND WATER AND, IF NECESSARY, A WATERLESS SKIN CLEANSER. IF IRRITATION OR REDNESS DEVELOPS AND PERSISTS, SEEK MEDICAL ATTENTION.

INHALATION (BREATHING):
FIRST AID IS NOT NORMALLY REQUIRED. IF BREATHING DIFFICULTIES DEVELOP, MOVE VICTIM AWAY FROM SOURCE OF EXPOSURE AND INTO FRESH AIR. SEEK IMMEDIATE MEDICAL ATTENTION.

INGESTION (SWALLOWING):
FIRST AID IS NOT NORMALLY REQUIRED; HOWEVER, IF SWALLOWED AND SYMPTOMS DEVELOP, SEEK MEDICAL ATTENTION.

NOTE TO PHYSICIANS:
HIGH-PRESSURE HYDROCARBON INJECTION INJURIES MAY PRODUCE SUBSTANTIAL NECROSIS OF UNDERLYING TISSUE DESPITE AN INNOCUOUS APPEARING EXTERNAL WOUND. OFTEN THESE INJURIES REQUIRE EXTENSIVE EMERGENCY SURGICAL DEBRIDEMENT AND ALL INJURIES SHOULD BE EVALUATED BY A SPECIALIST IN ORDER TO ASSESS THE EXTENT OF INJURY.

5. FIRE FIGHTING MEASURES

FLAMMABLE PROPERTIES:

FLASHPOINT: 450 DEG. F/232 DEG. C (COC)

OSHA FLAMMABILITY CLASS: NOT APPLICABLE

LEL%: 0.9
UEL%: 7.0

AUTOIGNITION TEMPERATURE: NO DATA

BURN RATE (SOLIDS): NO DATA

UNUSUAL FIRE & EXPLOSION HAZARDS:
THIS MATERIAL MAY BURN, BUT WILL NOT IGNITE READILY.

EXTINGUISHING MEDIA:
DRY CHEMICAL, CARBON DIOXIDE, FOAM, WATER, SAND, OR EARTH IS RECOMMENDED. CARBON DIOXIDE CAN DISPLACE OXYGEN. USE CAUTION WHEN APPLYING CARBON DIOXIDE IN CONFINES SPACES.

FIRE FIGHTING INSTRUCTIONS:
FOR FIRES BEYOND THE INCIPIENT STAGE, EMERGENCY RESPONDERS IN THE IMMEDIATE HAZARD AREA SHOULD WEAR BUNKER GEAR. WHEN THE POTENTIAL CHEMICAL HAZARD IS UNKNOWN, IN ENCLOSED OR CONFINED SPACES, OR WHEN EXPLICITY REQUIRED BY DOT, A SELF CONTAINED BREATHING APPARATUS SHOULD BE WORN. IN ADDITION, WEAR OTHER APPROPRIATE PROTECTIVE EQUIPMENT AS CONDITIONS WARRANT (SEE SECTION 8).

ISOLATE IMMEDIATE HAZARD AREA, KEEP UNAUTHORIZED PERSONNEL OUT. CONTAIN SPILL IF IT CAN BE DONE WITH MINIMAL RISK. MOVE UNDAMAGED CONTAINERS FROM IMMEDIATE HAZARD AREA IF IT CAN BE DONE WITH MINIMAL RISK.

COOL EQUIPMENT EXPOSED TO FIRE WITH WATER, IF IT CAN BE DONE WITH MINIMAL RISK.

6. ACCIDENTAL RELEASE MEASURES

THIS MATERIAL MAY BURN, BUT WILL NOT IGNITE READILY. KEEP ALL SOURCES OF IGNITION AWAY FROM SPILL/RELEASE. STAY UPWIND AND AWAY FROM SPILL. NOTIFY PERSONS DOWN WIND OF THE SPILL/RELEASE, ISOLATE IMMEDIATE HAZARD AREA AND KEEP UNAUTHORIZED PERSONNEL OUT. CONTAIN SPILL IF IT CAN BE DONE WITH MINIMAL RISK. WEAR APPROPRIATE PROTECTIVE EQUIPMENT INCLUDING RESPIRATORY PROTECTION AS CONDITIONS WARRANT (SEE SECTION 8).

PREVENT SPILLED MATERIAL FROM ENTERING SEWERS, STORM DRAINS, OTHER UNAUTHORIZED DRAINAGE SYSTEMS, AND NATURAL WATERWAYS. NOTIFY FIRE AUTHORITIES AND APPROPRIATE FEDERAL, STATE, AND LOCAL AGENCIES. CLEANUP UNDER EXPERT SUPERVISION IS ADVISED. MINIMIZE DUST GENERATION. SWEEP UP AND PACKAGE APPROPRIATELY FOR DISPOSAL. IF SPILL OF ANY AMOUNT IS MADE INTO OR UPON NAVIGABLE WATERS, THE CONTIGUOUS ZONE, OR ADJOINING SHORELINES, NOTIFY THE NATIONAL RESPONSE CENTER (PHONE NUMBER 800-424-8802).

7. HANDLING AND STORAGE

HANDLING:
THE USE OF APPROPRIATE RESPIRATORY PROTECTION IS ADVISED WHEN CONCENTRATIONS EXCEED ANY ESTABLISHED EXPOSURE LIMITS (SEE SECTIONS 2 AND 8).

DO NOT WEAR CONTAMINATED CLOTHING OR SHOES. USE GOOD PERSONAL HYGIENE PRACTICES.

HIGH PRESSURE INJECTION OF HYDROCARBON FUELS, HYDRAULIC OILS OR GREASES UNDER THE SKIN MAY HAVE SERIOUS CONSEQUENCES EVEN THOUGH NO SYMPTOMS OR INJURY MAY BE APPARENT. THIS CAN HAPPEN ACCIDENTALLY WHEN USING HIGH PRESSURE EQUIPMENT SUCH AS HIGH PRESSURE GREASE GUNS, FUEL INJECTION APPARATUS OR FROM PINHOLE LEAKS IN TUBING OF HIGH PRESSURE HYDRAULIC OIL EQUIPMENT.

"EMPTY" CONTAINERS RETAIN RESIDUE AND MAY BE DANGEROUS. DO NOT PRESSURIZE, CUT, WELD, BRAZE, SOLDER, DRILL, GRIND, OR EXPOSE SUCH CONTAINERS TO HEAT, FLAME, SPARKS, OR OTHER SOURCES OF IGNITION. THEY MAY EXPLODE AND CAUSE INJURY OR DEATH. "EMPTY" DRUMS SHOULD BE COMPLETELY DRAINED, PROPERLY BUNGED, AND PROMPTLY SHIPPED TO THE SUPPLIER OR A DRUM RECONDITIONER. ALL CONTAINERS SHOULD BE DISPOSED OF IN AN ENVIRONMENTALLY SAFE MANNER AND IN ACCORDANCE WITH GOVERNMENTAL REGULATIONS.

BEFORE WORKING ON OR IN TANKS WHICH CONTAIN OR HAVE CONTAINED THIS MATERIAL, REFER TO OSHA REGULATIONS, ANSI Z49.1 AND OTHER REFERENCES PERTAINING TO CLEANING, REPAIRING, WELDING, OR OTHER CONTEMPLATED OPERATIONS.

STORAGE:
KEEP CONTAINER(S) TIGHTLY CLOSED. USE AND STORE THIS MATERIAL IN COOL, DRY, WELL-VENTILATED AREAS AWAY FROM HEAT AND ALL SOURCES OF IGNITION. STORE ONLY IN APPROVED CONTAINERS. KEEP AWAY FROM ANY INCOMPATIBLE MATERIAL (SEE SECTION 10). PROTECT CONTAINER(S) AGAINST PHYSICAL DAMAGE.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

ENGINEERING CONTROLS:
IF CURRENT VENTILATION PRACTICES ARE NOT ADEQUATE TO MAINTAIN AIRBORNE CONCENTRATIONS BELOW THE ESTABLISHED EXPOSURE LIMITS (SEE SECTION 2), ADDITIONAL VENTILATION OR EXHAUST SYSTEMS MAY BE REQUIRED.

PERSONAL PROTECTIVE EQUIPMENT (PPE):

RESPIRATORY:

INHALATION IS NOT AN EXPECTED ROUTE OF EXPOSURE. HOWEVER, A NIOSH CERTIFIED AIR PURIFYING RESPIRATOR WITH A TYPE 95 (R OR P) PARTICULATE FILTER MAY BE USED UNDER CONDITIONS WHERE AIRBORNE CONCENTRATIONS ARE EXPECTED TO EXCEED EXPOSURE LIMITS (SEE SECTION 2).

PROTECTION PROVIDED BY AIR PURIFYING RESPIRATORS IS LIMITED (SEE MANUFACTURER'S RESPIRATOR SELECTION GUIDE). USE A POSITIVE PRESSURE AIR SUPPLIED RESPIRATOR IF THERE IS POTENTIAL FOR UNCONTROLLED RELEASE, EXPOSURE LEVELS ARE NOT KNOWN, OR ANY OTHER CIRCUMSTANCES WHERE AIR PURIFYING RESPIRATORS MAY NOT PROVIDE ADEQUATE PROTECTION.

A RESPIRATORY PROTECTION PROGRAM THAT MEETS OSHA'S 29 CFR 1910.134 AND ANSI Z88.2 REQUIREMENTS MUST BE FOLLOWED WHENEVER WORKPLACE CONDITIONS WARRANT A RESPIRATOR'S USE.

SKIN:
THE USE OF GLOVES IMPERVIOUS TO THE SPECIFIC MATERIAL HANDLED IS ADVISED TO PREVENT SKIN CONTACT, POSSIBLE IRRITATION, AND ABSORPTION (SEE GLOVE MANUFACTURER LITERATURE FOR INFORMATION ON PERMEABILITY).

EYE/FACE:
APPROVED EYE PROTECTION TO SAFEGUARD AGAINST POTENTIAL EYE CONTACT, IRRITATION, OR INJURY IS RECOMMENDED. DEPENDING ON CONDITIONS OF USE, A FACE SHIELD MAY BE NECESSARY.

OTHER PROTECTIVE EQUIPMENT:
A SOURCE OF CLEAN WATER SHOULD BE AVAILABLE IN THE WORK AREA FOR FLUSHING EYES AND SKIN. IMPERVIOUS CLOTHING SHOULD BE WORN AS NEEDED.

9. PHYSICAL AND CHEMICAL PROPERTIES

NOTE:
UNLESS OTHERWISE STATED, VALUES ARE DETERMINED AT 20 DEG. C (68 DEG. F) AND 760 MMHg (1 ATM).

BURN RATE (SOLIDS ONLY): NO DATA

APPEARANCE: BLACK

PHYSICAL STATE: SEMI-SOLID

ODOR: CHARACTERISTIC PETROLEUM

VAPOR PRESSURE (MMHg): <0.01

VAPOR DENSITY (AIR = 1): >5

BOILING POINT/RANGE: NO DATA

FREEZING/MELTING POINT: 365 DEG. F/185 DEG. C

SOLUBILITY IN WATER: NEGLIGIBLE

SPECIFIC GRAVITY: 0.90 @ 60 DEG. F

PERCENT VOLATILE: NEGLIGIBLE

EVAPORATION RATE (nBuAc = 1): <0.01

BULK DENSITY: 7.50 LBS/GAL

FLASHPOINT: 450 DEG. F / 232 DEG. C (COC)

FLAMMABLE/EXPLOSIVE LIMITS (%):
LEL: 0.9
UEL: 7.0

10. STABILITY AND REACTIVITY

STABILITY:
STABLE UNDER NORMAL AMBIENT AND ANTICIPATED STORAGE AND HANDLING CONDITIONS OF TEMPERATURE AND PRESSURE.

CONDITIONS TO AVOID:
EXTENDED EXPOSURE TO HIGH TEMPERATURES CAN CAUSE DECOMPOSITION.

MATERIALS TO AVOID (INCOMPATIBLE MATERIALS):
AVOID CONTACT WITH STRONG OXIDANTS SUCH AS LIQUID CHLORINE, CONCENTRATED OXYGEN, SODIUM HYPOCHLORITE OR CALCIUM HYPOCHLORITE.

HAZARDOUS DECOMPOSITION PRODUCTS:
COMBUSTION CAN YIELD MAJOR AMOUNTS OF OXIDES OF CARBON AND MINOR AMOUNTS OF OXIDES OF SULFUR AND NITROGEN. OXIDES OF MOLYBDENUM MAY ALSO BE FORMED.

HAZARDOUS POLYMERIZATION: WILL NOT OCCUR.

11. TOXICOLOGICAL INFORMATION

LUBRICANT BASE OIL (PETROLEUM (CAS# VARIOUS):

CARCINOGENICITY:
THE PETROLEUM BASE OILS CONTAINED IN THIS PRODUCT HAVE BEEN HIGHLY REFINED BY A VARIETY OF PROCESSES INCLUDING SOLVENT EXTRACTION, HYDROTREATING, AND DEWAXING TO REMOVE AROMATICS AND IMPROVE PERFORMANCE CHARACTERISTICS. NONE OF THE OILS USED ARE LISTED AS A CARCINOGEN BY NTP, IARC, OR OSHA.

DEASPHALTED RESIDUUM.. C24 (CAS# 64741-95-3):

CARCINOGENICITY:
SKIN APPLICATION OF A SIMILAR MATERIAL, VACUUM TOWER BOTTOMS, PRODUCED EQUIVOCAL RESULTS IN MOUSE TUMOR BIOASSAYS, BUT NEGATIVE RESULTS IN BOTH SKIN TUMOR INITIATION AND PROMOTION STUDIES. UNTREATED VACUUM DISTILLATES HAVE BEEN IDENTIFIED AS A CARCINOGEN BY IARC.

12. ECOLOGICAL INFORMATION

NOT EVALUATED AT THIS TIME

13. DISPOSAL CONSIDERATIONS

THIS MATERIAL, IF DISCARDED AS PRODUCED, IS NOT A RCRA "LISTED" OR "CHARACTERISTIC" HAZARDOUS WASTE. USE WHICH RESULTS IN CHEMICAL OR PHYSICAL CHANGE OR CONTAMINATION MAY SUBJECT IT TO REGULATION AS A HAZARDOUS WASTE. ALONG WITH PROPERLY CHARACTERIZING ALL WASTE MATERIALS, CONSULT STATE AND LOCAL REGULATIONS REGARDING THE PROPER DISPOSAL OF THIS MATERIAL.

14. TRANSPORT INFORMATION

NOTE: NOT CLASSIFIED AS HAZARDOUS

15. REGULATORY INFORMATION

EPA SARA 311/312 (TITLE III HAZARD CATEGORIES):
ACUTE HEALTH: NO
CHRONIC HEALTH: NO
FIRE HAZARD: NO
PRESSURE HAZARD: NO
REACTIVE HAZARD: NO

SARA 313 AND 40 CFR 372:
THIS MATERIAL CONTAINS THE FOLLOWING CHEMICALS SUBJECT TO THE REPORTING REQUIREMENTS OF SARA 313 AND 40 CFR 372:

COMPONENT	CAS NUMBER	WEIGHT %
ZINC COMPOUND	PROPRIETARY	<1

CALIFORNIA PROPOSITION 65:

WARNING:
THIS MATERIAL CONTAINS THE FOLLOWING CHEMICALS WHICH ARE KNOWN TO THE STATE OF CALIFORNIA TO CAUSE CANCER, BIRTH DEFECTS OR OTHER REPRODUCTIVE HARM, AND ARE SUBJECT TO THE REQUIREMENTS OF CALIFORNIA PROPOSITION 65 (CA HEALTH & SAFETY CODE SECTION 25249.5):

COMPONENT	EFFECT
RESIDUAL FUEL OILS	SKIN CANCER

CARCINOGEN IDENTIFICATION:
THIS MATERIAL HAS NOT BEEN IDENTIFIED AS A CARCINOGEN BY NTP, IARC, OR OSHA, SEE SECTION 11 FOR CARCINOGENICITY INFORMATION OF INDIVIDUAL COMPONENTS, IF ANY.

EPA (CERCLA) REPORTABLE QUANTITY: NONE

16. OTHER INFORMATION

ISSUE DATE: 01/01/02

PREVIOUS ISSUE DATE: 05/31/01

PRODUCT CODE: 5477020000

REVISED SECTIONS: NONE

PREVIOUS PRODUCT CODE: 5477020000

MSDS NUMBER: 5477020000

DISCLAIMER OF EXPRESSED AND IMPLIED WARRANTIES:

THE INFORMATION PRESENTED IN THIS MATERIAL SAFETY DATA SHEET IS BASED ON DATA BELIEVED TO BE ACCURATE AS OF THE DATE THIS MATERIAL SAFETY DATA SHEET WAS PREPARED. HOWEVER, NO WARRANTY OF MERCHANTABILITY, FITNESS FOR ANY PARTICULAR PURPOSE, OR ANY OTHER WARRANTY IS EXPRESSED OR IS TO BE IMPLIED REGARDING THE ACCURACY OR COMPLETENESS OF THE INFORMATION PROVIDED ABOVE, THE RESULTS TO BE OBTAINED FROM THE USE OF THIS INFORMATION OR THE PRODUCT, THE SAFETY OF THIS PRODUCT, OR THE HAZARDS RELATED TO ITS USE. NO RESPONSIBILITY IS ASSUMED FOR ANY DAMAGE OR INJURY RESULTING FROM ABNORMAL USE OR FROM ANY FAILURE TO ADHERE TO RECOMMENDED PRACTICES. THE INFORMATION PROVIDED ABOVE, AND THE PRODUCT, ARE FURNISHED ON THE CONDITION THAT THE PERSON RECEIVING THEM SHALL MAKE THEIR OWN DETERMINATION AS TO THE SUITABILITY OF THE PRODUCT FOR THEIR PARTICULAR PURPOSE AND ON THE CONDITION THAT THEY ASSUME THE RISK OF THEIR USE. IN ADDITION, NO AUTHORIZATION IS GIVEN NOR IMPLIED TO PRACTICE ANY PATENTED INVENTION WITHOUT A LICENSE.

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76 LUBRICANTS
EXTRA DUTY GEAR LUBE (ALL GRADES) **Revised: 02/22/2005**

MSDS Contents

MSDS CODE: 720080

STATUS: FINAL

DATE OF ISSUE: 22-FEB-2005

76 LUBRICANTS

MATERIAL SAFETY DATA SHEET

76 EXTRA DUTY GEAR LUBE (ALL GRADES)

1. PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME: 76 EXTRA DUTY GEAR LUBE (ALL GRADES)

PRODUCT CODE: 47601, 47602, 47603, 47604, 47605, 47606, 47607, 47609

INTENDED USE: GEAR LUBRICANT

SYNONYMS:
76 EXTRA DUTY GEAR LUBE 2EP
76 EXTRA DUTY GEAR LUBE 3EP
76 EXTRA DUTY GEAR LUBE 4EP
76 EXTRA DUTY GEAR LUBE 5EP
76 EXTRA DUTY GEAR LUBE 6EP
76 EXTRA DUTY GEAR LUBE 7EP
76 EXTRA DUTY GEAR LUBE 8EP
76 EXTRA DUTY GEAR LUBE 9EP

CHEMICAL FAMILY: PETROLEUM HYDROCARBON

RESPONSIBLE PARTY:
76 LUBRICANTS
A DIVISION OF CONOCO PHILLIPS
600 N. DAIRY ASHFORD
HOUSTON, TEXAS 77079-1175

CUSTOMER SERVICE: 888-766-7676

TECHNICAL INFORMATION: 800-435-7761

THE INTENDED USE OF THIS PRODUCT IS INDICATED ABOVE. IF ANY ADDITIONAL USE
IS KNOWN, PLEASE CONTACT US AT THE TECHNICAL INFORMATION NUMBER LISTED.

EMERGENCY OVERVIEW:

24 HOUR EMERGENCY TELEPHONE NUMBERS:
SPILL, LEAK, FIRE OR ACCIDENT CALL CHEMTREC:
NORTH AMERICA: (800) 424-9300
OTHERS: (703) 527-3887 (COLLECT)

CALIFORNIA POISON CONTROL SYSTEM: (800) 356-3219

HEALTH HAZARDS/PRECAUTIONARY MEASURES:
AVOID CONTACT WITH EYES, SKIN AND CLOTHING. WASH THOROUGHLY AFTER HANDLING.

PHYSICAL HAZARDS/PRECAUTIONARY MEASURES:
KEEP AWAY FROM ALL SOURCES OF IGNITION.

APPEARANCE: CLEAR AND BRIGHT

PHYSICAL FORM: LIQUID

ODOR: CHARACTERISTIC PETROLEUM

NFPA 704 HAZARD CLASS:
HEALTH 1 (SLIGHT)
FLAMMABILITY 1 (SLIGHT)
INSTABILITY 0 (LEAST)

HMIS HAZARD CLASS:
HEALTH 1 (SLIGHT)
FLAMMABILITY 1 (SLIGHT)
PHYSICAL HAZARDS 0 (LEAST)

2. COMPOSITION / INFORMATION ON INGREDIENTS

NON-HAZARDOUS COMPONENTS:

COMPONENT	CAS NO	PERCENT (%)	ACGIH	OSHA	NIOSH	OTHER
LUBRICANT BASE OIL (PETROLEUM)	VARIOUS	97-98	5 MG/M3 TWA 10 MG/M3 STEL	5 MG/M3 TWA	2500 MG/M3 IDLH	AS OIL MIST, IF GENERATED 5 MG/M3 NOHSC TWA
ADDITIVES	PROP-RIETARY	2-3	NE	NE	NE	NE

ALL COMPONENTS ARE LISTED ON THE TSCA INVENTORY.

THE BASE OIL FOR THIS PRODUCT CAN BE A MIXTURE OF ANY OF THE FOLLOWING HIGHLY
REFINED PETROLEUM STREAMS:
CAS 64741-88-4; CAS 64741-89-5; CAS 64741-96-4; CAS 64741-97-5;
CAS 64742-01-4; CAS 64742-52-5; CAS 64742-53-6; CAS 64742-54-7;
CAS 64742-55-8; CAS 64742-56-9; CAS 64742-57-0; CAS 64742-62-7;
CAS 64742-63-8; CAS 64742-65-0; CAS 72623-83-7; CAS 72623-85-9;
CAS 72623-86-0; CAS 72623-87-1

NOTE:
STATE, LOCAL OR OTHER AGENCIES OR ADVISORY GROUPS MAY HAVE ESTABLISHED MORE

STRINGENT LIMITS. CONSULT AN INDUSTRIAL HYGIENIST OR SIMILAR PROFESSIONAL, OR YOUR LOCAL AGENCIES, FOR FURTHER INFORMATION.

1%=10,000 PPM.
NE=NOT ESTABLISHED

3. HAZARDS IDENTIFICATION

POTENTIAL HEALTH EFFECTS:

EYE:
CONTACT MAY CAUSE MILD EYE IRRITATION INCLUDING STINGING, WATERING, AND REDNESS.

SKIN:
CONTACT MAY CAUSE MILD SKIN IRRITATION INCLUDING REDNESS, AND A BURNING SENSATION. PROLONGED OR REPEATED CONTACT CAN WORSEN IRRITATION BY CAUSING DRYING AND CRACKING OF THE SKIN LEADING TO DERMATITIS (INFLAMMATION). NO HARMFUL EFFECTS FROM SKIN ABSORPTION ARE EXPECTED.

INHALATION (BREATHING):
NO INFORMATION AVAILABLE. STUDIES BY OTHER EXPOSURE ROUTES SUGGEST A LOW DEGREE OF TOXICITY BY INHALATION.

INGESTION (SWALLOWING): NO HARMFUL EFFECTS EXPECTED FROM INGESTION.

SIGNS AND SYMPTOMS:
EFFECTS OF OVEREXPOSURE MAY INCLUDE IRRITATION OF THE EYES, IRRITATION OF THE NOSE AND THROAT, IRRITATION OF THE DIGESTIVE TRACT, IRRITATION OF THE RESPIRATORY TRACT, NAUSEA, DIARRHEA.

CANCER:
INADEQUATE EVIDENCE AVAILABLE TO EVALUATE THE CANCER HAZARD OF THIS MATERIAL. SEE SECTION 11 FOR CARCINOGENICITY INFORMATION OF INDIVIDUAL COMPONENTS, IF ANY.

TARGET ORGANS: NO DATA AVAILABLE FOR THIS MATERIAL.

DEVELOPMENTAL: NO DATA AVAILABLE FOR THIS MATERIAL.

PRE-EXISTING MEDICAL CONDITIONS:
CONDITIONS AGGRAVATED BY EXPOSURE MAY INCLUDE SKIN DISORDERS, RESPIRATORY (ASTHMA-LIKE) DISORDERS.

4. FIRST AID MEASURES

EYE:
IF IRRITATION OR REDNESS DEVELOPS, MOVE VICTIM AWAY FROM EXPOSURE AND INTO FRESH AIR. FLUSH EYES WITH CLEAN WATER. IF SYMPTOMS PERSIST, SEEK MEDICAL ATTENTION.

SKIN:
REMOVE CONTAMINATED SHOES AND CLOTHING AND CLEANSE AFFECTED AREA(S) THOROUGHLY BY WASHING WITH MILD SOAP AND WATER. IF IRRITATION OR REDNESS DEVELOPS AND PERSISTS, SEEK MEDICAL ATTENTION.

INHALATION (BREATHING):
IF RESPIRATORY SYMPTOMS DEVELOP, MOVE VICTIM AWAY FROM SOURCE OF EXPOSURE AND INTO FRESH AIR. IF SYMPTOMS PERSIST, SEEK MEDICAL ATTENTION. IF VICTIM

IS NOT BREATHING, CLEAR AIRWAY AND IMMEDIATELY BEGIN ARTIFICIAL RESPIRATION.
IF BREATHING DIFFICULTIES DEVELOP, OXYGEN SHOULD BE ADMINISTERED BY QUALIFIED
PERSONNEL. SEEK IMMEDIATE MEDICAL ATTENTION.

INGESTION (SWALLOWING):
FIRST AID IS NOT NORMALLY REQUIRED; HOWEVER, IF SWALLOWED AND SYMPTOMS
DEVELOP, SEEK MEDICAL ATTENTION.

NOTES TO PHYSICIAN:
HIGH-PRESSURE HYDROCARBON INJECTION INJURIES MAY PRODUCE SUBSTANTIAL
NECROSIS OF UNDERLYING TISSUE DESPITE AN INNOCUOUS APPEARING EXTERNAL WOUND.
OFTEN THESE INJURIES REQUIRE EXTENSIVE EMERGENCY SURGICAL DEBRIDEMENT AND
ALL INJURIES SHOULD BE EVALUATED BY A SPECIALIST IN ORDER TO ASSESS THE
EXTENT OF INJURY.

ACUTE ASPIRATIONS OF LARGE AMOUNTS OF OIL-LADEN MATERIAL MAY PRODUCE A
SERIOUS ASPIRATION PNEUMONIA. PATIENTS WHO ASPIRATE THESE OILS SHOULD BE
FOLLOWED FOR THE DEVELOPMENT OF LONG-TERM SEQUELAE. INHALATION EXPOSURE TO
OIL MISTS BELOW CURRENT WORKPLACE EXPOSURE LIMITS IS UNLIKELY TO CAUSE
PULMONARY ABNORMALITIES.

5. FIRE-FIGHTING MEASURES

FLAMMABLE PROPERTIES:

FLASH POINT: >399 DEG. F / 204 DEG. C

OSHA FLAMMABILITY CLASS: NOT APPLICABLE

NFPA FLAMMABILITY CLASS: NO DATA

LEL%: NO DATA
UEL%: NO DATA

AUTOIGNITION TEMPERATURE: NO DATA

UNUSUAL FIRE & EXPLOSION HAZARDS:
THIS MATERIAL MAY BURN, BUT WILL NOT IGNITE READILY. VAPORS ARE HEAVIER THAN
AIR AND CAN ACCUMULATE IN LOW AREAS. IF CONTAINER IS NOT PROPERLY COOLED, IT
CAN RUPTURE IN THE HEAT OF A FIRE.

EXTINGUISHING MEDIA:
DRY CHEMICAL, CARBON DIOXIDE, FOAM, OR WATER SPRAY IS RECOMMENDED. WATER OR
FOAM MAY CAUSE FROTHING OF MATERIALS HEATED ABOVE 212 DEG. F CARBON DIOXIDE
CAN DISPLACE OXYGEN. USE CAUTION WHEN APPLYING CARBON DIOXIDE IN CONFINED
SPACES.

FIRE FIGHTING INSTRUCTIONS:
FOR FIRES BEYOND THE INCIPIENT STAGE, EMERGENCY RESPONDERS IN THE IMMEDIATE
HAZARD AREA SHOULD WEAR BUNKER GEAR. WHEN THE POTENTIAL CHEMICAL HAZARD IS
UNKNOWN, IN ENCLOSED OR CONFINED SPACES, OR WHEN EXPLICITLY REQUIRED BY DOT,
A SELF CONTAINED BREATHING APPARATUS SHOULD BE WORN. IN ADDITION, WEAR OTHER
APPROPRIATE PROTECTIVE EQUIPMENT AS CONDITIONS WARRANT (SEE SECTION 8).

ISOLATE IMMEDIATE HAZARD AREA, KEEP UNAUTHORIZED PERSONNEL OUT. STOP
SPILL/RELEASE IF IT CAN BE DONE WITH MINIMAL RISK. MOVE UNDAMAGED CONTAINERS
FROM IMMEDIATE HAZARD AREA IF IT CAN BE DONE WITH MINIMAL RISK.

WATER SPRAY MAY BE USEFUL IN MINIMIZING OR DISPERSING VAPORS AND TO PROTECT
PERSONNEL. COOL EQUIPMENT EXPOSED TO FIRE WITH WATER, IF IT CAN BE DONE WITH
MINIMAL RISK. AVOID SPREADING BURNING LIQUID WITH WATER USED FOR COOLING
PURPOSES.

6. ACCIDENTAL RELEASE MEASURES

THIS MATERIAL MAY BURN, BUT WILL NOT IGNITE READILY. KEEP ALL SOURCES OF IGNITION AWAY FROM SPILL/RELEASE.

STAY UPWIND AND AWAY FROM SPILL/RELEASE. NOTIFY PERSONS DOWN WIND OF THE SPILL/RELEASE, ISOLATE IMMEDIATE HAZARD AREA AND KEEP UNAUTHORIZED PERSONNEL OUT. STOP SPILL/RELEASE IF IT CAN BE DONE WITH MINIMAL RISK. WEAR APPROPRIATE PROTECTIVE EQUIPMENT INCLUDING RESPIRATORY PROTECTION AS CONDITIONS WARRANT (SEE SECTION 8).

PREVENT SPILLED MATERIAL FROM ENTERING SEWERS, STORM DRAINS, OTHER UNAUTHORIZED DRAINAGE SYSTEMS, AND NATURAL WATERWAYS. DIKE FAR AHEAD OF SPILL FOR LATER RECOVERY OR DISPOSAL. SPILLED MATERIAL MAY BE ABSORBED INTO AN APPROPRIATE ABSORBENT MATERIAL.

NOTIFY FIRE AUTHORITIES AND APPROPRIATE FEDERAL, STATE, AND LOCAL AGENCIES. IMMEDIATE CLEANUP OF ANY SPILL IS RECOMMENDED. IF SPILL OF ANY AMOUNT IS MADE INTO OR UPON NAVIGABLE WATERS, THE CONTIGUOUS ZONE, OR ADJOINING SHORELINES, NOTIFY THE NATIONAL RESPONSE CENTER (PHONE NUMBER 800-424-8802).

7. HANDLING AND STORAGE

HANDLING:
DO NOT ENTER CONFINED SPACES SUCH AS TANKS OR PITS WITHOUT FOLLOWING PROPER ENTRY PROCEDURES SUCH AS ASTM D-4276 AND 29 CFR 1910.146. THE USE OF APPROPRIATE RESPIRATORY PROTECTION IS ADVISED WHEN CONCENTRATIONS EXCEED ANY ESTABLISHED EXPOSURE LIMITS (SEE SECTIONS 2 AND 8).

DO NOT WEAR CONTAMINATED CLOTHING OR SHOES. USE GOOD PERSONAL HYGIENE PRACTICES.

"EMPTY" CONTAINERS RETAIN RESIDUE AND MAY BE DANGEROUS. DO NOT PRESSURIZE, CUT, WELD, BRAZE, SOLDER, DRILL, GRIND, OR EXPOSE SUCH CONTAINERS TO HEAT, FLAME, SPARKS, OR OTHER SOURCES OF IGNITION. THEY MAY EXPLODE AND CAUSE INJURY OR DEATH. "EMPTY" DRUMS SHOULD BE COMPLETELY DRAINED, PROPERLY BUNGED, AND PROMPTLY SHIPPED TO THE SUPPLIER OR A DRUM RECONDITIONER. ALL CONTAINERS SHOULD BE DISPOSED OF IN AN ENVIRONMENTALLY SAFE MANNER AND IN ACCORDANCE WITH GOVERNMENTAL REGULATIONS.

HIGH PRESSURE INJECTION OF HYDROCARBON FUELS, HYDRAULIC OILS OR GREASES UNDER THE SKIN MAY HAVE SERIOUS CONSEQUENCES EVEN THOUGH NO SYMPTOMS OR INJURY MAY BE APPARENT. THIS CAN HAPPEN ACCIDENTALLY WHEN USING HIGH PRESSURE EQUIPMENT SUCH AS HIGH PRESSURE GREASE GUNS, FUEL INJECTION APPARATUS OR FROM PINHOLE LEAKS IN TUBING OF HIGH PRESSURE HYDRAULIC OIL EQUIPMENT.

BEFORE WORKING ON OR IN TANKS WHICH CONTAIN OR HAVE CONTAINED THIS MATERIAL, REFER TO OSHA REGULATIONS, ANSI Z49.1, AND OTHER REFERENCES PERTAINING TO CLEANING, REPAIRING, WELDING, OR OTHER CONTEMPLATED OPERATIONS.

STORAGE:
KEEP CONTAINER(S) TIGHTLY CLOSED. USE AND STORE THIS MATERIAL IN COOL, DRY, WELL-VENTILATED AREAS AWAY FROM HEAT AND ALL SOURCES OF IGNITION. STORE ONLY IN APPROVED CONTAINERS. KEEP AWAY FROM ANY INCOMPATIBLE MATERIAL (SEE SECTION 10). PROTECT CONTAINER(S) AGAINST PHYSICAL DAMAGE.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

ENGINEERING CONTROLS:
IF CURRENT VENTILATION PRACTICES ARE NOT ADEQUATE TO MAINTAIN AIRBORNE CONCENTRATIONS BELOW THE ESTABLISHED EXPOSURE LIMITS (SEE SECTION 2), ADDITIONAL ENGINEERING CONTROLS MAY BE REQUIRED.

PERSONAL PROTECTIVE EQUIPMENT (PPE):

RESPIRATORY:
A NIOSH CERTIFIED AIR PURIFYING RESPIRATOR WITH A TYPE 95 (R OR P) PARTICULATE FILTER MAY BE USED UNDER CONDITIONS WHERE AIRBORNE CONCENTRATIONS ARE EXPECTED TO EXCEED EXPOSURE LIMITS (SEE SECTION 2).

PROTECTION PROVIDED BY AIR PURIFYING RESPIRATORS IS LIMITED (SEE MANUFACTURER'S RESPIRATOR SELECTION GUIDE). USE A NIOSH APPROVED SELF-CONTAINED BREATHING APPARATUS (SCBA) OR EQUIVALENT OPERATED IN A PRESSURE DEMAND OR OTHER POSITIVE PRESSURE MODE IF THERE IS POTENTIAL FOR AN UNCONTROLLED RELEASE, EXPOSURE LEVELS ARE NOT KNOWN, OR ANY OTHER CIRCUMSTANCES WHERE AIR PURIFYING RESPIRATORS MAY NOT PROVIDE ADEQUATE PROTECTION.

A RESPIRATORY PROTECTION PROGRAM THAT MEETS OSHA'S 29 CFR 1910.134 AND ANSI Z88.2 REQUIREMENTS MUST BE FOLLOWED WHENEVER WORKPLACE CONDITIONS WARRANT A RESPIRATOR'S USE.

SKIN:
THE USE OF GLOVES IMPERVIOUS TO THE SPECIFIC MATERIAL HANDLED IS ADVISED TO PREVENT SKIN CONTACT AND POSSIBLE IRRITATION (SEE MANUFACTURERS LITERATURE FOR INFORMATION ON PERMEABILITY).

EYE/FACE:
APPROVED EYE PROTECTION TO SAFEGUARD AGAINST POTENTIAL EYE CONTACT, IRRITATION, OR INJURY IS RECOMMENDED. DEPENDING ON CONDITIONS OF USE, A FACE SHIELD MAY BE NECESSARY.

OTHER PROTECTIVE EQUIPMENT:
A SOURCE OF CLEAN WATER SHOULD BE AVAILABLE IN THE WORK AREA FOR FLUSHING EYES AND SKIN. IMPERVIOUS CLOTHING SHOULD BE WORN AS NEEDED.

SUGGESTIONS FOR THE USE OF SPECIFIC PROTECTIVE MATERIALS ARE BASED ON READILY AVAILABLE PUBLISHED DATA. USERS SHOULD CHECK WITH SPECIFIC MANUFACTURERS TO CONFIRM THE PERFORMANCE OF THEIR PRODUCTS.

9. PHYSICAL AND CHEMICAL PROPERTIES

NOTE:
UNLESS OTHERWISE STATED, VALUES ARE DETERMINED AT 20 DEG. C (68 DEG. F) AND 760 MMHg (1 ATM).

APPEARANCE: CLEAR AND BRIGHT

PHYSICAL FORM: LIQUID

ODOR: CHARACTERISTIC PETROLEUM

ODOR THRESHOLD: NO DATA

pH: NOT APPLICABLE

VAPOR PRESSURE (MMHg): <1

VAPOR DENSITY (AIR=1): >1

BOILING POINT: NO DATA

MELTING/FREEZING POINT: <5 DEG. F / -15 DEG. C

SOLUBILITY IN WATER: NEGLIGIBLE

PARTITION COEFFICIENT (n-OCTANOL/WATER): NO DATA

SPECIFIC GRAVITY: 0.87-0.91

BULK DENSITY: 7.3-7.6
BULK DENSITY UNITS: LBS/GAL

VISCOSITY CST @ 100 DEG. C: 8.8-65
VISCOSITY CST @ 40 DEG. C: 60-1100

PERCENT VOLATILE: NEGLIGIBLE

EVAPORATION RATE (nBuAc=1): <1

FLASH POINT: >399 DEG. F / 204 DEG. C

LEL%: NO DATA
UEL%: NO DATA

AUTOIGNITION TEMPERATURE: NO DATA

10. STABILITY AND REACTIVITY

STABILITY:
STABLE UNDER NORMAL AMBIENT AND ANTICIPATED STORAGE AND HANDLING CONDITIONS OF TEMPERATURE AND PRESSURE.

CONDITIONS TO AVOID:
EXTENDED EXPOSURE TO HIGH TEMPERATURES CAN CAUSE DECOMPOSITION.

MATERIALS TO AVOID (INCOMPATIBLE MATERIALS):
AVOID CONTACT WITH STRONG OXIDIZING AGENTS, STRONG ACIDS, STRONG BASES.

HAZARDOUS DECOMPOSITION PRODUCTS:
COMBUSTION CAN YIELD CARBON, NITROGEN AND SULFUR OXIDES.

HAZARDOUS POLYMERIZATION: WILL NOT OCCUR.

11. TOXICOLOGICAL INFORMATION

CHRONIC DATA:

LUBRICANT BASE OIL (PETROLEUM) - CAS: VARIOUS:

CARCINOGENICITY:
THE PETROLEUM BASE OILS CONTAINED IN THIS PRODUCT HAVE BEEN HIGHLY REFINED BY A VARIETY OF PROCESSES INCLUDING SOLVENT EXTRACTION, HYDROTREATING, AND DEWAXING TO REMOVE AROMATICS AND IMPROVE PERFORMANCE CHARACTERISTICS. ALL OF THE OILS MEET THE IP-346 CRITERIA OF LESS THAN 3 PERCENT PAH'S AND THEREFORE NONE ARE LISTED AS A CARCINOGEN BY NTP, IARC, OR OSHA.

ACUTE DATA:

LUBRICANT BASE OIL (PETROLEUM) - CAS: VARIOUS
DERMAL LD50: >2 G/KG
LC50: NO INFORMATION AVAILABLE
ORAL LD50: >5 G/KG

ADDITIVES - CAS: PROPRIETARY:
DERMAL LD50: NO INFORMATION AVAILABLE
LC50: NO INFORMATION AVAILABLE
ORAL LD50: NO INFORMATION AVAILABLE

12. ECOLOGICAL INFORMATION

NOT EVALUATED AT THIS TIME.

13. DISPOSAL CONSIDERATIONS

THIS MATERIAL UNDER MOST INTENDED USES WOULD BECOME USED OIL DUE TO CONTAMINATION BY PHYSICAL OR CHEMICAL IMPURITIES. RECYCLE ALL USED OIL. WHILE BEING RECYCLED, USED OIL IS REGULATED BY 40 CFR 279. USE RESULTING IN CHEMICAL OR PHYSICAL CHANGE OR CONTAMINATION MAY ALSO SUBJECT IT TO REGULATION AS HAZARDOUS WASTE. UNDER FEDERAL REGULATIONS, USED OIL IS A SOLID WASTE MANAGED UNDER 40 CFR 279. HOWEVER, IN CALIFORNIA, USED OIL IS MANAGED AS HAZARDOUS WASTE UNTIL TESTED TO SHOW IT IS NOT HAZARDOUS. CONSULT STATE AND LOCAL REGULATIONS REGARDING THE PROPER HANDLING OF USED OIL. IN THE CASE OF USED OIL, THE INTENT TO DISCARD IT MAY CAUSE THE USED OIL TO BE REGULATED AS HAZARDOUS WASTE.

CONTENTS SHOULD BE COMPLETELY USED AND CONTAINERS EMPTIED PRIOR TO DISCARD. RINSATE MAY BE CONSIDERED A RCRA HAZARDOUS WASTE AND MUST BE DISPOSED OF WITH CARE AND IN COMPLIANCE WITH FEDERAL, STATE AND LOCAL REGULATIONS. LARGE EMPTY CONTAINERS, SUCH AS DRUMS, SHOULD BE RETURNED TO THE DISTRIBUTOR OR A DRUM RECONDITIONER. TO ASSURE PROPER DISPOSAL OF SMALL EMPTY CONTAINERS, CONSULT WITH STATE AND LOCAL REGULATIONS AND DISPOSAL AUTHORITIES.

14. TRANSPORTATION INFORMATION

DOT PROPER SHIPPING NAME: NOT REGULATED

NOTE:
MATERIAL IS UNREGULATED UNLESS IN CONTAINER OF 3500 GALLONS OR MORE, THEN PROVISIONS OF 49 CFR PART 130 APPLY FOR LAND SHIPMENT.

IMDG SHIPPING DESCRIPTION: NOT REGULATED

ICAO/IATA SHIPPING DESCRIPTION: NOT REGULATED

15. REGULATORY INFORMATION

U.S. REGULATIONS:

EPA SARA 311/312 (TITLE III HAZARD CATEGORIES):
ACUTE HEALTH: NO
CHRONIC HEALTH: NO
FIRE HAZARD: NO
PRESSURE HAZARD: NO
REACTIVE HAZARD: NO

SARA - SECTION 313 AND 40 CFR 372:
THIS MATERIAL CONTAINS THE FOLLOWING CHEMICALS SUBJECT TO THE REPORTING REQUIREMENTS OF SARA 313 AND 40 CFR 372: NONE KNOWN

EPA (CERCLA) REPORTABLE QUANTITY (IN POUNDS): NONE KNOWN

CERCLA/SARA - SECTION 302 EXTREMELY HAZARDOUS SUBSTANCES AND TPQS (IN POUNDS):
THIS MATERIAL CONTAINS THE FOLLOWING CHEMICALS SUBJECT TO THE REPORTING REQUIREMENTS OF SARA 302 AND 40 CFR 372: NONE KNOWN

CALIFORNIA PROPOSITION 65:
WARNING:
THIS MATERIAL CONTAINS THE FOLLOWING CHEMICALS WHICH ARE KNOWN TO THE STATE OF CALIFORNIA TO CAUSE CANCER, BIRTH DEFECTS OR OTHER REPRODUCTIVE HARM, AND ARE SUBJECT TO THE REQUIREMENTS OF CALIFORNIA PROPOSITION 65 (CA HEALTH & SAFETY CODE SECTION 25249.5): NONE KNOWN

CARCINOGEN IDENTIFICATION:
THIS MATERIAL HAS NOT BEEN IDENTIFIED AS A CARCINOGEN BY NTP, IARC, OR OSHA. SEE SECTION 11 FOR CARCINOGENICITY INFORMATION OF INDIVIDUAL COMPONENTS, IF ANY.

TSCA: ALL COMPONENTS ARE LISTED ON THE TSCA INVENTORY.

INTERNATIONAL REGULATIONS:

CANADIAN REGULATIONS:
THIS PRODUCT HAS BEEN CLASSIFIED IN ACCORDANCE WITH THE HAZARD CRITERIA OF THE CONTROLLED PRODUCTS REGULATIONS (CPR) AND THE MSDS CONTAINS ALL THE INFORMATION REQUIRED BY THE CPR.

DOMESTIC SUBSTANCES LIST: LISTED

WHMIS CLASSIFICATION: NOT REGULATED

16. OTHER INFORMATION

ISSUE DATE: 22-FEB-2005

PREVIOUS ISSUE DATE: 01/01/2002

PRODUCT CODE: 47601, 47602, 47603, 47604, 47605, 47606, 47607, 47609

REASON FOR REVISION:
COMBINED ALL GRADES INTO SINGLE MSDS.
CHANGED RESPONSIBLE PARTY FROM PHILLIPS TO CONOCO PHILLIPS. OTHER FORMATTING CHANGES

PREVIOUS PRODUCT CODE:
5246020000, 5233030000, 5247040000, 5248050000, 5249060000, 5250070000, 5251080000, 5252090000

MSDS CODE: 720080

DISCLAIMER OF EXPRESSED AND IMPLIED WARRANTIES:

THE INFORMATION PRESENTED IN THIS MATERIAL SAFETY DATA SHEET IS BASED ON DATA BELIEVED TO BE ACCURATE AS OF THE DATE THIS MATERIAL SAFETY DATA SHEET WAS PREPARED. HOWEVER, NO WARRANTY OF MERCHANTABILITY, FITNESS FOR ANY PARTICULAR PURPOSE, OR ANY OTHER WARRANTY IS EXPRESSED OR IS TO BE IMPLIED REGARDING THE ACCURACY OR COMPLETENESS OF THE INFORMATION PROVIDED ABOVE, THE RESULTS TO BE OBTAINED FROM THE USE OF THIS INFORMATION OR THE PRODUCT, THE SAFETY OF THIS PRODUCT, OR THE HAZARDS RELATED TO ITS USE. NO RESPONSIBILITY IS ASSUMED FOR ANY DAMAGE OR INJURY RESULTING FROM ABNORMAL USE OR FROM ANY FAILURE TO ADHERE TO RECOMMENDED PRACTICES. THE INFORMATION PROVIDED ABOVE, AND THE PRODUCT, ARE FURNISHED ON THE CONDITION THAT THE PERSON RECEIVING THEM SHALL MAKE THEIR OWN DETERMINATION AS TO THE SUITABILITY OF THE PRODUCT FOR THEIR PARTICULAR PURPOSE AND ON THE CONDITION THAT THEY ASSUME THE RISK OF THEIR USE. IN ADDITION, NO AUTHORIZATION IS GIVEN NOR IMPLIED TO PRACTICE ANY PATENTED INVENTION WITHOUT A LICENSE.

ACME REFINING
PREMIUM AW HYDRAULIC OIL LIGHT **Revised: 03/01/2009**

MSDS Contents

MATERIAL SAFETY DATA SHEET

SECTION I PRODUCT IDENTIFICATION

MANUFACTURER'S NAME: ACME REFINING

TELEPHONE NO: (216) 961-6900

ADDRESS:
3591 WEST 56TH STREET
CLEVELAND, OHIO 44102

TRADE NAME: ACME PREMIUM AW HYDRAULIC OIL LIGHT

DATE: MARCH 1, 2009

SECTION II HAZARDOUS INGREDIENTS

COMPONENT NAME PERCENT (OPTIONAL) TLV (UNITS) C.A.S REG. NO.

SARA TITLE III SECTION 313

NO ITEM LISTED IN SECTION 313 IS PRESENT IN THIS PRODUCT IN A REPORTABLE QUANTITY.

IN EVENT OF OIL MISTING - 5 MG./CUBIC METER

SECTION III PHYSICAL DATA

PROX. BOILING POINT C: N/A

FREEZING POINT: N/A

VOLATILITY/VOL (%): N/A

VAPOR PRESSURE (MMHg) @ 20 C: N/A

VAPOR DENSITY (AIR = 1): N/A

SOLUBILITY IN H2O: INSOLUBLE

APPEARANCE: CLEAR AMBER LIQUID

SPECIFIC GRAVITY: 0.87

EVAPORATION RATE: N/A

NFPA HAZARD IDENTIFICATION:

DEGREE OF HAZARD:
HEALTH 1
FIRE 1
REACTIVITY 0

HAZARD RATING:
0-LEAST
1-SLIGHT
2-MODERATE
3-HIGH
4-EXTREME

SECTION IV FIRE AND EXPLOSION HAZARD DATA

FLASH POINT F: 400 F. COC

LOWER EXPLOSIVE LIMIT: N/A
UPPER EXPLOSIVE LIMIT: N/A

EXTINGUISH MEDIA: USE CARBON DIOXIDE, FOAM, FOG, OR DRY CHEMICAL

FIRE & EXPLOSION HAZARDS: NONE

FIRE FIGHTING PROCEDURES:
HANDLE AS A PETROLEUM FIRE, AVOID SMOKE INHALATION, WEAR SELF-CONTAINED BREATHING APPARATUS.

SECTION V HEALTH INFORMATION

CARCINOGENICITY:
NTP?: NO
IARC MONOGRAPHS?: NO
OSHA REGULATED?: NO

EFFECTS OF OVEREXPOSURE: MILD IRRITATION OF EYES AND SKIN.

INGESTION: MAY CAUSE NAUSEA AND VOMITING

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: ALLERGY, ECZEMA OR SKIN CONDITIONS

FIRST AID:
EYE CONTACT: FLUSH WITH WATER UNTIL IRRITATION SUBSIDES
SKIN CONTACT: WIPE OFF WITH DRY CLOTH, WASH THOROUGHLY WITH SOAP.
INHALATION: REMOVE INDIVIDUAL TO FRESH AIR.
INGESTION: DO NOT INDUCE VOMITING, DRINK WATER OR MILK.

SECTION VI REACTIVITY DATA

CHEMICAL STABILITY: STABLE

CONDITIONS TO AVOID: NONE

INCOMPATIBLE MATERIALS: STRONG OXIDANTS

DECOMPOSITION PRODUCTS: CO., AND OTHER ASPHYXIATES

HAZARDOUS POLYMERIZATION: WILL NOT OCCUR

SECTION VII SPILL, LEAK & DISPOSAL PROCEDURES

ACTION TO TAKE FOR SPILL:
SOAK UP WITH CHEMICAL ABSORBENT. SHOVEL INTO A CONTAINER FOR DISPOSAL.

DISPOSAL METHOD:
DISPOSE OF IN ACCORDANCE WITH ALL LOCAL, STATE, AND FEDERAL REGULATIONS.

SECTION VIII SPECIAL HANDLING INFORMATION

VENTILATION:
LOCAL EXHAUST: RECOMMENDED
RESPIRATORY PROTECTION: NONE REQUIRED FOR NORMAL CONDITIONS.

PROTECTIVE CLOTHING: CHEMICAL RESISTANT GLOVES, SAFETY GOGGLES

HANDLING AND STORAGE: KEEP CONTAINER CLOSED WHEN NOT IN USE.

OTHER PRECAUTIONS:
DO NOT REUSE EMPTY CONTAINERS. DO NOT PRESSURIZE OR EXPOSE CONTAINERS TO HEAT OR FLAME. KEEP CLOSED WHEN NOT IN USE.

THE INFORMATION SUPPLIED ABOVE IS PRESENTED IN GOOD FAITH AND HAS BEEN DERIVED FROM SOURCES BELIEVED TO BE RELIABLE. HOWEVER, NO WARRANTY, EXPRESSED OR IMPLIED IS EXTENDED REGARDING ITS ACCURACY OR THE RESULTS TO BE OBTAINED FROM ITS USE, SINCE CONDITIONS OF USE ARE BEYOND OUR CONTROL. ALL RISKS ARE ASSUMED BY THE USER.

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Material Safety Data Sheet Collection
Genium group inc.
1171 RiverFront Center, Amsterdam, NY 12010
(518) 842-4111

Issue Date: 2006-06

Hydrochloric Acid
HYD2200

Section 1 - Chemical Product and Company Identification 61

Material Name: Hydrochloric Acid
CAS Number: 7647-01-0
Chemical Formula: ClH
Structural Chemical Formula: HCl
EINECS Number: 231-595-7
ACX Number: X1002202-3
Synonyms: 4-D BOWL SANITIZER; ACIDE CHLORHYDRIQUE; ACIDO CLORHIDRICO; ACIDO CLORIDRICO; ANHYDROUS HYDROCHLORIC ACID; ANHYDROUS HYDROGEN CHLORIDE; AQUEOUS HYDROGEN CHLORIDE; BOWL CLEANER; CHLOORWATERSTOF; CHLOROHYDRIC ACID; CHLOROWODOR; CHLORURE D'HYDROGENE; CHLORURE D'HYDROGENE ANHYDRE; CHLORURO DE HIDROGENO; CHLORWASSERSTOFF; CLORURO DE HIDROGENO ANHIDRO; EMULSION BOWL CLEANER; EPA PESTICIDE CHEMICAL CODE 045901; HYDROCHLORIC ACID; HYDROCHLORIC ACID GAS; HYDROCHLORIDE; HYDROGEN CHLORIDE; HYDROGEN CHLORIDE (HCL); HYGEIA CREME MAGIC BOWL CLEANER; MURIATIC ACID; MURIATIC ACID); NOW SOUTH SAFTI-SOL BRAND CONCENTRATED BOWL CLEANSE WITHMAGIC ACTIO; PERCLEEN BOWL AND URINAL CLEANER; SPIRITS OF SALT; VARLEY'S OCEAN BLUE SCENTED TOILET BOWL CLEANER; VARLEY POLY-PAK BOWL CREME; WHITE EMULSION BOWL CLEANER; WUEST BOWL CLEANER SUPER CONCENTRATED
General Use: Hydrogen chloride is used to produce pharmaceutical hydrochlorides; vinyl chloride from acetylene; alkyl chlorides from olefins and arsenious chloride from arsenious oxide; electronic grade for etching semiconductor crystals. Used in the chlorination of rubber; in organic reactions involving isomerization, polymerization and alkylation; as a catalyst and condensing agent; for making chlorine where economical; in the separation of cotton from wool and cotton de-linting; as flux in the babbitt type of metal alloy; etching semi-conductor crystals.
Hydrochloric acid is used for pickling and heavy duty cleaning of metal parts; rust and scale removal. The production of chlorides; neutralizing bases; a laboratory reagent. For hydrolyzing starch and proteins in preparations for food. As a catalyst and solvent in organic synthesis. As "spirits of salts" for cleaning of lime and masonry from new brickwork. As flux or flux component for soldering; manufacture of "killed spirits".

Section 2 - Composition / Information on Ingredients

Name	CAS	%
hydrogen chloride	7647-01-0	> 99.0

OSHA PEL
Ceiling: 5 ppm, 7 mg/m^3.

NIOSH REL
Ceiling: 5 ppm (7 mg/m^3).

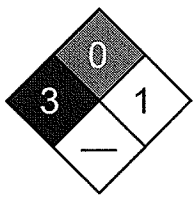
DFG (Germany) MAK
TWA: 5 ppm; PEAK: 5 ppm.

ACGIH TLV
Ceiling: 2 ppm.

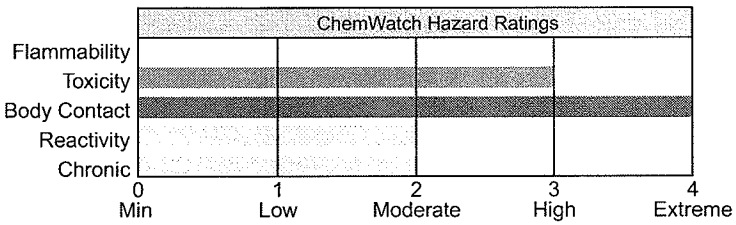
IDLH Level
50 ppm.

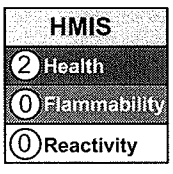
EU OEL
TWA: 5 ppm; STEL: 10 ppm.

Section 3 - Hazards Identification

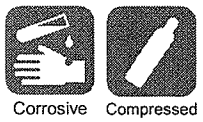


Fire Diamond





ANSI Signal Word
Danger!


Corrosive Compressed Gas

☆☆☆☆☆ Emergency Overview ☆☆☆☆☆

Colorless gas; characteristic suffocating, pungent odor. Corrosive. Stored as compressed gas which may cause frostbite. Chronic Effects: erosion of teeth.

Potential Health Effects

Target Organs: eyes, skin, respiratory system, liver (in animals)
Primary Entry Routes: inhalation, skin contact, eye contact
Acute Effects

Inhalation: The vapor is extremely discomforting to the upper respiratory tract, may cause severe mucous membrane damage and may be harmful if inhaled.
Inhalation of quantities of liquid mist may be extremely hazardous, even lethal due to spasm, extreme irritation of larynx and bronchi, chemical pneumonitis and pulmonary edema.
A single severe exposure may cause coughing and choking; bleeding of nose, inflammation and occasionally ulceration of the nose, throat and larynx. Fluid on the lungs followed by generalized lung damage may follow.
Breathing of vapor may aggravate asthma and inflammatory or fibrotic pulmonary disease.
High concentrations cause necrosis of the tracheal and bronchial epithelium, pulmonary edema, atelectasis and emphysema and damage to the pulmonary blood vessels and liver.
Inhalation hazard is increased at higher temperatures.
The vapor from heated material is extremely discomforting to the upper respiratory tract and lungs if inhaled.
Continued severe exposure can result in pulmonary edema and corrosion of tissues in the nose and throat.

Eye: Hydrogen Chloride: The vapor is extremely discomforting to the eyes and is capable of causing pain and severe conjunctivitis. Corneal injury may develop, with possible permanent impairment of vision, if not promptly and adequately treated.
The material may be irritating to the eye, with prolonged contact causing inflammation. Repeated or prolonged exposure to irritants may produce conjunctivitis.
Hydrochloric Acid: Eye contact is extremely painful and may cause rapid corneal damage. The liquid is extremely corrosive to the eyes and is capable of causing severe damage with loss of sight.
The vapor is highly discomforting and may be corrosive to the eyes. The vapor from heated material is extremely discomforting to the eyes.

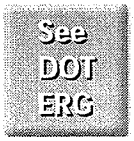
Skin: The material is corrosive to the skin and may cause chemical burns.
Toxic effects may result from skin absorption. Bare unprotected skin should not be exposed to this material. The material may accentuate any pre-existing skin condition.
The vapor is discomforting to the skin.

Ingestion: Considered an unlikely route of entry in commercial/industrial environments.
The liquid is extremely corrosive if swallowed and is capable of causing burns to mouth, throat, esophagus, with extreme discomfort, pain and may be fatal if swallowed in quantity. Ingestion may result in nausea, abdominal irritation, pain and vomiting.

Carcinogenicity: NTP - Not listed; IARC - Group 3, Not classifiable as to carcinogenicity to humans; OSHA - Not listed; NIOSH - Not listed; ACGIH - Not listed; EPA - Not listed; MAK - Not listed.

Chronic Effects: Chronic exposure may cause discoloration or erosion of the teeth, bleeding of the nose and gums; and ulceration of the nasal mucous membranes.
Repeated exposures of animals to concentrations of about 34 ppm produced no immediate toxic effects.
Workers exposed to hydrochloric acid suffered from gastritis and a number of cases of chronic bronchitis have also been reported.
Repeated or prolonged exposure to dilute solutions may cause dermatitis. Repeated exposure to low vapor concentrations can cause skin tenderness, bleeding of the nose and gums, chronic bronchitis, gastritis.

Section 4 - First Aid Measures



Inhalation: Remove to fresh air.
Lay patient down. Keep warm and rested.
If breathing is shallow or has stopped, ensure clear airway and apply resuscitation. Transport to hospital or doctor.

Eye Contact: Immediately hold the eyes open and flush continuously for at least 15 minutes with fresh running water. Ensure irrigation under eyelids by occasionally lifting the upper and lower lids.
Transport to hospital or doctor without delay. Removal of contact lenses after an eye injury should only be undertaken by skilled personnel.

Skin Contact: Immediately flush body and clothes with large amounts of water, using safety shower if available.
Quickly remove all contaminated clothing, including footwear.
Wash affected areas with water (and soap if available) for at least 15 minutes. Transport to hospital or doctor.

Ingestion: Contact a Poison Control Center. Rinse mouth out with plenty of water. Do NOT induce vomiting. Give a glass of water.

After first aid, get appropriate in-plant, paramedic, or community medical support.

Note to Physicians: For acute or short-term repeated exposures to strong acids:
1.Airway problems may arise from laryngeal edema and inhalation exposure.
Treat with 100% oxygen initially.
2.Respiratory distress may require cricothyroidotomy if endotracheal intubation is contraindicated by excessive swelling.

3. Intravenous lines should be established immediately in all cases where there is evidence of circulatory compromise.
4.Strong acids produce a coagulation necrosis characterized by formation of a coagulum (eschar) as a result of the desiccating action of the acid on proteins in specific tissues.

INGESTION:

1.Immediate dilution (milk or water) within 30 minutes post-ingestion is recommended.
2.Do not attempt to neutralize the acid since exothermic reaction may extend the corrosive injury.
3.Be careful to avoid further vomiting since re-exposure of the mucosa to the acid is harmful. Limit fluids to one or two glasses in an adult.
4.Charcoal has no place in acid management.
5.Some authors suggest the use of lavage within 1 hour of ingestion.

SKIN:

1.Skin lesions require copious saline irrigation. Treat chemical burns as thermal burns with non-adherent gauze and wrapping.
2.Deep second-degree burns may benefit from topical silver sulfadiazine.

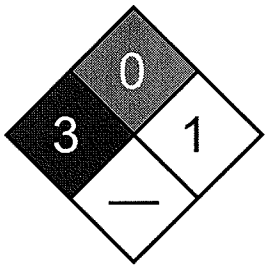
EYE:

1.Eye injuries require retraction of the eyelids to ensure thorough irrigation of the conjunctival cul-de-sacs. Irrigation should last at least 20-30 minutes. Do not use neutralizing agents or any other additives. Several liters of saline are required.
2.Cycloplegic drops (1% cyclopentolate for short-term use or 5% homatropine for longer term use), antibiotic drops, vasoconstrictive agents, or artificial tears may be indicated dependent on the severity of the injury.
3.Steroid eye drops should only be administered with the approval of a consulting ophthalmologist.

Section 5 - Fire-Fighting Measures

See DOT ERG

Flash Point: Nonflammable
Autoignition Temperature: Not applicable
LEL: Not applicable
UEL: Not applicable
Extinguishing Media: Water spray or fog; foam; Bromochlorodifluoromethane (BCF) (where regulations permit); Dry agent; Carbon dioxide.



Fire Diamond

General Fire Hazards/Hazardous Combustion Products: Noncombustible liquid. Will not burn, but heat produces highly toxic fumes/vapors.
Heating may cause expansion or decomposition leading to violent rupture of containers. Decomposes on heating and produces toxic fumes of hydrogen chloride. Decomposition may produce toxic fumes of chlorine.
Reacts with metals producing flammable/explosive hydrogen gas. Contact with moisture or water may generate heat causing ignition. Reacts vigorously with alkalis. Moderate fire hazard when in contact with reducing agents.

Fire Incompatibility: Reacts with metals producing flammable/explosive hydrogen gas.
Avoid reactions with metals, metal oxides, hydroxides, amines, carbonates, alkaline materials, acetic anhydride, cyanides, sulphides, sulphites, phosphides, acetylides, borides, carbides, silicides, vinyl acetate, formaldehyde and potassium permanganate, unsaturated organics, metal acetylides, sulphuric acid.
Note: Compatibility with plastics should be confirmed prior to use.

Fire-Fighting Instructions: Contact fire department and tell them location and nature of hazard.
Wear full body protective clothing with breathing apparatus. Prevent, by any means available, spillage from entering drains or waterways. Consider evacuation. Cool fire-exposed containers with water spray from a protected location. If safe to do so, remove containers from path of fire. Equipment should be thoroughly decontaminated after use. Water spray or fog may be used to disperse vapor. Do not approach cylinders suspected to be hot. If safe to do so, stop flow of gas.

Section 6 - Accidental Release Measures

See DOT ERG

Small Spills: DO NOT touch the spill material. Clean up all spills immediately. Wear fully protective PVC clothing and breathing apparatus. Contain and absorb spill with sand, earth, inert material or vermiculite. Use soda ash or slaked lime to neutralize. Collect residues and place in labeled plastic containers with vented lids. Clear area of personnel and move upwind. Avoid breathing vapors and contact with skin and eyes. Do not exert excessive pressure on valve; do not attempt to operate damaged valve. Water spray or fog may be used to disperse vapor.

Large Spills: Contact fire department and tell them location and nature of hazard. Clear area of personnel and move upwind. Wear full body protective clothing with breathing apparatus. Prevent, by any means available, spillage from entering drains or waterways. Consider evacuation. Stop leak if safe to do so. Remove leaking cylinders to a safe place if possible. Release pressure under safe, controlled conditions by opening the valve. Do not exert excessive pressure on valve; do not attempt to operate damaged valve. Shut off all possible sources of ignition and increase ventilation. Water spray or fog may be used to disperse vapor. Use soda ash or slaked lime to neutralize. Collect and seal in labeled drums for disposal. Wash spill area with large quantities of water. If contamination of

drains or waterways occurs, advise emergency services. After clean-up operations, decontaminate and launder all protective clothing and equipment before storing and reusing. DO NOT touch the spill material. Contain and absorb spill with sand, earth, inert material or vermiculite.
DO NOT USE WATER OR NEUTRALIZING AGENTS INDISCRIMINATELY ON LARGE SPILLS.
Regulatory Requirements: Follow applicable OSHA regulations (29 CFR 1910.120).

Section 7 - Handling and Storage

Handling Precautions: Avoid generating and breathing mist and vapor, breathing vapors and contact with skin and eyes.
Avoid physical damage to containers. Use in a well-ventilated area. Wear protective clothing and gloves when handling containers. Handle and open container with care.
WARNING: To avoid violent reaction, ALWAYS add material to water and NEVER water to material. When handling, DO NOT eat, drink or smoke. Always wash hands with soap and water after handling. Work clothes should be laundered separately. Use good occupational work practices. Observe manufacturer's storing and handling recommendations.
Atmosphere should be regularly checked against established exposure standards to ensure safe working conditions are maintained.
Local exhaust ventilation may be required for safe working, i.e. to keep exposures below required standards; otherwise, PPE is required.
Keep dry. Reacts violently with water.
Transport containers on a trolley. Avoid sources of heat. DO NOT transfer gas from one cylinder to another.
Recommended Storage Methods: Packaging as recommended by manufacturer. Check that containers are clearly labeled.
Cylinder. Ensure the use of equipment rated for cylinder pressure. Ensure the use of compatible materials of construction. Valve protection cap to be in place until cylinder is secured, connected. Cylinder must be properly secured either in use or in storage. Cylinder valve must be closed when not in use or when empty. Segregate full from empty cylinders. WARNING: Suckback into cylinder may result in rupture. Use back-flow preventive device in piping.
Hydrochloric acid: Packs of 2.5 litres or less require a child-resistant closure. Glass container or Plastic carboy or Polylined drum.
Regulatory Requirements: Follow applicable OSHA regulations.

Section 8 - Exposure Controls / Personal Protection

Engineering Controls: If risk of overexposure exists, wear air supplied breathing apparatus. Provide adequate ventilation in warehouse or closed storage areas. Use in a well-ventilated area. Local exhaust ventilation may be required for safe working, i. e. , to keep exposures below required standards; otherwise, PPE is required.
If risk of inhalation or overexposure exists, wear NIOSH-approved respirator or work in fume hood. Hydrogen chloride vapors will not be adequately absorbed by organic vapor respirators.
Personal Protective Clothing/Equipment:
Eyes: Chemical goggles. Full face shield.
DO NOT wear contact lenses. Contact lenses pose a special hazard; soft contact lenses may absorb irritants and all lenses concentrate them.
Hands/Feet: Neoprene gloves; rubber gloves. Nitrile gloves.
Safety footwear. Rubber boots.
Hydrochloric acid: Barrier cream and Neoprene gloves or Elbow length PVC gloves. Nitrile gloves.
PVC boots or PVC safety gumboots.
Respiratory Protection:
Exposure Range >5 to <50 ppm: Air Purifying, Negative Pressure, Half Mask
Exposure Range 50 to unlimited ppm: Self-contained Breathing Apparatus, Pressure Demand, Full Face
Cartridge Color: white
Other: Ensure there is ready access to a safety shower; Eyewash unit.
Acid-resistant overalls. Full protective suit. Operators should be trained in procedures for safe use of this material.
Glove Selection Index:

BUTYL	Best selection
BUTYL/NEOPRENE	Best selection
HYPALON	Best selection
NEOPRENE	Best selection
NEOPRENE/NATURAL	Best selection
NITRILE+PVC	Best selection
PE/EVAL/PE	Best selection
SARANEX-23	Best selection
VITON/NEOPRENE	Best selection
PVC	Best selection

NITRILE ..... Best selection
NATURAL RUBBER..... Satisfactory; may degrade after 4 hours continuous immersion
NATURAL+NEOPRENE..... Satisfactory; may degrade after 4 hours continuous immersion
NAT+NEOPR+NITRILE ..... Poor to dangerous choice for other than short-term immersion

Section 9 - Physical and Chemical Properties

Appearance/General Info: Hydrogen chloride: Colorless, corrosive gas. Pungent suffocating odor. White fumes in moist air. Soluble in methanol, ethanol, ether and benzene.
Hydrochloric acid: Clear to light yellow (orange tint for inhibited grades) fuming corrosive liquid with sharp, suffocating odor.

Physical State: Hydrogen chloride: Compressed gas; Hydrochloric acid: Liquid
Odor Threshold: 0.26 to 0.3 ppm
Vapor Pressure (kPa): < 24.8 at 25 °C
Vapor Density (Air=1): 1.268 at 20 °C
Formula Weight: 36.461
Specific Gravity (H_2O=1, at 4 °C): < 1.19 at 20 °C
Evaporation Rate: Slow

pH: Hydrochloric acid: < 1
Boiling Point: -85 °C (-121 °F)
Freezing/Melting Point: -114.44 °C (-173.992 °F)
Volatile Component (% Vol): 100
Decomposition Temperature (°C): Not applicable
Water Solubility: 56.1 g/100 cc hot water at 60 °C

Section 10 - Stability and Reactivity

Stability/Polymerization/Conditions to Avoid: Decomposes in the presence of moisture to produce corrosive acid. May generate sufficient heat to ignite combustible materials. Presence of heat source and direct sunlight (ultra-violet radiation). Product is considered stable under normal handling conditions. Hazardous polymerization will not occur.
Storage Incompatibilities: Hydrogen chloride: Segregate from most common metals and their alloys, alkalis, unsaturated organics, fluorine, metal carbides, metal acetylides, potassium permanganate and sulfuric acid. Compatibility with plastics should be confirmed prior to use.
Hydrochloric acid: Segregate from alkalies, oxidizing agents and chemicals readily decomposed by acids, i.e. cyanides, sulfides, carbonates. Avoid storage with metals, metal oxides, hydroxides, amines, carbonates, alkaline materials, acetic anhydride, cyanides, sulphides, sulphites, phosphides, acetylides, borides, carbides, silicides, vinyl acetate, formaldehyde and potassium permanganate. Reacts with zinc, brass, galvanized iron, aluminum, copper and copper alloys.

Section 11 - Toxicological Information

Toxicity
Inhalation (human) LC_{Lo}: 1300 ppm/30 m
Inhalation (human) LC_{Lo}: 3000 ppm/5 m
Inhalation (rat) LC_{50}: 3124 ppm/60 m
Inhalation (rat) LC_{50}: 4701 ppm/30 m
Oral (rat) LD_{50}: 900 mg/kg

Irritation
Eye (rabbit): 5 mg/30 s - mild

See *RTECS* MW 4025000, for additional data.

Section 12 - Ecological Information

Environmental Fate: No data found.
Ecotoxicity: TL_m Gambusia affinis (mosquito fish) 282 ppm/96 hr (fresh water) /Conditions of bioassay not specified; Lethal Lepomis macrochirus (bluegill sunfish) 3.6 mg/l/48 hr /Conditions of bioassay not specified; LC_{50} Cockle 330 to 1,000 mg/l/48 hr /Conditions of bioassay not specified; LC_{50} Carassius auratus (goldfish) 178 mg/l (1 to 2 hr survival time) /Conditions of bioassay not specified; LC_{50} Shore crab 240 mg/l/48 hr /Conditions of bioassay not specified; LC_{50} Shrimp 100 to 330 ppm/48 hr (salt water) /Conditions of bioassay not specified; LC_{100} Trout 10 mg/l 24 hr /Conditions of bioassay not specified
Biochemical Oxygen Demand (BOD): none

Section 13 - Disposal Considerations

Disposal: Recycle wherever possible. Consult manufacturer for recycling options. Treat and neutralize at an effluent treatment plant. Bury residue in an authorized landfill. Decontaminate empty containers with a lime slurry. Return empty containers to supplier or bury empty containers at an authorized landfill.
Return empty cylinders to supplier.

Section 14 - Transport Information

DOT Hazardous Materials Table Data (49 CFR 172.101):

Note: This material has multiple possible HMT entries. Choose the appropriate one based on state and condition of specific material when shipped.

Shipping Name and Description: Hydrogen chloride, anhydrous
ID: UN1050
Hazard Class: 2.3 - Poisonous gas
Packing Group:
Symbols:
Label Codes: 2.3 - Poison Gas, 8 - Corrosive
Special Provisions: 3
Packaging: **Exceptions:** None **Non-bulk:** 304 **Bulk:** None
Quantity Limitations: **Passenger aircraft/rail:** Forbidden **Cargo aircraft only:** Forbidden
Vessel Stowage: **Location:** D **Other:** 40

Shipping Name and Description: Hydrochloric acid
ID: UN1789
Hazard Class: 8 - Corrosive material
Packing Group: II - Medium Danger
Symbols:
Label Codes: 8 - Corrosive
Special Provisions: A3, A6, B3, B15, IB2, N41, T8, TP2, TP12
Packaging: **Exceptions:** 154 **Non-bulk:** 202 **Bulk:** 242
Quantity Limitations: **Passenger aircraft/rail:** 1 L **Cargo aircraft only:** 30 L
Vessel Stowage: **Location:** C **Other:**

Shipping Name and Description: Hydrochloric acid
ID: UN1789
Hazard Class: 8 - Corrosive material
Packing Group: III - Minor Danger
Symbols:
Label Codes: 8 - Corrosive
Special Provisions: IB3, T4, TP1, TP12
Packaging: **Exceptions:** 154 **Non-bulk:** 203 **Bulk:** 241
Quantity Limitations: **Passenger aircraft/rail:** 5 L **Cargo aircraft only:** 60 L
Vessel Stowage: **Location:** C **Other:**

Section 15 - Regulatory Information

EPA Regulations:
RCRA 40 CFR: Not listed
CERCLA 40 CFR 302.4: Listed per CWA Section 311(b)(4) 5000 lb (2268 kg)
SARA 40 CFR 372.65: Listed
SARA EHS 40 CFR 355: Listed
RQ: 5000 lb
TPQ: 500 lb
TSCA: Listed

Section 16 - Other Information

Disclaimer: Judgments as to the suitability of information herein for the purchaser's purposes are necessarily the purchaser's responsibility. Although reasonable care has been taken in the preparation of such information, Genium Group, Inc. extends no warranties, makes no representations, and assumes no responsibility as to the accuracy or suitability of such information for application to the purchaser's intended purpose or for consequences of its use.

Material Safety Data Sheet Collection
Genium group inc.
1171 RiverFront Center, Amsterdam, NY 12010
(518) 842-4111

Hydrogen Peroxide Solution 20-60%
HYD2600

Issue Date: 2006-06

Section 1 - Chemical Product and Company Identification 61

Material Name: Hydrogen Peroxide Solution 20-60% **CAS Number:** 7722-84-1
Chemical Formula: H_2O_2
Structural Chemical Formula: H_2O_2
EINECS Number: 231-765-0
ACX Number: X1002204-7
Synonyms: ALBONE; ALBONE 35; ALBONE 50; ALBONE 70; ALBONE 35CG; ALBONE 50CG; ALBONE 70CG; ALBONE DS; DIHYDROGEN DIOXIDE; HIGH-STRENGTH HYDROGEN PEROXIDE; HIOXYL; HYDROGEN DIOXIDE; HYDROGEN DIOXIDE SOLUTION; HYDROGEN PEROXIDE; HYDROGEN PEROXIDE (AQUEOUS); HYDROGEN PEROXIDE SOLUTION; HYDROGEN PEROXIDE SOLUTION (30%); HYDROGEN PEROXIDE SOLUTION 20-60%; HYDROPEROXIDE; INHIBINE; INTEROX; KASTONE; PERHYDROL; PERONE 30; PERONE 35; PERONE 50; PEROSSIDO DI IDROGENO; PEROXAAN; PEROXAN; PEROXIDE; PEROXYDE D'HYDROGENE; T-STUFF; SUPEROXOL; WASSERSTOFFPEROXID; WATERSTOFPEROXYDE
General Use: At varying concentrations used for bleaching and deodorizing of textiles, wood pulp, hair, fur etc.; source of organic and inorganic peroxides; pulp and paper industry; plasticizers; rocket fuel; foam rubber; manufacture of glycerol; antichlor; dyeing; electroplating; antiseptic, laboratory reagent, epoxidation, hydroxylation, oxidation and reduction; viscosity control for starch and cellulose derivatives; refining and cleaning metals; bleaching and oxidizing agent in food; neutralizing agent in wine distillation; seed disinfectant; substitute for chlorine water and sewage treatment.
Pharmaceutical grades : 200 Volume (50% H_2O_2) and 100 Volume (30% H_2O_2).

Section 2 - Composition / Information on Ingredients

Name	CAS	%
hydrogen peroxide	7722-84-1	20 - 60
water	7732-18-5	40 - 80

OSHA PEL
TWA: 1 ppm, 1.4 mg/m^3.

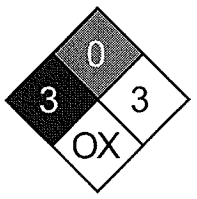
NIOSH REL
TWA: 1 ppm (1.4 mg/m^3).

DFG (Germany) MAK
TWA: 1 ppm; PEAK: 1 ppm.

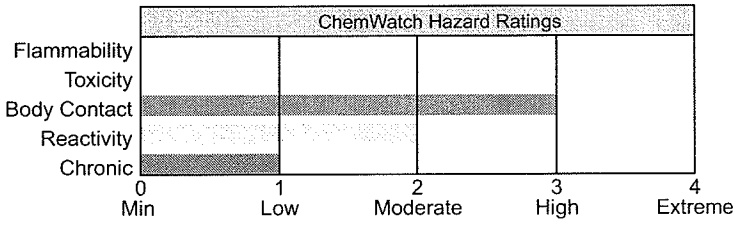
ACGIH TLV
TWA: 1 ppm.

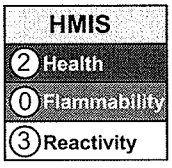
IDLH Level
75 ppm.

Section 3 - Hazards Identification



Fire Diamond





ANSI Signal Word
Danger!


Corrosive

☆☆☆☆☆ Emergency Overview ☆☆☆☆☆

Colorless liquid; slight acrid odor (high concentrations). Corrosive. Other Acute Effects: difficulty breathing, salivation, giddiness, muscle weakness, tremors/numbness of extremities, pulmonary edema, possible sight loss. Strong oxidizer.

Potential Health Effects

Target Organs: eyes, skin, respiratory system, central nervous system (CNS)
Primary Entry Routes: inhalation, skin contact, eye contact

Acute Effects

Inhalation: The vapor/mist is highly discomforting and corrosive to the upper respiratory tract.
Inhalation of excessive levels of mist may result in headache, dizziness, vomiting, diarrhea, irritability, insomnia and, in extreme cases, pulmonary edema.

Eye: The liquid is discomforting and is highly corrosive to the eyes and is capable of causing severe damage with loss of sight.
Reactions may not occur on exposure but response may be delayed with symptoms only appearing many hours later and may cause severe ulceration.

Skin: Skin contact will result in rapid drying and bleaching, leading to chemical burns on prolonged contact. Bare unprotected skin should not be exposed to this material. The material may accentuate any pre-existing skin condition.

Ingestion: The liquid is highly corrosive if swallowed and is capable of causing burns to mouth, throat, esophagus, with extreme discomfort, pain. Ingestion may result in nausea, abdominal irritation, pain, vomiting, and possible internal bleeding. Released oxygen gas may cause distension, pain, even severe organ damage.

Carcinogenicity: NTP - Not listed; IARC - Group 3, Not classifiable as to carcinogenicity to humans; OSHA - Not listed; NIOSH - Not listed; ACGIH - Class A3, Animal carcinogen; EPA - Not listed; MAK - Not listed.

Chronic Effects: Severe systemic poisoning can cause tremors and numbness of the extremities, shock, convulsions, and unconsciousness.

Section 4 - First Aid Measures

See DOT ERG

Inhalation: Remove to fresh air. Lay patient down. Keep warm and rested. If breathing is shallow or has stopped, ensure clear airway and apply resuscitation. Transport to hospital or doctor.

Eye Contact: Immediately hold the eyes open and wash continuously for at least 15 minutes with fresh running water. Ensure irrigation under eyelids by occasionally lifting the upper and lower lids. Transport to hospital or doctor without delay.
Removal of contact lenses after an eye injury should only be undertaken by skilled personnel.

Skin Contact: Immediately flush body and clothes with large amounts of water, using safety shower if available. Quickly remove all contaminated clothing, including footwear. Wash affected areas with water (and soap if available) for at least 15 minutes. Transport to hospital or doctor.

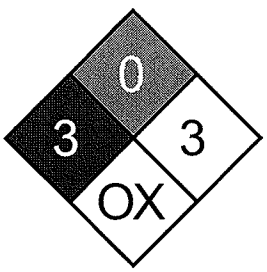
Ingestion: Rinse mouth out with plenty of water. Contact a Poison Control Center.
If swallowed, do NOT induce vomiting. Give a glass of water.

After first aid, get appropriate in-plant, paramedic, or community medical support.

Note to Physicians: Treat symptomatically.

Section 5 - Fire-Fighting Measures

See DOT ERG



Fire Diamond

Flash Point: Nonflammable

LEL: 40% v/v

UEL: 100% v/v

Extinguishing Media: Flooding quantities of water only in the early stages of a fire.
Water spray or fog. DO NOT use halogenated fire extinguishing agents.

General Fire Hazards/Hazardous Combustion Products: Non combustible liquid. Will not burn but increases intensity of fire. Contact with readily oxidizable organic material may cause ignition/fire. Heating may cause expansion or decomposition, leading to violent rupture of containers.

Fire Incompatibility: Avoid contact with organic materials/compounds, particularly finely divided combustible materials, as ignition may result. Violent catalytic decomposition will occur in contact with certain metals such as iron, copper, chromium, brass, bronze, lead, silver, manganese or their salts.

Fire-Fighting Instructions: Alert fire department and tell them location and nature of hazard..
May be violently or explosively reactive. Wear full body protective clothing with breathing apparatus. Prevent, by any means available, spillage from entering drains or water ways. Use fire fighting procedures suitable for surrounding area. Cool fire exposed containers with water spray from a protected location. Do not approach containers suspected to be hot. If safe to do so, remove containers from path of fire.

Section 6 - Accidental Release Measures

See DOT ERG

Small Spills: Clean up all spills immediately. Avoid contact with skin and eyes. Wear impervious gloves and safety glasses. Remove all ignition sources. Small quantities may be discharged to sewer with a large excess of water. Wipe up.

Large Spills: Clear area of personnel and move upwind. Alert fire department and tell them location and nature of hazard.
May be violently or explosively reactive. Wear full body protective clothing with breathing apparatus. Prevent, by any means available, spillage from entering drains or water ways. No smoking, bare lights or ignition sources.

Increase ventilation. Stop leak if safe to do so. Contain spill with sand, earth or vermiculite. Collect recoverable product into labeled containers for recycling. DO NOT return unused product to containers. Absorb remaining product with sand, earth or vermiculite. Collect residues and place in labeled plastic containers with vented lids. Wash spill area with large quantities of water.

After clean up operations, decontaminate and launder all protective clothing and equipment before storing and re-using. If contamination of drains or waterways occurs, advise emergency services.

Regulatory Requirements: Follow applicable OSHA regulations (29 CFR 1910.120).

Section 7 - Handling and Storage

Handling Precautions: Avoid generating and breathing mist. Handle and open container with care. Atmosphere should be regularly checked against established exposure standards to ensure safe working conditions are maintained. Use good occupational work practice. Observe manufacturer's storing and handling recommendations. Avoid all personal contact, including inhalation. Wear protective clothing when risk of exposure occurs. Avoid smoking, bare lights, heat or ignition sources. Use in a well-ventilated area. Avoid contact with incompatible materials. DO NOT return unused product to containers. Avoid sources of heat. Mild steel, brass, bronze and copper equipment should not be used. When handling, DO NOT eat, drink or smoke. Always wash hands with soap and water after handling. Work clothes should be laundered separately. Launder contaminated clothing before re-use.

Recommended Storage Methods: Packaging as recommended by manufacturer. Check that containers are clearly labelled. Glass container. Container to have vented cap. Properly passivated aluminium or stainless steel containers. Polyethylene containers or porcelain, vitreous stoneware.

Regulatory Requirements: Follow applicable OSHA regulations.

Section 8 - Exposure Controls / Personal Protection

Engineering Controls: Use in a well-ventilated area.

Personal Protective Clothing/Equipment:

Eyes: Chemical goggles. Full face shield.

Contact lenses pose a special hazard; soft lenses may absorb irritants and all lenses concentrate them.

Hands/Feet: Barrier cream and PVC gloves. Rubber boots.

Respiratory Protection:

Exposure Range >1 to 50 ppm: Supplied Air, Constant Flow/Pressure Demand, Half Mask

Exposure Range >50 to <75 ppm: Supplied Air, Constant Flow/Pressure Demand, Full Face

Exposure Range 75 to unlimited ppm: Self-contained Breathing Apparatus, Pressure Demand, Full Face

Note: odor threshold unknown

Other: Do not allow clothing wet with material to stay in contact with skin. Overalls, PVC apron and impervious apron. Eyewash unit. Ensure there is ready access to a safety shower.

Glove Selection Index:

NEOPRENE..... Best selection

NATURAL RUBBER..... Satisfactory; may degrade after 4 hours continuous immersion

Section 9 - Physical and Chemical Properties

Appearance/General Info: Clear, colorless, water-like liquid with a slightly sharp odor. Hydrogen peroxide readily decomposes and requires stabilization. Soluble in ether, insoluble in hydrocarbons and decomposed by many organic solvents.

Material hazard increases as concentration of peroxide increases.

Concentration (%w/w)	27.5	35	50	59.5
Boiling Pt.	106	107	114	119
Melting Pt.	-23	-33	-52	-56
Vap. Press. (mmHg)	15	13	10	8
Spec. grav.	1.10	1.13	1.20	1.24

Self accelerating decomposition temperature SADT (°C) >50 for all concentrations.

Physical State: Liquid

Vapor Density (Air=1): Not applicable.

Formula Weight: Not applicable.

Evaporation Rate: Not available

pH: Not available

pH (1% Solution): Not available.

Volatile Component (% Vol): Not available.

Decomposition Temperature (°C): Not applicable

Water Solubility: Miscible with water

Section 10 - Stability and Reactivity

Stability/Polymerization/Conditions to Avoid: Avoid any contamination of this material as it is very reactive and any contamination is potentially hazardous. Presence of heat source and direct sunlight. Solutions of hydrogen peroxide decompose slowly releasing oxygen. Heat or contaminants will accelerate decomposition. Containers may be pressurized. Hydrogen peroxide is decomposed by alkalis and even ordinary dust or rust.

Storage Incompatibilities: Rotate all stock to prevent aging. Use on FIFO (First In-First Out) basis. Segregate from combustible materials, particularly finely divided combustible materials and reducing agents.

Section 11 - Toxicological Information

Not available. Refer to individual constituents.

See *RTECS* MX 0899500, for additional data.

Section 12 - Ecological Information

Environmental Fate: No data found.
Ecotoxicity: Aquatic toxicity: more than 40 ppm/time period not specified/fingerling trout/toxic/salt water
Biochemical Oxygen Demand (BOD): none

Section 13 - Disposal Considerations

Disposal: Recycle wherever possible. Consult manufacturer for recycling options. Consult State Land Waste Management Authority for disposal. Decompose small amounts by slowly adding to warm caustic solution. Puncture containers to prevent re-use.

Section 14 - Transport Information

DOT Hazardous Materials Table Data (49 CFR 172.101):

Note: This material has multiple possible HMT entries. Choose the appropriate one based on state and condition of specific material when shipped.

Shipping Name and Description: Hydrogen peroxide, aqueous solutions *with more than 40 percent but not more than 60 percent hydrogen peroxide (stabilized as necessary)*
ID: UN2014
Hazard Class: 5.1 - Oxidizer
Packing Group: II - Medium Danger
Symbols:

Label Codes: 5.1 - Oxidizer, 8 - Corrosive
Special Provisions: 12, A3, A6, B53, B80, B81, B85, IB2, IP5, T7, TP2, TP6, TP24, TP37
Packaging: **Exceptions:** None **Non-bulk:** 202 **Bulk:** 243
Quantity Limitations: **Passenger aircraft/rail:** Forbidden **Cargo aircraft only:** Forbidden
Vessel Stowage: **Location:** D **Other:** 25, 66, 75, 106

Shipping Name and Description: Hydrogen peroxide, aqueous solutions *with not less than 20 percent but not more than 40 percent hydrogen peroxide (stabilized as necessary)*
ID: UN2014
Hazard Class: 5.1 - Oxidizer
Packing Group: II - Medium Danger
Symbols:

Label Codes: 5.1 - Oxidizer, 8 - Corrosive
Special Provisions: A2, A3, A6, B53, IB2, IP5, T7, TP2, TP6, TP24, TP37
Packaging: **Exceptions:** None **Non-bulk:** 202 **Bulk:** 243
Quantity Limitations: **Passenger aircraft/rail:** 1 L **Cargo aircraft only:** 5 L
Vessel Stowage: **Location:** D **Other:**

Section 15 - Regulatory Information

EPA Regulations:
RCRA 40 CFR: Not listed
CERCLA 40 CFR 302.4: Not listed
SARA 40 CFR 372.65: Not listed
SARA EHS 40 CFR 355: Listed
RQ: 1000 lb
TPQ: 1000 lb
TSCA: Listed

Section 16 - Other Information

Disclaimer: Judgments as to the suitability of information herein for the purchaser's purposes are necessarily the purchaser's responsibility. Although reasonable care has been taken in the preparation of such information, Genium Group, Inc. extends no warranties, makes no representations, and assumes no responsibility as to the accuracy or suitability of such information for application to the purchaser's intended purpose or for consequences of its use.

76 LUBRICANTS
SUPER MOTOR OIL **Revised: 10/15/2004**

MSDS Contents

76 LUBRICANTS

MSDS CODE: 721780

STATUS: FINAL

DATE OF ISSUE: 15-OCT-2004

MATERIAL SAFETY DATA SHEET

76 SUPER MOTOR OIL

1. PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME: 76 SUPER MOTOR OIL

PRODUCT CODE: 1043226, 1043286, 1043331, 1043376, 1043401

INTENDED USE: CRANKCASE OIL

SYNONYMS:
76 SUPER MOTOR OIL, SAE 10W-30
76 SUPER MOTOR OIL, SAE 10W-40
76 SUPER MOTOR OIL, SAE 20W-50
76 SUPER MOTOR OIL, SAE 30
76 SUPER MOTOR OIL, SAE 40

RESPONSIBLE PARTY:
76 LUBRICANTS
A DIVISION OF CONOCOPHILLIPS
600 N. DAIRY ASHFORD
HOUSTON, TEXAS 77079-1175

CUSTOMER SERVICE: 888-766-7676

TECHNICAL INFORMATION: 800-435-7761

THE INTENDED USE OF THIS PRODUCT IS INDICATED ABOVE. IF ANY ADDITIONAL USE IS KNOWN, PLEASE CONTACT US AT THE TECHNICAL INFORMATION NUMBER LISTED.

EMERGENCY OVERVIEW:

24 HOUR EMERGENCY TELEPHONE NUMBERS:
SPILL, LEAK, FIRE OR ACCIDENT CALL CHEMTREC:
NORTH AMERICA: (800) 424-9300
OTHERS: (703) 527-3887 (COLLECT)

CALIFORNIA POISON CONTROL SYSTEM: (800) 356-3219

HEALTH HAZARDS/PRECAUTIONARY MEASURES:
AVOID CONTACT WITH EYES, SKIN AND CLOTHING. WASH THOROUGHLY AFTER HANDLING.

PHYSICAL HAZARDS/PRECAUTIONARY MEASURES:
KEEP AWAY FROM ALL SOURCES OF IGNITION.

APPEARANCE: CLEAR, AMBER

PHYSICAL FORM: LIQUID

ODOR: CHARACTERISTIC PETROLEUM

NFPA 704 HAZARD CLASS:
HEALTH: 1 (SLIGHT)
FLAMMABILITY: 1 (SLIGHT)
INSTABILITY: 0 (LEAST)

HMIS HAZARD CLASS:
HEALTH: 1 (SLIGHT)
FLAMMABILITY: 1 (SLIGHT)
PHYSICAL HAZARDS: 0 (LEAST)

2. COMPOSITION/INFORMATION ON INGREDIENTS

HAZARDOUS COMPONENTS:

COMPONENT/CAS NO	PERCENT (%)	ACGIH	OSHA	NIOSH	OTHER
ZINC COMPOUND(S) PROPRIETARY	0.5-1.5	NE	NE	NE	NE

NON-HAZARDOUS COMPONENTS:

COMPONENT/CAS NO	PERCENT (%)	ACGIH	OSHA	NIOSH	OTHER
LUBRICANT BASE OIL (PETROLEUM) VARIOUS STEL 5 MG/M3 NOHSC TWA	77-91	5 MG/M3 TWA 10 MG/M3	5 MG/M3 TWA	2500 MG/M3 IDLH	AS OIL MIST, IF GENERATED
ADDITIVES PROPRIETARY	9-23	NE	NE	NE	NE

ALL COMPONENTS ARE LISTED ON THE TSCA INVENTORY.

THE BASE OIL FOR THIS PRODUCT CAN BE A MIXTURE OF ANY OF THE FOLLOWING HIGHLY REFINED PETROLEUM STREAMS:
CAS 64741-88-4; CAS 64741-89-5; CAS 64741-96-4; CAS 64741-97-5;
CAS 64742-01-4; CAS 64742-52-5; CAS 64742-53-6; CAS 64742-54-7;
CAS 64742-55-8; CAS 64742-56-9; CAS 64742-57-0; CAS 64742-62-7;
CAS 64742-63-8; CAS 64742-65-0; CAS 72623-83-7; CAS 72623-85-9;
CAS 72623-86-0; CAS 72623-87-1

NOTE:
STATE, LOCAL OR OTHER AGENCIES OR ADVISORY GROUPS MAY HAVE ESTABLISHED MORE STRINGENT LIMITS. CONSULT AN INDUSTRIAL HYGIENIST OR SIMILAR PROFESSIONAL, OR YOUR LOCAL AGENCIES, FOR FURTHER INFORMATION.

1%=10,000 PPM.
NE=NOT ESTABLISHED

3. HAZARDS IDENTIFICATION

POTENTIAL HEALTH EFFECTS:

EYE:
CONTACT MAY CAUSE MILD EYE IRRITATION INCLUDING STINGING, WATERING, AND REDNESS.

SKIN:
CONTACT MAY CAUSE MILD SKIN IRRITATION INCLUDING REDNESS, AND A BURNING SENSATION. PROLONGED OR REPEATED CONTACT CAN WORSEN IRRITATION BY CAUSING DRYING AND CRACKING OF THE SKIN LEADING TO DERMATITIS (INFLAMMATION). NO HARMFUL EFFECTS FROM SKIN ABSORPTION ARE EXPECTED.

INHALATION (BREATHING):
NO INFORMATION AVAILABLE. STUDIES BY OTHER EXPOSURE ROUTES SUGGEST A LOW DEGREE OF TOXICITY BY INHALATION.

INGESTION (SWALLOWING): NO HARMFUL EFFECTS EXPECTED FROM INGESTION.

SIGNS AND SYMPTOMS:
EFFECTS OF OVEREXPOSURE MAY INCLUDE IRRITATION OF THE NOSE AND THROAT, IRRITATION OF THE RESPIRATORY TRACT, NAUSEA, DIARRHEA.

CANCER:
INADEQUATE EVIDENCE AVAILABLE TO EVALUATE THE CANCER HAZARD OF THIS MATERIAL. SEE SECTION 11 FOR CARCINOGENICITY INFORMATION OF INDIVIDUAL COMPONENTS, IF ANY.

TARGET ORGANS: NO DATA AVAILABLE FOR THIS MATERIAL.

DEVELOPMENTAL: NO DATA AVAILABLE FOR THIS MATERIAL.

PRE-EXISTING MEDICAL CONDITIONS:
CONDITIONS AGGRAVATED BY EXPOSURE MAY INCLUDE SKIN DISORDERS.

4. FIRST AID MEASURES

EYE:
IF IRRITATION OR REDNESS DEVELOPS, MOVE VICTIM AWAY FROM EXPOSURE AND INTO FRESH AIR. FLUSH EYES WITH CLEAN WATER. IF SYMPTOMS PERSIST, SEEK MEDICAL ATTENTION.

SKIN:
WIPE MATERIAL FROM SKIN AND REMOVE CONTAMINATED SHOES AND CLOTHING. CLEANSE AFFECTED AREA(S) THOROUGHLY BY WASHING WITH MILD SOAP AND WATER AND, IF NECESSARY, A WATERLESS SKIN CLEANSER. IF IRRITATION OR REDNESS DEVELOPS AND PERSISTS, SEEK MEDICAL ATTENTION.

INHALATION (BREATHING):

IF RESPIRATORY SYMPTOMS DEVELOP, MOVE VICTIM AWAY FROM SOURCE OF EXPOSURE AND INTO FRESH AIR. IF SYMPTOMS PERSIST, SEEK MEDICAL ATTENTION. IF VICTIM IS NOT BREATHING, CLEAR AIRWAY AND IMMEDIATELY BEGIN ARTIFICIAL RESPIRATION. IF BREATHING DIFFICULTIES DEVELOP, OXYGEN SHOULD BE ADMINISTERED BY QUALIFIED PERSONNEL. SEEK IMMEDIATE MEDICAL ATTENTION.

INGESTION (SWALLOWING):
FIRST AID IS NOT NORMALLY REQUIRED; HOWEVER, IF SWALLOWED AND SYMPTOMS DEVELOP, SEEK MEDICAL ATTENTION.

NOTES TO PHYSICIAN:
HIGH-PRESSURE HYDROCARBON INJECTION INJURIES MAY PRODUCE SUBSTANTIAL NECROSIS OF UNDERLYING TISSUE DESPITE AN INNOCUOUS APPEARING EXTERNAL WOUND. OFTEN THESE INJURIES REQUIRE EXTENSIVE EMERGENCY SURGICAL DEBRIDEMENT AND ALL INJURIES SHOULD BE EVALUATED BY A SPECIALIST IN ORDER TO ASSESS THE EXTENT OF INJURY.

ACUTE ASPIRATIONS OF LARGE AMOUNTS OF OIL-LADEN MATERIAL MAY PRODUCE A SERIOUS ASPIRATION PNEUMONIA. PATIENTS WHO ASPIRATE THESE OILS SHOULD BE FOLLOWED FOR THE DEVELOPMENT OF LONG-TERM SEQUELAE. INHALATION EXPOSURE TO OIL MISTS BELOW CURRENT WORKPLACE EXPOSURE LIMITS IS UNLIKELY TO CAUSE PULMONARY ABNORMALITIES.

5. FIRE-FIGHTING MEASURES

FLAMMABLE PROPERTIES:

FLASH POINT: 365 DEG. F/185 DEG. C (PMCC) APPROXIMATELY

OSHA FLAMMABILITY CLASS: NOT REGULATED

NFPA FLAMMABILITY CLASS: NO DATA

LEL%: NO DATA
UEL%: NO DATA

AUTOIGNITION TEMPERATURE: NO DATA

UNUSUAL FIRE & EXPLOSION HAZARDS:
THIS MATERIAL MAY BURN, BUT WILL NOT IGNITE READILY. VAPORS ARE HEAVIER THAN AIR AND CAN ACCUMULATE IN LOW AREAS. IF CONTAINER IS NOT PROPERLY COOLED, IT CAN RUPTURE IN THE HEAT OF A FIRE.

EXTINGUISHING MEDIA:
DRY CHEMICAL, CARBON DIOXIDE, FOAM, OR WATER SPRAY IS RECOMMENDED. WATER OR FOAM MAY CAUSE FROTHING OF MATERIALS HEATED ABOVE 212 DEG. F. CARBON DIOXIDE CAN DISPLACE OXYGEN. USE CAUTION WHEN APPLYING CARBON DIOXIDE IN CONFINED SPACES.

FIRE FIGHTING INSTRUCTIONS:
FOR FIRES BEYOND THE INCIPIENT STAGE, EMERGENCY RESPONDERS IN THE IMMEDIATE HAZARD AREA SHOULD WEAR BUNKER GEAR. WHEN THE POTENTIAL CHEMICAL HAZARD IS UNKNOWN, IN ENCLOSED OR CONFINED SPACES, OR WHEN EXPLICITLY REQUIRED BY DOT, A SELF CONTAINED BREATHING APPARATUS SHOULD BE WORN. IN ADDITION, WEAR OTHER APPROPRIATE PROTECTIVE EQUIPMENT AS CONDITIONS WARRANT (SEE SECTION 8).

ISOLATE IMMEDIATE HAZARD AREA, KEEP UNAUTHORIZED PERSONNEL OUT. STOP SPILL/RELEASE IF IT CAN BE DONE WITH MINIMAL RISK. MOVE UNDAMAGED CONTAINERS FROM IMMEDIATE HAZARD AREA IF IT CAN BE DONE WITH MINIMAL RISK.

WATER SPRAY MAY BE USEFUL IN MINIMIZING OR DISPERSING VAPORS AND TO PROTECT PERSONNEL. COOL EQUIPMENT EXPOSED TO FIRE WITH WATER, IF IT CAN BE DONE WITH

MINIMAL RISK. AVOID SPREADING BURNING LIQUID WITH WATER USED FOR COOLING PURPOSES.

6. ACCIDENTAL RELEASE MEASURES

THIS MATERIAL MAY BURN, BUT WILL NOT IGNITE READILY. KEEP ALL SOURCES OF IGNITION AWAY FROM SPILL/RELEASE.

STAY UPWIND AND AWAY FROM SPILL/RELEASE. NOTIFY PERSONS DOWN WIND OF THE SPILL/RELEASE, ISOLATE IMMEDIATE HAZARD AREA AND KEEP UNAUTHORIZED PERSONNEL OUT. STOP SPILL/RELEASE IF IT CAN BE DONE WITH MINIMAL RISK. WEAR APPROPRIATE PROTECTIVE EQUIPMENT INCLUDING RESPIRATORY PROTECTION AS CONDITIONS WARRANT (SEE SECTION 8).

PREVENT SPILLED MATERIAL FROM ENTERING SEWERS, STORM DRAINS, OTHER UNAUTHORIZED DRAINAGE SYSTEMS, AND NATURAL WATERWAYS. DIKE FAR AHEAD OF SPILL FOR LATER RECOVERY OR DISPOSAL. SPILLED MATERIAL MAY BE ABSORBED INTO AN APPROPRIATE ABSORBENT MATERIAL.

NOTIFY FIRE AUTHORITIES AND APPROPRIATE FEDERAL, STATE, AND LOCAL AGENCIES. IMMEDIATE CLEANUP OF ANY SPILL IS RECOMMENDED. IF SPILL OF ANY AMOUNT IS MADE INTO OR UPON NAVIGABLE WATERS, THE CONTIGUOUS ZONE, OR ADJOINING SHORELINES, NOTIFY THE NATIONAL RESPONSE CENTER (PHONE NUMBER 800-424-8802).

7. HANDLING AND STORAGE

HANDLING:
DO NOT ENTER CONFINED SPACES SUCH AS TANKS OR PITS WITHOUT FOLLOWING PROPER ENTRY PROCEDURES SUCH AS ASTM D-4276 AND 29CFR 1910.146. THE USE OF APPROPRIATE RESPIRATORY PROTECTION IS ADVISED WHEN CONCENTRATIONS EXCEED ANY ESTABLISHED EXPOSURE LIMITS (SEE SECTIONS 2 AND 8).

DO NOT WEAR CONTAMINATED CLOTHING OR SHOES. WASH THOROUGHLY AFTER HANDLING. USE GOOD PERSONAL HYGIENE PRACTICES.

HIGH PRESSURE INJECTION OF HYDROCARBON FUELS, HYDRAULIC OILS OR GREASES UNDER THE SKIN MAY HAVE SERIOUS CONSEQUENCES EVEN THOUGH NO SYMPTOMS OR INJURY MAY BE APPARENT. THIS CAN HAPPEN ACCIDENTALLY WHEN USING HIGH PRESSURE EQUIPMENT SUCH AS HIGH PRESSURE GREASE GUNS, FUEL INJECTION APPARATUS OR FROM PINHOLE LEAKS IN TUBING OF HIGH PRESSURE HYDRAULIC OIL EQUIPMENT.

"EMPTY" CONTAINERS RETAIN RESIDUE AND MAY BE DANGEROUS. DO NOT PRESSURIZE, CUT, WELD, BRAZE, SOLDER, DRILL, GRIND, OR EXPOSE SUCH CONTAINERS TO HEAT, FLAME, SPARKS, OR OTHER SOURCES OF IGNITION. THEY MAY EXPLODE AND CAUSE INJURY OR DEATH. CONTAINERS SHOULD BE DISPOSED OF IN AN ENVIRONMENTALLY SAFE MANNER AND IN ACCORDANCE WITH GOVERNMENTAL REGULATIONS.

BEFORE WORKING ON OR IN TANKS WHICH CONTAIN OR HAVE CONTAINED THIS MATERIAL, REFER TO OSHA REGULATIONS, ANSI Z49.1 AND OTHER REFERENCES PERTAINING TO CLEANING, REPAIRING, WELDING, OR OTHER CONTEMPLATED OPERATIONS.

STORAGE:
KEEP CONTAINER(S) TIGHTLY CLOSED. USE AND STORE THIS MATERIAL IN COOL, DRY, WELL-VENTILATED AREAS AWAY FROM HEAT AND ALL SOURCES OF IGNITION. STORAGE TEMPERATURES ABOVE 113 DEG. F MAY LEAD TO THERMAL DECOMPOSITION, RESULTING IN THE GENERATION OF HYDROGEN SULFIDE AND OTHER SULFUR CONTAINING GASES. STORE ONLY IN APPROVED CONTAINERS. KEEP AWAY FROM ANY INCOMPATIBLE MATERIAL (SEE SECTION 10). PROTECT CONTAINER(S) AGAINST PHYSICAL DAMAGE.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

ENGINEERING CONTROLS:
IF CURRENT VENTILATION PRACTICES ARE NOT ADEQUATE TO MAINTAIN AIRBORNE CONCENTRATIONS BELOW THE ESTABLISHED EXPOSURE LIMITS (SEE SECTION 2), ADDITIONAL ENGINEERING CONTROLS MAY BE REQUIRED.

PERSONAL PROTECTIVE EQUIPMENT (PPE):

RESPIRATORY:
A NIOSH CERTIFIED AIR PURIFYING RESPIRATOR WITH A TYPE 95 (R OR P) PARTICULATE FILTER MAY BE USED UNDER CONDITIONS WHERE AIRBORNE CONCENTRATIONS ARE EXPECTED TO EXCEED EXPOSURE LIMITS (SEE SECTION 2).

PROTECTION PROVIDED BY AIR PURIFYING RESPIRATORS IS LIMITED (SEE MANUFACTURER'S RESPIRATOR SELECTION GUIDE). USE A NIOSH APPROVED SELF-CONTAINED BREATHING APPARATUS (SCBA) OR EQUIVALENT OPERATED IN A PRESSURE DEMAND OR OTHER POSITIVE PRESSURE MODE IF THERE IS POTENTIAL FOR AN UNCONTROLLED RELEASE, EXPOSURE LEVELS ARE NOT KNOWN, OR ANY OTHER CIRCUMSTANCES WHERE AIR PURIFYING RESPIRATORS MAY NOT PROVIDE ADEQUATE PROTECTION. A RESPIRATORY PROTECTION PROGRAM THAT MEETS OSHA'S 29 CFR 1910.134 AND ANSI Z88.2 REQUIREMENTS MUST BE FOLLOWED WHENEVER WORKPLACE CONDITIONS WARRANT A RESPIRATOR'S USE.

SKIN:
THE USE OF GLOVES IMPERVIOUS TO THE SPECIFIC MATERIAL HANDLED IS ADVISED TO PREVENT SKIN CONTACT AND POSSIBLE IRRITATION (SEE MANUFACTURERS LITERATURE FOR INFORMATION ON PERMEABILITY).

EYE/FACE:
APPROVED EYE PROTECTION TO SAFEGUARD AGAINST POTENTIAL EYE CONTACT, IRRITATION, OR INJURY IS RECOMMENDED. DEPENDING ON CONDITIONS OF USE, A FACE SHIELD MAY BE NECESSARY.

OTHER PROTECTIVE EQUIPMENT:
A SOURCE OF CLEAN WATER SHOULD BE AVAILABLE IN THE WORK AREA FOR FLUSHING EYES AND SKIN. IMPERVIOUS CLOTHING SHOULD BE WORN AS NEEDED.

SUGGESTIONS FOR THE USE OF SPECIFIC PROTECTIVE MATERIALS ARE BASED ON READILY AVAILABLE PUBLISHED DATA. USERS SHOULD CHECK WITH SPECIFIC MANUFACTURERS TO CONFIRM THE PERFORMANCE OF THEIR PRODUCTS.

9. PHYSICAL AND CHEMICAL PROPERTIES

NOTE:
UNLESS OTHERWISE STATED, VALUES ARE DETERMINED AT 20 DEG. C (68 DEG. F) AND 760 MM HG (1 ATM).

APPEARANCE: CLEAR AMBER

PHYSICAL FORM: LIQUID

ODOR: CHARACTERISTIC PETROLEUM

ODOR THRESHOLD: NO DATA

pH: NOT APPLICABLE

VAPOR PRESSURE (MM HG): <1

VAPOR DENSITY (AIR=1): >1

BOILING POINT: NO DATA

SOLUBILITY IN WATER: NEGLIGIBLE

PARTITION COEFFICIENT (N-OCTANOL/WATER): NO DATA

SPECIFIC GRAVITY: 0.86-0.89

BULK DENSITY: 7.16-7.41

BULK DENSITY UNITS: LBS/GAL

VISCOSITY CST @ 100 DEG. C: 10.0 - 21.0

VISCOSITY CST @ 40 DEG. C: 67 - 193

PERCENT VOLATILE: NEGLIGIBLE

EVAPORATION RATE (NBUAC=1): <1

FLASH POINT: 365 DEG. F/185 DEG. C
TEST METHOD: (PMCC) APPROXIMATELY

LEL%: NO DATA
UEL%: NO DATA

AUTOIGNITION TEMPERATURE: NO DATA

10. STABILITY AND REACTIVITY

STABILITY:
STABLE UNDER NORMAL AMBIENT AND ANTICIPATED STORAGE AND HANDLING CONDITIONS OF TEMPERATURE AND PRESSURE.

CONDITIONS TO AVOID:
EXTENDED EXPOSURE TO HIGH TEMPERATURES CAN CAUSE DECOMPOSITION.

MATERIALS TO AVOID (INCOMPATIBLE MATERIALS):
AVOID CONTACT WITH STRONG OXIDIZING AGENTS, REDUCING AGENTS.

HAZARDOUS DECOMPOSITION PRODUCTS:
COMBUSTION CAN YIELD CARBON, NITROGEN, SULFUR, PHOSPHORUS, AND ZINC OXIDES. HYDROGEN SULFIDE AND ALKYL MERCAPTANS MAY ALSO BE RELEASED. THERMAL DECOMPOSITION MAY PRODUCE HYDROGEN SULFIDE AND OTHER SULFUR-CONTAINING GASES AT TEMPERATURES GREATER THAN 113 DEG. F. METHACRYLATE MONOMERS MAY ALSO BE FORMED.

HAZARDOUS POLYMERIZATION: WILL NOT OCCUR.

11. TOXICOLOGICAL INFORMATION

CHRONIC DATA:

LUBRICANT BASE OIL (PETROLEUM) - CAS: VARIOUS
CARCINOGENICITY:
THE PETROLEUM BASE OILS CONTAINED IN THIS PRODUCT HAVE BEEN HIGHLY REFINED BY

A VARIETY OF PROCESSES INCLUDING SOLVENT EXTRACTION, HYDROTREATING, AND DEWAXING TO REMOVE AROMATICS AND IMPROVE PERFORMANCE CHARACTERISTICS. ALL OF THE OILS MEET THE IP-346 CRITERIA OF LESS THAN 3 PERCENT PAH'S AND THEREFORE NONE ARE LISTED AS A CARCINOGEN BY NTP, IARC, OR OSHA.

ACUTE DATA:

LUBRICANT BASE OIL (PETROLEUM) - CAS: VARIOUS
DERMAL:
LD50 = >2 G/KG
LC50 = NO INFORMATION AVAILABLE
ORAL:
LD50 = >5 G/KG

ADDITIVES - CAS: PROPRIETARY
DERMAL:
LD50 = NO INFORMATION AVAILABLE
LC50 = NO INFORMATION AVAILABLE
ORAL:
LD50 = NO INFORMATION AVAILABLE

ZINC COMPOUND(S) - CAS: PROPRIETARY
DERMAL:
LD50 = NO INFORMATION AVAILABLE
LC50 = NO INFORMATION AVAILABLE
ORAL:
LD50 = NO INFORMATION AVAILABLE

12. ECOLOGICAL INFORMATION

NOT EVALUATED AT THIS TIME.

13. DISPOSAL CONSIDERATIONS

THIS MATERIAL UNDER MOST INTENDED USES WOULD BECOME USED OIL DUE TO CONTAMINATION BY PHYSICAL OR CHEMICAL IMPURITIES. RECYCLE ALL USED OIL. WHILE BEING RECYCLED, USED OIL IS REGULATED BY 40 CFR 279. USE RESULTING IN CHEMICAL OR PHYSICAL CHANGE OR CONTAMINATION MAY ALSO SUBJECT IT TO REGULATION AS HAZARDOUS WASTE. UNDER FEDERAL REGULATIONS, USED OIL IS A SOLID WASTE MANAGED UNDER 40 CFR 279. HOWEVER, IN CALIFORNIA, USED OIL IS MANAGED AS HAZARDOUS WASTE UNTIL TESTED TO SHOW IT IS NOT HAZARDOUS. CONSULT STATE AND LOCAL REGULATIONS REGARDING THE PROPER HANDLING OF USED OIL. IN THE CASE OF USED OIL, THE INTENT TO DISCARD IT MAY CAUSE THE USED OIL TO BE REGULATED AS HAZARDOUS WASTE.

CONTENTS SHOULD BE COMPLETELY USED AND CONTAINERS EMPTIED PRIOR TO DISCARD. RINSATE MAY BE CONSIDERED A RCRA HAZARDOUS WASTE AND MUST BE DISPOSED OF WITH CARE AND IN COMPLIANCE WITH FEDERAL, STATE AND LOCAL REGULATIONS. LARGE EMPTY CONTAINERS, SUCH AS DRUMS, SHOULD BE RETURNED TO THE DISTRIBUTOR OR A DRUM RECONDITIONER. TO ASSURE PROPER DISPOSAL OF SMALL EMPTY CONTAINERS, CONSULT WITH STATE AND LOCAL REGULATIONS AND DISPOSAL AUTHORITIES.

14. TRANSPORTATION INFORMATION

DOT PROPER SHIPPING NAME: NOT REGULATED
NOTE:

MATERIAL IS UNREGULATED UNLESS IN CONTAINER OF 3500 GALLONS OR MORE, THEN PROVISIONS OF 49 CFR PART 130 APPLY FOR LAND SHIPMENT.

IMDG SHIPPING DESCRIPTION: NOT REGULATED

ICAO/IATA SHIPPING DESCRIPTION: NOT REGULATED

15. REGULATORY INFORMATION

U.S. REGULATIONS:

EPA SARA 311/312 (TITLE III HAZARD CATEGORIES):
ACUTE HEALTH: NO
CHRONIC HEALTH: NO
FIRE HAZARD: NO
PRESSURE HAZARD: NO
REACTIVE HAZARD: NO

SARA - SECTION 313 AND 40 CFR 372:
THIS MATERIAL CONTAINS THE FOLLOWING CHEMICALS SUBJECT TO THE REPORTING REQUIREMENTS OF SARA 313 AND 40 CFR 372:

ZINC COMPOUND(S) PROPRIETARY 0.5-1.5%

EPA (CERCLA) REPORTABLE QUANTITY (IN POUNDS): NONE KNOWN

CERCLA/SARA - SECTION 302 EXTREMELY HAZARDOUS SUBSTANCES AND TPQS (IN POUNDS):
THIS MATERIAL CONTAINS THE FOLLOWING CHEMICALS SUBJECT TO THE REPORTING REQUIREMENTS OF SARA 302 AND 40 CFR 372: NONE KNOWN

CALIFORNIA PROPOSITION 65:
WARNING:
THIS MATERIAL CONTAINS THE FOLLOWING CHEMICALS WHICH ARE KNOWN TO THE STATE OF CALIFORNIA TO CAUSE CANCER, BIRTH DEFECTS OR OTHER REPRODUCTIVE HARM, AND ARE SUBJECT TO THE REQUIREMENTS OF CALIFORNIA PROPOSITION 65 (CA HEALTH & SAFETY CODE SECTION 25249.5): NONE KNOWN

USED ENGINE OILS, WHILE NOT A COMPONENT OF THIS MATERIAL, IS ON THE PROPOSITION 65 LIST OF CHEMICALS KNOWN TO THE STATE OF CALIFORNIA TO CAUSE CANCER.

CARCINOGEN IDENTIFICATION:
THIS MATERIAL HAS NOT BEEN IDENTIFIED AS A CARCINOGEN BY NTP, IARC, OR OSHA. SEE SECTION 11 FOR CARCINOGENICITY INFORMATION OF INDIVIDUAL COMPONENTS, IF ANY.

USED MOTOR OIL HAS BEEN IDENTIFIED AS A POSSIBLE SKIN CARCINOGEN BY IARC.

TSCA: ALL COMPONENTS ARE LISTED ON THE TSCA INVENTORY.

INTERNATIONAL REGULATIONS:

CANADIAN REGULATIONS:
THIS PRODUCT HAS BEEN CLASSIFIED IN ACCORDANCE WITH THE HAZARD CRITERIA OF THE CONTROLLED PRODUCTS REGULATIONS (CPR) AND THE MSDS CONTAINS ALL THE INFORMATION REQUIRED BY THE CPR.

DOMESTIC SUBSTANCES LIST: LISTED

WHMIS CLASSIFICATION: NOT REGULATED

16. OTHER INFORMATION

ISSUE DATE: 15-OCT-2004

PREVIOUS ISSUE DATE: 3/27/2002

PRODUCT CODE: 1043226, 1043286, 1043331, 1043376, 1043401

REASON FOR REVISION:
COMPOSITION INFORMATION MODIFIED - SEE SECTION 2
COMBINED ALL GRADES INTO SINGLE MSDS.

PREVIOUS PRODUCT CODE: 3310052000

MSDS CODE: 721780

DISCLAIMER OF EXPRESSED AND IMPLIED WARRANTIES:
THE INFORMATION PRESENTED IN THIS MATERIAL SAFETY DATA SHEET IS BASED ON DATA BELIEVED TO BE ACCURATE AS OF THE DATE THIS MATERIAL SAFETY DATA SHEET WAS PREPARED. HOWEVER, NO WARRANTY OF MERCHANTABILITY, FITNESS FOR ANY PARTICULAR PURPOSE, OR ANY OTHER WARRANTY IS EXPRESSED OR IS TO BE IMPLIED REGARDING THE ACCURACY OR COMPLETENESS OF THE INFORMATION PROVIDED ABOVE, THE RESULTS TO BE OBTAINED FROM THE USE OF THIS INFORMATION OR THE PRODUCT, THE SAFETY OF THIS PRODUCT, OR THE HAZARDS RELATED TO ITS USE. NO RESPONSIBILITY IS ASSUMED FOR ANY DAMAGE OR INJURY RESULTING FROM ABNORMAL USE OR FROM ANY FAILURE TO ADHERE TO RECOMMENDED PRACTICES. THE INFORMATION PROVIDED ABOVE, AND THE PRODUCT, ARE FURNISHED ON THE CONDITION THAT THE PERSON RECEIVING THEM SHALL MAKE THEIR OWN DETERMINATION AS TO THE SUITABILITY OF THE PRODUCT FOR THEIR PARTICULAR PURPOSE AND ON THE CONDITION THAT THEY ASSUME THE RISK OF THEIR USE. IN ADDITION, NO AUTHORIZATION IS GIVEN NOR IMPLIED TO PRACTICE ANY PATENTED INVENTION WITHOUT A LICENSE.

ALCONOX
LIQUINOX **Revised: 07/14/2006**

MSDS Contents

MSDS_LIQUINOX_ENGLISH_ANSI

LIQUINOX

MSDS

SECTION 1: PRODUCT AND COMPANY IDENTIFICATION

CHEMICAL FAMILY: DETERGENT.

MANUFACTURER:
ALCONOX, INC.
30 GLENN ST.
SUITE 309
WHITE PLAINS, NY 10603.

MANUFACTURER EMERGENCY: 800-255-3924.

PHONE NUMBER: 813-248-0585 (OUTSIDE OF THE UNITED STATES).

SUPPLIER: SAME AS MANUFACTURER.

PRODUCT NAME: LIQUINOX

SECTION 2: INGREDIENT INFORMATION

C.A.S.	CONCENTRATION %	INGREDIENT NAME	T.L.V.	LD/50	LC/50
25155-30-0	10-30	SODIUM DODECYLBENZENE-SULFONATE	NOT AVAILABLE	438 MG/KG RAT ORAL 1330 MG/KG MOUSE ORAL	NOT AVAILABLE

SECTION 3: HAZARD IDENTIFICATION

ROUTE OF ENTRY: SKIN CONTACT, EYE CONTACT, INHALATION AND INGESTION.

EFFECTS OF ACUTE EXPOSURE:

EYE CONTACT: MAY CAUSE IRRITATION.

SKIN CONTACT: PROLONGED AND REPEATED CONTACT MAY CAUSE IRRITATION.

INHALATION: MAY CAUSE HEADACHE AND NAUSEA.

INGESTION:
MAY CAUSE VOMITING AND DIARRHEA.
MAY CAUSE GASTRIC DISTRESS.

EFFECTS OF CHRONIC EXPOSURE: SEE EFFECTS OF ACUTE EXPOSURE

SECTION 4: FIRST AID MEASURES

SKIN CONTACT:
REMOVE CONTAMINATED CLOTHING.
WASH THOROUGHLY WITH SOAP AND WATER.
SEEK MEDICAL ATTENTION IF IRRITATION PERSISTS.

EYE CONTACT:
CHECK FOR AND REMOVE CONTACT LENSES.

FLUSH EYES WITH CLEAR, RUNNING WATER FOR 15 MINUTES WHILE HOLDING EYELIDS
OPEN: IF IRRITATION PERSISTS, CONSULT A PHYSICIAN.

INHALATION:
REMOVE VICTIM TO FRESH AIR.
IF IRRITATION PERSISTS, SEEK MEDICAL ATTENTION.

INGESTION:
DO NOT INDUCE VOMITING, SEEK MEDICAL ATTENTION.
DILUTE WITH TWO GLASSES OF WATER.
NEVER GIVE ANYTHING BY MOUTH TO AN UNCONSCIOUS PERSON.

SECTION 5: FIRE FIGHTING MEASURES

FLAMMABILITY: NOT FLAMMABLE.

CONDITIONS OF FLAMMABILITY: SURROUNDING FIRE.

EXTINGUISHING MEDIA:
CARBON DIOXIDE, DRY CHEMICAL, FOAM.
WATER
WATER FOG.

SPECIAL PROCEDURES:
SELF-CONTAINED BREATHING APPARATUS REQUIRED.
FIREFIGHTERS SHOULD WEAR THE USUAL PROTECTIVE GEAR.
USE WATER SPRAY TO COOL FIRE EXPOSED CONTAINERS.

AUTO-IGNITION TEMPERATURE: NOT AVAILABLE.

FLASH POINT (DEG. C), METHOD: NONE

LOWER FLAMMABILITY LIMIT (% VOL): NOT APPLICABLE.
UPPER FLAMMABILITY LIMIT (% VOL): NOT APPLICABLE.

EXPLOSION DATA:
SENSITIVITY TO STATIC DISCHARGE: NOT AVAILABLE.
SENSITIVITY TO MECHANICAL IMPACT: NOT AVAILABLE.

HAZARDOUS COMBUSTION PRODUCTS:
OXIDES OF CARBON (COx).
HYDROCARBONS.

RATE OF BURNING: NOT AVAILABLE.

EXPLOSIVE POWER: CONTAINERS MAY RUPTURE IF EXPOSED TO HEAT OR FIRE.

SECTION 6: ACCIDENTAL RELEASE MEASURES

LEAK/SPILL:
CONTAIN THE SPILL.
PREVENT ENTRY INTO DRAINS, SEWERS, AND OTHER WATERWAYS.
WEAR APPROPRIATE PROTECTIVE EQUIPMENT.
SMALL AMOUNTS MAY BE FLUSHED TO SEWER WITH WATER.
SOAK UP WITH AN ABSORBENT MATERIAL.
PLACE IN APPROPRIATE CONTAINER FOR DISPOSAL.
NOTIFY THE APPROPRIATE AUTHORITIES AS REQUIRED.

SECTION 7: HANDLING AND STORAGE

HANDLING PROCEDURES AND EQUIPMENT:
PROTECT AGAINST PHYSICAL DAMAGE.
AVOID BREATHING VAPORS/MISTS.
WEAR PERSONAL PROTECTIVE EQUIPMENT APPROPRIATE TO TASK.
WASH THOROUGHLY AFTER HANDLING.
KEEP OUT OF REACH OF CHILDREN.
AVOID CONTACT WITH SKIN, EYES AND CLOTHING.
AVOID EXTREME TEMPERATURES.
LAUNDER CONTAMINATED CLOTHING PRIOR TO REUSE.

STORAGE REQUIREMENTS:
STORE AWAY FROM INCOMPATIBLE MATERIALS.
KEEP CONTAINERS CLOSED WHEN NOT IN USE.

SECTION 8: EXPOSURE CONTROLS / PERSONAL PROTECTION

PRECAUTIONARY MEASURES:

GLOVES/TYPE: WEAR APPROPRIATE GLOVES.

RESPIRATORY/TYPE: NONE REQUIRED UNDER NORMAL USE.

EYE/TYPE: SAFETY GLASSES RECOMMENDED.

FOOTWEAR/TYPE: SAFETY SHOES PER LOCAL REGULATIONS.

CLOTHING/TYPE: AS REQUIRED TO PREVENT SKIN CONTACT.

OTHER/TYPE:
EYE WASH FACILITY SHOULD BE IN CLOSE PROXIMITY.
EMERGENCY SHOWER SHOULD BE IN CLOSE PROXIMITY.

VENTILATION REQUIREMENTS: LOCAL EXHAUST AT POINTS OF EMISSION.

EXPOSURE LIMIT OF MATERIAL: NOT AVAILABLE.

SECTION 9: PHYSICAL AND CHEMICAL PROPERTIES

PHYSICAL STATE: LIQUID.

APPEARANCE & ODOR:
ODORLESS.
PALE YELLOW.

ODOR THRESHOLD (PPM): NOT AVAILABLE.

VAPOR PRESSURE (MMHg): @ 20 DEG. C (68 DEG. F). 17

VAPOR DENSITY (AIR=1): >1

VOLATILES (%) BY VOLUME: NOT AVAILABLE.

EVAPORATION RATE (BUTYL ACETATE = 1): <1.

BOILING POINT (DEG. C): 100 (212F)

FREEZING POINT (DEG. C): NOT AVAILABLE.

pH: 8.5

SPECIFIC GRAVITY @ 20 DEG. C (WATER = 1).: 1.083

SOLUBILITY IN WATER (%): COMPLETE.

COEFFICIENT OF WATER\OIL DIST.: NOT AVAILABLE

VOC: NONE

CHEMICAL FAMILY: DETERGENT.

SECTION 10: STABILITY AND REACTIVITY

CHEMICAL STABILITY:
PRODUCT IS STABLE UNDER NORMAL HANDLING AND STORAGE CONDITIONS.

CONDITIONS OF INSTABILITY: EXTREME TEMPERATURES.

HAZARDOUS POLYMERIZATION: WILL NOT OCCUR.

INCOMPATIBLE SUBSTANCES:
STRONG ACIDS.
STRONG OXIDIZING AGENTS.

HAZARDOUS DECOMPOSITION PRODUCTS: SEE HAZARDOUS COMBUSTION PRODUCTS.

SECTION 11: TOXICOLOGICAL INFORMATION

LD50 OF PRODUCT, SPECIES & ROUTE: >5000 MG/KG RAT ORAL.

LC50 OF PRODUCT, SPECIES & ROUTE: NOT AVAILABLE.

SENSITIZATION TO PRODUCT: NOT AVAILABLE.

CARCINOGENIC EFFECTS: NOT LISTED AS A CARCINOGEN.

REPRODUCTIVE EFFECTS: NOT AVAILABLE.

TERATOGENICITY: NOT AVAILABLE.

MUTAGENICITY: NOT AVAILABLE.

SYNERGISTIC MATERIALS: NOT AVAILABLE.

SECTION 12: ECOLOGICAL INFORMATION

ENVIRONMENTAL TOXICITY: NO DATA AT THIS TIME.

ENVIRONMENTAL FATE: NO DATA AT THIS TIME.

SECTION 13: DISPOSAL CONSIDERATIONS

WASTE DISPOSAL: IN ACCORDANCE WITH LOCAL AND FEDERAL REGULATIONS.

SECTION 14: TRANSPORT INFORMATION

D.O.T. CLASSIFICATION: NOT REGULATED.

SPECIAL SHIPPING INFORMATION: NOT REGULATED.

SECTION 15: REGULATORY INFORMATION

CANADIAN REGULATORY INFORMATION:

WHMIS CLASSIFICATION: NOT CONTROLLED.

DSL STATUS: NOT AVAILABLE.

USA REGULATORY INFORMATION:

SARA HAZARD CATEGORIES SECTIONS 311/312:
IMMEDIATE (ACUTE) HEALTH HAZARD: NO.
DELAYED (CHRONIC) HEALTH HAZARD: NO.
FIRE HAZARD: NO.

SUDDEN RELEASE OF PRESSURE: NO.
REACTIVE: NO.

SARA SECTION 313: NONE

TSCA INVENTORY:
ALL COMPONENTS OF THIS PRODUCT ARE LISTED ON THE TSCA INVENTORY.

NFPA:
HEALTH HAZARD 1
FLAMMABILITY 0
REACTIVITY 0

HMIS:
HEALTH HAZARD 1
FLAMMABILITY 0
PHYSICAL HAZARD 0
PPE A

SECTION 16: OTHER INFORMATION

SUPPLIER MSDS DATE: 2006/07/14

DATA PREPARED BY:
GLOBAL SAFETY MANAGEMENT
3340 PEACHTREE ROAD, #1800
ATLANTA, GA 30326

PHONE: 877-683-7460

FAX: (877) 683-7462

WEB: WWW.GLOBALSAFETYNET.COM

EMAIL: INFO@GLOBALSAFETYNET.COM.

GENERAL NOTE:
THIS MATERIAL SAFETY DATA SHEET WAS PREPARED FROM INFORMATION OBTAINED FROM VARIOUS SOURCES, INCLUDING PRODUCT SUPPLIERS AND THE CANADIAN CENTER FOR OCCUPATIONAL HEALTH AND SAFETY.

MS 01.40.01.01.06.1

AIR PRODUCTS AND CHEMICALS
ISOBUTYLENE Revised: 07/01/1999

MSDS Contents

MATERIAL SAFETY DATA SHEET

SECTION 1. PRODUCT IDENTIFICATION

PRODUCT NAME: ISOBUTYLENE

CHEMICAL NAME:
ISOBUTYLENE, UNSATURATED ALIPHATIC HYDROCARBON, ALKENE, LIQUEFIED PETROLEUM GAS (LPG), LP-GAS

FORMULA: (CH3)2C:CH3 OR C4H8

SYNONYMS: ISOBUTENE, 1,1-DIMETHYL ETHYLENE, 2-METHYL PROPYLENE

MANUFACTURER: AIR PRODUCTS AND CHEMICALS, INC.
7201 HAMILTON BOULEVARD
ALLENTOWN, PA 18195 - 1501

PRODUCT INFORMATION: (800) 752-1597

MSDS NUMBER: 1068

REVISION: 5

REVIEW DATE: JULY 1999

REVISION DATE: JULY 1999

SECTION 2. COMPOSITION / INFORMATION ON INGREDIENTS

ISOBUTYLENE IS PACKAGED AS PURE PRODUCT (>99%).

CAS NUMBER: 115-11-7

EXPOSURE LIMITS:
OSHA: NONE ESTABLISHED
ACGIH: SIMPLE ASPHYXIANT

NIOSH: NONE ESTABLISHED

ACGIH RECOMMENDS 1000 PPM TWA FOR LPG (LIQUEFIED PETROLEUM GAS).

SECTION 3. HAZARD IDENTIFICATION

EMERGENCY OVERVIEW:
ISOBUTYLENE IS A FLAMMABLE, COLORLESS LIQUEFIED COMPRESSED GAS PACKAGED IN CYLINDERS UNDER ITS OWN VAPOR PRESSURE OF 39.4 PSIA AT 70 DEG. F. IT POSES AN IMMEDIATE FIRE AND EXPLOSION HAZARD WHEN MIXED WITH AIR AT CONCENTRATIONS EXCEEDING 1.8%. HIGH CONCENTRATIONS THAT CAN CAUSE RAPID SUFFOCATION ARE ABOVE THE LOWER FLAMMABLE LIMIT AND MUST NOT BE ENTERED. ISOBUTYLENE IS HEAVIER THAN AIR AND MAY COLLECT IN LOW AREAS OR TRAVEL ALONG THE GROUND WHERE THERE MAY BE AN IGNITION SOURCE PRESENT. DIRECT CONTACT WITH LIQUID CAN CAUSE FROSTBITE.

EMERGENCY TELEPHONE NUMBERS:
(800) 523-9374 CONTINENTAL U.S., CANADA AND PUERTO RICO
(610) 481-7711 OTHER LOCATIONS

ACUTE POTENTIAL HEALTH EFFECTS:

ROUTES OF EXPOSURE:

EYE CONTACT:
CONTACT WITH LIQUID (OR RAPIDLY EXPANDING GAS) MAY CAUSE IRRITATION AND FROSTBITE.

INGESTION:
INGESTION IS NOT A LIKELY ROUTE OF EXPOSURE FOR ISOBUTYLENE. LIQUEFIED GAS MAY CAUSE FREEZE BURNS TO THE MUCOUS MEMBRANES AND POSSIBLE CENTRAL NERVOUS SYSTEM DEPRESSION.

INHALATION:
ISOBUTYLENE IS A CENTRAL NERVOUS SYSTEM (CNS) DEPRESSANT AND A MILD ANESTHETIC. IT CAN ALSO REDUCE THE AMOUNT OF OXYGEN IN THE AIR NECESSARY TO SUPPORT LIFE. EXPOSURE TO OXYGEN-DEFICIENT ATMOSPHERES (LESS THAN 19.5%) MAY PRODUCE DIZZINESS, NAUSEA, VOMITING, LOSS OF CONSCIOUSNESS, AND DEATH. AT VERY LOW OXYGEN CONCENTRATIONS (LESS THAN 12%) UNCONSCIOUSNESS AND DEATH MAY OCCUR WITHOUT WARNING. IT SHOULD BE NOTED THAT BEFORE SUFFOCATION COULD OCCUR, THE LOWER FLAMMABLE LIMIT FOR ISOBUTYLENE IN AIR WILL BE EXCEEDED; CAUSING BOTH AN OXYGEN DEFICIENT AND AN EXPLOSIVE ATMOSPHERE.

SKIN CONTACT:
CONTACT WITH LIQUID (OR RAPIDLY EXPANDING GAS) CAN CAUSE IRRITATION AND FROSTBITE.

POTENTIAL HEALTH EFFECTS OF REPEATED EXPOSURE:

ROUTE OF ENTRY: SKIN CONTACT

SYMPTOMS: REPEATED OR PROLONGED CONTACT MAY CAUSE DERMATITIS.

TARGET ORGANS: SKIN

MEDICAL CONDITIONS AGGRAVATED BY OVEREXPOSURE: MAY AGGRAVATE DERMATITIS.

CARCINOGENICITY:
ISOBUTYLENE IS NOT LISTED AS A CARCINOGEN OR POTENTIAL CARCINOGEN BY NTP, IARC, OR OSHA SUBPART Z.

SECTION 4. FIRST AID MEASURES

EYE CONTACT:
FLUSH EYES WITH PLENTY OF LUKEWARM WATER FOR SEVERAL MINUTES. SEEK MEDICAL ATTENTION IMMEDIATELY.

INGESTION:
WASH OUT MOUTH WITH LUKEWARM WATER PROVIDED PERSON IS CONSCIOUS. OBTAIN PROMPT MEDICAL ATTENTION.

INHALATION:
REMOVE PERSON TO FRESH AIR. IF NOT BREATHING, ADMINISTER ARTIFICIAL RESPIRATION. IF BREATHING IS DIFFICULT, ADMINISTER OXYGEN. OBTAIN PROMPT MEDICAL ATTENTION.

SKIN CONTACT:
IF LIQUID ISOBUTYLENE COMES IN CONTACT WITH SKIN, REMOVE CONTAMINATED CLOTHING AND FLUSH WITH PLENTY OF LUKEWARM WATER FOR SEVERAL MINUTES. SEEK MEDICAL ATTENTION IMMEDIATELY.

NOTES TO PHYSICIAN:
TREATMENT OF OVEREXPOSURE SHOULD BE DIRECTED AT THE CONTROL OF SYMPTOMS AND THE CLINICAL CONDITION.

SECTION 5. FIRE FIGHTING MEASURES

FLASH POINT: NOT APPLICABLE

AUTOIGNITION: 869 DEG. F (465 DEG. C)

FLAMMABLE RANGE: 1.8% - 9.6%

EXTINGUISHING MEDIA: CARBON DIOXIDE, DRY CHEMICAL, WATER.

SPECIAL FIRE FIGHTING INSTRUCTIONS:
EVACUATE ALL PERSONNEL FROM AREA. IF POSSIBLE, WITHOUT RISK, SHUT OFF SOURCE OF ISOBUTYLENE, THEN FIGHT FIRE ACCORDING TO TYPES OF MATERIALS BURNING. EXTINGUISH FIRE ONLY IF GAS FLOW CAN BE STOPPED. THIS WILL AVOID POSSIBLE ACCUMULATION AND RE-IGNITION OF A FLAMMABLE GAS MIXTURE. KEEP ADJACENT CYLINDERS COOL BY SPRAYING WITH LARGE AMOUNTS OF WATER UNTIL THE FIRE BURNS ITSELF OUT. SELF-CONTAINED BREATHING APPARATUS (SCBA) MAY BE REQUIRED.

UNUSUAL FIRE AND EXPLOSION HAZARDS:
MOST CYLINDERS ARE DESIGNED TO VENT CONTENTS WHEN EXPOSED TO ELEVATED TEMPERATURES. PRESSURE IN A CYLINDER CAN BUILD UP DUE TO HEAT AND IT MAY RUPTURE IF PRESSURE RELIEF DEVICES SHOULD FAIL TO FUNCTION. ISOBUTYLENE VAPORS ARE HEAVIER THAN AIR AND MAY TRAVEL TO A SOURCE OF IGNITION AND FLASH BACK.

HAZARDOUS COMBUSTION PRODUCTS: CARBON MONOXIDE

SECTION 6. ACCIDENTAL RELEASE MEASURES

STEPS TO BE TAKEN IF MATERIAL IS RELEASED OR SPILLED:
EVACUATE IMMEDIATE AREA. ELIMINATE ANY POSSIBLE SOURCES OF IGNITION, AND PROVIDE MAXIMUM EXPLOSION-PROOF VENTILATION. USE A FLAMMABLE GAS METER (EXPLOSIMETER) CALIBRATED FOR ISOBUTYLENE TO MONITOR CONCENTRATION. NEVER ENTER AN AREA WHERE THE ISOBUTYLENE CONCENTRATION IS GREATER THAN 0.36% (WHICH IS 20% OF THE LOWER

FLAMMABLE LIMIT). AN IMMEDIATE FIRE AND EXPLOSION HAZARD EXISTS WHEN ATMOSPHERIC ISOBUTYLENE CONCENTRATIONS EXCEED 1.8%. USE APPROPRIATE PROTECTIVE EQUIPMENT (SCBA AND FIRE RESISTANT SUIT). SHUT OFF SOURCE OF LEAK IF POSSIBLE. ISOLATE ANY LEAKING CYLINDER. IF LEAK IS FROM CONTAINER, PRESSURE RELIEF DEVICE OR ITS VALVE, CONTACT YOUR SUPPLIER. IF THE LEAK IS IN THE USER'S SYSTEM, CLOSE THE CYLINDER VALVE, SAFELY VENT THE PRESSURE, AND PURGE WITH AN INERT GAS BEFORE ATTEMPTING REPAIRS.

SECTION 7. STORAGE AND HANDLING

STORAGE:
STORE CYLINDERS IN A WELL-VENTILATED, SECURE AREA, PROTECTED FROM THE WEATHER. CYLINDERS SHOULD BE STORED UPRIGHT WITH VALVE OUTLET SEALS AND VALVE PROTECTION CAPS IN PLACE. THERE SHOULD BE NO SOURCES OF IGNITION. ALL ELECTRICAL EQUIPMENT SHOULD BE EXPLOSION-PROOF IN THE STORAGE AREAS. STORAGE AREAS MUST MEET NATIONAL ELECTRICAL CODES FOR CLASS 1 HAZARDOUS AREAS. FLAMMABLE STORAGE AREAS MUST BE SEPARATED FROM OXYGEN AND OTHER OXIDIZERS BY A MINIMUM DISTANCE OF 20 FT. OR BY A BARRIER OF NON-COMBUSTIBLE MATERIAL AT LEAST 5 FT. HIGH HAVING A FIRE RESISTANCE RATING OF AT LEAST 1/2 HOUR. POST "NO SMOKING OR OPEN FLAMES" SIGNS IN THE STORAGE OR USE AREAS. DO NOT ALLOW STORAGE TEMPERATURE TO EXCEED 125 DEG. F (52 DEG. C). STORAGE SHOULD BE AWAY FROM HEAVILY TRAVELED AREAS AND EMERGENCY EXITS. FULL AND EMPTY CYLINDERS SHOULD BE SEGREGATED. USE A FIRST-IN FIRST-OUT INVENTORY SYSTEM TO PREVENT FULL CONTAINERS FROM BEING STORED FOR LONG PERIODS OF TIME.

HANDLING:
DO NOT DRAG, ROLL, SLIDE OR DROP CYLINDER. USE A SUITABLE HAND TRUCK DESIGNED FOR CYLINDER MOVEMENT. NEVER ATTEMPT TO LIFT A CYLINDER BY ITS CAP. SECURE CYLINDERS AT ALL TIMES WHILE IN USE. USE A SEPARATE CONTROL VALVE TO SAFELY DISCHARGE GAS FROM CYLINDER. USE A CHECK VALVE TO PREVENT REVERSE FLOW INTO CYLINDER. NEVER APPLY FLAME OR LOCALIZED HEAT DIRECTLY TO ANY PART OF THE CYLINDER. DO NOT ALLOW ANY PART OF THE CYLINDER TO EXCEED 125 DEG. F (52 DEG. C). ONCE CYLINDER HAS BEEN CONNECTED TO PROPERLY PURGED AND INERTED PROCESS, OPEN CYLINDER VALVE SLOWLY AND CAREFULLY. IF USER EXPERIENCES ANY DIFFICULTY OPERATING CYLINDER VALVE, DISCONTINUE USE AND CONTACT SUPPLIER. NEVER INSERT AN OBJECT (E.G., WRENCH, SCREWDRIVER, ETC.) INTO VALVE CAP OPENINGS. DOING SO MAY DAMAGE VALVE CAUSING A LEAK TO OCCUR. USE AN ADJUSTABLE STRAP-WRENCH TO REMOVE OVER-TIGHT OR RUSTED CAPS. ALL PIPED SYSTEMS AND ASSOCIATED EQUIPMENT MUST BE GROUNDED. ELECTRICAL EQUIPMENT SHOULD BE NON-SPARKING OR EXPLOSION-PROOF.

SPECIAL PRECAUTIONS:
ALWAYS STORE AND HANDLE COMPRESSED GAS CYLINDERS IN ACCORDANCE WITH COMPRESSED GAS ASSOCIATION, INC. (TELEPHONE 703-412-0900) PAMPHLET CGA P-1, SAFE HANDLING OF COMPRESSED GASES IN CONTAINERS. LOCAL REGULATIONS MAY REQUIRE SPECIFIC EQUIPMENT FOR STORAGE OR USE.

SECTION 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

ENGINEERING CONTROLS:

VENTILATION:
PROVIDE ADEQUATE NATURAL OR EXPLOSION-PROOF VENTILATION TO PREVENT ACCUMULATION OF GAS CONCENTRATIONS ABOVE 0.36% (20% OF LEL).

RESPIRATORY PROTECTION:
EMERGENCY USE: DO NOT ENTER AREAS WHERE ISOBUTYLENE CONCENTRATION IS GREATER THAN 0.36% (20% OF LEL). EXPOSURE TO CONCENTRATIONS BELOW THIS CONCENTRATION DO NOT REQUIRE RESPIRATORY PROTECTION.

EYE PROTECTION:
SAFETY GLASSES FOR HANDLING CYLINDERS. CHEMICAL GOGGLES WITH FULL FACESHIELD FOR CONNECTING OR DISCONNECTING CYLINDERS.

SKIN PROTECTION:
LEATHER GLOVES FOR HANDLING CYLINDERS. NEOPRENE GLOVES DURING USE OF PRODUCT. FIRE RESISTANT SUIT AND GLOVES IN EMERGENCY SITUATIONS.

OTHER PROTECTIVE EQUIPMENT:
SAFETY SHOES ARE RECOMMENDED WHEN HANDLING CYLINDERS.

SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

APPEARANCE, ODOR AND STATE:
AT ROOM TEMPERATURE AND ATMOSPHERIC PRESSURE, ISOBUTYLENE IS A COLORLESS, FLAMMABLE GAS WITH A MILD ODOR. IT IS SHIPPED AS A LIQUEFIED GAS UNDER ITS OWN VAPOR PRESSURE.

MOLECULAR WEIGHT: 56.1

BOILING POINT (1 ATM): 20.1 DEG. F (-6.6 DEG. C)

SPECIFIC GRAVITY (AIR = 1): 2.0

FREEZING POINT / MELTING POINT: -220.1 DEG. F (-140.1 DEG. C)

VAPOR PRESSURE (AT 70 DEG. F (21.1 DEG. C)): 39.4 PSIA

GAS DENSITY (AT 70 DEG. F (21.1 DEG. C) AND 1 ATM): 0.15 LB/FT3

SOLUBILITY IN WATER: NEGLIGIBLE

LIQUID DENSITY (AT 70 DEG. F (21.1 DEG. C), SAT.): 37.56 LB/FT3

SECTION 10. STABILITY AND REACTIVITY

CHEMICAL STABILITY: STABLE

CONDITIONS TO AVOID:
CYLINDERS SHOULD NOT BE EXPOSED TO TEMPERATURES IN EXCESS OF 125 DEG. F (52 DEG, C).

INCOMPATIBILITY (MATERIALS TO AVOID): OXYGEN, HALOGENS AND OXIDIZERS

REACTIVITY:
A) HAZARDOUS DECOMPOSITION PRODUCTS: NONE
B) HAZARDOUS POLYMERIZATION: MAY OCCUR AT HIGH TEMPERATURES OR PRESSURES OR IN THE PRESENCE OF A CATALYST.

SECTION 11. TOXICOLOGICAL INFORMATION

LC50 (INHALATION): NOT APPLICABLE. SIMPLE ASPHYXIANT.

LD50 (ORAL): NOT APPLICABLE

LD50 (DERMAL): NOT APPLICABLE

SKIN CORROSIVITY: ISOBUTYLENE IS NOT CORROSIVE TO THE SKIN.

ADDITIONAL NOTES:
ISOBUTYLENE IS A CNS DEPRESSANT AND ACTS AS A SIMPLE ASPHYXIANT AND MILD ANESTHETIC.

SECTION 12. ECOLOGICAL INFORMATION

AQUATIC TOXICITY: NOT DETERMINED

MOBILITY: NOT DETERMINED

PERSISTENCE AND BIODEGRADABILITY: NOT DETERMINED

POTENTIAL TO BIOACCUMULATE: NOT DETERMINED

REMARKS:
THIS PRODUCT DOES NOT CONTAIN ANY CLASS I OR CLASS II OZONE DEPLETING CHEMICALS.

SECTION 13. DISPOSAL CONSIDERATIONS

UNUSED PRODUCT / EMPTY CYLINDER:
RETURN CYLINDER AND UNUSED PRODUCT TO SUPPLIER. DO NOT ATTEMPT TO DISPOSE OF UNUSED PRODUCT.

DISPOSAL:
RESIDUAL PRODUCT IN THE SYSTEM MAY BE BURNED IF A SUITABLE BURNING UNIT (FLAIR INCINERATOR) IS AVAILABLE ON SITE. THIS SHALL BE DONE IN ACCORDANCE WITH FEDERAL, STATE, AND LOCAL REGULATIONS. WASTES CONTAINING THIS MATERIAL MAY BE CLASSIFIED BY EPA AS HAZARDOUS WASTE BY CHARACTERISTIC (I.E., IGNITABILITY, CORROSIVITY, TOXICITY, REACTIVITY). WASTE STREAMS MUST BE CHARACTERIZED BY THE USER TO MEET FEDERAL, STATE, AND LOCAL REQUIREMENTS.

SECTION 14. TRANSPORT INFORMATION

DOT SHIPPING NAME: ISOBUTYLENE

HAZARD CLASS: 2.1

IDENTIFICATION NUMBER: UN1055

SHIPPING LABEL(S): FLAMMABLE GAS

PLACARD (WHEN REQUIRED): FLAMMABLE GAS

SPECIAL SHIPPING INFORMATION:
CYLINDERS SHOULD BE TRANSPORTED IN A SECURE UPRIGHT POSITION IN A WELL-VENTILATED TRUCK. NEVER TRANSPORT IN PASSENGER COMPARTMENT OF A VEHICLE. ENSURE CYLINDER VALVE IS PROPERLY CLOSED, VALVE OUTLET CAP HAS BEEN REINSTALLED, AND VALVE PROTECTION CAP IS SECURED BEFORE SHIPPING CYLINDER.

CAUTION:
COMPRESSED GAS CYLINDERS SHALL NOT BE REFILLED EXCEPT BY QUALIFIED PRODUCERS OF COMPRESSED GASES. SHIPMENT OF A COMPRESSED GAS CYLINDER WHICH HAS NOT BEEN FILLED BY THE OWNER OR WITH THE OWNER'S WRITTEN CONSENT IS A VIOLATION OF

FEDERAL LAW (49 CFR 173.301).

NORTH AMERICAN EMERGENCY RESPONSE GUIDEBOOK NUMBER (NAERG #): 115

SECTION 15. REGULATORY INFORMATION

U.S. FEDERAL REGULATIONS:

EPA - ENVIRONMENTAL PROTECTION AGENCY
CERCLA: COMPREHENSIVE ENVIRONMENTAL RESPONSE, COMPENSATION, AND LIABILITY ACT OF 1980 (40 CFR PARTS 117 AND 302)
 REPORTABLE QUANTITY (RQ): NONE

SARA TITLE III: SUPERFUND AMENDMENT AND REAUTHORIZATION ACT

SECTIONS 302/304: EMERGENCY PLANNING AND NOTIFICATION (40 CFR PART 355)
 EXTREMELY HAZARDOUS SUBSTANCES: ISOBUTYLENE IS NOT LISTED.
 THRESHOLD PLANNING QUANTITY (TPQ): NONE
 REPORTABLE QUANTITY (RQ): NONE

SECTIONS 311/312: HAZARDOUS CHEMICAL REPORTING (40 CFR PART 370)
 IMMEDIATE HEALTH: YES PRESSURE: YES
 DELAYED HEALTH: NO REACTIVITY: NO
 FIRE: YES

SECTION 313: TOXIC CHEMICAL RELEASE REPORTING (40 CFR PART 372)
ISOBUTYLENE DOES NOT REQUIRE REPORTING UNDER SECTION 313.

CLEAN AIR ACT:
SECTION 112 (R): RISK MANAGEMENT PROGRAMS FOR CHEMICAL ACCIDENTAL RELEASE (40 CFR PART 68)
 ISOBUTYLENE IS LISTED AS A REGULATED SUBSTANCE.
 THRESHOLD PLANNING QUANTITY (TPQ): 10,000 LBS

TSCA: TOXIC SUBSTANCE CONTROL ACT
ISOBUTYLENE IS LISTED ON THE TSCA INVENTORY.

OSHA - OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION:
29 CFR PART 1910.119: PROCESS SAFETY MANAGEMENT OF HIGHLY HAZARDOUS CHEMICALS
ISOBUTYLENE IS NOT LISTED IN APPENDIX A AS A HIGHLY HAZARDOUS CHEMICAL. HOWEVER, ANY PROCESS THAT INVOLVES A FLAMMABLE GAS ON SITE IN ONE LOCATION, IN QUANTITIES OF 10,000 POUNDS (4,553 KG) OR GREATER IS COVERED UNDER THIS REGULATION UNLESS IT IS USED AS FUEL.

STATE REGULATIONS:

CALIFORNIA:
PROPOSITION 65: THIS PRODUCT IS NOT A LISTED SUBSTANCE WHICH THE STATE OF CALIFORNIA REQUIRES WARNING UNDER THIS STATUTE.

SECTION 16. OTHER INFORMATION

NFPA RATINGS:
HEALTH: = 1
FLAMMABILITY: = 4
REACTIVITY: = 0
SPECIAL:

HMIS RATINGS:
HEALTH: = 0
FLAMMABILITY: = 4
REACTIVITY: = 0

ALAMO CEMENT
CEMENT, PORTLAND **Revised: 03/04/1991**

MSDS Contents

U.S. DEPARTMENT OF LABOR
OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION

OMB NO 1218-0074
EXPIRATION DATE 05/31/86

MATERIAL SAFETY DATA SHEET

REQUIRED UNDER USDL SAFETY AND HEALTH REGULATIONS FOR SHIPYARD EMPLOYMENT
(29 CFR 1915)

3/4/91

SECTION I

MANUFACTURER'S NAME: ALAMO CEMENT

ADDRESS (NUMBER, STREET, CITY, STATE AND ZIP CODE):
P.O. BOX 34807
SAN ANTONIO, TX 78233

EMERGENCY TELEPHONE NO.

CHEMICAL NAME AND SYNONYMS: CEMENT

TRADE NAME AND SYNONYMS: CEMENT, PORTLAND

CHEMICAL FAMILY: CEMENT, CALCIUM

FORMULA: SILICATES & ALUMINATES

SECTION II - HAZARDOUS INGREDIENTS

PAINTS, PRESERVATIVES AND SOLVENTS	%	TLV (UNITS)
PIGMENTS	N/A	
CATALYST	N/A	
VEHICLE	N/A	
SOLVENTS	N/A	
ADDITIVES	N/A	
OTHERS	N/A	

ALLOYS AND METALLIC COATINGS	%	TLV (UNITS)
BASE METAL	N/A	

ALLOYS	N/A
METALLIC COATINGS	N/A
FILLER METAL PLUS COATING OR CORE FLUX	N/A
OTHERS	N/A

HAZARDOUS MIXTURES OF OTHER LIQUIDS, SOLIDS, OR GASES

	%	TLV (UNITS)
N/A		

SECTION III - PHYSICAL DATA

BOILING POINT (DEG. F):	N/A
SPECIFIC GRAVITY (H2O = 1):	3.17
VAPOR PRESSURE (MM HG.):	N/A
PERCENT VOLATILE BY VOLUME (%):	0.0
VAPOR DENSITY (AIR = 1):	N/A
EVAPORATION RATE (= 1):	0.0
SOLUBILITY IN WATER:	50% - 80%
APPEARANCE AND ODOR:	GREY, NO ODOR

SECTION IV - FIRE AND EXPLOSION HAZARD DATA

FLASHPOINT (METHOD USED): N/A

FLAMMABLE LIMITS: LEL: UEL:

EXTINGUISHING MEDIA: N/A

SPECIAL FIRE FIGHTING PROCEDURES: N/A

UNUSUAL FIRE AND EXPLOSION HAZARDS: NONE

SECTION V - HEALTH HAZARD DATA

THRESHOLD LIMIT VALUE:

EFFECTS OF OVEREXPOSURE: MAY CAUSE SLIGHT SKIN IRRITATION OR DRYING OUT AS A RESULT OF PROLONGED OVEREXPOSURE.

EMERGENCY FIRST AID PROCEDURES: WASH WITH EYE WASH IF DUST GETS IN EYE, SEE PHYSICIAN. WASH HANDS AND SKIN WITH SOAP AND WATER, USE NORMAL HAND MOISTURIZING CREAM IF SKIN IS DRY OR CHAPPED.

SECTION VI - REACTIVITY DATA

STABILITY:
- UNSTABLE ( )
- STABLE (X)

CONDITIONS TO AVOID:

INCOMPATIBILITY (MATERIALS TO AVOID):

HAZARDOUS DECOMPOSITION PRODUCTS: NONE

HAZARDOUS POLYMERIZATION:
MAY OCCUR ( )
WILL NOT OCCUR (X)

CONDITIONS TO AVOID:

SECTION VII - SPILL OR LEAK PROCEDURES

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED: SHOVEL OR SWEEP UP AND RE-USE, IF POSSIBLE; OTHERWISE, DISPOSE OF AS AN AGGREGATE AND AVOID WATER DUE TO CEMENT'S NATURE OF HARDENING IN CONTACT WITH WATER.

WASTE DISPOSAL METHOD: SEE ABOVE

SECTION VIII - SPECIAL PROTECTION INFORMATION

RESPIRATORY PROTECTION (SPECIFY TYPE): OSHA-MSHA APPROVED SILICA DUST RESPIRATOR

VENTILATION: SUBJECT TO LOCAL CODES
LOCAL EXHAUST:
MECHANICAL (GENERAL):
SPECIAL:
OTHER:

PROTECTIVE GLOVES: COTTON OR NORMAL RUBBER GLOVES

EYE PROTECTION: STANDARD SAFETY GLASSES

OTHER PROTECTIVE EQUIPMENT: USE CLOTHING AS NECESSARY TO AVOID SKIN CONTACT

SECTION IX - SPECIAL PRECAUTIONS

PRECAUTIONS TO BE TAKEN IN HANDLING AND STORING: PROTECT FROM MOISTURE

OTHER PRECAUTIONS:

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Material Safety Data Sheet Collection
Genium group inc.
1171 RiverFront Center, Amsterdam, NY 12010
(518) 842-4111

Potassium Permanganate
POT7020

Issue Date: 2006-06

Section 1 - Chemical Product and Company Identification 61

Material Name: Potassium Permanganate **CAS Number:** 7722-64-7
Chemical Formula: $KMnO_4$
Structural Chemical Formula: $KMnO_4$
EINECS Number: 231-760-3
ACX Number: X1000083-0
Synonyms: Potassium Permanganate; POTASSIUM PERMANGANATE; ALGAE-K; ARGUCIDE; C.I. 77755; CAIROX; CHAMELEON MINERAL; CHLORISOL; CONDY'S CRYSTALS; DIVERSEY DIVERSOL CX WITH ARODYNE; DIVERSEY DIVERSOL CXU; EPA PESTICIDE CHEMICAL CODE 068501; HILCO #88; ICC 237 DISINFECTANT,SANITIZER,DESTAINER,AND DEODORIZER; KALIUMPERMANGANAAT; KALIUMPERMANGANAT; PERMANGANATE DE POTASSIUM; PERMANGANATE OF POTASH; PERMANGANATO POTASICO; PERMANGANIC ACID (HMNO4),POTASSIUM SALT; PERMANGANIC ACID POTASSIUM SALT; POTASSIO (PERMANGANATO DI); POTASSIUM (PERMANGANATE DE); PURPLE SALT; SOLO SAN SOO; WALKO TABLETS
General Use: Bleaching resins, waxes, fats, oils, straw, cotton, silk and other fibers and chamois skins; dyeing wood brown; printing fabrics; washing carbon dioxide in manufacture of mineral waters; photography; tanning leathers; purifying water; with formaldehyde solution to expel formaldehyde gas for disinfecting; as an important reagent in analytical and synthetic organic chemistry.

Section 2 - Composition / Information on Ingredients

Name	CAS	%
potassium permanganate	7722-64-7	>99

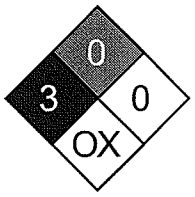
OSHA PEL
Ceiling: 5 mg/m^3; as Mn.

ACGIH TLV
TWA: 0.2 mg/m^3. *Manganese - Elemental & inorganic cmpds (as Mn)*

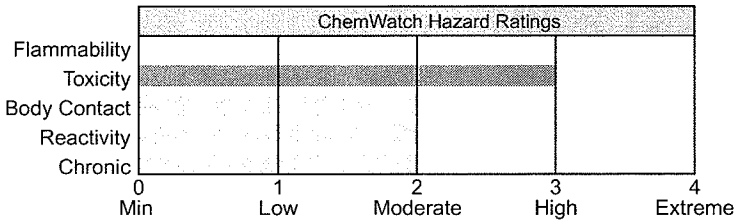
NIOSH REL
TWA: 1 mg/m^3; STEL: 3 mg/m^3; as Mn inorganic.

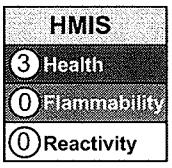
DFG (Germany) MAK
TWA: 0.5 mg/m^3; PEAK: 5 mg/m^3; as Mn inorganic, ceiling, measured as inhalable fraction of the aerosol, substances with systemic effects, onset of effect greater than 2 hours, half-life greater than shift length, strongly cumulative.

Section 3 - Hazards Identification



Fire Diamond





ANSI Signal Word
Danger!


Corrosive

☆☆☆☆☆ Emergency Overview ☆☆☆☆☆
Odorless, dark purple crystals. Corrosive. Other Acute Effects: respiratory tract irritation, blood/kidney damage. Strong oxidizer.

Potential Health Effects

Target Organs: respiratory system, eyes, skin, gastrointestinal (GI) tract
Primary Entry Routes: ingestion, inhalation

Acute Effects

Inhalation: The material is moderately discomforting to the upper respiratory tract and may be harmful if inhaled.
Manganese fume is toxic and produces nervous system effects characterized by tiredness. Acute poisoning is rare although acute inflammation of the lungs may occur. A chemical pneumonia may also result from frequent exposure.
Inhalation of freshly formed metal oxide particles sized below 1.5 microns and generally between 0.02 to 0.05 microns may result in "metal fume fever". Symptoms may be delayed for up to 12 hours and begin with the sudden onset of thirst, and a sweet, metallic or foul taste in the mouth.
Other symptoms include upper respiratory tract irritation accompanied by coughing and a dryness of the mucous membranes, lassitude and a generalized feeling of malaise. Mild to severe headache, nausea, occasional vomiting, fever or chills, exaggerated mental activity, profuse sweating, diarrhea, excessive urination and prostration may also occur. Tolerance to the fumes develops rapidly, but is quickly lost. All symptoms usually subside within 24-36 hours following removal from exposure.
Persons with impaired respiratory function, airway diseases, and conditions such as emphysema or chronic bronchitis, may incur further disability if excessive concentrations of particulate are inhaled.

Eye: The material is corrosive to the eyes and is capable of causing pain and severe conjunctivitis.
Corneal injury may develop, with possible permanent impairment of vision, if not promptly and adequately treated.

Skin: The material is highly discomforting to the skin and is capable of causing skin reactions which may lead to dermatitis.
Open cuts, abraded or irritated skin should not be exposed to this material.
The material may accentuate any pre-existing skin condition.

Ingestion: The material is corrosive to the gastrointestinal tract, may cause severe mucous membrane damage and may be harmful if swallowed.
Poisonings rarely occur after oral administration of manganese salts as they are generally poorly absorbed from the gut (generally less than 4%) and seems to be dependent, in part, on levels of dietary iron and may increase following the consumption of alcohol. A side-effect of oral manganese administration is an increase in losses of calcium in the feces and a subsequent lowering of calcium blood levels. Absorbed manganese tends to be slowly excreted in the bile.
Divalent manganese appears to be 2.5-3 times more toxic than the trivalent form.
Ingestion may cause brown discoloration and burns to the mouth with edema of the glottis, nausea, vomiting and diarrhea.
Over-exposure may result in anemia, swelling of the throat with possibility of suffocation and kidney damage.

Carcinogenicity: NTP - Not listed; IARC - Not listed; OSHA - Not listed; NIOSH - Not listed; ACGIH - Not listed; EPA - Class D, Not classifiable as to human carcinogenicity; MAK - Not listed.

Chronic Effects: Manganese is an essential trace element in all living organisms with the level of tissue manganese remaining remarkably constant throughout life.
Systemic poisoning may result from inhalation or chronic ingestion of manganese containing substances. Chronic exposure has been associated with two major effects; bronchitis/pneumonitis following inhalation of manganese dusts and "manganism", a neuropsychiatric disorder that may also arise from inhalation exposures.
Chronic exposure to low levels may result in the accumulation of toxic concentrations in critical organs. The brain in particular appears to sustain cellular damage to the ganglion. Symptoms appear before any pathology is evident and may include a mask-like facial expression, spastic gait, tremors, slurred speech, sometimes dystonia (disordered muscle tone), fatigue, anorexia, asthenia (loss of strength and energy), apathy and the inability to concentrate. Insomnia may be an early finding.
Rat studies indicate the gradual accumulation of brain manganese to produce lesions mimicking those found in Parkinsonism.
Long term exposures to manganese compounds may effect the central nervous system. Symptoms include muscular weakness and tremors similar to Parkinson's disease. Behavioral changes and handwriting differences may also appear. Other symptoms include sleepiness, weakness in the legs, muscle twitchings and tremors, nocturnal leg cramps, and a typical Parkinsonian slapping gait may appear. These systems may stimulate progressive bulbar paralysis, multiple sclerosis, amyotrophic lateral sclerosis and progressive lenticular degeneration. The blood may show increased erythrocyte formation and increased osmotic fragility.
No known cases of chronic manganese poisoning by potassium permanganate have been reported.

Section 4 - First Aid Measures

Inhalation: Remove to fresh air.
Lay patient down. Keep warm and rested.
If breathing is shallow or has stopped, ensure clear airway and apply resuscitation. Transport to hospital or doctor.

Eye Contact: Immediately hold the eyes open and flush continuously for at least 15 minutes with fresh running water. Ensure irrigation under eyelids by occasionally lifting the upper and lower lids.
Transport to hospital or doctor without delay. Removal of contact lenses after an eye injury should only be undertaken by skilled personnel.

Skin Contact: Immediately remove all contaminated clothing, including footwear (after rinsing with water).
Wash affected areas thoroughly with water (and soap if available).

Seek medical attention in event of irritation.

Ingestion: Contact a Poison Control Center.

Do NOT induce vomiting. Give a glass of water.

After first aid, get appropriate in-plant, paramedic, or community medical support.

Note to Physicians: Both dermal and oral toxicity of manganese salts is low because of limited solubility of manganese. No known permanent pulmonary sequelae develop after acute manganese exposure.

Treatment is supportive.

In clinical trials with miners exposed to manganese-containing dusts, L-dopa relieved extrapyramidal symptoms of both hypokinetic and dystonic patients.

For short periods of time symptoms could also be controlled with scopolamine and amphetamine. BAL and calcium EDTA prove ineffective.

For potassium intoxications:

1.Hyperkalemia, in patients with abnormal renal function, results from reduced renal excretion following intoxication.

2.The presence of electrocardiographic evidence of hyperkalemia or serum potassium levels exceeding 7.5 mE/L indicates a medical emergency requiring an intravenous line and constant cardiac monitoring.

3.The intravenous ingestion of 5-10 mL of 10% calcium gluconate in adults, over a 2 minute period, antagonizes the cardiac and neuromuscular effects.

The duration of action is approximately 1 hour.

Section 5 - Fire-Fighting Measures

Flash Point: Nonflammable

Autoignition Temperature: Not applicable

LEL: Not applicable

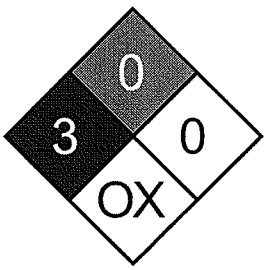
UEL: Not applicable

Extinguishing Media: Jets of water; water spray or fog; foam; dry chemical powder.

BCF (where regulations permit).

Carbon dioxide.

See DOT ERG



Fire Diamond

General Fire Hazards/Hazardous Combustion Products: Will not burn but increases intensity of fire.

Heating may cause expansion or decomposition leading to violent rupture of containers.

Heat affected containers remain hazardous.

Contact with combustibles such as wood, paper, oil or finely divided metal may cause ignition, combustion or violent decomposition.

May emit irritating, poisonous or corrosive fumes.

May cause spontaneous ignition if mixed with glycol, or anti-freeze compounds.

Reacts violently when exposed to sulfuric acid or hydrogens peroxide.

May form explosive compounds with ammonium compounds.

Decomposes on heating and produces oxygen, oxides of manganese and potassium. Reacts with concentrated acids to produce oxygen.

Reacts with hydrochloric acid to produce chlorine.

Fire Incompatibility: Oxidizing agents as a class are not necessarily combustible themselves, but can increase the risk and intensity of fire in many other substances.

Reacts vigorously with metallic powders, ammonium compounds, phosphorous, carbon, arsenates, ethylene glycol, sulfur, hydrazine, metal hydrides, peroxides, alcohol and other combustible materials.

Avoid reaction with acids.

Potassium permanganate is readily decomposed by many reducing substances such as ferrous or mercury salts, iodides, bromides, oxalates, etc., especially in the presence of an acid.

Fire-Fighting Instructions: Contact fire department and tell them location and nature of hazard.

Wear full body protective clothing with breathing apparatus. Prevent, by any means available, spillage from entering drains or waterways.

Fight fire from a safe distance, with adequate cover.

Extinguishers should be used only by trained personnel.

Use water delivered as a fine spray to control fire and cool adjacent area.

Avoid spraying water onto liquid pools.

Do not approach containers suspected to be hot.

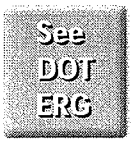
Cool fire-exposed containers with water spray from a protected location.

If safe to do so, remove containers from path of fire.

If fire gets out of control withdraw personnel and warn against entry.

Equipment should be thoroughly decontaminated after used.

Section 6 - Accidental Release Measures



Small Spills: Clean up all spills immediately. No smoking, bare lights, ignition sources.
Avoid all contact with any organic matter including fuel, solvents, sawdust, paper or cloth and other incompatible materials, as ignition may result.
Avoid breathing dust or vapors and all contact with skin and eyes.
Control personal contact by using protective equipment.
Contain and absorb spill with dry sand, earth, inert material or vermiculite. DO NOT use sawdust as fire may result.
Scoop up solid residues and seal in labeled drums for disposal.
Neutralize/decontaminate area.

Large Spills: Pollutant - Clear area of personnel and move upwind. Contact fire department and tell them location and nature of hazard.
May be violently or explosively reactive. Wear full body protective clothing with breathing apparatus. Prevent, by any means available, spillage from entering drains or waterways. Consider evacuation.
No smoking, flames or ignition sources. Increase ventilation.
Contain spill with sand, earth or other clean, inert materials. NEVER use organic absorbents such as sawdust, paper or cloth.
Use spark-free and explosion-proof equipment.
Collect residues and seal in labeled drums for disposal.
Wash area and prevent runoff into drains. Decontaminate equipment and launder all protective clothing before storage and reuse.
If contamination of drains or waterways occurs advise emergency services.
Cover residue with a reducer (hypo, a bisulfate or a ferrous salt, but not carbon, sulfur or a strong reducing agent) mix and spray with water.
To promote rapid reduction, add sulfuric acid with reducer above. Scoop into a metal container of water and neutralize with soda ash. Wash residue with soap solution containing some reducer.

Regulatory Requirements: Follow applicable OSHA regulations (29 CFR 1910.120).

Section 7 - Handling and Storage

Handling Precautions: Avoid personal contact and inhalation of dust, mist or vapors.
Provide adequate ventilation.
Always wear protective equipment and wash off any spillage from clothing.
Keep material away from light, heat, flammables or combustibles. Keep cool, dry and away from incompatible materials.
Avoid physical damage to containers.
Do not repack or return unused portions to original containers. Withdraw only sufficient amounts for immediate use.
Contamination can lead to decomposition leading to possible intense heat and fire. When handling NEVER smoke, eat or drink.
Always wash hands with soap and water after handling.
Use only good occupational work practices. Observe manufacturer's storing and handling directions.

Recommended Storage Methods: Check that containers are clearly labeled.
Packaging as recommended by manufacturer.
Glass container.
Plastic drum.
Polyethylene or polypropylene container.
Polylined drum.

Regulatory Requirements: Follow applicable OSHA regulations.

Section 8 - Exposure Controls / Personal Protection

Engineering Controls: General exhaust is adequate under normal operating conditions.
If risk of overexposure exists, wear NIOSH-approved respirator.
Correct fit is essential to obtain adequate protection.
Provide adequate ventilation in warehouse or closed storage areas.

Personal Protective Clothing/Equipment:

Eyes: Safety glasses with side shields; chemical goggles. Full face shield.
Contact lenses pose a special hazard; soft lenses may absorb irritants and all lenses concentrate them.

Hands/Feet: Impervious gloves; PVC gloves.
Rubber gloves.
Safety footwear.
Rubber boots.

Other: Overalls. Impervious protective clothing.
Eyewash unit.
Ensure there is ready access to a safety shower.

Equipment should be kept clean and in working-order.

Section 9 - Physical and Chemical Properties

Appearance/General Info: Purple-bronze (almost black) odorless, crystals or powder with a metallic luster. Sweet with an astringent after-taste. Decomposed by alcohol and many other organic solvents. Concentrated solutions are alkaline.

Physical State: Divided solid
Formula Weight: 158.04
Specific Gravity (H_2O=1, at 4 °C): 2.7
Evaporation Rate: Not applicable
pH: Not applicable
pH (1% Solution): >7

Boiling Point: Decomposes at 1 atm
Freezing/Melting Point: 240 °C (464 °F)
Volatile Component (% Vol): Not applicable
Decomposition Temperature (°C): <240
Water Solubility: 6.38 g/100 cc at 20 °C water

Section 10 - Stability and Reactivity

Stability/Polymerization/Conditions to Avoid: Presence of heat source and ignition source. Presence of elevated temperatures. Product is considered stable under normal handling conditions. Hazardous polymerization will not occur.

Storage Incompatibilities: Contact with acids produces toxic fumes.
Oxidizing agents as a class are not necessarily combustible themselves but can increase the risk and intensity of fire in many other substances.
Segregate from reducing agents, concentrated acids, tin, sulfur, alcohol, peroxides, bromides, iodides, arsenates, ethylene glycol, ammonium compounds, metallic powders, phosphorous, hydrazine, ferrous or mercury salts, oxalates and combustible materials and organic substances generally.

Section 11 - Toxicological Information

Toxicity
Oral (human) LD_{Lo}: 143 mg/kg
Oral (woman) TD_{Lo}: 2.4 mg/kg/d
Oral (rat) LD_{50}: 1090 mg/kg
Dyspnea, nausea, effects on spermatogenesis and the male fertility index recorded.

Irritation
Nil reported

See *RTECS* SD 6475000, for additional data.

Section 12 - Ecological Information

Environmental Fate: No data found.
Ecotoxicity: LC_{50} Ictalurus punctatus (channel catfish) 0.75 mg/l/96 hr /conditions of bioassay not specified
BCF: no food chain concentration potential
Biochemical Oxygen Demand (BOD): none

Section 13 - Disposal Considerations

Disposal: Recycle wherever possible. Special hazards may exist - specialist advice may be required.
Consult manufacturer for recycling options.
Follow applicable federal, state, and local regulations.
Treat and neutralize at an approved treatment plant.
Decontaminate empty containers. Observe all label safeguards until containers are cleaned and destroyed.
Puncture containers to prevent reuse and bury at an authorized landfill.
For small quantities: Dissolve solid residue in water. Add a reducer (hypo, a bisulfate, or a ferrous salt but not carbon, sulfur or strong reducing agent), and sulphuric acid to promote reduction.
Neutralize with soda ash.
Bury precipitate in an authorized landfill.
Decontaminate empty containers with reducer, acid and soda ash, as above.
Recycle containers wherever possible, otherwise dispose of in an authorized landfill.

Section 14 - Transport Information

DOT Hazardous Materials Table Data (49 CFR 172.101):

Shipping Name and Description: Potassium permanganate
ID: UN1490
Hazard Class: 5.1 - Oxidizer
Packing Group: II - Medium Danger
Symbols:
Label Codes: 5.1 - Oxidizer
Special Provisions: IB8, IP4
Packaging: **Exceptions:** 152 **Non-bulk:** 212 **Bulk:** 240
Quantity Limitations: **Passenger aircraft/rail:** 5 kg **Cargo aircraft only:** 25 kg
Vessel Stowage: **Location:** D **Other:** 56, 58, 69, 106, 107

Section 15 - Regulatory Information

EPA Regulations:
RCRA 40 CFR: Not listed
CERCLA 40 CFR 302.4: Listed per CWA Section 311(b)(4) 100 lb (45.35 kg)
SARA 40 CFR 372.65: Listed as Compound
SARA EHS 40 CFR 355: Not listed
TSCA: Listed

Section 16 - Other Information

Disclaimer: Judgments as to the suitability of information herein for the purchaser's purposes are necessarily the purchaser's responsibility. Although reasonable care has been taken in the preparation of such information, Genium Group, Inc. extends no warranties, makes no representations, and assumes no responsibility as to the accuracy or suitability of such information for application to the purchaser's intended purpose or for consequences of its use.

ANTHRATECH WESTERN CANADA
SILICA SAND Revised: 09/30/2001

MSDS Contents

MATERIAL SAFETY DATA SHEET

SECTION 1 - PRODUCT IDENTIFICATION AND USE

PRODUCT IDENTIFIER: SILICA SAND

VARIOUS SIZES, INCLUDING SILICA FLOUR, PLAY SAND, TRACTION SAND

DESCRIPTION: ODORLESS, GRANULAR SAND

PRODUCT USE: WATER TREATMENT FILTRATION, SAND BLASTING ABRASIVE

MANUFACTURER'S NAME:
AWI(ANTHRATECH WESTERN INC.)
4450-46 AVENUE, SE
CALGARY, ALBERTA T2B 3N7

EMERGENCY PHONE: (403) 255-7377

SUPPLIER'S NAME:
AWI (ANTHRATECH WESTERN INC.)
4450-46 AVENUE, SE
CALGARY, ALBERTA T2B 3N7

EMERGENCY PHONE: (403) 620-4505

SECTION 2 - HAZARDOUS INGREDIENTS

SILICA, CRYSTALLINE QUARTZ
C.A.S. NUMBER: 14808-60-7
LD50: N/A
LC50: N/A

SECTION 3 - PHYSICAL DATA

PHYSICAL STATE: SOLID

ODOR & APPEARANCE: ODORLESS, GRANULAR SAND

ODOR THRESHOLD: N/A

SPECIFIC GRAVITY: 2.6 (APPROXIMATE)

VAPOR PRESSURE: N/A

VAPOR DENSITY: N/A

EVAPORATION RATE: N/A

BOILING POINT: 4000 DEG. F

FREEZING POINT: N/A

pH: 7.3

COEFFICIENT OF WATER/OIL DISTRIBUTION: N/A

SECTION 4 - FIRE AND EXPLOSION DATA

CONDITIONS OF FLAMMABILITY: N/A

MEANS OF EXTINCTION: N/A

FLASH POINT: N/A

UPPER FLAMMABLE LIMIT: N/A
LOWER FLAMMABLE LIMIT: N/A

AUTO-IGNITION TEMPERATURE: N/A

EXPLOSION DATA (MECHANICAL IMPACT): N/A

EXPLOSION DATA (STATIC IMPACT): N/A

SECTION 5 - REACTIVITY DATA

CONDITIONS UNDER WHICH THE PRODUCT IS CHEMICALLY UNSTABLE: N/A

SUBSTANCE OR CLASS OF SUBSTANCE WITH WHICH THE PRODUCT IS INCOMPATIBLE: N/A

CONDITIONS OF REACTIVITY: N/A

HAZARDOUS DECOMPOSITION PRODUCTS: N/A

SECTION 6 - TOXICOLOGICAL PROPERTIES

SKIN CONTACT: NO EFFECT

SKIN ABSORPTION: NO EFFECT

EYE CONTACT: NO LONG-TERM EFFECT OTHER THAN DUST DISCOMFORT

INGESTION: NO EFFECT

INHALATION ACUTE EXPOSURE: NO IMMEDIATE EFFECT

CHRONIC EXPOSURE:
RESPIRATORY DISEASES MAY DEVELOP SUCH AS SILICOSIS, PNEUMOCONIOSIS AND PULMONARY FIBROSIS

EXPOSURE LIMITS:

ACGIH TLV:
CRYSTALLINE QUARTZ
TLV-TWA: 0.1 MG/CUBIC M (RESPIRABLE DUST)

SEE THRESHOLD LIMIT VALUE AND BIOLOGICAL EXPOSURE INDICES FOR 1987-1988 AMERICAN CONFERENCE OF GOVERNMENTAL INDUSTRIAL HYGIENISTS, BE CHANGED TO 50 MICROGRAMS RESPIRABLE FREE SILICA PER CUBIC METER OF AIR (50 (MICRO)G/CUBIC M) AVERAGED OVER A WORK SHIFT OF UP TO 10 HOURS PER DAY, 40 HOURS PER WEEK. THE NIOSH CRITERIA DOCUMENT OF CRYSTALLINE SILICA SHOULD BE CONSULTED FOR MORE DETAILED INFORMATION.

SECTION 7 - PREVENTIVE MEASURES

USE LOCAL EXHAUST TO CONTROL DUST DISPERSION. FOR RESPIRATORY PROTECTION, USE AN AIR-SUPPLIED RESPIRATOR OR OTHER CONVENTIONAL PARTICULATE RESPIRATORY PROTECTION BASED ON CONSIDERATIONS OF AIRBORNE CONCENTRATIONS AND DURATION OF EXPOSURE. FOR MORE INFORMATION CONTACT THE FOLLOWING STANDARDS:

1) AMERICAN NATIONAL STANDARD INSTITUTE (ANSI 2.88.2)
2) OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION (OSHA -29CFR PART 1910.134)
3) MINE SAFETY AND HEALTH ADMINISTRATION (MSHA - CFR PART 56)

SAFETY GLASSES SHOULD BE WORN TO PREVENT DUST IN EYES, IN CASE OF SPILL, VACUUM SPILLAGE AND DISPOSE OF WASTE IN CONTAINERS OF SLURRY TO AVOID REDISPERSION.

STORE IN SILOS OR BAGS.

SECTION 8 - FIRST AID MEASURES

EYE CONTACT:
A WATER WASH WILL REMOVE PARTICLES

INHALATION:
REMOVE FROM CONTAMINATED AREA. IF SHORTNESS OF BREATH OR OTHER BREATHING PROBLEMS PERSIST, CONSULT A PHYSICIAN.

SECTION 9 - PREPARATION OF DATE OF MSDS

PREPARED BY: PRODUCTION & QUALITY CONTROL

TELEPHONE NUMBER: (403) 255-7377

DATE PREPARED: SEPTEMBER 30, 2001

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Contract No. FA8903-09-D-8580, Task Order 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-5

Appendix F
NFPA 70 E – Electrical Safety Tables

NFPA 70 (E) Table 130.7 (C) (9) (a) Hazard/Risk Category Classifications

Task (Assumes Equipment Is Energized, and Work Is Done Within the Flash Protection boundary	Hazard/Risk Category	V-rated Gloves	V-rated Tools
Panel boards Rated 240 V and Below --- Notes 1 and 3			
Circuit breaker (CB) or fused switch operation with covers on	0	N	N
CB or fused switch operation with covers off	0	N	N
Work on energized parts, including voltage testing	1	Y	Y
Remove/install CBs or fused switches	1	Y	Y
Removal of bolted covers (to expose bare, energized parts)	1	N	N
Opening hinged covers (to expose bare, energized parts)	0	N	N
Panel boards or Switchboards Rated >240 V and up to 600 V (with molded case or insulated case circuit breakers) --- Notes 1 and 3			
CB or fused switch operation with covers on	0	N	N
CB or fused switch operation with covers off	1	N	N
Work on energized parts, including voltage testing	2*	Y	Y
600 V Class Motor control Centers (MCCs) --- Notes 2 (except as indicated) and 3			
CB or fused switch or starter operation with enclosure doors closed	0	N	N
Reading a panel meter while operating a meter switch	0	N	N
CB or fused switch or starter operation with enclosure doors open	1	N	N
Work on energized parts, including voltage testing	2*	Y	Y
Work on control circuits with energized parts 120 V or below, exposed	0	Y	Y
Work on control circuits with energized parts > 120 V exposed	2*	Y	Y
Insertion or removal of individual starter "buckets" from MCC - Note 4	3	Y	N
Application of safety grounds, after voltage test	2*	Y	N
Removal of bolted covers (to expose bare, energized parts)	2*	N	N
Opening hinged covers (to expose bare, energized parts)	1	N	N
600 V Class Switchgear (with power circuit breakers or fused switches)-- Notes 5 and 6			
CB or fused switch operation with enclosure door closed	0	N	N
Reading a panel meter while operating a meter switch	0	N	N
CB or fused switch operation with enclosure door open	1	N	N
Work on energized parts, including voltage testing	2*	Y	Y
Work on control circuits with energized parts 120 V or below, exposed	0	Y	Y
Work on control circuits with energized parts > 120 V, exposed	2*	Y	Y
Insertion or removal (racking) of CBs from cubicles, doors open	3	N	N
Insertion or removal (racking) of CBs from cubicles, doors closed	2	N	N
Application of safety grounds, after voltage test	2*	Y	N
Removal of bolted covers (to expose bare, energized parts)	3	N	N
Opening hinged covers (to expose bare, energized parts)	2	N	N

NFPA 70 (E) Table 130.7 (C) (9) (a) Hazard/Risk Category Classifications (Continued)

Task (Assumes Equipment Is Energized, and Work Is Done Within the Flash Protection Boundary)	Hazard/Risk Category	V-rated Gloves	V-rated Tools
Other 600 V Class (277 V through 600 V, nominal) Equipment -- Note 3			
Lighting or small power transformers (600 V, maximum)	--	--	--
Removal of bolted covers (to expose bare, energized parts)	2*	N	N
Opening hinged covers (to expose bare energized parts)	1	N	N
Work on energized parts, including voltage testing	2*	Y	Y
Application of safety grounds, after voltage test	2*	Y	N
Revenue meters (kW-hour, at primary voltage and current)	--	--	--
Insertion or removal	2*	Y	N
Cable trough or tray cover removal or installation	1	N	N
Miscellaneous equipment cover removal or installation	1	N	N
Work on energized parts, including voltage testing	2*	Y	Y
Application of safety grounds, after voltage test	2*	Y	N
NEMA E2 (fused contactor) Motor Starters, 2.3 kV Through 7.2 kV			
Contactor operation with enclosure doors closed	0	N	N
Reading a panel meter while operating a meter switch	0	N	N
Contactor operation with enclosure doors open	2*	N	N
Work on energized parts, including voltage testing	3	Y	Y
Work on control circuits with energized parts 120 V or below, exposed	0	Y	Y
Work on control circuits with energized parts > 120 V, exposed	3	Y	Y
Insertion or removal (racking) of starters from cubicles, doors open	3	N	N
Insertion or removal (racking) of starters from cubicles, doors closed	2	N	N
Application of safety grounds, after voltage test	3	Y	N
Removal of bolted covers (to expose bare, energized parts)	4	N	N
Opening hinged covers (to exposed bare, energized parts)	3	N	N
Metal Clad Switchgear, 1 kV and Above			
CB or fused switch operation with enclosure doors closed	2	N	N
Reading a panel meter while operating a meter switch	0	N	N
CB or fused switch operation with enclosure doors open	4	N	N
Work on energized parts, including voltage testing	4	Y	Y
Work on control circuits with energized parts 120 V or below, exposed	2	Y	Y
Work on control circuits with energized parts > 120 V, exposed	4	Y	Y
Insertion or removal (racking) of CBs from cubicles, doors open	4	N	N
Insertion or removal (racking) of CBs from cubicles, doors closed	2	N	N
Application of safety grounds, after voltage test	4	Y	N
Removal of bolted covers (to expose bare, energized parts)	4	N	N
Opening hinged covers (to expose bare, energized parts)	3	N	N
Opening voltage transformer or control power transformer compartments	4	N	N

NFPA 70 (E) Table 130.7 (C) (9) (a) Hazard/Risk Category Classifications (Continued)

Task (Assumes Equipment Is Energized, and Work Is Done Within the Flash Protection Boundary)	Hazard/Risk Category	V-rated Gloves	V-rated Tools
Other Equipment 1 kV and Above			
Metal clad load interrupter switches, fused or unfused	--	--	--
Switch operation, doors closed	2	N	N
Work on energized parts, including voltage testing	4	Y	Y
Removal of bolted covers (to expose bare, energized parts)	4	N	N
Opening hinged covers (to expose bare, energized parts)	3	N	N
Outdoor disconnect switch operation (hook stick operated)	3	Y	Y
Outdoor disconnect switch operation (gang-operated, from grade)	2	N	N
Insulated cable examination, in manhole or other confined space	4	Y	N
Insulated cable examination, in open area	2	Y	N

Note:
V-rated Gloves are gloves rated and tested for the maximum line-to-line voltage upon which work will be done.
V-rated Tools are tools rated and tested for the maximum line-to-line voltage upon which work will be done.
2* means that a double-layer switching hood and hearing protection are required for this task in addition to the other Hazard/Risk Category 2 requirements of Table 130.7 (C) (10).

Y = yes (required)

N = no (not required)

Notes:
1. 25 kA short circuit current available, 0.03 second (2 cycle) fault clearing time.
2. 65 kA short circuit current available, 0.03 second (2 cycle) fault clearing time.
3. For < 10 kA short circuit current available, the hazard/risk category required may be reduced by one number
4. 65 kA short circuit current available, 0.33 second (20 cycle) fault clearing time.
5. 65k A short circuit current available, up to 1.0 second (60 cycle) fault clearing time.
6. for < 25 kA short circuit current available, the hazard/risk category required may be reduced by one number

NFPA 70 (E) Table 130.7 (C) (10) Protective Clothing and Personal Protective Equipment (PPE) Matrix

Protective Clothing and Equipment	Protective Systems for Hazard/Risk Category					
Hazard/Risk Category Number	**-1** (Note 3)	**0**	**1**	**2**	**3**	**4**
Non-melting (according to ASTM F 1506-00) or Untreated Natural Fiber						
a. T-shirt (short-sleeve)	X			X	X	X
b. Shirt (long-sleeve)		X				
c. Pants (long)	X	X	X (Note 4)	X (Note 6)	X	X
FR Clothing (Note 1)						
a. Long-sleeve shirt			X	X	X (Note 9)	X
b. Pants			X (Note 4)	X (Note 6)	X (Note 9)	X
c. overall			(Note 5)	(Note 7)	X (Note 9)	(Note 5)
d. Jacket, parka, or rainwear			AN	AN	AN	AN
FR Protective Equipment						
a. Flash suit jacket (multilayer)						X
b. Flash suit pants (multilayer)						X
c. Head protection						
1. Hard hat			X	X	X	X
2. FR hard hat liner					AR	AR
d. Eye protection		--	--	--	--	--
1. Safety glasses	X	X	X	AL	AL	AL
2. Safety goggles				AL	AL	AL
e. Face and head area protection		--	--	--	--	--
1. Arc-rated face shield, or flash suit hood				X (Note 8)		
2. Flash suit hood					X	X
3. Hearing protection (car canal inserts)				X (Note 8)	X	X
f. Hand protection			--	--	--	--
Leather gloves (Note 2)			AN	X	X	X
g. Foot protection						
Leather work shoes			AN	X	X	X

AN = As needed
AL = Select one in group
AR = As required
FR = Flame Resistant
X = Minimum required

Notes:
1. See Table 130.7(C) (11). Arc rating for a garment is expressed in cal/cm^2.
2. If voltage-rated gloves are required, the leather protectors worn external to the rubber gloves satisfy this requirement.
3. Hazard/Risk Category Number "-1" is only defined if determined by Notes 3 or 6 of Table 130.7(C) (9) (a).
4. Regular weight (minimum 12 oz/yd^2 fabric weight), untreated, denim cotton blue jeans are acceptable in lieu of FR pants. The FR pants used for Hazard/Risk Category 1 shall have a minimum arc rating of 4.
5. Alternate is to use FR coveralls (minimum arc rating of 4) instead of FR shirt and FR pants.
6. If the FR pants have a minimum arc rating of 8, long pants of non-melting or untreated natural fiber pants and t-shirt.
7. Alternate is to use FR coveralls (minimum arc rating of 4) over non-melting or untreated natural fiber pants and T-shirt.
8. A face shield with a minimum arc rating of 8, with wrap-around guarding to protect not only the face, but also the forehead, ears, and neck (or, alternatively, a flash suit hood), is required.
9. Alternate is to use two sets of FR coveralls (the inner with a minimum arc rating of 4 and outer coverall with a minimum arc rating of 5) over non-melting or untreated natural fiber clothing, instead of FR coveralls over FR shirt and FR pants over non-melting or untreated natural fiber clothing.

NFPA 70 (E) Table 130.7 (C) (11) Protective Clothing Characteristics

Hazard/Risk Category	Clothing Description (Typical number of clothing layers is given in parentheses)	Required Minimum Arc Rating of PPE [J/cm^2(cal/cm^2)]
0	Non-melting, flammable materials (i.e., untreated cotton, wool rayon, or silk, or blends of these materials) with a fabric weight at least 4.5 oz/yd^2 (1)	N/A
1	Flame Resistant (FR) shirt and FR pants or FR coverall (1)	16.74 (4)
2	Cotton underwear -- conventional short sleeve and brief/shorts plus FR shirt and FR pants (1 and 2)	33.47 (8)
3	Cotton underwear plus FR shirt and FR pants plus FR coverall, or cotton underwear plus two FR coveralls (2 or 3)	104.6 (25)
4	Cotton underwear plus FR shirt and FR pants plus multilayer flash suit (3 or more)	167.36 (40)

Note: Arc rating is defined in Article 100 and can be either ATPV or E_{BT}. ATPV is defined in ASTM F 1959-99 as the incident energy on a fabric or material that results in sufficient heat transfer through the fabric or material to cause the onset of a second-degree burn based on the Stoll curve. E_{BT} is defined in ASTM F 1959-99 as the average of the five highest incident energy exposure values below the Stoll curve where the specimens do not exhibit break-open. E_{BT} is reported when ATPV cannot be measured due to FR fabric break-open.

NFPA 70E Table 130.2(C)

Approach Boundaries to Live Parts for Shock Protection

(All dimensions are distance from live part to employee.)

(1)	(2)	(3)	(4)	(5)
	Limited Approach Boundary [1]		Restricted Approach Boundary [1], Includes Inadvertent Movement Adder	Prohibited Approach Boundary [1]
Nominal System Voltage Range, Phase to Phase	Exposed Moveable Conductor	Exposed Fixed Circuit Part		
Less than 50	Not specific	Not specific	Not specific	Not specific
50 to 300	3.05 m (10 ft 0 in.)	1.07 m (3 ft 6 in.)	Avoid contact	Avoid contact
301 to 750	3.05 m (10 ft 0 in.)	1.07 m 3 ft 6 in.)	304.8 mm (1 ft 0 in.)	25.4 mm (0 ft 1 in.)
751 to 15 kV	3.05 m (10 ft 0 in.)	1.53 m (5 ft 0 in.)	660.4 mm (2 ft 2 in.)	177.8 mm (0 ft 7 in.)
15.1 kV to 36 kV	3.05 m (10 ft 0 in.)	1.83 m (6 ft 0 in.)	787.4 mm (2 ft 7 in.)	254 mm (0 ft 10 in.)
36.1 kV to 46 kV	3.05 m (10 ft 0 in.)	2.44 m (8 ft 0 in.)	838.2 mm (2 ft 9 in.)	431.8 mm (1 ft 5 in.)
46.1 kV to 72.5 kV	3.05 m (10 ft 0 in.)	2.44 m (8 ft 0 in.)	965.2 mm (3 ft 2 in.)	635 mm (2 ft 1 in.)
72.6 kV to 121 kV	3.25 m (10 ft 8 in.)	2.44 m (8 ft 0 in.)	991 mm (3 ft 3 in.)	812.8 mm (2 ft 8 in.)
138 kV to 145 kV	3.36 m (11 ft 0 in.)	3.05 m (10 ft 0 in.)	1.093 m (3 ft 7 in.)	939.8 mm (3 ft 1 in.)
161 kV to 169 kV	3.56 m (11 ft 8 in.)	3.56 m (11 ft 8 in.)	1.22 m (4 ft 0 in.)	1.07 m (3 ft 6 in.)
230 kV to 242 kV	3.97 m (13 ft 0 in.)	3.97 m (13 ft 0 in.)	1.6 m (5 ft 3 in.)	1.45 m (4 ft 9 in.)
345 kV to 362 kV	4.68 m (15 ft 4 in.)	4.68 m (15 ft 4 in.)	2.59 m (8 ft 6 in.)	2.44 m (8 ft 0 in.)
500 kV to 550 kV	5.8 m (19 ft 0 in.)	5.8 m (19 ft 0 in.)	3.43 m (11 ft 3 in.)	3.28 m (10 ft 9 in.)
765 kV to 800 kV	7.24 m (23 ft 9 in.)	7.24 m (23 ft 9 in.)	4.55 m (14 ft 11 in.)	4.4 m (14 ft 5 in.)

Note: For Flash Protection Boundary, see NFPA 70E 130.3(A)

1: See definitions in Article 100 and text in NFPA 70E 130.2(D)(2) and Annex C for elaboration

Contract No. FA8903-09-D-8580, Task Order 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-5

Appendix G
Guidelines for Standard Safety Disciplinary Actions

Guidelines for Standard Safety Disciplinary Actions Acknowledgment Form

I have read and understand the Shaw Environmental and Infrastructure, Inc. *Guidelines for Standard Safety Disciplinary Actions*.

Printed Name	Signature	Representing	Date

Contract No. FA8903-09-D-8580, Task Order 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-5

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Contract No. FA8903-09-D-8580, Task Order 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-5

Appendix H
Incident Notification, Reporting, and Management Procedure

Incident Notification, Reporting, and Management Procedure

Directions, Notes, and Reminders

- **Follow this procedure step-by-step for all incidents.**
- **This procedure has limited application to subcontractors. Assist subcontractors with medical emergencies (as applicable) and then immediately notify the Program H&S Manager for guidance.**
- **Periodically review this procedure in order to be familiar with the steps - prior to an incident occurring.**
- **For injuries and vehicle accidents, secure the scene to prevent additional injury/incident, administer on-site first aid, and arrange for emergency assistance prior to making any other notifications.**
- **The Site Supervisor is responsible for making all other notifications to:**
  - **CORE Health Networks (must be notified while employee is en route to medical care facility): 877-EHS-Shaw (or 877-347-7429)**
  - **Shaw Help Desk / Hot Line: 866-299-3445**
  - **Project Manager: Kathleen Romalia - (720) 554-8207 Cell**
  - **Marcia Musgrave: 419-425-6160.**
- **A Supervisor (or SSHO) is responsible for notifying the Program H&S Manager or Alternate H&S Manager by telephone prior to making any other notifications (other than calling 911 and CORE).**
- **A Supervisor or the SSHO shall accompany all injured personnel to the CORE clinic or to the hospital emergency room.**
- **The Project Manager shall notify the Program Manager in person or by telephone no later than two hours after the incident.**
- **All incident reports shall be completed by typing (when feasible and applicable).**
- **All incident reports shall be submitted (email or fax) to the Program H&S Manager or Alternate H&S Manager for review and distribution.**
- **Complete all the blanks on the INCIDENT NOTIFICATION AND COMMUNICATION CONTACT LIST (page 6) and post near all site telephones.**

Incident Notification, Reporting, and Management Procedure

Action	Who / When	Under what circumstances	How	Notes
1. Notify Site Superintendent for all incidents (no matter how minor)	Injured person, first person recognizing incident, driver/passenger, or employee causing damage *Immediately*	All incidents no matter how minor (including minor cuts, scratches, minor strains/sprains, and insect bites)	In person or by telephone	Site Superintendent to make note of very minor incidents (such as band-aid over scratch) in field logbook
2. For ***life-threatening injuries / illnesses*** - make scene safe, contact local emergency personnel For ***non life-threatening injuries / illnesses*** - make scene safe, transport injured person to doctor at an occupational medical facility For ***vehicle accidents*** – make scene safe, notify police, aid injured parties For ***equipment / property damage*** - make scene safe, prevent further damage or injuries	Site Superitendent *Immediately (concurrently with next step if injury or illness)* Site Superitendent *Immediately (concurrently with next step if injury or illness)* Driver/passenger *Immediately* Employee causing damage *Immediately*	In case of serious injury or illness requiring off-site medical care	Via ambulance Via vehicle	Site Superitendent or Site Safety Officer must immediately go to emergency care facility. Follow HS101 post accident alcohol and drug testing procedure. Site Superitendent or Site Safety and Health Officer must transport and stay with injured person until released from care. Make medical personnel aware of Shaw's "restricted work will be provided" and "no prescriptions if possible" policies. CORE clinics are the preferred urgent care facilities when possible, unless injury is severe and victim is transported by ambulance.
3. Notify CORE Health Networks (for injuries / illnesses to Shaw employees only)	Site Superitendent *Immediately, prior to transporting the injured employee, unless injuries are life threatening*	• Serious injury requiring off-site medical care • If employee states that he/she has been exposed to any chemical or biological substance • If illness is work related	CORE Medical 877-347-7429 Note: Outside Continental US call: **225-614-9561**	Not required for temporary agency and subcontractor labor Provide name of injured employee, name and phone # of treating medical facility, description of the incident CORE will help with medical facility coordination and follow-up care
4. Notify Program H&S Manager (if unsure, see contact list) Notify Alternate H&S Manager if Program H&S Manager cannot be contacted. (if unsure, see contact list)	Site Superitendent *Immediately (concurrently with providing transportation to occupational medical facility or EMS transport to hospital)*	All incidents except on-site first aid cases	See Incident Notification and Communication Contact List (attached)	Program H&S Manager will notify H&S Director

Incident Notification, Reporting, and Management Procedure

Action	Who / *When*	Under what circumstances	How	Notes
5. Notify Shaw Notification Hotline / Help Desk	Site Superintendent *As soon as possible. Prior to sending an individual for medical treatment*	• Illness and/or injury (doctors cases and above) • Any utility damage • Property damage (damage > $2,500.00) • Vehicle accidents (All) • Criminal activity (i.e. bomb threat, theft) • Natural disaster (all) • Explosion and/or fires (damage > $2,500.00 or result in injury) • Environmental spills/releases (incidents that requires regulatory notification or have an offsite impact) • Regulatory agency visit • Fatalities	Shaw Notification Hotline / Help Desk Phone Number: 866-299-3445 Note - Outside the Continental US call: 225-215-5056	Request name of Hotline / Help Desk operator for future reference and note date/time of notification
6. Complete forms: I*njuries and illnesses*: • Authorization for Release of Protected Medical Information • Authorization for Treatment of Occupational Injury/Illness • Return-To-Work Examination Form ***and*** fax to CORE ***and*** email or fax to Program H&S Manager	Injured employee and medical facility personnel (Site Superintendent or Site Safety and Health Officer is responsible for verifying forms are completed) *Prior to leaving medical facility*	• Serious injury requiring off-site medical care • If employee states that he/she has been exposed to any chemical or biological substance	Fax to CORE: 225.292.8986 Email or fax to Program H&S Manager	Site Superintendent or Site Safety and Health Officer must take these forms with him/her to occupational medical facility or hospital (Contained in HS 020) Contact Program H&S Manager for blank electronic forms or obtain forms from: http://shawnet3.shawgrp.com/sites/eihs/federal/Lists/Announcements/DispForm.aspx?ID=8
7. Call Project Manager and notify of incident (Remind Project Manager of notification responsibilities to Program Manager)	Site Superintendent *As soon as reasonably possible*	If Hot Line / Help Desk notification is required (see # 5 above)	See Incident Notification and Communication Contact List	Project Manager will verbally report incident to upper level of Operations/Business Line Management *As soon as reasonably possible*
8. Notify Marcia Musgrave	Site Superintendent	All incidents involving personnel (injuries, illnesses, vehicle accidents)	419-425-6160	

Incident Notification, Reporting, and Management Procedure

Action	Who / When	Under what circumstances	How	Notes
9. Call back Program H&S Manager to report on status of *injured / ill employee*	Site Superintendent *Prior to employee leaving medical facility*	All injuries and illnesses requiring off-site medical care	See Incident Notification and Communication Contact List (attached)	
10. Complete forms (typed electronically): *OSHA Recordable Cases* • Superintendent's Employee Injury/Illness Report Form • Injured Employee Statement • Witness Statement Form(s) *First Aid Cases (Doctor's)* • Superintendent's Employee Injury/Illness Report • Injured Employee Statement • Witness Statement Form(s) Email or Fax completed forms to Program H&S Manager and CORE	• Site Superintendent • Witnesses *As soon as possible – no later than 24 hours*	All injuries, illnesses, and first aide cases	Email or fax to Program H&S Manager See Incident Notification and Communication Contact List (attached) Fax to CORE 225.292.8986	Site Superintendent should have these forms with him/her at all times (Contained in HS 020) Contact Program H&S Manager for blank electronic forms or obtain forms from: http://shawnet3.shawgrp.com/sites/eihs/federal/Lists/Announcements/DispForm.aspx?ID=8
11. Complete forms (typed electronically): *Chargeable Vehicle Accidents* • Vehicle Accident Report • Witness Statement Form(s) • Driving Record Certification (Procedure HS800) *Non-Chargeable Vehicle Accidents* • Vehicle Accident Report • Witness Statement Form(s) *Equipment, Property Damage and General Liability Incidents* • Equipment, Property Damage and General Liability Loss Report • Witness Statement Form(s) Email or Fax completed forms to Program H&S Manager	• Site Superintendent • Witnesses *As soon as possible – no later than 24 hours*	All vehicle accidents and /or all property damage	Email or fax to Program H&S Manager Health See Incident Notification and Communication Contact List (attached)	Superintendent should have these forms with him/her at all times (Contained in HS 020) Contact Program H&S Manager for blank electronic forms or obtain forms from: http://shawnet3.shawgrp.com/sites/eihs/federal/Lists/Announcements/DispForm.aspx?ID=8

Incident Notification, Reporting, and Management Procedure

Action	Who / When	Under what circumstances	How	Notes
12. Complete these additional forms (typed electronically): *OSHA Recordable Cases* • Incident Investigation Report *First Aid Cases (Doctor's)* • Incident Investigation Report *Chargeable Vehicle Accidents* • Incident Investigation Report *Non-Chargeable Vehicle Accidents* • Incident Investigation Report *Equipment, Property Damage and General Liability Incidents* • Incident Investigation Report *Near Miss* • Incident Investigation Report	Site Superitendent *As soon as possible – no later than 72 hours of incident*	Near Misses as defined by HS020	Email or fax to Program H&S Manager See Incident Notification and Communication Contact List (attached)	Superitendent should have these forms with him/her at all times (Contained in HS 020) Contact Program H&S Manager for blank electronic forms or obtain forms from: http://shawnet3.shawgrp.com/sites/eihs/federal/Lists/Announcements/DispForm.aspx?ID=8
• SharePoint electronic Near Miss Report Email or Fax completed forms to Program H&S Manager	*As soon as possible – no later than 96 hours of incident*	All other Near Misses	Contact Program H&S Manager	Do not include any employee or project identification information – *these reports are anonymous*
13. Perform "Accident Review Board" (ARB) as required by HS020 - Coordinate through Program H&S Manager	Program H&S Manager *Within 10 days of incident*	OSHA Recordable Cases Chargeable Vehicle Accidents		
Perform "Incident Review Board" (IRB) to extract lessons learned - Coordinate through Program H&S Manager		Doctor's First Aid Cases Utility damage or significant property damage		An IRB is outside of the HS020 requirements for an ARB.

INCIDENT NOTIFICATION AND COMMUNICATION CONTACT LIST

Project Number: 143253 **Project/Office Name / Location: Kirtland AFB, Albuquerque, NM**

Name	Phone Number(s)	Fax Number	E-mail
Shaw Notification Hotline/Helpdesk	866-299-3445 225-215-5056	N/A	N/A
CORE (Must be notified prior to or during transport to medical treatment center)	877-EHS-Shaw-(877-347-7429)	225.292.8986	
Program H&S Manager: Dave Mummert	Office 419.425.6129 Cell 419.348.1544		david.mummert@shawgrp.com
Site Safety and Health Officer (SSHO) - James Vigerust	505-262-8736 Office 505-410-4995 (cell)		james.vigerust@shawgrp.com
Project Manager: Kathleen Romalia	Office (720)554-8207 Cell (720) 989-1154		kathleen.romalia@shawgrp.com
E&I H&S Director – Andrew Johnson	513-782-4972 (office) 859-393-4346 (cell)		andrew.johnson@shawgrp.ocm

Final
Site Safety and Health Plan
Scott Air Force Base
Belleville, Illinois

Prepared for U.S. Air Force Center for Engineering and the Environment
2261 Hughes Ave., Suite 155
Lackland Air Force Base, Texas 78236-9861

Prepared by Shaw Environmental & Infrastructure, Inc.
1401 Enclave Parkway, Suite 250
Houston, Texas 77077

Contract No. FA8903-09-D-8580, Task Order No. 0013
Project No. 144106
Revision 0
January 2012

Shaw® a world of Solutions™

Final
Site Safety and Health Plan
Scott Air Force Base
Belleville, Illinois

Midwest Region Performance Based Remediation
Contract No. FA8903-09-D-8580
Task Order No. 0013

Revision 0
January 2012

Developed by:	David L Mummert, Certified Industrial Hygienist Shaw Program Health and Safety Manager	January 6, 2012 Date
Reviewed/ Concurred by:	Kathleen Romalia Shaw Project Manager	January 6, 2012 Date
Reviewed/ Concurred by:	Spencer Patterson, PE Shaw Program Manager	January 6, 2012 Date
Reviewed/ Concurred by:	Joe Colella Shaw Installation Lead	January 6, 2012 Date
Reviewed/ Concurred by:	James Vigerust, Jr. Shaw Site Safety Officer	January 6, 2012 Date

Site Safety and Health Plan Disclaimer

This Base wide Site Safety and Health Plan (SSHP) has been designed for the methods presently contemplated by Shaw Environmental & Infrastructure, Inc. (Shaw) for execution of the proposed work. Therefore, the SSHP may not be appropriate if the work is not performed by or using the methods presently contemplated by Shaw.

In addition, as the work is performed, conditions different from those anticipated may be encountered and the SSHP may have to be modified through SSHP Amendments. Therefore, Shaw makes no representations of warranties as to the adequacy of the SSHP, except for warranties specifically stated in the SSHP itself.

Table of Contents

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-6

Table of Contents (continued)

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-6

Table of Contents (continued)

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-6

Table of Contents (continued)

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-6

Table of Contents (continued)

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-6

List of Figures

List of Tables

List of Appendices

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-6

Acronyms and Abbreviations

ACGIH	American Conference of Governmental Industrial Hygienists
ACM	Asbestos Containing Material
AFB	Air Force Base
AFCEE	Air Force Center for Engineering and the Environment
AHA	Activity Hazard Analysis
AIDS	acquired immunodeficiency syndrome
ANSI	American National Standards Institute
APR	air purifying respirator
ATSDR	Agency for Toxic Substances and Disease Registry
CIH	Certified Industrial Hygienist
CFR	Code of Federal Regulation
CNS	central nervous system
COR	Contracting Officer's Representative
CPR	cardiopulmonary resuscitation
CRZ	Contamination Reduction Zone
DEET	N,N-Diethyl-m-toluamide
DNAPL	dense nonaqueous phase liquid
EHS	environmental, health, and safety
EMS	Emergency Medical Service
EZ	Exclusion Zone
HARP	hazard assessment and resolution process
HAZWOPER	Hazardous Waste Operations and Emergency Response
HBV	hepatitis B virus
HIV	human immunodeficiency virus
HSM	Health and Safety Manager
HTRW	Hazardous, Toxic, and Radioactive Waste
IDLH	immediately dangerous to life and health
JSA	Job Safety Analysis
LEL	lower explosive limit
LNAPL	light non-aqueous phase liquid
MD	Medical Doctor
MEC	munitions and explosives of concern
mg/m^3	milligram(s) per cubic meter
MPH	Master of Public Health
MSA	Mine Safety Administration
MSDS	Material Safety Data Sheet
NFPA	National Fire Protection Association
NIOSH	National Institute for Occupational Safety and Health
OSHA	Occupational Safety and Health Administration
PAH	polyaromatic hydrocarbon
PEL	permissible exposure limit
PFD	personal flotation device
PPE	personal protective equipment

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-6

Acronyms and Abbreviations (continued)

ppm	part(s) per million
PVC	polyvinyl chloride
QC	quality control
SAR	supplied air respirator
Shaw	Shaw Environmental & Infrastructure, Inc.
SSHO	Site Safety and Health Officer
SSHP	site safety health plan
STEL	short-term exposure limit
TLV	threshold limit value
TWA	time-weighted average
USACE	U.S. Army Corps of Engineers
USAF	U.S. Air Force
U.S.	United States
WERC09	Worldwide Environmental Restoration and Construction 2009

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-6

1.0 INTRODUCTION

This Scott Air Force Base (AFB) Site Safety and Health Plan (SSHP) describes the safety and health guidelines developed by Shaw Environmental & Infrastructure, Inc. (Shaw) to protect Shaw personnel, subcontractors, Government personnel, and members of the public involved in the Air Force Center for Engineering and the Environment (AFCEE) project for the Worldwide Environmental Restoration and Construction 2009 (WERC09), performed under Contract Number FA8903-09-D-8580, Task Order 0013, at Scott AFB, Belleville, Illinois. This SSHP is intended to encompass the general scope of authority, responsibilities for accident and incident prevention and provide basic guidelines for implementing, enforcing, and monitoring safe work practices and procedures.

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-6

This SSHP is prepared in accordance with the standards established by the United States (U.S.) Occupational Safety and Health Administration (OSHA) for regulated sites. Specifically, this SSHP complies with the appropriate standards contained in 29 Code of Federal Regulations (CFR) 1910.120; 29 CFR 1926.65; the *Safety and Health Requirements Manual EM 385-1-1* (U.S. Army Corps of Engineers [USACE], 2008); and *Safety and Occupational Health Requirements for Hazardous, Toxic, and Radioactive Waste (HTRW) Activities* (USACE, 2007). The safety and health measures presented are in effect for the duration of the project. This document is intended for use by Shaw personnel and subcontractors. All personnel working on the project sites are required to abide by these measures. Where not specifically mentioned, all personnel are required to comply with the applicable regulations contained in 29 CFR 1910, 29 CFR 1926, the *Safety and Health Requirements Manual*, and the health and safety rules of the Government installation that concern related activities. Each person working on this project must sign the SSHP Acknowledgment Form (Appendix A). The procedures and guidelines contained herein are based upon the best available information at the time of the plan's preparation. Any revisions to this plan will be made with the knowledge and concurrence of Shaw and AFCEE. Revisions to this SSHP will be included as a SSHP Amendment (Appendix B). This SSHP used in conjunction with the Activity Hazard Analyses (AHA)s (Appendix C) and SSHP Addenda, if applicable (Section 1.1) will also serve as the project's:

- Accident Prevention Plan;
- Emergency Response Plan;
- Emergency Action Plan; and
- Fire Prevention Plan.

1.1 Site Safety and Health Plan Addenda

A SSHP Addendum will be prepared for activities that are necessary to complete the project, but not covered by this SSHP that are conducted at each of the three Performance-Based Remediation sites. The SSHP Addenda will be specific to the work to be accomplished and will provide the following:

- Scope of work.
- Chemical hazards specific to the scope of work.
- AHA (described in Section 3.14 of this document), which identify the specific hazards associated with the scope of work and the measures required to control those hazards.
- Personal protective equipment (PPE) requirements for the specific activities.
- Monitoring requirements.

All SSHP Addenda will become a component of this SSHP. The SSHP Addenda will be attached to this SSHP as Appendix B.

1.2 Site Background

Scott AFB occupies approximately 3,545 acres in St. Clair County, Illinois, near Belleville, Illinois about 20 miles east of the St. Louis metropolitan area. Scott AFB is home to 66 tenant units, including U.S. Transportation Command, Air Mobility Command, the Military's Surface Deployment and Distribution Command, 18th Air Force, 932nd Airlift Wing 126th Air Refueling Wing, the Air Force Global Logistics Support Center, the Air Force Network Integration Center, the Defense Information Systems Agency and the Defense Information Technology Contracting Organization. The primary mission of Scott AFB is global mobility support.

1.3 Safety and Health Policy Statement

This section presents Shaw's Safety and Health Policy Statement for all Shaw employees, clients and partners and Shaw's corporate-wide objective of zero accidents for all projects.

"Shaw Environmental & Infrastructure, Inc. expects all of our employees, clients, and partners to uphold the highest environmental, health, and safety (EHS) standards to promote a positive and proactive safety attitude and to exhibit a heightened awareness of their surroundings both on and off the job. We must identify risks and hazards and implement appropriate controls in order to provide an injury-free work environment where people, equipment, and the environment are not placed at unreasonable threat of injury or damage.

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-6

We will continually strive to be good citizens in our own community, as well as in every community in which we operate.

The Environmental Health and Safety Program and the components of our Occupational Health & Safety Management System have been developed to guide us in our daily activities. We also commit ourselves to continual improvement in EHS management. Further, I ask that you include our EHS process in all aspects of your work, assist in the maintenance of our process, and communicate this policy to all persons working for or on behalf of Shaw with the intent that they are made aware of their individual EHS obligations.

Through compliance with this policy, we will all actively participate in this process and advocate this philosophy. Together, we can accomplish our goals and exceed the minimum requirements provided by applicable laws and regulations, thus resulting in all stakeholders being proud to be a part of a team that truly values the importance of health, safety, and respect for the environment. Accordingly, we will maintain the position as a recognized leader in all of our business endeavors through a stewardship-based approach for our fellow employees, the environment, and the communities in which we live and work.

We are committed to the spirit and intent of this EHS policy statement and the laws, rules, and regulations to which we subscribe at its foundation."

George Bevan
President Shaw Environmental & Infrastructure, Inc.

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-6

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-6

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2.0 ORGANIZATION, QUALIFICATIONS, AND RESPONSIBILITIES

There will be numerous personnel required to complete the tasks for this project. The necessary personnel will be on-site Shaw project personnel, various subcontractors, off-site project team members, and government employees. All project personnel share the responsibility for safely completing project activities.

2.1 On-Site Personnel

All on-site personnel are responsible for continuous adherence to safety and health procedures during the performance of assigned work. In no case may work be performed in a manner that conflicts with the inherent safety and environmental precautions outlined in this SSHP. After due warning personnel violating safety procedures will be dismissed from the site and possibly terminated from further work.

Any person who observes unsafe acts or conditions or other safety problems has "Stop Work Authority" and shall immediately report the deficiency to supervisory personnel. If there is any dispute with regard to safety and health, on-site staff will attempt to resolve the issue and if the issue cannot be resolved on-site, they will consult off-site technical staff and supervisors for assistance. The specific task or operation in question shall remain discontinued until the issue is resolved.

2.2 Project Manager

The Project Manager, Kathleen Romalia, shall be the point of contact for AFCEE for the Scott AFB project. She has ultimate authority and responsibility for the establishment and maintenance of project administration control procedures. The Project Manager issues communications to AFCEE on the project status. The Project Manager, through the Installation Lead, oversees the activities of all Shaw personnel, ensures compliance with the scope of work environmental activities, and controls project consistency. Additionally, the Project Manager is ultimately responsible for the development, implementation, and enforcement of the comprehensive Safety and Health Program.

2.3 Installation Lead

The Installation Lead, Joe Colella, shall be the point of contact for all field activities and will report directly to the Project Manager. He will ensure that all activities are conducted in a safe manner and shall communicate all unsafe conditions to the Project Manager. The Installation Lead oversees the activities of all Shaw personnel, ensures compliance with the scope of work environmental activities, and controls project consistency.

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-6

2.4 Construction Manager

The Construction Manager is responsible for the field implementation and enforcement of this SSHP. The Construction Manager is also responsible for working with the Site Safety and Health Officer (SSHO) on a daily basis and maintaining contact with the Project Manager and Program Health and Safety Manager (HSM) for matters regarding project health and safety. The Construction Manager reports to the Project Manager.

2.5 Program Health and Safety Manager

The Program HSM, David Mummert, Certified Industrial Hygienist (CIH), is responsible for the following actions:

- Develop, maintain, and oversee implementation of this SSHP
- Visit the project to audit the effectiveness of the SSHP, as needed
- Remain available for project emergencies
- Develop modifications to this SSHP as needed
- Evaluate occupational exposure monitoring/air sampling data and adjust SSHP requirements as necessary
- Approve this SSHP by signature

2.6 Site Safety and Health Officer

The SSHO, James Vigerust, is the primary safety official and emergency response coordinator at the project. On a daily basis will assure operations are conducted in accordance with the SSHP, AFCEE requirements, and OSHA regulations. The SSHO reports, project-wide, to the Project Manager during execution of project activities, but reports directly to the Program HSM with functional issues. The SSHO has the authority to suspend operations at the project due to non-compliance. An alternate SSHO will be assigned by the primary SSHO when is not available on-site.

The SSHO has the overall responsibility to conduct exposure monitoring and/or air sampling and to select and/or adjust PPE use. The SSHO shall have the authority and is responsible for the following actions:

- Be present during operations to implement the SSHP
- Inspect site activities to identify safety and occupational health deficiencies and correct them

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-6

- Coordinate changes/modifications to the SSHP with the HSM, Construction Manager, Project Manager, and Contracting Officer's Representative (COR)
- Conduct project-specific training

Inspections completed by the SSHO will also be used to determine if operations are being conducted in accordance with the SSHP, AFCEE requirements, and OSHA regulations. These inspections shall be documented; deficiencies to be corrected shall be noted as an action item list and provided to the HSM for follow-up. Daily safety inspections shall be documented on the Daily Safety Inspection Report (Appendix D). Copies of the inspections will be provided to AFCEE, if requested.

Other SSHO responsibilities include the following:

- General Safety and Health Program administration.
- On-site contact for regulatory agencies on matters of safety and health.
- Establish employee exposure monitoring notification programs.
- Investigate significant accidents and illnesses and implement corrective action plans.
- Implement all safety procedures and operations on site.
- Observe work party members for symptoms of on-site exposure or stress.
- Arrange for the availability of on-site emergency medical care and first aid, as necessary.
- Determine evacuation routes, verify that an effective means of emergency communication is always available while workers are on site, establish and post local emergency telephone numbers, and arrange emergency transportation.
- Establish work zones.
- Present tailgate safety meetings and maintain attendance logs and records.
- Verify that the respiratory protection program is implemented, when necessary.
- Verify that decontamination procedures meet established criteria, when necessary.
- Monitor employee work hours and limit those work hours that are excessive.

In addition to having the pre-requisite 40-hour OSHA Hazardous Waste Operations and Emergency Response (HAZWOPER) training and updated 8-hour HAZWOPER Refresher

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-6

certifications, 8 hour Site Supervisor Certification the SSHO must also have completed the 30-hour OSHA construction safety class.

2.7 Subcontractor Personnel

Both Shaw and subcontractors share the responsibility for the safety and health of their employees. Subcontractors are also responsible for complying with the standards established in this SSHP, the guidelines established in Shaw Procedure No. HS011, "Health & Safety Rules for Contractors"; *Safety and Health Requirements Manual EM 385-1-1* (USACE, 2008); and all other project safety requirements. Subcontractors shall be pre-qualified according to the requirements of Shaw Procedure No. SOP-T-PR-301, "Qualification of Sources." The following are some of the requirements that apply to subcontractors:

- All subcontractors under the direction of Shaw will report to the Construction Manager.
- An assigned safety representative for each subcontractor shall be present on any day that work is being performed. The name of the assigned safety representative shall be conveyed to the Construction Manager.
- Subcontractors shall submit all training and medical surveillance documents to Shaw prior to mobilization.
- Planned operations for the day shall be verbally conveyed to the Construction Manager at the beginning of each day.
- All subcontractor employees working on site shall sign the Site Entry Log (Appendix D) at the beginning and end of each workday.
- All subcontractor personnel shall attend a project safety orientation prior to beginning work on site.
- All subcontractor personnel shall attend the morning tailgate safety meeting and prepare Job Safety Analyses. If scheduling precludes attendance at the Shaw meeting, then subcontractors shall hold and document their own safety meeting. Safety meeting documentation, using the Safety Meeting/Training Log form (Appendix D), is to be submitted to the SSHO.
- All accidents, fires, injuries, illnesses, and spills shall be immediately reported to the SSHO.
- Heavy equipment is to be inspected prior to use at the project site by a competent mechanic using the USACE Safety Inspection Checklist for Construction Equipment (Appendix D). Heavy equipment shall be inspected daily by the

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-6

equipment operator using the Daily Equipment Inspection form (Appendix D). Inspection documentation is to be submitted to the SSHO.

- Vehicles, such as trucks and automobiles are to be inspected daily by the individual driving using the Vehicle Inspection form (Appendix D). Inspection documentation is to be submitted to the SSHO weekly.
- Subcontractors are required to frequently inspect work sites for safety deficiencies and correct all deficiencies. Documentation of these inspections, as well as the corrective actions implemented, is to be submitted to the SSHO. The Project Safety Inspection Report (Appendix D), Daily Safety Inspection Report (Appendix D), or equivalent shall be used.

2.8 Visitors and Other On-Site Personnel

Visitors and other on-site personnel shall check in with the SSHO in order to verify that all appropriate entry requirements are met. All visitors will be briefed by the SSHO on the hazards to be expected on the site(s) and the safety and health controls required (i.e., hardhat, foot protection, etc.). The SSHO will verify that all visitors entering the site are properly protected and are wearing or provided with the appropriate PPE. A stock of common PPE (i.e., hard hats, eye protection, hearing protection, reflective vests, etc.) shall be maintained at the project for use by visitors. Visitors are responsible for providing their own respiratory protection, if required, as Shaw cannot provide respiratory protection to visitors. The SSHO will provide an escort for all visitors while on site.

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-6

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-6

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3.0 ACCIDENT PREVENTION PLAN

This section addresses general safety areas specified in Appendix A of the *Safety and Health Requirements Manual EM 385-1-1* (USACE, 2008), as components of the Accident Prevention Plan.

3.1 Project Safety Goal

Safety is Shaw's highest priority. Shaw and project personnel have targeted a goal of zero injuries, illnesses, and environmental incidents for the duration of this project. Additionally, there is a goal in place for experiencing zero vehicle incidents. All activities shall be conducted in a manner that supports these goals.

3.2 Indoctrination of New Employees

Both Shaw and subcontractor personnel are required to attend a safety-orientation meeting prior to commencing work. Safety-orientation meetings shall be documented and kept on file. Refer to Section 9.4 for an outline of the information that is conveyed to all personnel.

3.3 Fire Prevention and Protection

This section details fire prevention and protection procedures/resources to be used at each project.

3.3.1 Workplace Fire Hazards

The primary fire hazards at each project consist of fueling operations, storage of fuels, other flammable liquids at the project sites, and welding and cutting activities.

3.3.2 Potential Ignition Sources

The potential ignition sources at the project include smoking materials, welding/cutting equipment, vehicle/equipment exhaust, catalytic converters, and engine block surfaces. Personnel shall also be alert for other ignition sources such as, static electricity, lightning, and electrical equipment.

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-6

3.3.3 Fire Control Systems, Equipment, and Procedures

Depending on the nature and extent of any fire, the following fire control systems and equipment shall be evaluated or provided at the project:

- The Scott AFB Fire Department shall be contacted prior to beginning new operations at the project site. The Scott AFB Fire Department shall also be contacted at the conclusion of operations.
- Fire extinguishers shall be provided at work areas. Project vehicles and heavy equipment shall also be equipped with fire extinguishers.
- A Scott AFB Hot Work Permit is required before a flame or spark-producing activity is to commence with work on base property.(Section 4.2.3).
- The AHA for fueling operations shall be followed (Appendix C14, "*Fueling Operations*").
- Flammable and oxidizing materials shall be stored in marked (No Smoking, Matches, or Open Flame) flammable materials storage areas with fire extinguishers available.
- Smoking shall only be permitted in designated areas. Personnel shall never discard cigarette butts into the environment while working at the project.
- All fires, no matter how small, shall be reported to the Scott AFB Fire Department, immediately.
- Project personnel are only permitted to extinguish small fires in their incipient stages.
- Fighting fires is prohibited by project personnel and shall only be performed by fire department personnel (Section 11.5).

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-6

3.3.4 Fire Control Equipment Maintenance Responsibilities

The SSHO is responsible for performing the monthly inspections (documented on the Emergency Eyewash Station/Fire Extinguisher Inspection Checklist [Appendix D]) and obtaining annual service for all Shaw fire extinguishers used at the project. Subcontractors are responsible for performing the monthly inspections and obtaining annual service for their fire extinguishers used at the project. Vehicle and heavy equipment operators are responsible for the inspection of fire extinguishers on vehicles/equipment.

3.4 Housekeeping

Housekeeping shall be a priority at each project site. The following provisions are specified to maintain a high standard of housekeeping:

- The importance of housekeeping and the expectations that good housekeeping shall be maintained will be regular topics of the morning safety meetings.
- Job sites and work areas shall be cleaned up on a daily basis.
- Subcontractors are required to maintain good housekeeping practices.
- Dumpsters and adequate waste/trash receptacles shall be provided as necessary in sufficient quantities in active work areas and are to be emptied regularly. Potentially contaminated waste shall be segregated from sanitary waste for proper characterization and/or disposal. Hazardous waste containers shall be labeled according to applicable regulations.
- Housekeeping is an operational/safety item, which shall be regularly considered during routine inspections.
- Nails shall be bent-over or removed from scrap lumber immediately.

3.5 Mechanical Equipment Inspections

Before any machinery or mechanized equipment is placed in use, it shall be inspected and tested in accordance with the manufacturer's recommendations and requirements of the *Safety and Health Requirements Manual EM 385-1-1* (USACE, 2008) and shall be certified in writing by a competent person to meet the manufacturer's recommendations and requirements of the manual. Subsequent re-inspections will be conducted at least annually thereafter. These inspections shall be documented on the USACE Safety Inspection Checklist for Construction Equipment (Appendix D). All safety deficiencies noted during the inspection shall be corrected prior to the equipment being placed in service at the project. If at any time the machinery or mechanized equipment is removed and subsequently returned to the project (other than equipment removed for routine off-site operations as part of the project), it shall be re-inspected and recertified prior to use. All heavy equipment shall be inspected by each operator prior to use on the project and shall then be inspected on a daily basis. Daily inspections shall be documented on the Daily Equipment Inspection form (Appendix D). Deficiencies in the equipment shall be noted on the form. All inspection documentation shall be submitted to the SSHO prior to using the equipment if safety deficiencies are observed and at the end of the day if no safety deficiencies are observed.

The SSHO shall immediately evaluate the inspection forms and determine if the equipment is in need of immediate repairs and if it should be "red tagged" and taken out of service. If the

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-6

equipment is taken out of service, then the equipment shall not be used until the SSHO is satisfied that the necessary repairs have been made. For minor deficiencies that do not compromise the safe operation of the equipment, repairs shall be made at the discretion of the equipment owner. All inspection records are to be kept on file in the Shaw field office.

3.6 First Aid and Medical Facilities

The following addresses first aid and medical facilities:

- Effective emergency communication devices must always be available while personnel are present at the site.
- Employees working alone in a remote location or away from other workers shall be provided an effective means of emergency communications. This means of communication could include a cellular phone, two-way radios, hard-line telephones or other acceptable means. The selected communication must be readily available (easily within the immediate reach) of the employee and must be tested prior to the start of work to verify that it effectively operates in the area/environment. An employee check-in/check-out communication procedure shall be developed to assure employee safety (see Section 4.5.1, Lone Worker Procedure).
- Emergency telephone numbers shall be posted at all Shaw-controlled telephones (Section 11.2).
- A large first aid kit shall be provided and maintained at the project. The first aid kit shall be inspected weekly by the SSHO. A seal may be placed on first aid kits to allow for less frequent inspections, such as, if the seal is not broken, then an inspection is not required. There shall be a small first aid kit available in all project vehicles. First aid kits in project vehicles do not need to be inspected if the factory plastic wrapping is intact. First aid kits shall be inspected using the First Aid Kit Inspection Log (Appendix D).
- The nearest hospital for the project is:

  St Elizabeth's Hospital
  211 South Third Street
  Belleville, Illinois 62220
  618-234-2120

  The distance to the hospital is approximately 10.2 miles from the Scott AFB, with a travel time of approximately 20 minutes. The route map to the hospital is depicted in Figure 2.

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-6

- The nearest CORE Health Networks medical clinic for the project is:

  Midwest Occupational Medicine, Ltd
  4550 Memorial Dr.
  Belleville, Illinois 62226
  (618) 257-0063

  The distance to the clinic is approximately 13.5 miles from Scott AFB, with a travel time of approximately 24 minutes. The route map to the clinic is depicted in Figure 3.

  Shaw employees shall utilize the CORE clinic for injuries that do not require assistance or transport by Emergency Medical Service (EMS).

The route maps to the clinic and hospital shall be available in all project vehicles; however, the facility to care for serious medical emergencies shall be determined by the EMS responding to the incident. At a minimum, the SSHO and at least one other on-site employee, including subcontractors, shall be certified in first aid and cardiopulmonary resuscitation (CPR) during intrusive activities. First aid and CPR training/certification must be made by a reputable provider, such as, the American Red Cross or American Heart Association.

3.7 Sanitation

The following provisions shall be made to address sanitation:

- Portable toilets shall be provided, as necessary, at convenient locations at the project site. Arrangements shall be made for the routine servicing and cleaning of these units.
- Safe drinking water is to be provided at each project site and provisions shall be made as necessary to provide safe drinking water at individual field locations. One-serving size individual bottle of water or disposable sanitary cups shall be provided along with receptacles for their disposal. All outlets dispensing non-potable water (under Shaw or subcontractor control) shall be posted with appropriate warning signs. Systems furnishing non-potable water and systems furnishing potable water shall be constructed to remain completely independent of each other.
- Portable washing facilities shall be provided as necessary at project sites and in Contamination Reduction Zones (CRZ). Portable washing facilities shall consist of, at a minimum, soap, water, and paper towels.

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-6

3.8 Illumination

Adequate lighting shall be provided to perform all activities in a safe manner. Work shall be scheduled, when possible, during daylight hours. When work is performed before sunrise, after sunset, inside buildings, or within other structures, the minimum lighting requirements specified in Table 7-1 of the *Safety and Health Requirements Manual EM 385-1-1* (USACE, 2008) shall be provided.

3.9 Engineering and Administrative Controls

The use of engineering and administrative controls shall be the preferred method of controlling or eliminating hazards. Only in cases where the use or application of engineering and administrative controls is deemed to be not feasible, then PPE may be used.

3.10 Signs, Labels, and Tags

Hazard warning signs shall be used to define specific hazards of a nature, such that failure to designate them may lead to accidental injury to workers or the public, or both, or to property damage. All new and replacement signs shall be in accordance with the requirements contained in 29 CFR 1910.145.

All containers of hazardous materials shall be labeled as to contents and the associated hazards. Hazard warning labels, whether on containers or equipment, shall not be removed by employees without the permission of the SSHO.

Tags shall be used as a means to prevent accidental injury or illness to employees who are exposed to hazardous or potentially hazardous conditions, equipment, or operations, which are out of the ordinary, unexpected, or not readily apparent. Tags shall be used until the identified hazard is eliminated or the hazardous operation is completed. Tags need not be used where signs, guarding, or other positive means of protection are being used. All equipment that is in need of repair for safety-related reasons shall be tagged as “Out of Service” until the equipment has been satisfactorily repaired.

3.11 Safety Promotions

The following methods for promoting accident prevention will be enacted:

- Accident prevention will be a regular topic discussed at safety meetings.
- All personnel will be encouraged to sign a Zero Accident Pledge poster (Appendix D) that is to be posted at the project.
- A Safety Incentive Award Program shall be implemented to reward safe employee behavior.

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-6

3.12 Accident Reporting

All accidents, regardless of their severity, shall be reported to the Construction Manager, SSHO, Project Manager, HSM, and COR. Other provisions for accident reporting and investigation are addressed later in this SSHP (Section 13.4).

3.13 Scope of Work

Shaw is responsible for all efforts needed to support the selected remediation efforts at the Scott AFB. Activities include, but are not limited to the following:

- Mobilization & Demobilization.
- General Site Activities.
- Collect Surface Soil Samples.
- Collect Subsurface Soil Samples.
- Collect Surface Water and Ground Water Samples.
- Well Drilling and Well Installation.
- Surface Soil Removal.
- Backfill Excavations.
- Surveying.
- Site Restoration.
- Soil Borrow Material Import (Loading, Transportation, & Dumping).
- Equipment Decontamination.

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-6

Scopes of work for the individual project sites will be verified prior to fieldwork initiation. If a specific activity is not covered by this SSHP an SSHP Addendum shall be completed, reviewed and approved as stated in Section 1.1, Site Safety and Health Plan Addenda.

3.14 Activity Hazard Analysis

AHAs identify potential safety, health, and environmental hazards associated with specific tasks and provide protective measures for personnel, the community, and the environment. The AHAs have been developed for all major tasks performed for the project and included in this SSHP as Appendix C. An AHA shall also be prepared when new tasks are added, the job situation changes, or when it becomes necessary to alter safety requirements. Work will not proceed on a particular task/phase until the AHA has been reviewed with the work crews. The AHAs shall be reviewed and modified by the Construction Manager and SSHO (with

input from field employees and subcontractors). The AHAs shall be reviewed and modified throughout the workday, as necessary, to address changing site conditions, operations, or changes of competent/qualified person(s). The AHAs shall also be reviewed and modified during the daily tailgate safety meetings and Job Safety Analysis (JSA) meetings. Modifications will be handwritten in ink on the specific AHA. Additions or modifications to the AHAs, which are less conservative or allow for a downgrade in PPE requirements, must have written approval from the HSM.

The names of the competent/qualified person(s) required for a particular activity, (*i.e.*, excavations, scaffolding, fall protection, and other activities) as specified by OSHA shall be identified and included in the AHA. If more than one competent/qualified person will be used on the AHA, a list of names will be included as an attachment to the AHA. Those listed shall be competent and qualified for the type of work involved and familiar with current site safety issues. If a new competent/qualified person (not on the original list) is added, the list shall be updated (this is an administrative action not requiring an updated AHA). The new person shall acknowledge in writing that he/she has reviewed the AHA and is familiar with current site safety issues. Additions or changes to this SSHP must be attached as an SSHP Amendment (Appendix B). Any amendment to this SSHP must have written approval from the HSM.

3.15 Job Safety Analysis

Job Safety Analyses are an effective management technique for identifying hazardous conditions and unsafe acts in the workplace. A JSA is intended to analyze the individual steps or activities, which together create a job or specific work duty, and to detect any actual or potential hazards that may be present. Each crew must complete a JSA for each task that will be accomplished for that day, as required by Shaw Procedure No. HS045, “Job Safety Analysis”. The JSA shall be revised, as necessary, when unforeseen circumstances arise or work site conditions change. Any revisions shall be immediately communicated with the affected site workers. If the need to complete an unplanned task becomes necessary at any point throughout the day, a new JSA shall be prepared to cover that task. The JSAs shall be completed using the JSA Checklist Form and JSA Worksheet Form, both of which can be found in Appendix D.

3.16 Hazard Assessment Resolution Process

Hazard Assessment Resolution Process (HARP) is brief, paperless, general risk assessment made by employees in each work area. The objective of HARP is to identify and eliminate or control potential real-time workplace hazards, which could lead to an accident.

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-6

HARP requires workers to continuously be aware of the immediate work environment so as to detect conditions unanticipated by our work planning. This involves a three-step process:

1. Assess the hazard(s) and risk(s) to identify what could go wrong and what is the worst thing that could happen.
2. Analyze the situation to determine how to reduce the risks. Evaluate each identified risk and implement the appropriate safeguards to control the hazards.
3. Act to ensure safe operations:
   - Take the necessary steps to complete the job safely.
   - Follow written standards and procedures (SSHP, AHAs, JSAs, etc.).
   - Don't proceed until it's safe.

In performing the HARP, focus attention on surroundings, equipment, tools, PPE, and critical steps prior to focusing on the task; consider the chemical, physical, and environmental hazards associated with the task.

Risk reduction is a critical component of HARP. The following risks shall be avoided:

- Hurrying.
- Presume the job is routine or simple.
- Belief that nothing bad can happen.
- Not talking about precautions with co-workers.
- Not raising a "gut feel."

The appropriate hazard resolution and corrective actions must take place before proceeding with the task:

- Communicate hazards and precautions to take with co-workers and supervisor.
- Eliminate or control the hazards. The implementation of administrative controls is sometimes effective, i.e., marking the hazard with warning tape, signs, or tags.
- If the risk is unacceptable or if a hazard cannot be satisfactorily controlled, then stop work and contact the SSHO or HSM.

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-6

3.17 Safety Observation Program

Safety observations are behavior-based and provide a systematic feedback process between line personnel and supervision to proactively identify opportunities for safety improvement in work areas.

Employees engaged in work activities are often the most knowledgeable about the hazards of their work and can provide valuable feedback on unsafe conditions and unsafe practices, which may require corrective action.

The Safety Observation Program is a tool for employees to provide information on actual or potential safety hazards that they observe in their workplace, which if left unreported may result in an accident and or injury. This program also provides a mechanism for recommending corrective actions.

The Shaw Safety Observation Program:

- Identifies practices that could cause accidents, injuries, or damage.
- Identifies specific needs for coaching and training.
- Checks the adequacy of the SSHP, AHAs, JSAs, and compliance with general site rules and other procedures.
- Monitors the effectiveness of training.

The SSHO must develop a schedule for conducting safety observations. A general guideline for the number of observations in a week is one observation per 100 work hours on the project. The schedule for observation(s) shall be communicated to site personnel.

The volunteer conducting the safety observation shall record their findings on the Safety Observation Reporting Card, as required by Shaw Procedure No. HS026, “Safety Observation Procedure”. Tasks or items that require follow-up because of serious risk potential must be addressed immediately by the SSHO. Items with lesser risk should be discussed in the next tailgate safety meeting. The action items and corrective actions, including dates and responsible person(s) shall be documented on the Safety and Occupational Health Deficiency Tracking Log (Appendix D), maintained, and available for inspection.

3.18 Safety and Health Bulletin Board

A safety and health bulletin board shall be maintained in an area commonly accessed by workers at the Field Office. The bulletin board shall be maintained current, in clear view of on-site workers, and protected against the elements and unauthorized removals. The SSHO

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-6

shall evaluate the content of the bulletin board each week, at a minimum, and update if necessary. It shall contain at least the following safety and health information:

- Map denoting the route to the nearest emergency care facility.
- Emergency telephone numbers.
- Copy of the most up-to-date SSHP shall be mounted on or adjacent to the bulletin board or state the location, which will be accessible on the site by all workers.
- Copy of current SSHP Addenda shall be mounted on or adjacent to the bulletin board or state the location, which will be accessible on the site by all workers.
- Copy of current AHA(s) shall be mounted on or adjacent to the bulletin board or state the location, which will be accessible on the site by all workers.
- OSHA Form 300A shall be posted in accordance with OSHA requirements and mounted on or adjacent to the bulletin board or state the location, which will be accessible on the site by all workers.
- Copy of Safety and Occupational Health Deficiency Tracking Log (Appendix D) shall be mounted on or adjacent to the bulletin board or state the location where it will be accessible by all workers upon request.
- Safety and health promotional posters (includes Environmental, Health, and Safety Mission Vision Poster [Appendix D]).
- Date of last lost workday injury.
- OSHA Safety and Health Poster.

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-6

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4.0 PROJECT HAZARDS AND HAZARD CONTROL MEASURES

There are potential chemical, physical, and environmental hazards present at the project sites. The anticipated hazards at the project sites and the recommended control measures are presented in this section. A site-specific hazard assessment of each remedial area will be performed by the SSHO to assess exposure potential to site workers from contaminants, physical hazards, remedial activities and environmental stressors. Additional information on specific hazards and control measures are outlined in the AHAs and SSHP Addenda when developed.

4.1 Chemical Hazards

Potential exposure exists to personnel through all routes (i.e., dermal contact, inhalation of dust and vapors, and ingestion). The exposure potential will be clearly identified in the SSHP Addendum hazard assessment. The use of engineering and administrative controls, where practical, along with PPE and proper decontamination procedures are required when performing work with contaminated media.

These various hazardous inorganic and inorganic chemicals have been identified as potentially being present as contaminants in soils and waters at these 3 sites at Scott AFB. The majority of these chemicals are related to past fuel releases, leaking underground storage tanks, and maintenance operations which occurred at the site i.e. solvents. These chemicals are considered toxic and some are identified as being carcinogenic. The chemicals potentially present at the 3 specified sites at Scott AFB are summarized below:

- ***Particulates not otherwise regulated/Particulates not otherwise specified.*** Particulates not otherwise regulated target the eyes, skin, and upper respiratory system. Symptoms of exposure include irritation to the eyes, skin, throat and upper respiratory system. (permissible exposure limit [PEL]- time-weighted average [TWA]: 15 milligrams per cubic meter [mg/m^3] [total]; 5 mg/m^3 – [respirable fraction]; immediately dangerous to life and health [IDLH]: not determined; threshold limit value [TLV]-TWA: 10 mg/m^3 [inhalable particles]; 3 mg/m^3 – [respirable particles]).
- ***Arsenic.*** Particulates not otherwise regulated target the eyes, skin, and upper respiratory system. Symptoms of exposure include irritation to the eyes, skin, throat and upper respiratory system. (PEL-TWA: 15 mg/m^3 [total]; 5 mg/m^3 – [respirable fraction]; IDLH: not determined; TLV-TWA: 10 mg/m^3 [inhalable particles]; 3 mg/m^3 – [respirable particles]).

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-6

- ***BTEX.*** The term BTEX refers to a combination of benzene, toluene, ethylbenzene and xylene. The presence of this material is usually indicative of petroleum hydrocarbon contamination. The individual compounds are discussed in this section.

- ***Benzene.*** Benzene targets the eyes, skin, respiratory system, blood, central nervous system (CNS), and bone marrow. Symptoms of exposure include irritation eyes, skin, nose, respiratory system; dizziness; headache, nausea, staggered gait; anorexia, lassitude (weakness, exhaustion); dermatitis; bone marrow depression; (potential occupational carcinogen). Benzene is a confirmed human carcinogen (ACGIH, 2011). (PEL-TWA: 1 part per million [ppm], short-term exposure limit [STEL]: 5 ppm; IDLH: Carcinogen [500 ppm]; TLV-TWA: 0.5 ppm, 2.5 ppm; TLV-STEL with a skin notation.) TLV Basis: Leukemia (ACGIH, 2011).

- ***Toluene.*** Toluene targets the CNS, skin, eyes, liver, kidneys, and respiratory system. Symptoms of exposure include irritated eyes and nose, headaches, dizziness, lassitude, confusion, euphoria, muscle fatigue, insomnia, anxiety, liver and kidney damage, lacrimation, paresthesia, dermatitis, and dilated pupils (NIOSH, 2007). Toluene is not classifiable as a human carcinogen (ACGIH, 2011). (PEL-TWA: 200 ppm, PEL-Ceiling: 300 ppm, PEL-10-minute maximum peak in any 3 hours: 500 ppm, IDLH: 500 ppm; TLV-TWA: 20 ppm) TLV Basis: visual impairment; female reproductive; pregnancy loss (ACGIH, 2011).

- ***Ethylbenzene.*** Ethylbenzene targets the central nervous system, skin, eyes, and respiratory system. Symptoms of exposure include irritated eyes, skin, and mucous membranes; headaches, narcosis, dermatitis, and coma. Ethylbenzene is a confirmed animal carcinogen with unknown relevance to humans (ACGIH, 2011). (PEL-TWA: 100 ppm; IDLH: 800 ppm [10 percent lower explosive limit {LEL}]; TLV-TWA: 100 ppm, TLV-STEL: 125 ppm.) TLV Basis - Critical Effect(s): upper respiratory tract and eye irritation; CNS impairment (ACGIH, 2011).

- ***Xylenes.*** Xylenes target the eyes, skin, respiratory system, central nervous system, gastrointestinal tract, blood, liver, and kidneys. Symptoms of exposure include irritation to the eyes, skin, nose, throat; dizziness, excitement, drowsiness, in-coordination, staggering gait; corneal vacuolization; anorexia, nausea, vomiting, abdominal pain; dermatitis. Xylenes are not classifiable as human carcinogens (ACGIH, 2011). (PEL-TWA: 100 ppm; IDLH: 900 ppm; TLV-TWA: 100 ppm, TLV-STEL: 150 ppm.) TLV Basis: upper respiratory tract and eye irritation; CNS impairment (ACGIH, 2011).

- ***Polyaromatic Hydrocarbons (PAHs)*** PAHs, also known as coal tar pitch volatiles, are a collection of polycyclic aromatic hydrocarbons associated with burning of organic material, and coal and petroleum refining. PAHs can cause eye, nose and throat irritation. Skin exposure with concurrent sunlight exposure can cause severe sunburn. Some of the individual constituents are human carcinogens. (PEL-TWA: 0.2 mg/m^3, IDLH: Carcinogen [80 mg/m^3]; TLV-TWA: 20.2 mg/m3, 5 ppm) TLV Basis: Cancer (ACGIH, 2011).

4.1.1 Hydrogen Sulfide and Methane

There is potential for hydrogen sulfide gas and methane to be present in the landfills or identified remedial areas due to the decomposition of various materials. The hazards of hydrogen sulfide and methane gas are summarized in the following:

- ***Hydrogen sulfide.*** Hydrogen sulfide is a colorless gas with a strong odor of rotten eggs. Note: The sense of smell becomes rapidly fatigued and cannot be relied upon to warn of the continuous presence of hydrogen sulfide. Hydrogen sulfide targets the eyes, respiratory system, and central nervous system. Symptoms of exposure include irritation of the eyes and respiratory system; apnea; coma; convulsions; eye disturbances and damage; dizziness; headache; lassitude; irritability; insomnia; and gastrointestinal disturbances (NIOSH, 2007). (PEL-Ceiling: 20 ppm; IDLH: 100 ppm; TLV-TWA: 1 ppm, TLV-STEL: 5 ppm) TLV Basis: upper respiratory tract irritation; CNS impairment (ACGIH, 2011).
- ***Methane.*** Methane is a colorless, odorless gas. The material is highly flammable. It has very low degree of toxicity however is recognized as a simple asphyxiant (i.e., excludes oxygen from the air). No exposure indices have been developed for this material.

4.1.2 Unknown Chemical Containers

If reactive chemicals, chemical containers, gas cylinders, drums, or barrels are encountered, the field crew shall immediately stop work, exit the area, and contact the Construction Manager or SSHO and the HSM. Operations will be resumed only after the appropriate controls have been implemented.

4.1.3 Asbestos

While there is no mention of asbestos containing materials (ACM), there is potential for ACM to be encountered during project activities. If suspected ACM is identified (brake shoes, insulation, floor tiles, ceiling tiles, siding, shingles, pipes, etc.), the field crew shall immediately stop work, exit the area, and contact the Construction Manager or SSHO and the HSM. Operations will be resumed only after the appropriate controls have been

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-6

implemented. Normal dust control measures will limit low concentrations of asbestos fibers from becoming an inhalation hazard.

4.1.4 Raw Sewage

The potential for contacting raw sewage during project activities has not been determined. Potential work around or near sewage lines will be evaluated by the Construction Manager and SSHO prior to work beginning in that specific area.

4.1.5 Munitions and Explosives of Concern

The presence of Munitions and Explosives of Concern (MEC) has not been identified in project documents. If suspected or known MEC is encountered, the field crew shall immediately stop work, leave the exclusion zone (EZ), and contact the Construction Manager or SSHO and the HSM (Section 6.1). The MEC shall not be probed, touched, or handled by unauthorized personnel under any circumstance. The basic guidelines for MEC safety are listed below:

- Do not continue to move towards suspected MEC.
- Once you recognize a MEC hazard, do not move any closer.
- Stop all work.
- Make all radio transmissions at least 100 meters away from a MEC hazard.
- Do not try to remove anything that is on or near MEC.
- Do not touch, move, or disturb the MEC.
- Stay away from MEC.
- Mark a MEC hazard area properly so that other personnel will stay away from it.
- Evacuate all non-essential personnel from a MEC hazard area.
- Report through your chain of command all MEC hazards that affect operations.

Specific emergency procedures for MEC encounters are included in Section 11.7.

4.1.6 Radiological Hazards

No radiological hazards have been identified with anticipated project activities. If a suspected radiological hazard is identified (radium painted dials, vacuum tubes, trefoil symbols, etc.), the field crew shall immediately stop work, exit the area, and contact the Construction Manager or SSHO and the HSM.

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-6

4.1.7 Operational Chemicals/Hazard Communication Program

Hazardous chemicals will be brought to project sites for use in activities supporting the planned work. These chemicals are used as fuels, construction materials, solvents, cements, cleaning solutions, paints, etc. The use of operational chemicals is regulated by OSHA under the Hazard Communication Standard (29 CFR 1910.1200). A written hazard communication program has been established as Shaw Procedure No. HS060, "Hazard Communication Program," which includes the following elements:

- ***Container Labeling***—Project personnel will ensure that all containers are labeled according to their contents. This requirement will apply to containers from manufacturers and those produced on site by operations. The labels on all incoming and outgoing containers will be checked for identity, hazard warning, and the name and address of the responsible party.
- ***Material Data Safety Sheets (MSDS)***—MSDSs will be provided on site for each hazardous chemical used or known to be present at the site.
- ***Employee Information and Training***—Employees will receive annual chemical hazard safety training, supplemented by informal daily safety meetings. Project specific chemical hazards will be communicated to employees through an initial site orientation meeting and daily safety meetings. Employees may request copies of specific MSDSs by completing the "Employee Request for Material Safety Data Sheet (MSDS)" form provided in Appendix D.

The written hazard communication program will be available at the project site for personnel review and provides requirements for the safe use of operational chemicals. Proper ventilation and PPE shall be used when working with operational chemicals. Air monitoring may be performed as needed to assess and control exposures resulting from the use of operational chemicals. An inventory list of the operational chemicals (Hazardous Chemical Inventory List) used and an MSDS for operational chemicals shall be completed by the SSHO, placed in Appendix E or a stand-alone document, and made available at the project site. A copy of the Inventory and MSDSs shall be provided to Scott AFB Fire Department upon request.

4.2 Physical Hazards

There will be numerous physical hazards associated with site operations that require consideration. Some of these physical hazards are as follows:

- Noise and hearing conservation;
- Slips, trips, and falls;

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-6

- Fires, explosions, and hot work;
- Use of ladders and scaffolding;
- Use of small tools;
- Use of cutting tools;
- Use of heavy and mechanized equipment;
- Operation of motor vehicles;
- Material handling;
- Hazardous energies (i.e., electrical, mechanical, and pressure);
- Air compressor use;
- Portable generator use;
- Intrusive activities;
- Excavation;
- Confined space entry;
- Dust;
- Use of pressure washers and steam washers;
- Excessive work hours;
- Working over or near water; and
- Workplace reproductive hazards.

4.2.1 Noise and Hearing Conservation

There will be many sources of noise at each project site. Noise may be generated from the use of equipment and tools. Hearing loss, resulting from occupational exposure to noise, can be prevented. Shaw Procedure No. HS402, "Hearing Conservation Program," shall be implemented at each project site whenever there is employee noise exposures equal to or exceeds an eight-hour TWA of 85 decibels, A-scale. As part of the criteria for a hearing conservation program, audiometric testing of personnel must be conducted annually. The SSHO shall conduct noise surveys as necessary to determine if engineering controls should be implemented and/or if hearing protection is adequate. Personnel shall wear hearing protection when working with or around heavy equipment, power tools, as noise monitoring indicates, or in areas posted as such. Warning signs shall be posted in areas where noise (greater than 85 decibels) necessitates the use of hearing protection.

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-6

4.2.2 Slips, Trips, and Falls

The following details procedures to prevent slips, trips, and falls:

- Personnel shall keep work areas clean and orderly. Tools, equipment, and materials shall be used and stored in a fashion to minimize tripping hazards.
- Debris shall not be left lying around in any place, particularly in areas where personnel walk.
- Spills shall be cleaned up immediately.
- Personnel are prohibited from walking or working on surfaces or equipment that is not intended as walking or working surfaces.
- Personnel shall take extra precautions, such as establishing firm handholds, wearing suitable footwear, and walking slowly when walking on surfaces during wet, snowy, or icy weather.
- Walking and working surfaces shall be properly maintained during inclement winter weather, as feasible.
- Personnel shall not jump from elevated places or equipment.
- Personnel using hand and mechanical tools shall position themselves properly and consider the events if a tool slips or suddenly moves.
- Electrical extension cords and electrical wiring shall be kept clear of walking and working areas and/or covered, buried, or otherwise secured.
- Running is prohibited on job sites unless under emergency conditions.
- Employees exposed to fall hazards shall be protected by standard guardrail, catch platforms, temporary floors, safety nets, personal fall protection devices, or the equivalent. No employee may be exposed to a fall of over 6 feet without being adequately protected.
- Shaw Procedure No. HS301, “Fall Protection,” shall be followed when there is a fall hazard of 6 feet or greater.

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-6

4.2.3 Hot Work

Hot work (e.g., welding, burning, and cutting) conducted on site shall comply with the following requirements: Scott AFB has a Hot Work Program that is independent of Shaw. All hot work done on base shall comply with the base program. Scott AFB follows the Chapter 9 and 10 requirements of the *Safety and Health Requirements Manual EM 385-1-1* (USACE, 2008). The SSHO is the contact with the fire department for hot work permits.

- Shaw Procedure No. HS314, "Hot Work in Hazardous Locations," shall be followed whenever there is spark/ignition producing activities in progress at the project site.
- The SSHO shall establish areas approved for welding, cutting, and other hot work.
- The SSHO is responsible for authorizing welding, cutting, and other hot work in areas not specifically designed or approved for such operations (Hot Work Permit).
- All personnel shall be protected from welding radiation, flashes, sparks, molten metal, and slag.
- All welding, burning, and cutting equipment shall be inspected daily by the operator. Defective equipment shall be tagged and removed from service, replaced or repaired, and re-inspected before again being placed in service.
- All welders, cutters, and their supervisors shall be properly trained in the safe operation of their equipment, safe welding/cutting practices, and welding/cutting respiratory and fire protection.
- The handling of compressed gas cylinders shall comply with the requirements established in Shaw Procedure No. HS304, "Compressed Gas Cylinders."
- Cutting, welding, or other hot work shall be permitted only in areas that are or have been made fire safe.
- Cutting or welding shall not be permitted in the following situations:
  - In areas not authorized by the SSHO.
  - In the presence of explosive atmospheres (i.e., mixtures of flammable gases, vapors, liquids, or dusts with air), or explosive atmospheres that may develop inside un-cleaned or improperly prepared drums, tanks, or other containers, and equipment that has previously contained such materials.

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-6

  - In any area where combustible gas indicator readings are in excess of 10 percent of the lower explosive limit.
  - On storage or process vessels or lines in service that contain flammable or combustible liquids, gases, vapors, or solids.

- Before any welding, cutting, or other hot work is permitted, the area shall be inspected by the SSHO to verify that the following requirements have been met:
  - Cutting and welding equipment to be used shall be in safe operating condition and in good repair.
  - Where practical, all combustible material shall be relocated at least 35 feet away from the hot work site. Where relocation is impractical, combustibles shall be protected with flameproof covers or otherwise shielded.
  - At a minimum, two fully charged and operable fire extinguishers, appropriate for the type of possible fire (4-A:60-B:C), shall be available at each work area.
  - A fire watch shall be required whenever hot work is performed in hazardous locations.
  - Combustible gas indicator readings shall be taken to verify the work area is free of combustible gases and vapors.
  - The work area is free of toxic contaminants at concentrations in excess of established TLVs or all personnel who will work in the area have been provided respiratory protection and protective apparel appropriate for the degree of exposure.
  - When hot work is to be performed on tanks or other vessels that contain or have contained flammable or combustible liquids, the vessel shall be properly isolated, purged, cleaned, or inerted as appropriate, to reduce the concentrations of flammable/combustible vapors to safe levels.
  - A Hot Work Permit (Appendix D) shall be completed by the SSHO, reviewed with personnel who will perform the hot work, and posted near the job site.
  - A Hot Work Permit is good only for the date issued and valid only for the 8-hour shift for which it is issued. If the work area is completely vacated by personnel, such as, during lunch, a new permit may need to be issued.

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-6

- If at any time during the hot work operation a change in conditions at the work site is suspected, such as a release of flammable gases or vapors in the work area, work shall be stopped immediately and the SSHO shall be notified. Such work stoppage invalidates the Hot Work Permit, and a new permit shall be completed after inspections and tests have been performed by the SSHO.
- No erasures or changes of dates on Hot Work Permits shall be permitted.

4.2.4 Use of Ladders and Scaffolds

Ladders and scaffolding shall only be used at each project under the following conditions:

- Ladder use shall comply with Shaw Procedure No. HS302, "Ladder Safety."
- Scaffold erection and use shall comply with all applicable OSHA regulations. A trained competent person shall supervise all scaffold erection and use.

4.2.5 Use of Small Tools

Hand and power tools shall be used, inspected, and maintained in accordance with the manufacturer's instructions and recommendations and will be used only for the purpose for which designed. A copy of the manufacturer's instructions and recommendations shall be maintained at the project site. The following requirements shall be adhered to:

- Tools designed to accommodate guards will be equipped with such guards when in use.
- Tools shall be inspected to ascertain safe operating conditions and are to be kept clean and free of accumulated dirt.
- Electric power tools and extension cords shall be used with ground fault circuit interrupter.
- Portable power cords will be designated as hard usage or extra hard usage and shall not be used if damaged, patched, oil-soaked, worn, or frayed.
- Connections on pneumatic lines shall be secured with a safety lashing.
- Explosive-actuated tools will meet the design requirements of American National Standards Institute (ANSI) A10.3 and only be operated by a qualified operator.
- Explosive-actuated tools and charges shall be secured at all times to prevent unauthorized possession or use.

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-6

- Explosive-actuated tools shall not be loaded until just prior to the intended firing time; neither loaded nor empty tools are to be pointed at any employees; hands shall be kept clear of the open barrel end.
- Hand tools, such as hammers and chisels, shall be inspected and dressed if necessary to remove mushroomed heads, which may separate and become projectile hazards.

4.2.6 Use of Cutting Tools

Proper cutting tools, such as scissors, snips, side cutters, etc., are to be used when possible in lieu of box cutters or knives. Furthermore, if box cutters are determined to be the appropriate tool for the job, the only type that should be used is the design that has a self-retracting blade capability. Employees must utilize appropriate PPE (leather gloves) to allow for further protection. There are many cutting tool manufacturers that offer a variety of safety knives, which are available for all types of cutting. The SSHO shall evaluate each cutting task in order to determine that the safest and most appropriate cutting tool is used. The SSHO shall also provide training in the proper use of the selected cutting tool. The following evaluation shall be made for each cutting task:

- Determine that hand knives are actually the most practical tool for the task. Where possible, use the safest cutting tool for the job (e.g., scissors, snips, or wire strippers).
- If a knife happens to be the correct tool, keep the knife sharp and clean. A dull blade can cause accidents because more force is needed to cut an object. However, a knife or any other unprotected blade tool must be the last resort when choosing a cutting tool.
- Maintain a supply of either replacement knives and/or blades and make them readily available.
- Cut away from yourself, ending the knife stroke away from your body. Hold the item you are cutting firmly, and do not cut downwards and towards your body. Cut into the air or onto hard surface.
- Confirm that appropriate PPE (e.g., gloves) specific to the task is available to employees and used when the possibility of injury exists.

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-6

- Personal knives (e.g., pocketknives) shall not be considered as a tool for any type of work-related cutting. Employees are required to ask for a cutting tool from their supervisor, thereby resulting in an additional review of using the right cutting tool for the job.
- The SSHO is to inspect material cutting activities to verify that leather gloves are being used to protect hands.

4.2.7 Use of Heavy and Mechanized Equipment

Excavators, front-end loaders, drill rigs, direct-push rigs, and other types of specialized equipment may be used to accomplish the work at the project. The use of this equipment can be dangerous. Extra care shall be exercised in its use and while working in the vicinity of this equipment.

4.2.7.1 Heavy Construction Equipment

Various types of heavy construction equipment will be used for project activities. All operators of this equipment shall be familiar with the requirements for inspection and operation of the equipment that they will be using. Before equipment is placed into use and on a daily basis, the operator is to inspect and verify that it is in safe operating condition, as described in Section 3.5. The following guidelines shall be adhered to while operating heavy construction equipment:

- Equipment shall not be operated in a manner that will endanger persons or property nor will the safe operating speeds or loads be exceeded.
- Getting on or off of equipment while it is in motion is prohibited.
- Equipment shall be operated in accordance with the manufacturer's instructions and recommendations.
- Determinations of road conditions and structures shall be made in advance to verify that clearances and load capacities are safe for the passage of equipment.
- All machinery or equipment shall be shut down and positive means taken to prevent its operation while repairs or manual lubrications are being done. Equipment designed to be serviced while running is exempt from this requirement.
- Buckets, blades, dump bodies, and similar equipment will be either fully lowered or blocked when being repaired or when not in use. All controls shall be in a neutral position, with the engines stopped and brakes set, unless work being performed on the machine requires otherwise, per manufacturer recommendations.

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-6

- No guard, safety appliance, or device shall be removed from machinery or equipment, or made ineffective except for making immediate repairs, lubrications, or adjustments, and then only after the power has been shut off. All guards and devices will be replaced immediately after completion of repairs and adjustments and before power is turned on.
- Mechanized equipment shall be shut down prior to and during fueling operations. Closed systems, with automatic shut-off, which prevent spillage if connections are broken, may be used to fuel diesel powered equipment left running.
- Each piece of heavy equipment and other similar equipment shall be equipped with at least one dry chemical or carbon dioxide fire extinguisher with a minimum rating of 10-B:C.
- Personnel shall not work, pass under, or ride in the buckets or booms of loaders in operation.
- All self-propelled construction equipment, whether moving alone or in combination, shall be equipped with a reverse signal alarm.
- Seat belt use is required while operating equipment.

Spotters for the operator shall be the only personnel allowed in the vicinity of the heavy equipment. Spotters shall stay out of the boom radius area. Personnel needing to approach heavy equipment while operating shall observe the following protocols:

- Wear Class 2 high visibility vests meeting ANSI specifications
- Make eye contact with the operator (and spotter)
- Signal the operator to cease heavy equipment activity
- Approach the equipment only after the operator has given signal to do so.

4.2.7.2 Mechanized Equipment – Use of Quick Connect/Disconnect Systems

The manufacturer's specifications and operating manuals for hydraulic equipment and attachments utilizing quick connect/disconnect systems shall be followed. After completing a switch in attachments, the equipment operator shall take the actions necessary to verify the quick connect/disconnect system is positively engaged.

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-6

4.2.7.3 Hydraulic Excavators, Wheel Loaders, Track Loaders, and Backhoe/Loaders Used to Transport or Hoist Loads with Rigging

When hydraulic excavating equipment is to be used to transport or hoist loads utilizing hooks, eyes, slings, chains, or other rigging, the following requirements shall apply:

- A Lift Plan Worksheet (Hydraulic Equipment) (Appendix D) shall be completed.
- Operations involving the use of hydraulic excavating equipment and rigging to transport or hoist loads require different operator skills and considerations than the standard excavating operations routinely performed with hydraulic excavating equipment. An AHA specific to the transporting or hoisting operation shall be prepared (Appendix C15, "*Rigging and Lifting with Hydraulic Equipment*"). The AHA shall include, but not be limited to the following:
  - Written proof of qualifications of equipment operators, riggers, and others involved in the transporting and hoisting operations.
  - Performance of the operational test described in section 16.N.01 (b) of the *Safety and Health Requirements Manual EM 385-1-1* (USACE, 2008).
  - Proper operating procedures in accordance with the equipment manufacturers operating manual.
  - Proper use and on site availability of manufacturer's load rating capacities or charts.
  - Proper use of rigging, including positive latching devices to secure the load and rigging.
  - Inspection of rigging (complete a "Rigging Inspection Checklist. (Appendix D)
  - Use of tag lines to control the load.
  - Communications.
  - Establishment of a sufficient swing radius (equipment, rigging, and load).
  - Stability of surfaces beneath the hydraulic excavating equipment.
- An operational test with the selected hydraulic excavating equipment will be performed in the presence of the Government Designated Authority, if available. The operational test shall consist of a demonstration that the test load and selected rigging can be safely lifted, maneuvered, controlled, stopped, and landed. The operational test shall be representative of the complete cycle of the proposed transporting or hoisting operation, including configuration, orientation, and positioning of the excavating equipment and the use of identical rigging. The test

load shall be equivalent to the maximum anticipated load, but shall not exceed 100 percent of the manufacturer's load rating capacity for the excavating equipment as configured. Written documentation of the performance of the operational test outlining test procedures and results shall be maintained at the on-site project office.

- All rigging and rigging operations shall comply with the requirements of Section 15 of the *Safety and Health Requirements Manual EM 385-1-1* (USACE, 2008). Hooks, eyes, slings, chains, or other rigging shall not be attached to or hung from the teeth of a bucket during the transporting or hoisting of a load by hydraulic excavating equipment.
- After the completion and acceptance of an operational test described in 16.S.01 (b) of *Safety and Health Requirements Manual EM 385-1-1* (USACE, 2008), if repairs, major maintenance, or reconfiguration are required to be performed on the hydraulic excavating equipment or attachments, another operational test as described in 16.S.01 (b) (USACE, 2008) shall be performed to demonstrate that the completed repairs are satisfactory and that the test load and selected rigging can be safely lifted, maneuvered, controlled, stopped, and landed.
- Loads shall be lifted the minimum height necessary to clear the ground or other obstacles and carried as low as possible when the equipment is traveling.
- Loads shall not be lifted over personnel.
- Adequate clearances shall be maintained from electrical sources.
- Hydraulic excavating equipment shall not be used to hoist personnel. The riding of personnel on loads, hooks, hammers, buckets, or any other hydraulic excavating equipment attachment is prohibited.

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-6

4.2.7.4 Drill Rig /Direct-Push Safety

All drilling operations are to comply with Shaw Procedure No. HS316, "Drill Rig Operations." All members of the drill/direct-push crew(s) shall receive site-specific training prior to beginning work. The Shaw Field Team Leader must have successfully completed Shaw's in-house training pertinent to competent person drilling oversight training. The Field Team Leader is required not only to have successfully completed competent person drilling oversight training, but to have an appropriate educational background, coupled with field experience and the authority to make changes to correct deficiencies, or to stop the job if need be. The driller is responsible for the safe operation of the drill/direct-push rig, as well as the crew's adherence to the requirements of this SSHP. The driller is to verify that all safety equipment is in proper condition and is properly used. The members of the crew shall follow all instructions provided by the manufacturer of the drill/direct-push rig, wear the required

PPE, and be aware of all hazards and control procedures. The drill/direct-push crews shall participate in the daily tailgate safety meeting and be aware of all emergency procedures.

All drilling/direct-push activities must comply with Shaw Procedure No. HS308, "Underground/Overhead Utility Contact Prevention." After all mark-outs have been completed and documented on the Utility Mark-Out Documentation form (Appendix D), each bore or probe-hole location must be advanced by hand digging, probing, posthole digging, and/or air knifed to 5 feet below ground surface. Should the local geology be prone to refusal or should there be any other reason the above methods cannot be used to ensure the 5 feet clearance, ground-penetrating radar or other methods would then be required to ensure the boring or probe hole is cleared (5 feet minimum). Besides utilization of ground penetrating radar or other methods mentioned above, anytime the 5 feet clearance cannot be obtained, the SSHO must obtain a written variance from the Regional Vice President (or equivalent level such as Operations Director for Federal Business Line) or designee. This would include a telephone call to both the Regional Vice President and Regional Health and Safety Manager and signed approval by all parties involved. The Pre-drilling/Boring/Geoprobe Checklist and the Direct-Push Rig Inspection Checklist and/or Drill Rig Inspection Checklist (Appendix D) must be completed prior to drilling, boring, or direct-push activity.

4.2.8 Operation of Motor Vehicles

All Shaw owned, leased, or rented vehicle operations shall comply with the requirements of Shaw Procedure No. HS800, "Motor Vehicle Operation: General Requirements" and Shaw Procedure No. HS810, "Commercial Motor Vehicle Operation and Maintenance." Shaw vehicles shall be inspected on a daily basis. Additionally, all Shaw vehicles shall be inspected prior to any trip, which is 50 miles or greater. Vehicle inspections shall be documented on the Vehicle Inspection form (Appendix D).

Subcontractors operating motor vehicles at projects shall comply with all federal, state, and local traffic regulations. Subcontractors shall only use vehicles that are in good condition and safe to operate. Subcontractors shall inspect their vehicles on a daily basis and submit the inspection documentation to the SSHO. Vehicle inspections shall be documented on the Vehicle Inspection form (Appendix D).

All personnel shall drive defensively and wear seat belts while vehicles are in motion. All personnel must observe the maximum-posted speed limits on the base roadways and parking lots. Vehicles must not be parked closer than 15 feet from fire hydrants. Vehicle must pull over to the right side of the road when approached by emergency vehicles – remain stopped until the emergency vehicles have safely passed. All Shaw employees are required to attend a defensive driving training course.

Operators of vehicles may only use cellular telephones with hands-free devices while the vehicle is in motion. Operators of vehicles are not permitted to send text messages while the vehicle is in motion. Prior to using a hand-held cellular telephone, drivers shall find a safe place to bring their vehicle to a stop. This requirement does not preclude passenger(s) from using cellular telephones while the vehicle is in motion. The use of headphones and earphones for music or radio is prohibited while operating a motor vehicle.

Since backing accidents at these types of projects are frequent, the following guidelines shall be observed:

- Backing of vehicles shall be avoided when possible.
- Extra care shall be taken to back vehicles when unavoidable.
- Back-up slowly and back-up the shortest distance necessary to accomplish the maneuver.
- When parking vehicles, vehicles shall be backed into the space whenever possible.
- Before entering a vehicle, which has been parked, the driver should first physically perform a 360 degree walk around the vehicle to observe all areas and especially the area behind the vehicle.
- Spotters shall be used to back vehicles whenever possible or necessary.

4.2.9 Material Handling

Various materials and equipment may be handled manually during project operations. Care should be taken when lifting and handling heavy or bulky items to avoid back injuries. The following fundamentals address the proper lifting techniques that are essential in preventing back injuries:

- Size, shape, and weight of the object to be lifted shall first be considered. No individual employee is permitted to lift any object that weighs over 60-pounds. Multiple employees or the use of mechanical lifting devices is required for objects over the 60-pound limit.
- Anticipated path to be taken by the lifter should be inspected for the presence of slip, trip, and fall hazards.
- Feet shall be placed far enough apart for good balance and stability (typically shoulder width).
- Worker shall get as close to the load as possible. Legs shall be bent at the knees.

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-6

- Back shall be kept as straight as possible and abdominal muscles should be tightened.
- Twisting motions should be avoided when performing manual lifts.
- To lift the object, the legs are straightened from their bending position.
- Take small turning steps without twisting the knees or the back if it is necessary to turn with the load.
- A worker shall never carry a load that cannot be seen over or around.
- When placing an object down, the stance and position are identical to that for lifting. The legs are bent at the knees and the object lowered.

When two or more workers are required to handle the same object, coordination is essential for sharing the weight between the individuals carrying the load and to make a uniform lift. When carrying the object, each worker, if possible, shall face the direction in which the object is being carried. In handling bulky or heavy items, the following guidelines shall be followed to avoid injury to the hands and fingers:

- A firm grip on the object is essential; leather gloves shall be used as necessary.
- Hands and the object shall be free of oil, grease, and water, which might prevent a firm grip. Fingers shall be kept away from any points that could cause them to be pinched or crushed, especially when setting the object down.
- Item shall be inspected for metal slivers, sharp or jagged edges, burrs, and rough or slippery surfaces prior to being lifted.

4.2.10 Hazardous Energies (Electrical, Mechanical, and Pressurized Systems)

All portable electrical equipment and extension cords shall be protected with a ground fault circuit interrupter as part of the circuit. Applicable OSHA standards for electrical power, 29 CFR 1926 Subpart K and Section 11 of the *Safety and Health Requirements Manual EM 385-1-1* (USACE, 2008) apply.

Only qualified electricians may work on electrical circuits. Qualified personnel shall be trained with the proper use of the special precautionary techniques, PPE, including arc-flash, insulating and shielding materials, and insulated tools and test equipment.

Live parts to which an employee might be exposed shall be put into an electrically safe work condition (de-energized) before an employee works on or near them, unless it can be demonstrated that de-energizing introduces additional or increased hazards or is infeasible

due to equipment design or operational limitations. This rule applies to all electrical work, including changing a light bulb.

Where work is performed in locations containing un-insulated energized overhead lines that are not guarded or isolated, precautions shall be taken to prevent employees from contacting such lines directly with any unguarded parts of their body or indirectly through conductive materials, tools, or equipment. Refer to Table 2 when working near overhead power lines. Where the work to be performed is such that contact with un-insulated energized overhead lines is possible, the lines shall be de-energized and visibly grounded at the point of work, or suitably guarded.

Employees working in areas where electrical hazards are present shall be provided with, and shall use PPE that is designed and constructed for the specific part of the body to be protected and for the work to be performed, as required by Section 130.7 of National Fire Protection Association (NFPA) 70 E (2011), *Standard for Electrical Safety in the Workplace*. Refer to Appendix G.

Employees shall use insulated tools and/or handling equipment when working inside the Limited Approach Boundary of exposed live parts where tools or handling equipment might make accidental contact. Insulated tools shall be protected from damage to the insulating material.

Before starting each electrical job, the qualified employee in charge shall conduct a job briefing with the employees involved. The briefing shall cover such subjects as hazards associated with the job, work procedures involved, special precautions, energy source controls, and PPE requirements.

Only hard or extra-hard usage extension cords shall be used. Extension cords, power tools, and lighting equipment shall be inspected before each use, protected from damage, and kept out of wet areas.

The handling of compressed gas cylinders shall comply with the requirements established in Shaw Procedure No. HS304. All pressure vessels shall be designed, inspected, and tested in accordance with ASTM International standards.

Lockout/tagout procedures are to be implemented during servicing or maintenance of machines and equipment to preclude the unexpected release of stored energy or inadvertent energizing. These procedures are contained in Shaw Procedure No. HS315, “Control of Hazardous Energy Sources,” and comply with the requirements established in 29 CFR 1926.417. The appropriate logs and forms found in Appendix D and listed below shall be completed for all lockout/tagout:

- Lockout Log;
- Lockout/Tagout for Compressed Air and Gases;
- Lockout/Tagout for Electrical Equipment;
- Lockout/Tagout for Hydraulic Equipment;
- Lockout/Tagout for Steam, Water, and Fluid Lines; and
- Lockout/Tagout Procedure for Specific Equipment.

Subcontractors may implement their own lockout/tagout procedure if the SSHO has approved its use and verifies that it is no less protective than the Shaw Procedure.

4.2.11 Air Compressor Use

Refer to the air compressor manufacturer's instructions for safe operation. Prior to use, the Checklist – Portable Air Compressor (Appendix D) shall be completed. Never use an air compressor in enclosed or partially enclosed spaces due to the quick build-up of high levels of carbon monoxide. The concentration of carbon monoxide shall be monitored when using air compressors in areas of poor ventilation. The concentration of carbon monoxide in the work area shall not be allowed to exceed 25 ppm.

All air compressors and hoses shall be inspected before use, operated, and maintained by designated, qualified personnel. All air compressors shall be equipped with a pressure gauge and relief-valve, and only be operated at design pressures. Chicago fittings shall be secured together with tie-wire or equivalent and secured with safety lashings.

Before refueling the air compressor, shut it off and let it cool down. Gasoline spilled on hot engine parts could ignite. A 20-B:C fire extinguisher shall be readily available in locations where an air compressor is being used.

Use hearing protection when working near an air compressor.

4.2.12 Portable Generator Use

Refer to the generator manufacturer's instructions for safe operation. Never use a generator in enclosed or partially enclosed spaces due to the quick build-up of high levels of carbon monoxide. The concentration of carbon monoxide shall be monitored when using generators in areas of poor ventilation. The concentration of carbon monoxide in the work area shall not be allowed to exceed 25 ppm.

Keep the generator dry and do not use in rain or wet conditions. To protect from moisture, operate it on a dry surface under an open, canopy-like structure. Dry your hands, if wet,

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-6

before touching the generator. Use a heavy duty, outdoor-rated extension cord that is rated (in watts or amps) at least equal to the sum of the connected appliance loads. Check that the entire cord is free of cuts or tears and that the plug has all three prongs, especially a grounding pin. Ground generators by using a hand-inserted ground-rod, if recommended by the manufacturer.

Before refueling the generator, turn it off and let it cool down. Gasoline spilled on hot engine parts could ignite. A 20-B:C fire extinguisher shall be readily available in locations where a generator is being used.

Use hearing protection when working near a generator.

4.2.13 Intrusive Activities

Intrusive activities are defined as any activity that produces a man-made cut, cavity, trench, or depression into the earth's surface formed by earth removal or any activity that results in an object placed into the earth below the surface. These activities include excavating, drilling, auguring, boring, shoveling, fence post driving, driving stakes, etc. Intrusive activities can be dangerous and can result in severe personal injury or death. Intrusive activities can also cause significant property damage to utilities, structures, and operational equipment. Breaching underground utilities can result in electrocution from damaged electrical lines, fires from broken fuel/gas lines, and disruption of telephone service. All intrusive activities must comply with Shaw Procedure No. HS308.

Before any intrusive activity begins, positive steps shall be taken to determine if the area contains underground utilities or overhead hazards. It is important to understand that underground utilities may be found in areas that have been properly investigated and thought not to have utilities present. Personnel shall always be alert for marking tape, wires, pipes, previously disturbed soils, crushed stone or sand bedding/backfill, containers, discolored soil, MEC, or anything else unusual.

The Intrusive Activities Clearance Procedure shall be followed. The procedure is designed to identify and protect underground installations or indicate that none exists. Intrusive activity shall not begin until the SSHO has signed off on the Intrusive Activities Permit form (Appendix D).

The SSHO will:

- Prepare a map indicating the area(s) where intrusive activity is planned to occur.
- Perform the necessary reviews.

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-6

- Contact Cugach, the base utility locating service, at least 3 business days prior to intrusive activities.
- Verify that all underground installations have been located, physically marked, and then noted on the map.
- Mark all overhead utilities with kilovolts rating on the map. Refer to Table 2 and Section 4.2.10 when working near overhead power lines.
- Notify the appropriate agencies, such as the COR and property owners (when applicable)
- Complete the Utility Mark-Out Documentation form (Appendix D)
- Issue the Intrusive Activities Permit.

A safety meeting shall be held and a JSA completed by all personnel involved in the intrusive activities prior to initiating work.

4.2.14 Excavation

When performing excavation activities, Shaw Procedure No. HS307, "Excavation and Trenching" and Shaw Procedure No. HS308, "Underground/Overhead Utility Contact Prevention" shall be followed. Any excavation 5 feet deep or greater, into which persons will enter and perform work, shall be shored, sloped, or otherwise made safe for entry. Excavations less than 5 feet in depth in which a competent person, as defined in 29 CFR 1926.650, examines and determines there to be no potential for cave-in, do not require protective systems. Certain excavations and trenches are considered confined spaces that require a confined space entry permit (Section 4.2.15).

Daily inspections of the excavation shall be made using an Excavation Inspection form (Appendix D) and a Soils Classification Worksheet (Appendix D) completed by a competent person as defined in 29 CFR 1926.650. All excavated materials shall be placed at least 2 feet from the edge of the excavation. Perimeter protection shall be provided for unattended excavations as specified in Section 25.B of the *Safety and Health Requirements Manual EM 385-1-1* (USACE, 2008). Open excavations shall be lighted at night, although, Shaw will attempt to minimize the need to perform intrusive activities at night. The SSHO shall evaluate the exposure of the excavation to employees, the public, vehicles, and equipment. This evaluation shall be used in determining the class of perimeter protection.

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-6

All project personnel shall participate in the site-specific training session and be instructed on the following requirements:

- Before commencing intrusive activities such as excavating, etc., the existence and location of underground pipes, electrical equipment, communication lines, gas lines, etc. shall be determined and documented. Only hand digging is permitted within 3 feet of underground high voltage, product, or gas lines. Once the line is exposed, heavy equipment can be used but must remain at least 3 feet from the exposed line.
- Operations shall be suspended, ignition sources eliminated, and the area shall be ventilated if the concentration of flammable/combustible vapors reach or exceed 10 percent of the lower explosive limit. A combustible gas indicator shall be used to make this determination.
- If excavating equipment is being operated in the vicinity of overhead power lines, Table 2 will be used to determine safe working distances.
- Personnel entry into any excavation 5 feet deep or greater is only permitted if the necessary protective systems are in place. Employees shall wear a harness with a lifeline securely attached to it when entering excavations classified as confined spaces or that otherwise present the potential for emergency rescue.
- Employees shall not work in excavations in which there is accumulated water, or in excavations in which water is accumulating, unless adequate precautions have been taken to protect employees against the hazards posed by water accumulation. If water is controlled or prevented from accumulating by the use of water removal equipment, the process shall be monitored by a competent person to ensure proper operation.
- Excavations greater than 4 feet in depth, which require personnel to enter, shall have sufficient means of entry and egress (e.g., stairs, ladders, and ramps). Ladders will be provided and secured as necessary. Ladders shall extend at least 3 feet above grade. Means of entry/egress shall not require personnel to travel laterally more than 25 feet.

4.2.15 Confined Space Entry

A confined space is defined as a space large enough and so configured that an employee can bodily enter and perform assigned work, has limited means for entry or exit, and is not designed for continuous employee occupancy. Confined space work may pose additional hazards such as chemical exposures, flammable/explosive atmospheres, electrocution, oxygen deficiency, etc. Shaw Environmental, Inc. has detailed training for confined space

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-6

entry: only properly trained personnel shall supervise and participate in confined space entry procedures or serve as standby attendants.

Entering a trench greater than 5 feet deep, entering a sewer, or entering a tank may be potential confined space entries. Personnel shall never enter a confined space without a permit issued by the SSHO. If personnel are uncertain about whether their activity involves a confined space entry, they shall stop work and notify their supervisor or the SSHO. Shaw Procedure No. HS300, "Confined Spaces," shall be followed for all confined space entries, if such an activity is needed.

All confined spaces are initially considered permit required. Under certain conditions, a space may be re-classified as a non-permit, confined space provided the SSHO approves the reclassification and the space meets the criteria outlined in Shaw Procedure No. HS300.

Shaw Procedure No. HS300 identifies the tug signals that may be used during entry as referenced on the Entry Permit for Permit-Required Confined Space (Appendix D).

4.2.15.1 Rescue and Emergency Services

Shaw recommends the use of non-company rescue services whenever possible. In certain instances, such as unavailability of a qualified outside provider, Shaw employees can participate in rescues if they have been provided the required equipment and training.

4.2.15.2 Outside Rescue Services

Prior to designating a non-company rescue service, an evaluation of their capabilities must be conducted. This documented evaluation can be conducted by an entry supervisor or a health and safety representative. The Rescue Service Evaluation form (Appendix D) can be used to document this evaluation. The rescue service must be certified by the evaluator as capable of performing rescues prior to being identified as the rescue service provider.

Each selected rescue service will be informed of the hazards they may encounter at the location. They will also be provided access to all Permit-Required Confined Spaces from which a rescue may be necessary.

4.2.15.3 Shaw Rescue Services

Shaw personnel assigned to provide emergency entry and rescue services will be trained annually in the proper use of personal protective and rescue equipment. Such training will include a simulated rescue exercise. Shaw rescue services will be evaluated using the Rescue Service Evaluation form (Appendix D) and must be certified by the evaluator as capable of performing rescues prior to being identified as the rescue service provider.

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-6

4.2.16 Dust

The generation of dust and fugitive emissions shall be prevented when possible and controlled when necessary. Work practices shall be adjusted in a manner to minimize dust generation, such as lowering excavation rates, not letting soils free-fall from equipment buckets, and traveling slow on dirt roads. Personnel shall avoid working in dust by positioning themselves upwind of dust generating activities. Excessive dust shall be controlled by suppression with water from an AFCEE-approved source. Dust that is not controlled may necessitate the use of respiratory protection.

4.2.17 Use of Pressure Washers or Steam Washers

The use of steam/pressure washers shall comply with Shaw Procedure No. HS303, "Pressurized Water Cleaning and Cutting Equipment." All personnel using steam/pressure washers shall wear Level D – Modified PPE, at a minimum. Eye, face, and shin/metatarsal protection is mandatory.

The pressure/steam washer shall be inspected before each use. The manufacturer's instruction manual shall be used to guide the inspection process.

Personnel shall be trained in the use of the washing equipment. All personnel working in the equipment decontamination area shall be trained in the emergency shut-off procedures for the equipment being used. The minimum amount of steam/pressure that will complete the job should be used. Pressure washers exceeding 3,000 pounds per square inch shall not be used without the approval of the HSM.

The spray from such equipment shall only be directed at surfaces to be cleaned and never at body parts or other personnel; high-pressure water can easily cut through skin and flesh! Personnel working in the immediate area shall also use eye, face, and shin/metatarsal protection.

Personnel shall keep a firm grip on the wand and not point it at anything that is not being washed. Pressure washer operators must maintain good footing. The trigger on the wand shall never be wired/fixed open. Operators are to take adequate breaks to avoid fatigue.

Hot surfaces shall be avoided. Pressure or steam washing equipment shall be shut off and allowed to cool prior to re-fueling.

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-6

4.2.18 Excessive Work Hours

The following workday duration limitations for hours worked on the projects are in effect:

- Personnel working on projects, including those who are operating hoisting equipment or mobile construction equipment, may work up to 12 hours at the site, which includes travel time to housing, but excludes non-compensated time. This workday duration is subject to reduction by the other requirements and factors described below. The 12-hour limit is primarily due to motor vehicle driving restrictions.
- Personnel shall not operate motor vehicles after being in a duty status (regardless of their role or function) for more than 12 hours during any 24-hour period without at least eight consecutive hours of rest. A minimum of eight consecutive hours shall be provided for rest in each 24-hour period.
- No employee may drive continuously for more than 10 hours in any single on-duty period. (Continuous period of more than 10 hours in any 24-hour period without at least eight consecutive hours of rest.)

For each project effort, the SSHO is responsible for adjusting the workday duration within the limits set above.

The following factors will be considered by the SSHO for adjusting the workday duration:

- Time of year (e.g., reduce workday duration because there is less daylight in winter).
- Temperature/weather (e.g., reduce workday duration when the temperature is very cold, very hot, or very windy).
- Type of work (e.g., reduce workday duration for personnel involved in physically demanding phases of work).
- Individual personnel limitations (e.g., reduce workday duration for personnel with minor head colds or suffering from temporary effects of allergies).

For any questions regarding the implementation of this policy, contact the HSM.

4.2.19 Transportation

Many of the individual sites are located in areas of high vehicle, equipment, and pedestrian traffic. When working in these areas extra caution should be used because of the unpredictable nature of vehicular traffic. Barriers should be placed around work areas, shielding workers from vehicular traffic and blocking pedestrian traffic from entering the

work area. Flaggers should always be used if any portion of the roadway is blocked or if barriers are inadequate or unfeasible. Flaggers are required to be trained on proper hand signals, signage, state regulations, and U.S. Department of Transportation regulations as applicable.

4.2.20 Working Over or Near Water

Working over or near water is not anticipated for proposed activities under the WERC09 contract.

4.3 General Work Rules

While all the procedures outlined in this SSHP are required, the following list presents general work rules that must be strictly enforced by the Construction Manager and Subcontractor Supervisors:

- Loose jewelry, clothing, or long hair is not permitted on or near equipment with moving parts.
- Personnel shall not enter a restricted area unless authorized.
- All work zones, as established on the site, shall be observed. All required PPE shall be worn prior to entering these zones.
- Legible and understandable labels shall be affixed prominently to the containers of waste materials.
- An emergency eyewash unit shall be located immediately adjacent to employees who handle hazardous or corrosive materials, such as battery acid, etc. All operations involving the potential for eye injury, splash, etc. shall have eyewash units locally available and capable of delivering at least 0.4 gallons per minute for at least 15 minutes. The eyewash unit maintenance shall be documented on the Emergency Eyewash Station/Fire Extinguisher Inspection Checklist (Appendix D)
- If on-site activities continue later than dusk, adequate lighting shall be provided.
- Field activities shall be suspended during severe weather such as thunderstorms, lightning, and winter storm warnings.
- Damaged PPE shall be immediately repaired or replaced, as appropriate.
- Personnel shall thoroughly wash their hands and face before eating, smoking, or drinking.
- Unauthorized removal of materials from the project is prohibited.

- Possession of controlled substances and prohibited items, such as alcohol, illicit drugs, firearms, and weapons while working on site is strictly prohibited.
- Operations involving the potential for fire hazards shall be conducted in a manner as to minimize the risk of fire.
- Overhead and underground utility hazards shall be identified and/or located prior to conducting operations.

4.3.1 Disciplinary Actions

A successful safety program is achieved by assigning qualified personnel, providing the necessary training and orientation, adequately planning for the work and following the plans, adhering to the policies and procedures, reinforcing positive behavior, and rewarding safe performance. A mechanism is also necessary to consistently apply disciplinary action to employees who jeopardize the safety of themselves and their coworkers by not following the established plans, policies, and procedures. Therefore, Shaw Guide – 004, "Guidelines for Standard Safety Disciplinary Actions", is applicable and in effect for this project (Appendix G).

4.4 Buddy System

The "buddy system" will be used at all times while working on-site – this requires that personnel maintain visual, voice, cellular telephone, or radio communication.

4.4.1 Lone Worker Procedure

Occasionally, only one worker may be present at the project to perform routine operations such as performing paperwork in the office. During these routine operations, there will be no "buddy" present on site. Even though there will be no buddy present on site at these times, communications must still be maintained. The lone field worker shall carry a cellular telephone or two-way radio on their person, at all times, while working at the project site (a landline telephone will suffice if the worker is in an office). Arrangements shall be made by the lone field workers, with at least one other person (monitor),and the SSHO to affect hourly communications. This hourly communication shall convey the following information:

- Present location.
- Present status.
- Anticipated activities and location of anticipated activities (include routes of expected travel).

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-6

- Estimated duration of anticipated activities.
- Identify other anticipated activities, projected travel routes, and activity locations if the lone field worker will complete the initial task prior to making the next scheduled contact with the other employee.

The lone field worker should initiate the hourly communication to the monitor at a designated time (e.g., the top of the hour). If the monitor does not receive the status call at the pre-designated time, then the monitor shall try to establish communications with the lone employee. If the lone field employee answers, then the update shall be made and the schedule of calls shall continue. If the lone field employee does not answer, the monitor shall try again in five minutes. If contact is not made on the second try, then the monitor shall notify the local emergency services, such as police. All information provided from the last communication (see above) shall be provided to the emergency services. Additionally, the telephone number of the monitor (or other means of contact) shall be provided to the emergency services.

Upon mobilization to the project, the SSHO shall verify that emergency communications are established for all activities.

Important: This procedure applies to routine tasks only. Non-routine tasks require the buddy system to be in effect.

4.5 Environmental Hazards

In addition to chemical and physical hazards, there are environmental hazards that may be present. For the purposes of this SSHP, the environmental hazards are comprised of extreme ambient temperatures, insects, spiders, rodents, poisonous plants, and sunburn. Since some people are more sensitive or allergic to various biological hazards, the Allergy/Sensitivity Questionnaire (Appendix D) may be voluntarily completed by personnel during site orientation training. This form is used to alert the SSHO of these sensitivities so that additional precautions may be made.

4.5.1 Heat Stress

Heat stress is of concern for worker safety during the summer months or when working in areas containing steam lines or other heat generating equipment. Heat stress is caused by a number of interacting factors, including environmental conditions, clothing, PPE, workload, and individual characteristics. Heat stress can cause physical discomfort, loss of efficiency, or personal illness/injury.

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-6

Individuals vary in their susceptibility to heat stress. Factors that may predispose individuals to heat stress include the following:

- Lack of physical fitness and/or obesity.
- Insufficient acclimation.
- Age.
- Dehydration.
- Alcohol and/or drug use.
- Infection.
- Sunburn.
- Diarrhea.
- Chronic disease.
- Medical conditions and/or the use of some medications, such as beta-blockers for high blood pressure.

The amount and type of PPE worn, directly influences reduced work tolerance and the increased risk of heat stress. Personal protective equipment adds weight, bulk, reduces the body's capability for physiological thermoregulation (i.e., evaporation, convection, and radiation), and increases energy expenditure.

4.5.1.1 Signs and Symptoms of Heat Stress

If the body's physiological processes fail to maintain a normal body temperature because of excessive heat, a number of physical reactions can occur – ranging from mild to fatal.

These physical reactions to excessive heat include the following:

- Heat rash is caused by continuous exposure to heat and humidity and aggravated by chafing clothes. Heat rash decreases the body's ability to tolerate heat in addition to being a nuisance.
- Heat cramps are caused by profuse perspiration with inadequate electrolytic fluid replacement. Heat cramps cause painful muscle spasms and pain in the extremities and abdomen.
- Heat exhaustion is caused by increased stress on various organs to meet increased demand to cool the body. Heat exhaustion causes shallow breathing; pale, cool, moist skin; profuse sweating; and dizziness.

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-6

- Heat stroke is the most severe form of heat stress. Heat stroke symptoms include hot, dry skin; no perspiration; nausea; dizziness; confusion; strong, rapid pulse; coma; and sometimes death. Heat stroke is a serious medical emergency. The affected person shall be cooled down rapidly and medical attention must be given immediately (Section 4.5.1.4 for heat stroke first aid treatment).

The ACGIH states that excessive heat stress may be marked by one or more of the following symptoms, and an individual's exposure to heat stress should be discontinued when any of the following occur (2011):

- Sustained (several minutes) heart rate is in excess of 180 beats per minute minus the individual's age in years (180 minus age) for individuals with assessed normal cardiac performance; or
- Body core temperature is greater than 101.3 degrees Fahrenheit (°F) for medically selected and acclimatized personnel; or greater than 100.4°F in unselected, un-acclimatized workers; or
- Recovery heart rate at 1 minute after a peak work effort is greater than 120 beats per minute; or
- There are symptoms of sudden and severe fatigue, nausea, dizziness, or lightheadedness.

An individual may be at greater risk of heat stress if the following symptoms occur:

- Profuse sweating is sustained over several hours.
- Weight loss over a shift is greater than 1.5 percent of body weight.
- 24-hour urinary sodium excretion is less than 50 millimoles (ACGIH, 2011).

4.5.1.2 Heat Stress Prevention

The following practices will help prevent heat stress:

- Acclimatize workers to hot working conditions.
- Provide plenty of liquids to replace the body fluids lost by perspiration. Fluid intake should be forced because, under conditions of heat stress, the normal thirst mechanism is not adequate to bring about a voluntary replacement of lost fluids.
- Provide personal cooling devices.
- Conduct strenuous field operations in the early morning and provide shade when possible.

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-6

- Train personnel to recognize the signs and symptoms of heat stress, its prevention, and treatment.
- Rotate personnel to various job duties and establish adequate work/rest cycles.
- Provide shade or shelter during rest periods.

4.5.1.3 Heat Stress Treatment

Workers expressing the symptoms of heat stress shall notify the SSHO immediately. At the onset of heat related illness, activities must be halted and treatment initiated. Early detection and treatment of heat stress helps to prevent further serious illness or injury. Individuals that have experienced heat related illness could become more sensitive and predisposed to additional future heat stress related problems.

Heat exhaustion can be alleviated by having the affected person rest in a cool, shaded location and have them drink cool water. To cool down the affected person's body:

- Remove impermeable PPE.
- Remove worker from direct sunshine.
- Apply copious amounts of cool, not cold, water on them.
- Have them drink cool water, not cold, if conscious.

4.5.1.4 Heat Stroke Treatment

Heat stroke is a true medical emergency. In a heat stroke situation, the body must be cooled immediately to prevent severe injury or death – medical attention must be immediately obtained. The following shall be performed if heat stroke is suspected:

- Transportation of the victim to a medical facility must not be delayed – seek immediate medical attention.
- Apply cold packs, if available; place under the arms, around the neck, or any other place where they can cool large surface blood vessels.
- If transportation to a medical facility is delayed, reduce body temperature by immersing victim in a cool water bath (however, be careful not to over-chill the victim once body temperature is reduced below 102°F). If this is not possible, continuously douse victim with cool water and fan for evaporative cooling.

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-6

4.5.1.5 Acclimatization

Physiologically adjusting or acclimatizing personnel to hot conditions is extremely important. Supervisors shall provide the necessary time for adequate worker acclimatization, due to each individual's physical condition and his or her ability to work in hot and humid environments.

4.5.1.6 Physiological Monitoring

Adequate work/rest periods shall be implemented as necessary to prevent heat stress on personnel. However, since individuals vary in their susceptibility to heat stress, Shaw will also utilize physiological monitoring to aid in measuring each individual's response to heat stress. The initiation of physiological monitoring will be required when employees are working in environments exceeding 90°F ambient air temperatures. Physiological monitoring is also required when ambient temperatures exceed 70°F and impermeable garments are worn. Ambient air temperatures shall be recorded on the Ambient Air Temperature Log (Appendix D) when ambient temperatures exceed 70°F. The two physiological parameters that each individual will monitor are as follows:

- Heart Rate—Each individual will count his/her radial (wrist) pulse as early as possible during each rest period. If the heart rate of any individual exceeds 75 percent of their calculated maximum heart rate (maximum heart rate equals 200 minus age) at the beginning of the rest period, then the work cycle will be decreased by one-third. The rest period will remain the same. An individual is not permitted to return to work until his/her sustained heart rate is below 75 percent of their calculated maximum heart rate.
- Body Temperature—Each individual will measure his/her body temperature with an intra-aural (ear) thermometer, as directed by the thermometer manufacturer's instructions, as early as possible in the first rest period. If the temperature exceeds 99.6°F at the beginning of the rest period, then the work cycle shall be decreased by one third. The rest period will remain the same.

An individual is not permitted to return to work if his/her temperature exceeds 100.4°F. Physiological monitoring data will be recorded on the Employee Physiological Monitoring Record for Heat Stress (Appendix D).

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-6

4.5.1.7 Training

Personnel, including subcontractor employees, who may be exposed to hot working environments shall be trained on the following:

- Employees:
  - Sources of heat stress, influence of protective clothing, and importance of acclimatization.
  - How the body handles heat.
  - Heat-related illnesses and their recognition (signs and symptoms).
  - Preventive/corrective measures.
  - Individual factors, such as age, weight, gender, level of acclimatization, etc. that may predispose some workers to heat stress.
  - Medical conditions and use of prescription drugs, such as beta blockers, that may modify a worker's ability to adapt physiologically to heat stress.
  - Physiological monitoring, record keeping of oral temperature/pulse, and establishment of work-rest regimes.
  - First aid procedures.
- Supervisors:
  - Physiological monitoring, record keeping of oral temperature/pulse, and establishment of work-rest regimes.
  - First aid procedures.

4.5.2 Ticks and Tick-Borne Diseases

Working in tall grass, especially in or at the edge of wooded areas, increases the potential for ticks to bite workers. Ticks can be particularly numerous in the spring and fall. Ticks are vectors of many different diseases including Rocky Mountain spotted fever, Q fever, ehrlichiosis, tularemia, Colorado tick fever, Lyme, and Lyme like disease. Ticks attach to the skin and intravenously feed on blood, creating an opportunity for disease transmission.

The symptoms of tick-borne diseases are high fever, head and joint aches, nausea, and vomiting. Additionally, persons infected with Rocky Mountain spotted fever may develop a red, spotty rash. Symptoms of tularemia may also include occasional cough, chest pain, swollen lymph glands, and severe pneumonia. Lyme disease usually (60 to 80 percent of the cases) presents a distinctive bull's eye rash at the site of the bite in addition to flu-like

symptoms and swollen lymph nodes. If tick-borne diseases are not properly treated with the appropriate antibiotic(s), then arthritis, heart disease, brain/nerve disorders, liver damage, and kidney damage are possible.

Wearing long-sleeved, light-colored shirts, light-colored trousers tucked into the socks, and the use of insect repellent containing N,N-Diethyl-m-toluamide (DEET) help prevent tick bites.

Periodically during the workday, employees should inspect themselves for the presence of ticks. If a tick is discovered, the following procedure should be used to remove it:

- Do not try to detach a tick with your bare fingers; bacteria from a crushed tick may be able to penetrate even unbroken skin. Fine tipped tweezers should be used.
- Grip the tick as close to your skin as possible and gently pull it straight away from you until it releases its hold.
- Do not twist the tick as you pull and do not squeeze its body. That may actually inject bacteria into your skin.
- Thoroughly wash your hands and the bite area with soap and water, and then apply an antiseptic to the bite area.
- Save the tick in a small container noting the date and the location on the body of the bite.
- Notify the SSHO and HSM of any tick bites as soon as possible.

All personnel sustaining a tick bite should consult a physician. Consult http://www.osha.gov for more information concerning ticks and tick-borne illnesses.

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-6

4.5.3 Chiggers

Chiggers may be a problem while working at some project locations. Chiggers, also known as “red-bugs” or “harvest mites,” are the immature stages of a tiny red mite. They inhabit areas of tall grass, associated with low, wet spots, ponds and stream banks, wild berry patches, and forest underbrush. The larvae attach themselves to the clothing of people or to the fur of passing animals. Before settling down to feed, chiggers move to a constriction, such as sock tops, waistbands, or armpits. Feeding chiggers inject a salivary fluid, which dissolves the host’s cells, and then they suck up the liquefied tissue. Within a few hours, small, reddish, intensely itching welts appear. These bites may continue to itch for several days up to two weeks after the chigger is dislodged. Following are suggestions that should provide some protection from chiggers:

- Stay out of areas where chiggers are likely to be present including wood lots, pastures, roadside ditches, or other areas with tall grasses and weeds. Chiggers are especially common in moist low-lying areas.
- Wear loose-fitting clothing (if possible) when working outdoors. Vehicles should be frequently vacuumed to reduce the number of chiggers that may have been deposited.
- Apply a repellent containing DEET to shoes, socks, and trousers before entering chigger infested areas. Caution: some individuals may be sensitive to DEET – always read and follow label directions.
- Immediately after possible exposure to chiggers, take a bath, thoroughly scrubbing the body with hot soapy water. This will kill or dislodge many of the chiggers. The clothes that were worn when the bite(s) occurred should be placed in a plastic bag for temporary storage until they can be laundered.
- When bites begin to itch, one course of treatment is to apply rubbing alcohol, followed by one of the nonprescription local anesthetics. A baking soda paste, calamine lotion, or product such as "After-Bite" or "Chigarid" also will help reduce discomfort. Avoid scratching bites since this only increases irritation and may lead to a secondary infection of the bite.

4.5.4 Rodents

Potential exists for exposure to microbiological hazards such as viruses that may be present in rodent feces. Hantavirus pulmonary syndrome is a deadly disease transmitted by infected rodents through urine, droppings, or saliva. Humans can contract the disease when they breathe in the aerosolized virus. Hantavirus pulmonary syndrome was first recognized in 1993, and has since been identified throughout the United States. The Hantavirus is known to be present in Illinois. The HSM shall be contacted prior to working in areas where rodent droppings have been observed and may be disturbed. No work shall be performed in areas where rodent droppings are observed until the appropriate precautions have been taken.

4.5.5 Poisonous Plants

Three or five leaves radiating from a stem identify poison ivy, poison oak, and poison sumac. Poison ivy is in the form of a vine (and sometimes low-lying) while oak and sumac are bush-like. All of these plants can produce a delayed allergic reaction. The plant tissues have an oleoresin, urushiol, which is active in live, dead, and dried parts. The urushiol may be carried through smoke, dust, contaminated articles, and the hair of animals. Additionally, when operating a chain saw to clear brush in the winter or early spring, saw dust may be contaminated with enough urushiol to cause a severe rash. Symptoms usually occur 24 to

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-6

48 hours after exposure resulting in rashes that itch and blister. Should exposure to any of these plants occur, perform the following:

- First, cleanse exposed skin with generous amounts of isopropyl (rubbing) alcohol. (Avoid returning to the area of the poison ivy on the same day. Alcohol removes your skin's protection along with the urushiol and any new contact will cause the urushiol to penetrate twice as fast.)
- Second, wash skin with water. (Water temperature does not matter; if you're outside, it's likely only cold water will be available.)
- Third, take a regular shower with soap and warm water. Do not use soap before this point because "soap will tend to pick up some of the urushiol from the surface of the skin and move it around."
- Clothes, shoes, tools, and anything else that may have been in contact with the urushiol should be wiped off with alcohol and water. Be sure to wear gloves or otherwise cover your hands while doing this and then discard the hand covering.

The Food and Drug Administration considers over-the-counter topical corticosteroids (commonly called hydrocortisones under brand names such as Cortaid and Lanacort) safe and effective for temporary relief of itching associated with poison ivy. The best preventative measure for poisonous plants is recognition and avoidance. The use of disposable gloves and Tyvek® coveralls is recommended to help prevent skin contact with these plants.

4.5.6 Flying Insects

Flying insects such as mosquitoes, wasps, hornets, and bees may be encountered while working at project sites. Personnel who are allergic to bee stings should notify their supervisor and the SSHO. A voluntary Allergy/Sensitivity Questionnaire (Appendix D) may be completed by employees to help identify personnel who are allergic or sensitive to insect bites or stings. Mosquito bites can be effectively prevented by the use of insect repellants containing DEET. Insect repellant containing DEET shall be available to personnel while working on site. Additionally, special insecticide preparations, such as Repel Permanone, shall be available for treating worker's clothing. Commercially prepared ointments for treatment of insect bites and bee stings shall be available on site. All personnel shall immediately report any bee stings to their supervisor and the SSHO.

4.5.7 Spiders

Personnel shall be alert to the potential for spider bites. Spiders sometimes establish residence in dark places, stored clothing, and PPE. It is advisable for personnel to inspect

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-6

clothing and PPE for spiders prior to donning. If a spider bite is sustained, personnel shall report it to the SSHO.

4.5.8 Snakes

In North America the venomous snakes are rattlesnakes, copperheads, water moccasins and coral snakes. In Texas, rattlesnakes and copperheads are the most prevalent venomous snakes. Snakes typically are found in underbrush and tall grassy areas. Do not attempt to catch a snake.

If a person is bitten by a snake, wash and immobilize the injured area, keeping it lower than the heart if possible. Seek medical attention immediately and notify the SSHO.

4.5.9 Sunburn

Personnel working in direct sunlight, are encouraged to wear wide-brim hats (where hard hats are not a requirement) and apply sunscreen to all unprotected skin surfaces. The benefits of preventing sunburn and skin cancer are self-evident. Sunscreen will be provided for use by project personnel while working on site.

4.5.10 Inclement Weather

Inclement weather can pose hazards to project personnel. The Construction Manger or SSHO will evaluate weather conditions each day and take the appropriate precautions to minimize the hazards associated with the weather. Additional information on severe weather is provided in Section 11.9.

4.5.11 High Winds

If high winds are anticipated or underway, the following precautions shall be taken:

- Secure lightweight or loose items.
- Avoid handling items with large surface areas, such as plywood and polyethylene sheeting.
- Use caution and keep a firm grip when opening doors.
- Wear dust proof goggles if dust and soil particles are airborne.
- If cranes are being used, follow manufacturer recommendations for operating in wind.

4.5.12 Heavy Rain

Most outdoor activities will be suspended during heavy rain. Personnel shall not work outdoors if heavy rain is accompanied by lightning (Section 11.9.2). Personnel shall exit all

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-6

excavations until inspected by a competent person; excavations shall be inspected with a higher frequency during periods of heavy rain. Electric tools and equipment shall not be used outdoors while raining, unless designed for use under wet conditions.

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-6

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-6

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5.0 PERSONAL PROTECTIVE EQUIPMENT

When engineering and administrative controls are not feasible or adequate to protect personnel from the hazards associated with project activities, PPE use will be required.

5.1 Levels of Protection

The following are general and typical descriptions of the PPE that will be required during project activities. The U.S. Environmental Protection Agency terminology for levels of PPE is used: Levels A, B, C, and D.

5.1.1 Level A Protection

Level A protection use is not anticipated during this project.

5.1.2 Level B Protection

Level B protection use is not anticipated during this project; however, Level B protection use may be required during activities when engineering controls are necessary but ineffective at maintaining the concentration of hazardous substances to below action levels in the work area and/or breathing zone of personnel. Level B protection use may also be required for Confined Space Entries. The HSM shall be contacted prior to all Confined Space Entries.

Level B PPE, in general, consists of the following:

- Supplied air respirator (SAR): airline respirators with 5-minute egress bottles or self-contained breathing apparatus.
- Work clothing as prescribed by weather.
- Hard hats meeting ANSI Z89.1 specifications.
- Safety-toed work boots meeting ANSI Z41 specifications.
- Nitrile surgical gloves (inner or double layer).
- Chemical gloves (outer, as necessary).
- Disposable Tyvek® coveralls with hoods, elastic wrists, and ankles (as necessary).
- Tychem® SL coveralls with hoods, elastic wrists, and ankles (if contact with light non-aqueous phase liquid [LNAPL] or dense nonaqueous phase liquid [DNAPL] is possible).
- Tychem® QC coveralls with hoods, elastic wrists, and ankles (if contact with slightly contaminated groundwater or slightly contaminated wet soil is possible).

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-6

- Chemical resistant boot covers and/or outer boots (polyvinyl chloride [PVC]/latex/neoprene when there is potential for shoe/boot contact with contaminated soil or water).
- Hearing protection (if necessary or required).
- High visibility vests (when working near vehicular traffic).
- Splash shield (if necessary).
- Type III or Type V personal flotation device (PFD) (when working next to or over water and a drowning hazard exists).
- Work gloves, such as leather, cotton, or other material that provides cut/abrasion resistance (as necessary).

5.1.3 Level C Personal Protective Equipment

Level C PPE shall be worn by personnel if air monitoring action levels are exceeded, or as directed by the SSHO. Level C protection generally consists of the following PPE:

- Full-face air purifying respirator (APR) with NIOSH-approved combination high efficiency particulate air/organic vapor cartridges.
- Work clothing as prescribed by weather.
- Hard hats meeting ANSI Z89.1 specifications.
- Safety-toed work boots meeting ANSI Z41 specifications.
- Nitrile surgical gloves (inner or double layer).
- Chemical gloves (outer, as necessary).
- Disposable Tyvek® coveralls with hoods, elastic wrists, and ankles (as necessary).
- Tychem® SL coveralls with hoods, elastic wrists, and ankles (if contact with LNAPL or DNAPL is possible).
- Tychem® QC coveralls with hoods, elastic wrists, and ankles (if contact with slightly contaminated groundwater or slightly contaminated wet soil is possible).
- Chemical resistant boot covers and/or outer boots (PVC/latex/neoprene when there is potential for shoe/boot contact with contaminated soil or water).
- Hearing protection (if necessary or required).
- High visibility vests (when working near vehicular traffic).
- Splash shield (if necessary).

- Type III or Type V PFD (when working next to or over water and a drowning hazard exists).
- Work gloves, such as leather, cotton, or other material that provides cut/abrasion resistance (as necessary).

5.1.4 Level D – Modified Protection

Level D – modified PPE shall be worn by personnel for certain tasks or as directed by the SSHO. Level D – modified protection generally consists of the following PPE:

- Work clothing as prescribed by weather.
- Hard hats meeting ANSI Z89.1 specifications.
- Safety-toed work boots meeting ANSI Z41 specifications.
- Safety glasses with side shields meeting ANSI Z87.1 specifications.
- Nitrile surgical gloves (inner or double layer).
- Chemical gloves (outer, as necessary).
- Disposable Tyvek® coveralls with hoods, elastic wrists, and ankles (as necessary).
- Tychem® SL coveralls with hoods, elastic wrists, and ankles (if contact with LNAPL or DNAPL is possible).
- Tychem® QC coveralls with hoods, elastic wrists, and ankles (if contact with slightly contaminated groundwater or slightly contaminated wet soil is possible).
- Chemical resistant boot covers and/or outer boots (PVC/latex/neoprene when there is potential for shoe/boot contact with contaminated soil or water).
- Hearing protection (if necessary or required).
- High visibility vests (when working near vehicular traffic).
- Splash shield (if necessary).
- Type III or Type V PFD (when working next to or over water and a drowning hazard exists).
- Work gloves, such as leather, cotton, or other material that provides cut/abrasion resistance (as necessary).

Employees working in areas where electrical hazards are present shall be provided with, and shall use, protective equipment as required by Section 130.7 of NFPA 70 E (2004) that is

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-6

designed and constructed for the specific part of the body to be protected and for the work to be performed.

5.1.5 Level D Protection

Level D protection is the minimum level of protection that will be used for activities at the project. Level D PPE shall, at a minimum, consist of:

- Safety-toed work boots meeting ANSI Z41 specifications.
- Safety glasses with side shields meeting ANSI Z87.1 specifications.
- Hard hats meeting ANSI Z89.1 specifications.
- Hearing protection (if necessary or required).
- High visibility vests (when working near vehicular traffic).
- Type III or Type V PFD (when working next to or over water and a drowning hazard exists).
- Work gloves, such as leather, cotton, or other material that provides cut/abrasion resistance (as necessary).

5.2 Respiratory Protection

Respiratory protection equipment shall be NIOSH-approved and respirator use will conform to ANSI Z88.2 and OSHA 29 CFR 1910.134 requirements. Shaw Procedure No. HS601, "Respiratory Protection Program," details the medical qualification and training requirements, as well as the selection, use, inspection, cleaning, maintenance, storage, and fit testing of respiratory protection equipment. This procedure complies with the requirements contained within 29 CFR 1910.134.

All personnel (including visitors) using respiratory protection, shall possess a written opinion by the medical examiner of the person's ability to use the necessary respiratory protective equipment and shall have successfully passed a respirator fit test (Section 5.2.3) in accordance with Shaw Procedure No. HS601 within the last 12 months. Fit testing and any training related to respiratory protection for site personnel will be documented on the Training Acknowledgment Form (Appendix D).

5.2.1 Respirator Cartridge Change-out Schedule

The cartridge change-out schedule is largely based on the concentrations of the site contaminants. The cartridge change-out schedule shall be determined for each task by the HSM or SSHO and documented on the Job Safety Analysis. In general, workers will change

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-6

the filter cartridges when breathing resistance is noted or when workers notice any odor, irritation, or discomfort. Cartridges shall be changed at a minimum of once per day.

5.2.2 Respirator Inspection and Cleaning

Respirators shall be checked periodically by a qualified individual and inspected before each use by the wearer. All respirators and associated equipment will be decontaminated and hygienically cleaned after each use.

5.2.3 Respirator Fit Testing

Annual respirator fit tests are required of all personnel wearing negative-pressure respirators. The test will use isoamyl acetate or irritant smoke. The fit test must be for the style and size of the respirator to be used. Quantitative fit-testing is required for use of respirators in chemical environments where the respirator effective use limit exceeds 10 (exposure of 1 ppm inside the respirator for 10 ppm outside the respirator). Therefore, quantitative fit-testing is dependent on the PEL/TLV of the chemical substance involved. Quantitative fit-testing is required for potential exposure to airborne particulate levels that exceed 10 times the established PEL/TLV.

5.2.4 Facial Hair

No personnel who have facial hair, which interferes with the respirator's sealing surface, will be permitted to wear a respirator and will not be permitted to work in areas requiring respirator use.

5.2.5 Corrective Lenses

Normal eyeglasses cannot be worn under full-face respirators because the temple bars interfere with the respirator's sealing surfaces. For workers requiring corrective lenses, special spectacles designed for use with respirators will be provided.

5.2.6 Medical Certification

Only workers who have been certified by a physician as being physically capable of respirator usage will be issued a respirator. Personnel unable to pass a respiratory fit test or without medical clearance for respirator use will not be permitted to enter or work in areas on site that require respiratory protection. Employees will receive a written physicians opinion that they are fit for general hazardous waste operations as per 29 CFR 1910.120(f)(7).

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-6

5.3 Activity-Specific Levels of Protection

The required level of personal protection is specific to the activity being conducted and are outlined in Table 3. Levels of PPE are subject to change or to modification. Upgrading of PPE may occur when air monitoring action levels are exceeded or when specified by the SSHO. Levels of PPE shall not be downgraded without prior approval from the HSM.

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-6

6.0 SITE CONTROL AND WORK ZONES

The purpose of site control is to minimize chemical exposures to workers, protect the public from hazards due to site activities, and prevent vandalism. The work areas that pose chemical and physical hazards to personnel may be regarded as regulated or restricted. To prevent both exposures to unprotected personnel and migration of contamination due to tracking by personnel or equipment, work areas known to contain contamination will be clearly identified.

Shaw Environmental, Inc. will designate work zones at the project as suggested in *Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities* (NIOSH et al., 1985). Regulated work areas are divided into the following three zones:

- EZ;
- CRZ; and
- Support Zone

6.1 Exclusion Zone

The EZ is, in general, the area where chemical, physical, or other hazards occur/exist during project work. All employees are required to follow the established procedures when working in these areas. Fencing, banner tape, signs, or other appropriate means will identify the location of each EZ. An Exclusion Zone Entry log shall be maintained by the SSHO.

6.2 Contamination Reduction Zone

Personnel and equipment decontamination will be performed in the CRZ. All personnel and equipment entering or leaving an EZ will pass through the CRZ in order to prevent cross contamination and for the purpose of accountability. Personal protective equipment will be removed in the CRZ, cleaned, and properly stored or disposed of. All water generated from equipment and personal decontamination will be contained on site and disposed of in an appropriate manner.

6.3 Support Zone

The Support Zone, or clean zone, will be the area outside the EZ and CRZ and within the geographic perimeters of the site. The Support Zone is used for staging of materials, parking of vehicles, office facilities, sanitation facilities, and receipt of deliveries. Eating, drinking, and smoking will only be allowed in this area.

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-6

6.4 Project Site Security

All equipment shall be locked when project personnel are not present.

6.5 Site Entry Requirements

In order to allow an individual into regulated areas of the site (i.e., EZ and CRZ) he/she must meet the following requirements:

- Documentation of completing training requirements as described in Section 9.0 (including review of this SSHP and signing off as such).
- Documentation of completing medical surveillance requirements as described in Section 10.0.
- Respiratory fit testing, as necessary (Section 5.2.3).
- Attend the site-specific safety orientation training session (Section 9.4).
- Review the specific AHA(s) (Appendix C).
- Obtain authorization from SSHO.
- Don the appropriate PPE.
- Sign the site entry log.

6.6 Posting Site

Appropriate warning signs shall be strategically placed to give adequate warning and caution of hazards, instructions, and directions to workers and non-project personnel.

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-6

7.0 PERSONAL HYGIENE AND DECONTAMINATION

Decontamination of equipment and personnel will be performed to limit the migration of contaminants off site and between work zones. Decontamination will generally occur at the edge of an EZ. This section describes the necessary procedures for personnel and equipment decontamination. In general, everything that enters the EZ at the site shall either be decontaminated or properly discarded upon exit from the EZ. All personnel shall enter and exit an EZ through a CRZ.

7.1 Personnel Decontamination

Personnel decontamination consists of discarding disposable PPE, cleaning reusable PPE, and washing the hands and face. All personnel shall wash hand and face prior to eating, drinking, or using tobacco products.

7.1.1 Decontamination Procedures for Level D – Modified Personal Protective Equipment

In general, the personnel decontamination procedure for activities conducted in Level D – modified consists of personnel discarding disposable PPE, washing reusable PPE, then washing hands and face. In some circumstances, disposable wet napkins may be used in the field to wash hands and face until personnel have access to potable water.

7.1.2 Decontamination Procedures for Level C Personal Protective Equipment

The general decontamination sequence for activities conducted at Level C is as follows:

- Wash and rinse outer gloves and boots;
- Remove and rinse hard hat;
- Remove tape at wrist, boot, and hood interface;
- Remove outer gloves and boot covers;
- Remove APR, discard cartridges (if necessary), clean APR;
- Remove coveralls;
- Remove inner gloves; and
- Wash hands and face.

Disposable gloves and coveralls will be removed by turning inside out. Ground cloths, gloves, boot covers, coveralls, and APR cartridges will be placed into plastic trash bags and

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-6

stored at the CRZ for disposal. Respirators shall be cleaned with potable water in the field after each use and shall be washed at the end of the day using a soap and water wash followed by disinfecting. Respirators shall be inspected before each use for damage, missing parts, and proper function. Other reusable protective equipment worn by personnel performing field activities will be rinsed with potable water after each use and will be cleaned at the end of each day in the manner described by the manufacturer. Reusable PPE items will be air dried and properly stored. Air purifying respirators shall be thoroughly dried and placed in plastic bags for storage.

7.1.3 Decontamination Procedures for Level B Personal Protective Equipment

The general decontamination sequence for activities conducted at Level B is as follows:

- Remove SAR;
- Stage mask and/or harness and bottle for cleaning;
- Wash outer gloves and boots;
- Rinse outer gloves and boots;
- Remove tape at wrist, boot, and hood interface;
- Remove outer gloves and boot covers;
- Remove and rinse hard hat;
- Remove coveralls;
- Move to respirator wash area; wash mask and other respirator components;
- Remove inner surgical gloves and discard; and
- Wash hands and face.

Disposable gloves and coveralls will be removed by turning inside out. Ground cloths, gloves, coveralls, and gloves will be placed into plastic trash bags and stored at the CRZ for disposal. Respirators shall be cleaned with potable water in the field after each use and shall be washed at the end of the day using a soap and water wash followed by disinfecting and rinsing. Respirators shall be inspected before each use for damage, missing parts, and proper function. Other reusable PPE worn by personnel performing field activities will be rinsed with potable water after each use and will be cleaned at the end of each day in the manner described by the manufacturer. Reusable PPE items will be air dried and properly stored. All SAR masks shall be thoroughly dried and placed in plastic bags for storage.

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-6

7.2 Suspected Contamination

Any employee suspected of experiencing skin or clothing contact with a hazardous chemical is to remove affected clothing (as modesty permits and exposure warrants), thoroughly wash the affected area(s), and don clean clothes. Following this, he/she shall report to the SSHO.

7.3 Procedures for Equipment Decontamination

Equipment contacting contaminated soil or water will be pressure washed, dry brushed, wet-wiped, or washed with detergent and water. All wash waters will be collected for treatment or disposal, as required. Equipment decontamination will be conducted prior to removing equipment from the work area. The SSHO (or designee) will inspect all equipment leaving the site for adequacy of decontamination (visually clean unless otherwise specified).

7.4 Decontamination Equipment and Supplies

Decontamination equipment and supplies may consist of, but are not limited to, the following:

- Potable water;
- Washtubs;
- Non-phosphate detergent, such as Alconox;
- Brushes, hand sprayers;
- Pressure or steam washer;
- Paper towels;
- Plastic sheeting;
- 5-gallon buckets with lids;
- Garbage bags;
- 55-gallon drums or similar container for collection of decontamination fluids; and
- Labels or paint sticks for marking contents of containers.

7.5 Procedures for Emergency Decontamination

In the event of an accident and if immediate medical treatment is required to save a life, decontamination should be delayed until the victim is stabilized. Proceed with decontamination if it can be performed without interfering with essential life-saving techniques or first aid. If a worker has been exposed to corrosive materials such as sample preservative or battery acid, decontamination must be performed immediately. If an

emergency due to a heat related illness develops, protective clothing should be removed from the victim as soon as possible to reduce further stress.

If decontamination can be done:

- Wash, rinse, and/or remove protective clothing and equipment.

  Note: In the event that corrosive materials get in the eyes, first aid personnel should begin to administer 15-minute eye irrigation with water while EMS personnel are responding to the incident. Similarly, if a corrosive material is on an injured employee's skin, first aid personnel should flush the material off of the skin in conjunction with other first aid procedures being administered. EMS personnel should always be summoned as quickly as possible so as not to delay professional medical treatment.

If decontamination cannot be done:

- Alert medical personnel to potential contamination and instruct them about specific decontamination procedures, if necessary.
- Provide site personnel familiar with the incident at the medical facility.

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-6

8.0 ENVIRONMENTAL AND AMBIENT AIR MONITORING PROGRAM

Environmental and ambient air monitoring shall be conducted to determine the concentrations of toxic/flammable/combustible vapors and gases, oxygen, noise levels, and meteorological conditions. Ambient air monitoring is primarily used to verify that administrative controls, engineering controls, and PPE are effectively preventing harmful exposures to project personnel. Meteorological data shall be obtained as necessary for determining if physiological monitoring should be activated. The results of monitoring shall be conveyed to project personnel.

8.1 Types of Monitoring

The following monitoring will be performed as necessary:

- Real-time air monitoring
- Time-integrated personal air sampling
- Noise surveys/noise dosimetry

Refer to Table 4, "Direct Reading Air Monitoring Requirements."

8.1.1 Real-Time Air Monitoring

Real-time air monitoring will be conducted during intrusive work (drilling and excavation) in areas that are known or suspected to have chemical contamination or in areas where dust is generated. This type of monitoring will also be performed for soil and waste handling, and in special circumstances such as confined space entry, hot work (permitting), or during spills. The SSHO may use the following real-time instrumentation during the project:

- Photoionization detector for volatile organic compounds monitoring.
- Oxygen meter to measure for oxygen deficient/enriched atmospheres.
- Combustible gas indicator for flammable/combustible atmospheres.
- Hydrogen sulfide meter for measuring hydrogen sulfide concentrations.
- Carbon monoxide meter when internal combustion engines are operated near confined spaces while personnel are working in those spaces and in or near other poorly ventilated areas.
- Colorimetric tubes when working in areas that may potentially contain vinyl chloride and/or benzene.

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-6

- Aerosol monitor for measuring dust concentrations from dust generating activities.
- HazmatCAD with Chemical Agent detectors for site with possible CWM

8.1.1.1 Photoionization Detector

A Photovac 2020 photoionization detector, or equivalent, shall be used to determine the concentration of volatile organic compounds in the breathing zone of personnel. Lamp strength will be determined based on the primary contaminants of concern at each remedial site. Monitoring using this instrument will be conducted in the breathing zone of personnel who are performing intrusive work or in some instances, prior to and during confined space entry, during hot work or cleanup of chemical or fuel spills.

8.1.1.2 Combustible Gas Indicator/Oxygen Meter/Hydrogen Sulfide Meter/Carbon Monoxide Meter

An MSA Model FiveStar, or equivalent, shall be used to determine the concentration of flammable gases, oxygen, hydrogen sulfide, and carbon monoxide in the breathing zone of personnel prior to and during activities that include confined space entry, hot work and or cleanup of chemicals or fuel spills.

8.1.1.3 Colorimetric Detector Tubes

Colorimetric tubes may be used to characterize acid/base exposure potentials primarily to benzene and vinyl chloride. As appropriate, the HSM will designate the use of these measurement devices. Based on the chemical of concern identified for the Scott AFB, monitoring for vinyl chloride and benzene may be required at sites where chlorinated and fuel-related volatile organic compounds are known to exist.

The proposed type of colorimetric tubes will be the Drager Multi Glass Detector Model 21/31or Accuro. Colorimetric indicator tubes (detector tubes) that consist of a glass tube impregnated with an indicating chemical. The tube is connected to a piston or bellow pump to draw a know volume of air through the tube. Contaminant reacts with the indicator chemical in the tube, producing a change in color whose length is proportional to the contaminant concentration. The glass tube has degradations in ppm to match the length of stain. A preconditioning filter may precede the detector tube to remove interfering contaminants.

8.1.1.4 Real-Time Aerosol Monitor

Real-time aerosol monitors (MIE pDR-1000 or equivalent) shall be used to monitor dust emissions during and excavation and soil handling activities or other dust generating activities. The real-time aerosol monitors will be placed in the work area (near areas where ground personnel are working) and at the downwind site perimeter. The selected placement

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-6

of these instruments may need to be adjusted throughout the workday to compensate for changes of wind direction.

8.1.2 Real-Time Air Monitoring Action Levels

This section discusses the establishment of action levels of potential vapor and/or gas readings and dust concentrations which are measurable by real-time air monitoring instruments identified above. These action levels are presented in further detail in Table 4, "Direct Reading Air Monitoring Requirements".

Unexpected instrument readings at or above action levels generally warrant the following:

- All personnel will stop work in the area, exit the work area, and assemble upwind.
- Additional monitoring shall be performed to substantiate previous readings
- Implement engineering controls, as feasible.
- Upgrade level of PPE as specified or contact the HSM.

If previous readings are substantiated, engineering controls, such as increasing ventilation, shall be implemented to maintain air quality within specified levels or personnel shall upgrade to the specified level of protection (Table 3, "Task Protection Levels"). If engineering controls, such as increased ventilation, cannot maintain atmospheres to within acceptable qualities, then the HSM shall be contacted prior to continuing work activities.

8.1.2.1 Photoionization Detector Real-Time Action Levels

In general, site-specific volatile organic compound action levels will be established in addendums to this SSHP as the work plans are prepared. The action levels will be based on the most current data available for the media(s) of concern and will be protective of the personnel working at the sites. In the absence of a site-specific addendum for a particular location, the following action levels and response actions for volatile organic compounds will apply:

- Volatile organic chemical concentration greater than 2 ppm but less than 10 ppm sustained for one minute, in the breathing zone. Stop work and evaluate the hazard. Increase the monitoring frequency, provide engineering controls and upgrade PPE.
- Volatile organic chemicals concentration greater than 10 ppm but less than 50 ppm sustained for five seconds, in the breathing zone. Stop work, evaluate the hazard, and contact the HSM.

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-6

- Volatile organic chemicals concentration greater than 50 ppm sustained for one second, in the breathing zone. Stop work, evaluate the hazard, and contact the HSM.

8.1.2.2 Combustible Gas Indicator/Oxygen Meter/Hydrogen Sulfide Meter/Carbon Monoxide Meter

The following action levels are established for the collected air monitoring data:

- ***Combustible Gas.*** Greater than 10 percent of LEL, confirmed instantaneous reading requires personnel to evacuate work area, eliminate ignitions sources, and provide engineering controls such as increasing ventilation.
- ***Carbon Monoxide (work area).*** Sustained carbon monoxide readings exceeding 15 ppm requires personnel to evacuate work area and provide engineering controls such as increasing ventilation or re-positioning internal combustion engine exhausts downwind from work area.
- ***Hydrogen Sulfide (work area).*** Sustained hydrogen sulfide instrument readings exceeding 1 ppm requires personnel to evacuate work area and provide engineering controls such as increasing ventilation.
- ***Carbon Monoxide (work area).*** greater than 15 ppm, confirmed instantaneous reading requires personnel to evacuate work area and provide engineering controls such as increasing ventilation.

8.1.2.3 Colorimetric Detector Tubes

The following action levels are established for the collected air monitoring data:

- ***Vinyl Chloride (work area).*** Greater than 1 PPM, confirmed instantaneous reading requires personnel to evacuate work area and provide engineering controls such as increasing ventilation.
- ***Benzene (work area).*** Greater than 0,25 PPM, confirmed instantaneous reading requires personnel to evacuate work area and provide engineering controls such as increasing ventilation.

8.1.2.4 Real-Time Aerosol Monitor

The real-time aerosol monitors will be set to alarm when the instantaneous aerosol concentration reaches 1 mg/m^3. The alarm will be used to indicate that additional dust control is necessary.

The real-time aerosol monitors are capable of collecting and integrating the aerosol concentrations throughout the workday into a TWA. Aerosol monitors shall be visually

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-6

checked on an hourly basis during soil excavation, soil handling, and other dust generating activities to verify that the TWA remains below 1 mg/m^3. Aerosol monitors registering TWA aerosol concentrations at or above 2.5 mg/m^3 require that workers upgrade to Level C PPE and indicate that additional dust control measures are necessary. Failure to control workday TWA dust concentrations to below 2.5 mg/m^3 shall necessitate ceasing dust generating activities and contacting the Project Manager and HSM for implementing alternate work practices.

The full work shift time integrated concentrations will be evaluated at the conclusion of each workday to verify aerosol concentrations are maintained below action levels.

8.1.3 Personal Air Sampling (Time-Integrated)

Time integrated air sampling may be performed at the discretion of the HSM, if air-monitoring action levels are exceeded (Section 8.1.2). Air samples will be collected and analyzed following OSHA or NIOSH methods. An American Industrial Hygiene Association accredited laboratory shall be used to analyze all personal air samples. The analytical results shall be reported as a TWA concentration for comparison against the OSHA PEL and ACGIH TLV.

8.1.4 Noise Surveys/Noise Dosimetry

The SSHO shall conduct noise monitoring with a Sound Level Meter when it is suspected that equipment is producing noise at sound pressure levels greater than 80 decibels. Areas that are surveyed at sound pressure levels greater than 85 decibels shall be posted as a noise hazard area. Actual employee exposures for personnel working in noise hazard areas shall then be determined with a noise dosimeter. The equipment/area shall then be evaluated to determine if it is feasible to implement engineering controls.

8.2 Calibration, Handling, and Maintenance

All monitoring equipment will be maintained and calibrated by according to the manufacturer's recommendations. Care shall be given by the operator to the handling of instruments so that the accuracy and fitness for use are maintained. Calibration checks on real-time monitoring instruments shall be performed using standards, which are National Institute of Standards and Testing traceable. Calibration for all instruments will be performed and documented before and after each use. Only properly functioning instrumentation shall be used. Instrument maintenance shall be tracked on the Master List of Measuring and Test Equipment form (Appendix D).

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-6

8.3 Record Keeping

The SSHO is responsible for maintaining all air and noise monitoring records. The SSHO shall also obtain copies of air and noise monitoring records generated by subcontractors for inclusion into project files. The following records shall be maintained:

- Date, time, location, and operations performed.
- Meteorological data.
- Equipment identification, calibration data.
- Monitoring/sampling data.
- Engineering controls used to reduce exposure.
- Description of PPE worn.

Specifically, the following air and noise monitoring data and calibration records (Appendix D) shall be maintained, controlled, and retrievable at all times by the SSHO:

- Air Monitoring Data Record.
- Air Sampling Data Record.
- Colorimetric Detector Tube Log.
- Employee Notification of Industrial Hygiene Monitoring Results.
- Real Time Aerosol Monitoring Log.
- Noise Dosimeter Field Data Log.
- Noise Survey Field Data Log.
- Sound Level Meter/Noise Dosimeter Calibration Log.

These records shall be maintained in the field office files by the SSHO and stored in the permanent project files. Any Employee Notification of Industrial Hygiene Monitoring Results records for Shaw personnel will be forwarded to the Shaw HSM for inclusion in personnel files when appropriate. Any Employee Notification of Industrial Hygiene Monitoring Results records for subcontractor personnel will be forwarded to the Subcontractor Human Resources Department (or equivalent safety records personnel) for inclusion in personnel files when appropriate.

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-6

8.4 Quality Assurance/Quality Control

Monitoring instruments shall be properly maintained and calibrated before and after use. The calibration and field maintenance of monitoring instruments shall be performed against known standards and manufacturer specifications. Instruments shall be calibrated to plus or minus 5 percent against the known standards. If instruments cannot be calibrated within this tolerance or if operation becomes erratic, then the instruments shall not be used and dispatched for maintenance by qualified and authorized technicians.

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-6

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-6

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9.0 TRAINING REQUIREMENTS

This section describes general training, safety meetings, site-specific training, hazard communication, first aid and CPR, and other additional training, certification, and licenses needed to work on the project sites.

9.1 General Training

The SSHO is responsible for informing all site personnel and all visitors of the contents of this SSHP and ensuring that each person signs off on the Site Safety and Health Plan Acknowledgment Form (Appendix A). Documentation of certification of training requirements will be reviewed by the SSHO, placed in the project files, and submitted to AFCEE (as required).

9.2 Hazardous Waste Operations Training

All site personnel working in regulated areas at this project will meet the minimum training requirements as specified in 29 CFR 1926.65 and 29 CFR 1910.120. The following criteria are used to determine the level of training required:

- Personnel engaged in hazardous substance removal or other activities, which expose or potentially expose them to hazardous substances and health hazards shall receive a minimum of 40 hours of instruction off site and three days of supervised field experience.
- Personnel who perform limited activities at the site and are not potentially exposed to contaminant levels above the PEL shall receive a minimum of 24 hours of instruction off site, and one day of supervised field experience.

9.2.1 40-Hour Training

The following is a general list of topics covered in the 40-hour course:

- General site safety.
- Chemical, physical, and environmental hazards.
- Key management positions responsible for site safety and health.
- Safety, health, and other hazards (including noise).
- PPE.
- Work practices by which employees can minimize risks from hazards.
- Safe use of engineering controls and equipment on site.

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-6

- Medical surveillance requirements including recognition of signs and symptoms of exposure.
- Hazard communication (Worker Right-to-Know).
- Engineering controls and safe work practices.
- Components of the site Safety and Health Program.
- Decontamination practices for personnel and equipment.
- Confined space entry procedures.
- Emergency response procedures.

9.2.2 24-Hour Training

The same topics presented in the 40-hour course are reviewed in the 24-hour course but with less time and detail spent on each topic.

9.2.3 Supervisory Training

Field supervisory personnel including the SSHO will receive eight additional hours of specialized training. The following topics are discussed:

- Overall safety and health program.
- PPE program.
- Spill containment program.
- Health hazard monitoring procedures and techniques.

9.2.4 Refresher Training

Personnel covered by Sections 9.2.1 and 9.2.2 are required to complete 8 hours of refresher training annually on the following topics:

- Safe work practices.
- Chemical hazard awareness.
- Hearing conservation.
- Hazard communication.
- Respirator refresher.
- Confined space entry refresher.

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-6

9.2.5 Supervised Field Experience

Personnel covered by Section 9.2.1 will receive a minimum of 3 days actual field experience under the direct supervision of a trained, experienced supervisor. A minimum of 1 day is required for personnel who fall under the requirements of Section 9.2.2.

9.2.6 Visitor Training

Site access by personnel making deliveries or performing repairs to utilities, public or government officials, visitors, or local residents will be limited to support areas only. These persons will not be required to comply with the medical and training requirements as defined in this SSHP. Support Zone access will be limited to designated work, delivery, or observation areas to minimize any potential exposure to site contaminants. Site observation areas will be located upwind from the EZ. Weather conditions or other site activities may restrict access to these areas. Authorization for limited site access will be determined on a case-by-case basis by the SSHO in consultation with the HSM, Project Manager, the PDA, and the AFCEE. These personnel will be escorted on-site and will be strictly prohibited from entering the EZ or CRZ.

9.3 Safety Meetings

Employees shall be provided continuing safety and health training to enable them to perform their work in a safe manner.

9.3.1 Morning Safety Meetings

The SSHO shall conduct a safety meeting at the beginning of each shift. The topics discussed at this daily "tailgate" safety meeting shall include safety and health considerations for the day's activities, pertinent aspects of JSAs, necessary PPE, problems encountered, and new operations. Attendance records and meeting notes shall be documented on the Safety Meeting/Training Log form (Appendix D) and are maintained with the project files. At the conclusion of each shift, a debriefing for site employees will be held, if necessary.

9.4 Site-Specific Training

All personnel, including subcontractors, working at the project sites and falling within the scope and application of 29 CFR 1926.65 and 29 CFR 1910.120 shall attend a site specific orientation covering the following topics:

- Purpose and review of this SSHP including emergency response procedures as outlined in Section 11.0.
- The pertinent provisions for safety and health contained in *Safety and Health Requirements Manual EM 385-1-1* (USACE, 2008).

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-6

- Review of applicable AHAs (Appendix C).
- MEC awareness as appropriate.
- Names of personnel responsible for site safety.
- The provisions for medical care and facilities and the names of CPR and first aid trained personnel assigned to the project.
- Morning safety and preparatory meeting procedures.
- Safety and health hazards on site and the means to control/eliminate those hazards.
- Responsibilities for accident prevention and maintaining safe and healthful work environments.
- Stop Work authority.
- Procedures for reporting and correcting unsafe conditions or practices.
- Responsibilities for reporting all accidents and illnesses.
- PPE (use and care).
- Location of safety equipment (i.e., fire extinguishers, first aid kits, eyewash stations, etc.).
- Standard operating procedures, safety rules, and safe work practices for the project.
- Work zones and site control measures.
- Hazard Communication Program (includes discussion of MSDSs on site).
- Lead or asbestos awareness training (as appropriate).
- Hot work procedures.
- Lockout/tagout procedures.
- Fall protection.
- Fire prevention.
- Housekeeping.

The content of the training will be derived from information contained within this SSHP.

9.5 Hazard Communication

All personnel performing field activities involving hazardous operational chemicals shall receive basic hazard communication training, which involves a review of the Shaw written

hazard communication program, MSDSs, container labeling, chemical health hazards, and chemical hazard control procedures. Personnel shall be notified of the hazards of chemical contamination on site (if present) by a review of Section 4.1 of this SSHP. Material Safety Data Sheets for additional materials brought on site shall be reviewed with personnel prior to the use.

9.6 First Aid and Cardiopulmonary Resuscitation

There shall be at least two persons trained and certified in both American Red Cross first aid techniques and CPR on site whenever there are two or more employees working at the project. Those Shaw employees who are trained in first aid techniques and CPR will meet both the training and vaccination requirements of Shaw Procedure No. HS512, "Handling of Blood or Other Potentially Infectious Material."

9.7 Additional Training, Certification, and Licenses

In addition to the training, certification, and licensing previously detailed, the following shall also be required:

- All personnel operating motor vehicles shall hold a valid operator's license.
- All crane operators shall be designated as qualified meeting the specifications in the *Safety and Health Requirements Manual EM 385-1-1* (USACE, 2008). Qualification is to be renewed every 3 years.
- Personnel operating powered industrial trucks (forklifts) shall have a certificate designating them as a qualified operator.
- Any employee operating a power actuated tool shall be qualified as an operator of that tool as specified by the manufacturer. Recertification, if any, shall be obtained as specified by the manufacturer.
- Confined space entry, attendant, and supervisory personnel shall be trained and certified as specified in 29 CFR 1910.146. Confined space rescue personnel shall be trained and certified as specified in 29 CFR 1910.146 and shall practice rescues (from similar types of confined spaces) on an annual basis.
- The certification and recertification requirements for first aid (3 years) and CPR (1 year) are applicable. First aid and CPR training/certification must be made by a reputable provider.
- Personnel working from ladders shall be initially trained as specified in Shaw Procedure No. HS302, "Portable Ladder Safety".

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-6

- Personnel inspecting cranes shall have a certificate designating them as a competent person.
- Personnel inspecting excavations shall have a certificate designating them as a competent person.
- Personnel supervising scaffold erection shall have a certificate designating them as a competent person.
- Personnel operating arc-welding equipment shall have a certificate designating them as a qualified operator.
- Personnel operating gas welding and cutting equipment shall have a certificate designating them as a qualified operator.
- Personnel may only use portable fire extinguishers to extinguish small fires, if the employee has been trained and the employee is confident that the small fire can be safely extinguished.

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-6

10.0 MEDICAL SURVEILLANCE

Shaw utilizes the services of an Occupational Medicine physician for the medical surveillance requirements of all projects. Dr. William Nassetta (below) reviews all Shaw medical examinations and is available for medical consultation on an "as-needed" basis.

Dr. William Nassetta, MD, MPH
CORE Health Networks
12091 Bricksome Avenue
Suite B
Baton Rouge, Louisiana 70816
1-(877) EHS-SHAW (1-877-347-7429)
(225) 614-9561 (office)
(225) 295-4846 (fax)

Subcontractors should also utilize the services of an occupational medicine physician of their choice to meet any medical surveillance requirements.

10.1 Medical Examination

As required by Shaw Procedure No. HS100, "Medical Policies and Procedures," all personnel on site with the potential for exposure to contamination will have successfully completed a pre-placement or periodic/updated physical examination, as required by OSHA regulations.

10.1.1 Pre-Placement Examination

On-site personnel with the potential for exposure to contamination shall undergo a pre-placement examination that complies with 29 CFR 1926.65, 29 CFR 1910.120, and *Safety and Health Requirements Manual EM 385-1-1* (USACE, 2008) requirements for hazardous waste site operations and hazardous, toxic, and radioactive waste activities. Specifically, the following on-site personnel shall be required to participate in this medical surveillance program:

- All employees who are or may be exposed to hazardous substances or health hazards at or above the established PEL, above the published exposure levels for these substances, without regard to the use of respirators, for 30 days or more than a year.
- All employees who wear a respirator for 30 days or more a year or as required by 29 CFR 1910.134.

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-6

- All employees who are injured, become ill, or develop signs or symptoms due to possible overexposure involving hazardous substances or health hazards from an emergency response or hazardous waste operation.
- Members of HAZMAT teams.

Pre-placement medical examinations consist of the following:

- Medical and occupational history questionnaire, which includes information on past gastrointestinal, hematological, renal, cardiovascular, reproductive, immunological, and neurological problems.
- Physical examination.
- Chest X-ray (no more frequently than every 4 years).
- Blood pressure.
- Complete blood count and differential to include hemoglobin and hematocrit determinations, red cell indices, and smear of peripheral morphology.
- Blood urea nitrogen and serum creatinine.
- Sequential Multiple Analyzer Computer Profile (SMAC 24).
- Pulmonary function test.
- Audiogram.
- Electrocardiogram for employees over 35 years old or when other complications indicate the necessity.
- Stress test (as directed by the occupational physician based on electrocardiogram/pulmonary function testing).
- Visual acuity.
- Urinalysis, as necessary, for metals.

The medical surveillance provided to the employee includes a written opinion by the medical examiner of the employee's ability to use the necessary respiratory protective equipment. Any employee found to have a medical condition, which could directly or indirectly be aggravated by exposure to any chemical substance present, or by the use of respiratory equipment will not be employed for the project. A copy of the medical examination shall be provided at the employee's request.

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-6

The employee will be informed of any medical conditions that would result in work restriction or that would prevent them from working at hazardous waste sites.

10.1.2 Annual Exam

Site personnel may be required to receive an annual, updated exam meeting the requirements of 29 CFR 1926.65 and 29 CFR 1910.120. The results of these exams are compared to previous results and the baseline physical to determine if any medical effects due to exposure have occurred. Appropriate actions shall be taken as recommended by the physician should the results indicate an exposure; otherwise, employees are cleared for continued work.

In general, an annual exam is required when the employee meets at least one of the following criteria:

- All employees who are or may be exposed to hazardous substances or health hazards at or above the established PEL, above the published exposure levels for these substances, without regard to the use of respirators, for 30 days or more than a year.
- All employees who wear a respirator for 30 days or more than a year or as required by 29 CFR 1910.134.
- All employees who are injured, become ill or develop signs or symptoms due to possible overexposure involving hazardous substances or health hazards from an emergency response or hazardous waste operation.
- Members of HAZMAT teams.

When an annual examination is required, the frequency shall be at least once every 12 months unless the attending physician believes a longer interval (not greater than biennially) is appropriate.

10.1.3 Exit Exam

Shaw offers exit physical exams (optional) for all employees involved in the medical surveillance program that are leaving the company for any reason.

10.1.4 Other Exams

Periodically, the need arises to conduct medical examinations at times other than those previously discussed. These include reassignment in accordance with 29 CFR 1910.120 (f)(3)(i)(C) and 29 CFR 1926.65 (f)(3)(i)(C), if an employee develops signs or symptoms of illnesses relating to work place exposure, if the physician determines examinations needing to be conducted more often than once a year, and whenever an employee sustains a lost time injury or develops a lost time illness.

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-6

10.1.5 Hearing Conservation Program

Personnel, including subcontractors, shall participate in a continuing, effective hearing conservation program, as described in 29 CFR 1910.95 (c), whenever employee noise exposures equal or exceed an 8-hour TWA sound level of 85 decibels measured on the A scale (slow response) or, equivalently, a dose of 50 percent.

10.2 Subcontractor Requirements

Subcontractors shall certify that their employees have successfully completed a physical examination by a qualified physician on the Training Acknowledgment Form (Appendix D), when applicable. The physical examinations shall meet the requirements of 29 CFR 1926.65 and 29 CFR 1926.103. The subcontractor requirements for physical examination are the same as for Shaw employees (Section 10.1).

10.3 Medical Records

Medical and personal exposure monitoring records will be maintained according to the requirements of 29 CFR 1926.65 and 29 CFR 1910.120 and will be kept for a minimum of 30 years. The confidentiality of employee medical records shall be maintained. The written medical opinion from the occupational physician is kept in site files.

10.4 Medical Restrictions

When a medical care provider identifies a need to restrict work activity, the employee's home office will communicate the restriction to the employee SSHO and HSM. The terms of the restriction will be discussed with the employee and the SSHO. Every attempt will be made to keep the employee working, while not violating the terms of the medical restriction.

10.5 Drug and Alcohol Testing

Shaw is firmly committed to providing employees a safe and healthful workplace, and to providing clients and the public safe and efficient services. Employee involvement with the use, possession, or sale of alcohol, illegal drugs, or any substance represented as a controlled substance creates an impediment toward meeting these commitments and is prohibited.

At no time while on duty may employees use or be under the influence of alcohol, narcotics, intoxicants, or similar mind-altering substances. Employees found under the influence of or consuming such substances will be immediately removed from the job site, as specified in Section 01.C.02 of the *Safety and Health Requirements Manual EM 385-1-1* (USACE, 2008).

All employees of Shaw and its subcontractors are subject to drug and alcohol testing as described in Shaw Procedure No. HS101, "Drug and Alcohol Testing."

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-6

11.0 EMERGENCY RESPONSE PLAN AND CONTINGENCY PROCEDURES

An emergency is defined as a sudden, generally unexpected occurrence demanding immediate action. Emergencies at project sites include accidents, injuries requiring medical care, fires, explosions, spills and significant releases of hazardous substances to the environment, and extreme weather events. Upon mobilization to the project, the Construction Manager shall provide a means for effective emergency communications (landline telephone, cellular phone) prior to commencing site activities.

In the event that an emergency arises, the appropriate immediate response must be taken by the first person to recognize the situation. The field crew shall immediately notify the Construction Manager or SSHO of the incident, and the appropriate emergency service organization shall be contacted. A list of emergency contacts is provided in Table 5. A copy of the emergency telephone numbers and directions to the nearest selected CORE Health Networks network clinic and hospital shall be posted at the project site.

The Project Manager, HSM, and the COR shall be notified of any accident, injury, or illness.

In the case of injury or illness, a trained person will render the proper emergency first aid care. First aid equipment shall be available at the area of fieldwork. Personnel will be notified as to the locations of first aid equipment during the initial safety briefing session.

If the injury or illness is from exposure to a hazardous substance, the MSDS shall be provided to the medical personnel. Material Safety Data Sheets are provided for operational chemicals. The MSDS details first aid procedures to follow in the event an exposure occurs.

Unless the emergency event is extreme and obvious, the decision to cease all field activities and evacuate the site shall be made by the Construction Manager or SSHO. Field personnel will report to the pre-designated area, if possible.

11.1 Personnel Roles/Lines of Authority

The responsibilities of specific project individuals and the coordination of emergency service personnel are defined in the following subsections.

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-6

11.1.1 Construction Manager

At all times during scheduled work activities, a Construction Manager or SSHO will be present on site. This individual will be responsible for implementing these procedures and determining appropriate response actions. Specific responsibilities for the Construction Manager include the following:

- Evaluating and assessing emergency incidents or situations.
- Coordinating response activities on site.
- Informing field personnel of the potential hazards associated with the site.
- Summoning emergency response personnel.
- Notifying the Project Manager and HSM of an emergency situation.
- Verifying that all emergency equipment is routinely inspected and functional.
- Informing the appropriate emergency response agencies of the provisions made herein.
- Evaluating the safety of site personnel in the event of an emergency and providing evacuation coordination if necessary.

The Construction Manager or SSHO will direct all emergency response activities conducted or managed by Shaw.

11.2 List of Emergency Contacts and Notification

Emergency and non-emergency numbers are listed in Table 5. The Scott AFB Fire Department shall be contacted prior to initiating site activities. They shall be frequently advised and notified about upcoming site activities and potential emergencies. This shall be done to ascertain response capabilities and to obtain a response commitment.

The Construction Manager and SSHO will be notified immediately in the event of an emergency. The Construction Manager or SSHO will immediately evaluate the incident and, if necessary, notify emergency response personnel. If not previously notified, the COR will be advised of the situation. Telephone numbers for emergency contact personnel are listed in Table 5 of this SSHP. The list will be maintained with current contacts and telephone numbers, and provided in all project vehicles.

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-6

The information provided to the emergency contact should include the nature of the incident and the exact location. Specifically, the information should include the following:

- Name and telephone number of the individual reporting the incident.
- Location and type of incident.
- Nature of the incident.
- Number and nature of medical injuries.
- Potential for additional risks or dangers.
- Potential off-site risks or dangers.
- Movement or direction of spill/vapor/smoke.
- Response actions currently in progress.
- Estimate of quantity of any released materials.
- Status of incident.
- Other pertinent information.

When reporting spills only (Scott AFB Fire Department), the following information is to be provided:

- Name and telephone number of person making notification.
- Exact location, cause and time of spill or emergency.
- Type and description of emergency.
- Estimate of amount and type of material spilled.
- Extent of actual or potential environmental damage.
- Injuries or property damage, if any.
- Possible hazards to off-post human health and environment.
- Immediate response actions taken.

11.3 Medical Emergency Response

Minor injuries will be treated on site by qualified first aid/CPR providers. Injuries and illnesses that do not require immediate medical care shall be treated at the selected medical care facilities. The EMS shall be summoned in the event of moderate to severe physical injury, which requires immediate emergency care. In all cases, the Construction Manager or

SSHO shall accompany the injured worker to the appropriate medical care facility. Figure 2 indicates the location of the nearest hospital. Figure 3 indicates the location of the nearest CORE Health Networks network clinic. The route to the selected CORE Health Networks network clinic and the hospital shall be available in all project vehicles.

11.4 Personal Exposure or Injury

The following procedures will be implemented in the event of a personal injury (other than first aid only).

11.4.1 Serious Injuries Requiring Transport by Ambulance

The Construction Manager or SSHO will provide any necessary support to emergency responders.

Upon the realization that an individual(s) needs medical care with transport by ambulance, the following procedure will be used when applicable:

- Administer first aid and contact the Construction Manager or SSHO to arrange for dispatch of the EMS.
- Notify the HSM.
- Provide an individual to meet the EMS at the project site entrance, to minimize time in locating the injured worker(s).
- Wait for emergency care, document the event, and maintain communication with the Construction Manager or SSHO.

In the event of a chemical exposure, the following procedures shall be followed after summoning the EMS:

- **Skin Contact:**
  - Flush with water
  - Remove clothing, flush skin
  - Obtain prompt medical attention, as necessary
- **Inhalation:**
  - Remove the person from the area
  - Administer first aid/CPR, as needed
  - Obtain immediate medical attention

- **Ingestion:**
  - Contact the Poison Center for immediate treatment, then obtain immediate medical attention
  - Inducing vomiting may cause further injury to the victim; follow instructions from the MSDS and/or Poison Center
- **Eye Contact:**
  - Flush eyes immediately with water for a minimum of 15 minutes
  - Obtain immediate medical attention

11.5 Fire Control

In the event of a fire or explosion at the site, the following actions shall be implemented:

- Evacuate all personnel to a safe location upwind or crosswind of the incident. Contact the Construction Manager or SSHO.
- Concurrently with the above, contact the Scott AFB Fire Department.
- If personnel are present who have had training in the use of fire extinguishers, use available fire extinguishers to extinguish small fires, if the fire can be safely extinguished.
- Alert EMS about the possibility of fire victims, as appropriate.
- Document the incident in the field logbook and follow the procedures for incident reporting in Section 13.4.

11.6 Spill Prevention and Control

This spill prevention and control section sets forth the procedures for the coordination of and response to potential spills/discharges of hazardous materials or wastes.

11.6.1 Preemptive Measures

The following measures shall be taken to minimize the possibility of spills/discharges:

- Site controls are to be maintained so that only authorized personnel have access to work areas.
- Site personnel will be advised of appropriate spill/discharge control measures.

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-6

- Appropriate secondary containment structures will be used for storage of hazardous materials and wastes on site.
- Storage containment shall be examined daily.

11.6.2 Spill Response

If a hazardous material or waste release is observed at the site, the Construction Manager or SSHO will be immediately notified. The Scott AFB Fire Department shall then be notified by the Construction Manager or SSHO. An assessment will be made of the magnitude and potential impact of the release. If it is safe to do so, trained site personnel will attempt to locate the source of the release, prevent further release, and contain the spilled and/or affected materials as follows:

- The spill or release area will be approached from upwind.
- Hazards will be identified based on available information from witnesses or material identification documents. The potential hazards will be evaluated to determine the proper personal protection levels, methods, and equipment necessary for response.
- Eliminate possible ignition sources for flammable material spills (e.g., turn power off, no smoking).
- As necessary, the release area will be evacuated, isolated, and secured.
- Eliminate routes to water by closing/blocking floor drains and storm drains.
- Work zones, including a decontamination station, shall be set up.
- If possible, spill containment will initially be made without entering the immediate hazard area.
- Entry to the release area will be made by personnel with the PPE, training, methods, and equipment necessary to perform the work. Hazardous spill containment and collection will be performed as follows:
    a. Contain the spill with absorbent socks, booms, granules, or construction of temporary dikes.
    b. Control the spill at the source by closing valves, plugging leaks, up righting containers, over packing containers, or transferring contents of a leaking container.
    c. Collect the spilled material with shovels, pumps, or heavy equipment as necessary.

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-6

d. Contaminated soil or gravel shall be cleaned up as directed by AFCEE. If the determination is made to drum the contaminated media, the spill will be dug out until no further contamination is visible and placed in 55-gallon open head steel drums. The drum then must be marked for proper disposal.

- The decontamination procedures established in Section 7.0 shall be used after the response is complete. Refer to Section 7.5 for information on procedures for emergency decontamination.

If site personnel cannot safely respond to an environmental release, evacuation of the area may be warranted. Upon their arrival at the site, the Construction Manager or SSHO will brief emergency responders of the status and any potential hazards.

11.7 Munitions and Explosives of Concern Discovery

In the event known or suspected MEC is encountered, the following procedures shall be implemented:

- Workers shall flag visibly, for example, up in a tree, next to where the MEC find is located by means of a rag or surveyors flagging. This will enable a MEC Specialist to locate the ordnance/explosive find later.
- Evacuate all personnel to a safe location upwind of the MEC. Contact the Construction Manager or SSHO.
- Secure area against trespassers.
- The Construction Manager or SSHO will notify the Project Manager and HSM.
- The Project Manager will notify the COR to determine the appropriate course of action.
- The work area will remain evacuated until clearance has been given from the Project Manager and COR.

11.8 Site Evacuation Procedures

Voice, radio, or cellular telephone communication may be used to alert site workers and provide special instructions on site evacuation. Personnel shall evacuate to a designated safe, upwind location and perform a “head count.” The Construction Manager or SSHO is to remain in frequent contact for proper execution of the evacuation procedures.

Situations requiring evacuation may include unusually severe weather conditions or fires. In the event of project evacuation, other than weather related, the Scott AFB Fire Department will be notified immediately. A site emergency map that delineates evacuation routes,

emergency air horn locations, first aid kit locations, and rally point(s) shall be included in each site-specific addendum once the or SSHO has physically evaluated the site.

11.9 Adverse Weather Conditions

Personnel should be aware of the possibility for the occurrence of severe weather such as lightning, thunderstorms, high winds, or winter storms/blizzards. Necessary precautions or response, directed by the Construction Manager or SSHO, will be taken in the event of severe weather. Personnel may be advised to leave the project site and take refuge at home or a motel when high winds, heavy rain, or snowstorms are predicted and imminent. Outdoor operations will be suspended when the potential for lightning occurs.

Local weather broadcasts will be monitored by the Construction Manager or SSHO, when the likelihood for severe weather exists. Generally, cellular telephone communication will be utilized to alert crews to threatening weather. A severe weather shelter shall be identified and the location communicated with the crew(s) upon project mobilization.

11.9.1 Tornado Safety

In the event of a tornado, personnel should take cover in a basement, ditch, culvert, or interior room of a strong building. Personnel shall identify the nearest tornado shelter at each active remote work location prior to beginning operations. When a tornado has been sighted, go to your shelter immediately. Stay away from windows, doors, and outside walls.

- In a small building, go to the basement or storm cellar. If there is no basement, go to an interior room on the lower level (bathrooms, closets, interior hallways).
- Interior hallways on the lowest floor are usually safest. Stay away from open spaces and windows.
- Get under a piece of sturdy furniture such as a workbench or heavy table or desk and hold on to it.
- Use arms to protect head and neck.
- If in a trailer or vehicle, get out immediately and go to a more substantial structure.
- If there is no shelter nearby, lie flat in the nearest ditch, ravine, or culvert with your hands shielding your head.
- If in a car, get out and take shelter in a nearby building. Do not attempt to out-drive a tornado since they are erratic and move swiftly.
- Personnel should be aware that ditches and culverts may fill up with water quickly and should only use these as shelters as a last resort.

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-6

11.9.2 Lightning Safety

Outdoor activities will be suspended when the potential for lightning occurs. The following measures, offered by the National Lightning Safety Institute of Louisville, Colorado shall be taken to minimize the possibility of injury to personnel by lightning:

- The Construction Manager or SSHO is responsible to monitor weather conditions.
- Upon seeing lightning or hearing thunder, outdoor activities shall be suspended and personnel shall be evacuated to safe areas (i.e., inside vehicles or buildings). When clouds with dark bases and wind speeds pick up, anticipate thunderstorms. Those who have been struck by lightning did not seek cover in a timely fashion.
- The Construction Manager or SSHO will continue to monitor weather conditions.
- Outdoor activities may resume 30-minutes after the last bolt of lightning was observed and the last clap of thunder was heard.

People who have been struck by lightning do not carry an electrical charge and are safe to handle. Apply first aid immediately, if you are qualified to do so. Get emergency help promptly.

SAFE AREAS INCLUDE:

- Fully enclosed metal-topped vehicles with windows up.
- Substantial and permanent buildings.

UNSAFE AREAS INCLUDE:

- Small structures including huts and rain shelters.
- Nearby metallic objects like fences, gates, instrumentation and electrical equipment, wires, and power poles.

The following shall be avoided when lightning is in the area:

- Trees.
- Water.
- Open fields.
- Using hard-wired telephones and headsets.

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-6

If hopelessly isolated from shelter during close-in lightning, adopt a low crouching position with feet together (up on toes, if possible) and hands on ears. If hair stands on end or rises on back of neck, a lightning strike is imminent.

Remember the warning phrase from the National Lightning Safety Institute: "If you can see it (lightning), flee it; if you can hear it (thunder), clear it."

11.10 Emergency Equipment

At a minimum, the following emergency equipment shall be maintained at the project site(s):

- Fire extinguishers.
- First aid kits.
- Blood-borne pathogen control supplies or kit.
- Emergency eyewash, if corrosive materials are being used.
- Spill control.
- Communication devices.

This equipment is to be inspected by the SSHO on a monthly basis to verify that they are in good condition, ready to use, and easily accessible. Note: a seal may be maintained on first aid kits to indicate if the kit has been accessed within the preceding week. The weekly inspection of the first aid kit will only be necessary if the seal has been broken.

11.11 Critique and Follow-up of Emergency Procedures

The COR shall be verbally notified immediately and receive a written notification within 24 hours of all accidents or incidents including releases, fires, or explosions. The report shall include the following items:

- Name, organization, telephone number, and location of the contractor.
- Name and title of the person(s) reporting.
- Date and time of accident/incident.
- Location of accident/incident.
- Brief summary of accident/incident including pertinent details, such as, type of operation ongoing at time of accident.
- Cause of accident/incident, if known.
- Casualties.

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-6

- Details of any contamination.
- Estimated property damage, if applicable.
- Nature of damage, effect on contract schedule.
- Action taken by Shaw to maximize safety and security.
- Other damage or injuries sustained (public or private).

The Construction Manager and/or SSHO will investigate the cause of the incident to prevent its re-occurrence. The investigation should begin as soon as practical after the incident is under control but not later than the first workday after the incident. Investigations will follow the procedures described below:

- Interview witnesses and participants as soon as possible or practical.
- Determine the chronological sequence of events (opinions as to cause should not be solicited at this time).
- Note any movement, sounds, noises, or other sensory perceptions experienced by the participants or witnesses.
- Obtain weather data.
- Ascertain the location and position of all switches, controls, etc.
- Verify the condition of all safeguards.
- Determine if a revision to emergency procedures is warranted.

After the facts have been collected, causal factors should be identified and controlled/eliminated.

11.12 Hospital Information

The nearest local hospital for the project is:

St Elizabeth's Hospital
211 South Third Street
Belleville, Illinois 62220
618-234-2120

The distance to the hospital is approximately 10.2 miles from the Scott AFB, with a travel time of approximately 20 minutes. The route map to the hospital is depicted in Figure 2.

11.13 Medical Services Clinic Information

The CORE Health Networks network clinic for the project is:

Midwest Occupational Medicine, Ltd
4550 Memorial Dr.
Belleville, Illinois 62226
(618) 257-0063

The distance to the clinic is approximately 13.5 miles from Scott AFB, with a travel time of approximately 20 minutes. The route map to the clinic is depicted in Figure 3.

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-6

12.0 BLOOD-BORNE PATHOGEN EXPOSURE CONTROL PLAN

Blood-borne pathogens are microorganisms (i.e., bacteria, virus) sometimes present in blood and certain body fluids, which are capable of causing human disease or death. These pathogens can also be present on objects and surfaces that have had contact with infected blood or certain body fluids. Blood-borne pathogens are also capable of causing human disease or death to unprotected people who are exposed to infected blood or body fluids. Diseases caused by blood-borne pathogens include, but are not limited to, hepatitis A, hepatitis B, hepatitis C, malaria, acquired immunodeficiency syndrome (AIDS), and other sexually transmitted diseases. The most significant of these and of greatest concern are hepatitis B and AIDS.

Hepatitis B is a serious disease caused by the hepatitis B virus (HBV), which attacks the liver. The virus can cause lifelong infection, cirrhosis (scarring) of the liver, liver cancer, liver failure, and death. Exposure symptoms include fever, fatigue, nausea, vomiting, muscle aches, loss of appetite, and jaundice (yellowing of the eyes or skin). Hepatitis diagnosis is difficult because some symptoms are similar to the flu and may remain mild for an extended period. The HBV can remain infectious for up to 10 days, even in dried blood. Hepatitis B vaccine is available for all age groups to prevent HBV infection.

Human immunodeficiency virus (HIV) is the virus that causes AIDS. People with HIV have what is called HIV infection. Some of these people will develop AIDS because of their HIV infection. Humans may be infected with HIV for many years without experiencing any symptoms. Upon development of AIDS, symptoms may include weight loss, skin lesions, dry cough, fever, fatigue, diarrhea, swelling of the lymph glands, and death. Presently, no cure exists for HIV or AIDS, and no vaccination is currently available.

A hazard exists for blood and other bodily fluids to be infected with dangerous, infectious pathogens. Employees could become infected if they are exposed to these blood-borne pathogens.

The purpose of this Blood-borne Pathogen Exposure Control Plan is to provide the information, procedures, and requirements necessary to prevent employee exposure to blood-borne pathogens.

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-6

12.1 Regulatory, Requirement, and Policy Compliance

This Blood-borne Pathogen Exposure Control Plan has been prepared in compliance with:

- 29 CFR 1910.1030, Blood-borne Pathogens.
- *Safety and Health Requirements Manual EM 385-1-1,* Section A.03.06 (USACE, 2008).
- Shaw Procedure No. HS512, "Handling of Blood or other Infectious Material".

12.2 Exposure Determination

The OSHA requires employers to perform an exposure determination, identifying employees who may incur occupational exposure to blood or other potentially infectious materials. The exposure determination is made without regard to the use of PPE. For exposure determination purposes, employees are considered to be exposed, even if they wear PPE.

In general, it is anticipated that project activities will not present a high risk of employee exposure to blood or other body fluids. An exception to this would be under circumstances when personnel administer first aid care or CPR to injured workers and when personnel clean-up areas and equipment that may have been exposed to blood because of the incident. In these cases, there is reasonable potential for employee skin, eye, mucous membrane, or potential contact with blood or other bodily fluids.

The OSHA requires a listing of job classifications with identification of tasks performed in which some employees may have potential for occupational exposure. This requirement is for employees to clearly understand the tasks that they may perform have a potential for occupational exposure to infectious materials. The job classifications and associated tasks with an exposure potential are as follows:

- Construction Manager—Administer first aid or CPR; decontaminate or disinfect surfaces and articles that have contacted infectious materials, and prepare biohazard waste for temporary storage and subsequent disposal.
- Site Safety and Health Officer—Administer first aid or CPR; decontaminate or disinfect surfaces and articles that have contacted infectious materials, and prepare biohazard waste for temporary storage and subsequent disposal.

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-6

- Subcontractor Supervisors—Administer first aid or CPR; decontaminate or disinfect surfaces and articles that have contacted infectious materials, and prepare biohazard waste for temporary storage and subsequent disposal.
- Laborer—Administer first aid or CPR; decontaminate or disinfect surfaces and articles that have contacted infectious materials, and prepare biohazard waste for temporary storage and subsequent disposal.

These employees have potential for exposure to blood-borne pathogens when administering first aid or CPR and when performing post-accident clean-up operations due to the following:

- Contact or absorption of blood or blood-contaminated objects through open or broken skin (i.e., cuts, scratches, and rashes).
- Blood splashes to their eyes, nose, or mouth, or other mucous membranes.
- Punctures through the skin with a contaminated sharp object (i.e., scissors).

Workers can reduce their risk of contacting blood-borne pathogens by implementing the recommended work practices (outlined in this plan) before, during, and after responding to emergency medical incidents primarily involving personal injuries.

12.3 Schedule of Implementation

The procedures in this Blood-borne Pathogen Exposure Control Plan are to be implemented immediately.

Implementation includes:

- Verifying personnel who are available to voluntarily provide first aid care and CPR hold a valid training certificate from a reputable training provider (American Red Cross or American Heart Association).

  The Construction Manager or SSHO is responsible for verifying that an appropriate number of personnel have been trained in and hold valid certification to perform first aid and CPR.

- Verifying that personnel voluntarily providing first aid care, CPR, post-accident clean-up operations, and biohazard waste handling have received the specialized training meeting the requirements of 29 CFR 1910.1030; *Safety and Health Requirements Manual EM 385-1-1*, Section A.03.06 (USACE, 2008); and Shaw Procedure No. HS512, “Handling of Blood or other Infectious Material”. This

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-6

training is required for applicable personnel prior to the commencement of work and at least annually thereafter. This training shall cover the following elements:

- Copy of 29 CFR 1910.1030 and this procedure including an explanation of the contents.
- General explanation of the epidemiology and symptoms of blood-borne diseases.
- Explanation of the modes of transmission of blood-borne pathogens.
- Explanation of the appropriate methods for recognizing tasks and other activities that may involve exposure to blood and other potentially infectious materials.
- Explanation of the use and limitations of practices that will prevent or reduce exposure including appropriate engineering controls, work practices, and PPE.
- Information of the types, proper use, location, removal, handling, decontamination, and/or disposal of PPE.
- Explanation of the basis for selection of PPE.
- Information on the hepatitis B vaccine, including information on its efficacy, safety, and the benefits of being vaccinated.
- Information on the appropriate actions to take and persons to contact in an emergency
- Explanation of the procedure to follow if an exposure incident occurs including the method of reporting the incident and the medical follow-up that will be made available
- Information on the medical counseling that is provided for exposed individuals
- Explanation of required signs and labels

The Construction Manager or SSHO is responsible for verifying that this blood-borne pathogen training has occurred.

- Verifying that engineering controls are readily available at the project for use in an emergency. Engineering controls for this project include the following:
  - Red-bags for temporary storage of contaminated PPE and cleaning materials.
  - Appropriately labeled, 30-gallon hard-plastic container for the temporary storage of red-bagged waste.

- Whisk-broom and dust pan for cleaning up contaminated broken glass.
- Gallon container of Clorox® household bleach.
- Large utility sponge.
- Rolls of paper towels.
- Container of liquid disinfectant hand soap.
- "Biohazard" warning labels.
- Individually packaged disinfectant towelettes.
- CPR barriers.

The Construction Manager or SSHO is responsible for verifying that this inventory of engineering controls is readily available at the project site for emergency use.

Personal protective equipment is necessary to prevent employee exposures to infectious materials. The necessary PPE, which shall be maintained separately for use in an emergency include the following:

- P-100 Particulate filtering face-piece respirator (3-M 8293 or equivalent).
- Face-shields with ratcheting head-suspension.
- Safety glasses with clear lens.
- Disposable nitrile examination gloves.
- PVC Monkey Grip work gloves.
- Poly-coated or Saran-coated disposable Tyvek® coveralls with attached hood.
- Vinyl or latex disposable boot covers.
- Fluid-resistant surgical hoods.

The Construction Manager or SSHO is responsible for verifying that the above inventory of PPE is readily available at the project site for emergency use.

12.4 Work Practice Controls

Work practice controls reduce the likelihood of exposure by altering the manner in which a task is performed. The work practice controls outlined in this section are applicable to the administration of first aid and the subsequent clean-up operations.

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-6

Work practice controls shall be instituted whenever there is potential for employee contact with blood and bodily fluid. Situational examples where these controls are to be implemented include, but are not limited to:

- The voluntary administration of first aid care, such as application of bandages to minor or major cuts and abrasions of another person. This care may allow for contact with sores, wounds, broken skin, blood, or other bodily fluids.
- The voluntary administration of first aid care, such as providing CPR.
- Clean-up activities involving handling soiled articles (e.g., gauze, bandages, compresses, etc.) and the decontamination or disinfecting of surfaces and articles that have contacted potentially infectious materials, such as blood or other bodily fluids.
- Prepare biohazard waste for temporary storage and subsequent disposal.

Based upon professional judgment, an employee may choose to temporarily forego the use of PPE if the employee determines that the use of the PPE will further jeopardize his well-being or that of the injured worker. This limited application must be carefully evaluated and considered by the employee. If this situation does occur, Shaw will investigate and document the circumstances in an effort to provide alternative means to avoid further occurrence.

The following are specific work practice controls that shall be implemented in the above noted situations or whenever an employee determines that the implementation of these work practices is prudent or necessary:

- The appropriate PPE shall be donned prior to engaging in any activities that have the potential for employee contact with potentially infectious materials, such as blood or other bodily fluids.
- Hands and face will be washed as soon as possible after engaging in any activities that have the potential for employee contact with potentially infectious materials, such as blood or other bodily fluids. If wash facilities are not readily available, individually packaged disinfectant towelettes may be used in the interim.
- Eating, drinking, or smoking is not allowed in any work area where a potential exists for occupational exposure to blood-borne pathogens.
- Open wounds or cuts shall be promptly bandaged.
- Work surfaces and areas shall be cleaned and disinfected immediately after being contacted by potentially infectious materials. A 10 percent bleach solution (one part bleach added to nine parts water) shall be applied and allowed to have a

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-6

contact time of 15 minutes. Non-disposable articles, equipment, or materials contaminated with potentially infectious materials shall be similarly cleaned/disinfected prior to reuse.

- All bins, pails, cans, and similar receptacles intended for reuse, which have become contaminated with blood or other potentially infectious materials shall be cleaned and disinfected immediately after use.
- Broken glassware, which may be contaminated, shall not be picked up directly by hand. Broken glass shall be picked-up using mechanical means, such as by using a whiskbroom and dustpan.
- All PPE shall be immediately removed upon leaving the potentially contaminated work area, or as soon as possible if visibly contaminated. The contaminated PPE shall be placed in a labeled "red-bag" and then placed in the 30-gallon container for temporary storage and subsequent disposal.
- Any clothing that has contacted blood or other potentially infectious fluids shall be removed as soon as possible.
- Any clothing that has contacted blood or infectious fluids shall be placed in a labeled "red-bag" and then placed in the 30-gallon container for temporary storage and subsequent disposal.

12.4.1 Universal Precautions

Universal precautions is a method of infection control, which operates on the assumption that all human blood and bodily fluids are to be treated as if they are known to be infectious for HIV, HBV, or other blood-borne pathogens. Universal precautions shall be observed to prevent contact with blood or other potentially infectious materials. Universal precautions consist of the following practices:

- All workers shall routinely use appropriate barrier precautions to prevent skin and mucous-membrane exposure when contact with blood or other bodily fluids is anticipated. Gloves should be worn for touching blood and bodily fluids, mucous membranes, or non-intact skin and for handling items or surfaces contaminated with blood or body fluids. Masks and protective eyewear or face shields shall be worn during procedures that are likely to generate droplets of blood or other body fluids to prevent exposure of mucous membranes of the mouth, nose, and eyes. Protective suits shall be worn during procedures that are likely to generate splashes of blood or other bodily fluids.

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-6

- Hands and other skin surfaces shall be washed immediately and thoroughly if contaminated with blood or other bodily fluids. Hands shall be washed immediately after gloves are removed, using a disinfectant soap.
- Cardiopulmonary resuscitation barriers or other ventilation devices should be available for use in areas in which the need for resuscitation is foreseeable.
- Workers who have exudative lesions or weeping dermatitis shall be excluded from handling potentially infectious materials until the condition resolves.
- Pregnant workers should be especially familiar with and strictly adhere to precautions to minimize the risk of transmission.

12.4.2 Personal Protective Equipment

The proper use of PPE is an effective work practice control. The following requirements for PPE are mandatory whenever there is potential for employee contact with blood and bodily fluid:

- Inspect PPE prior to use to verify it is in good working order and without defects.
- Blood or other potentially infectious materials.
- Disposable (single use) gloves, such as surgical or examination gloves shall be replaced when visibly soiled, torn, punctured, or when their ability to function as a barrier is compromised. Gloves should be changed as soon as possible after contact with blood or bodily fluids. After use, remove gloves from top to bottom inside out, not allowing unprotected skin to contact the exterior of the gloves. Hands and other skin surfaces shall be washed with disinfectant soap immediately after care has been rendered or clean up has been completed. Gloves reduce the incidence of blood contamination of hands, but they cannot prevent penetrating injuries caused by sharp objects. Do not reuse gloves once removed. A CPR barrier shall be used when administering CPR.
- Protection for the eyes, face, hands, body, feet, and against inhalation hazards shall be provided as appropriate for each job.
- Gloves shall be worn when employees have the potential for direct skin contact with or when handling items or surfaces soiled with blood, other potentially infectious materials, mucous membranes, and non-intact skin.
- Polyvinyl chloride work gloves may be disinfected for immediate reuse if the integrity of the glove is not compromised; however, gloves must be discarded if they are cracked, peeling, discolored, torn, punctured, or exhibit other signs of

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-6

deterioration. All gloves shall be discarded at the conclusion of the activity or at the end of the shift – whichever comes first.

- Masks and eye protection or chin-length face shields shall be worn whenever splashes, spray, splatter, droplets, or aerosols of blood or other potentially infectious materials may be generated and there is a potential for eye, nose, or mouth contamination.
- Fluid-resistant clothing (e.g., coated Tyvek® suits) shall be worn if there is a potential for splashing or spraying of blood or potentially infectious materials. Coated Tyvek® coveralls shall also be worn during clean-up activities involving decontamination or disinfecting of surfaces and articles that have contacted potentially infectious materials, and when preparing biohazard waste for temporary storage and subsequent disposal.
- Fluid-resistant clothing (e.g., coated Tyvek® suits) shall be worn if there is a potential for clothing becoming soaked with blood or other potentially infectious materials.
- Surgical caps or hoods shall be worn if there is a potential for splashing or splattering of blood or potentially infectious materials on the head.
- Fluid-proof coverings shall be worn if there is a potential for shoes or boots to contact blood or other potentially infectious materials.
- Disposable nitrile or vinyl gloves shall be worn for touching blood and bodily fluids requiring universal precautions, mucous membranes, or non-intact skin and for handling items or surfaces soiled with blood or bodily fluids to which universal precautions apply.

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-6

12.4.3 Waste Handling

All wastes generated because of administering emergency first aid care and the subsequent clean-up activities shall be placed in red-bags, labeled as a biohazard, and kept separately from other trash. Wastes used in medical emergency treatment (i.e., gloves, towels, and gauze) shall also be bagged and stored in an identical manner. Red-bagged, biohazard waste shall be placed in the 30-gallon collection container, labeled, and secured for temporary storage and disposal. Additional containers shall be obtained as needed and containers shall not be overfilled.

12.5 Biohazard Waste Disposal

A Shaw Transportation and Disposal Coordinator shall be contacted to arrange for proper disposal of biohazard wastes. The waste shall remain secured on site in labeled container(s)

until disposal arrangements have been made at an approved disposal facility. Disposal of the infectious waste container(s) shall be in accordance with applicable local, state, and federal regulations.

12.6 Medical Requirements

Employees receive medical evaluations in accordance with Shaw Procedure No. HS100, "Medical Policies and Procedures". The medical requirements of this exposure control plan include provisions for vaccinations to all exposed employees as well as for post-exposure procedures and evaluations. All employees with potential for occupational exposure to blood borne pathogens shall receive the hepatitis B vaccination and tetanus vaccination prior to workplace exposure, unless they read and sign the Hepatitis B and Tetanus Vaccination Declination form (Appendix D).

12.6.1 Hepatitis B Vaccination

All potentially exposed employees will have made available to them, at no cost, a hepatitis B vaccination. Recombivax or Accelerated Recombivax vaccines shall be utilized. If the employee has previously received the hepatitis B vaccination and/or antibody testing reveals that the employee is immune, a new vaccination is not required. Employees may be subjected to occupational exposure immediately after receiving the first shot in the hepatitis B vaccination series. Antibody testing shall be performed 30-days after completing the hepatitis B vaccination series. Employees unable to develop immunity shall be precluded from further occupational exposure. If a physician recommends a booster dose(s), the doses shall be provided according to standard recommendations for medical practice. The employee will also receive training as to the vaccine's efficacy, safety, benefits, and consequences prior to administration. The vaccination series may also be initiated within 24-hours of an incident with exposure potential.

12.6.2 Tetanus Vaccination

All employees subject to this policy shall maintain current status documentation of their tetanus vaccination (current status for tetanus vaccination is within 5 years). All potentially exposed employees shall be offered a tetanus vaccination at no cost.

12.6.3 Post-Exposure Procedures and Evaluation

All exposure incidents shall be reported as required by Shaw Procedure No. HS020, "Accident Prevention Program: Reporting, Investigation and Review." The occupational medicine physician shall be advised in addition to standard notification procedures.

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-6

Following a report of an exposure incident, each involved employee shall be offered a confidential medical evaluation and follow-up, which includes at least the following elements:

- Documentation of the route(s) of exposure.
- Hepatitis B virus and HIV antibody status of the source patient(s) (if known), and how the exposure occurred.
- The medical confidentiality rights of the source patient shall be preserved at all times.
- If the source patient can be determined and permission is obtained, collection of and testing of the source patient's blood to determine the presence of HIV or HBV infection shall be conducted under the direction of the attending physician.
- Collection of blood from the exposed employee as soon as possible after the exposure incident for the determination of HIV and/or HBV status. Actual core antibody and surface antigen testing of the blood or serum sample may be done at that time or later if the employee so requests. If the test is deferred, arrangements shall be made through the attending physician to properly archive the specimen.
- Follow-up of the exposed employee including antibody and antigen testing, counseling, illness reporting, and safe and effective post-exposure prophylaxis, according to standard recommendations for medical practice as defined by the occupational medicine physician.

Where applicable laws require employee consent, documented consent shall be obtained prior to testing. If an employee refuses the blood test, documentation of the refusal will be made. Documentation of the test results shall be made available to the exposed employee(s). All test results shall be kept confidential.

12.6.4 Physician Information

The following information shall be provided to the evaluating physician:

- Copy of 29 CFR 1910.1030 and its appendices.
- Description of the affected employee's duties as they relate to the employee's occupational exposure.

12.6.5 Physician Opinion

For each potentially exposed employee evaluation, the employee shall receive a copy of the evaluating physician's written opinion within 15 working days of the completion of the evaluation. The written opinion shall be limited to the following information:

- The physician's recommended limitations upon the employee's ability to receive the hepatitis B vaccination.
- A statement that the employee has been informed of the results of the medical evaluation and that the employee has been told about any medical conditions resulting from exposure to blood or other potentially infectious materials, which require further evaluation or treatment.
- Specific findings or diagnoses, which are related to the employee's ability to receive the HBV vaccination. Any other findings and diagnoses shall remain confidential.

12.6.6 Hazard Communication

There are regulatory requirements for labels, signs, and training. The provisions and exceptions for these are contained in the subsections below.

12.6.7 Warning Labels

Containers used for disposal of blood-contaminated supplies and waste will be labeled in accordance with the word "biohazard." The following symbol shall be an integral part of the label:

12.6.8 Warning Signs

There will be no designated areas for medical treatment on project sites, because first aid is provided on an emergency basis only; therefore, warning signs are not applicable. In cases of potential exposure, observers and nonessential personnel should be verbally warned to keep a safe distance from injured personnel.

12.6.9 Employee Training Program

All employees who are first aid/CPR trained and may provide assistance shall be trained in the requirements for voluntary providers as described in Shaw Procedure No. HS512,

"Handling of Blood or other Infectious Material", this SSHP, and the general provisions of this procedure.

12.7 Recordkeeping

There are federal record-keeping requirements for training, medical, and incident reporting documentation. The provisions for keeping these records are contained in the subsections below.

12.7.1 Training Records

All employees covered under this exposure plan shall be trained as required. A record of the training shall be appropriately generated. The training record will contain the date of the training session(s), the contents or a summary of the training session(s), the names of persons conducting the training, and the names of all persons attending the training sessions. The training records will be maintained by the Shaw Training Department for at least 5 years from the training date.

12.7.2 Medical Records

Medical records necessary for Shaw employees will include documentation of HBV vaccination status, medical follow-up, post-exposure testing, and a medical professional's written evaluation. The employee medical records will be forwarded to and maintained by CORE Health Networks, 12091 Bricksome Avenue, Suite B, Baton Rouge, Louisiana 70816 for inclusion in the employee's medical file. Confidentiality of all medical records shall be maintained.

Shaw maintains employee medical records for the duration of the employee's employment plus 30 years thereafter. If, for whatever reason, Shaw no longer does business and no successor exists, Shaw will notify the director of NIOSH in writing 3 months prior to the disposal of records. If so directed, the records shall be transferred to the director of NIOSH.

12.7.3 Incident Recording

An incident that occurs because of rendering emergency medical care will be recorded on the OSHA 300 log as OSHA defines work-related injuries and illnesses. All injuries involving the release of blood or bodily fluids must be immediately reported to the HSM for proper reporting and follow-up.

12.8 Plan Review and Update

This Blood-borne Pathogen Exposure Control Plan shall be reviewed and updated on an annual basis.

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-6

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-6

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13.0 LOGS, REPORTS, AND RECORD KEEPING

Proper record keeping and data management are essential in the implementation of this SSHP. The forms associated with the record keeping and data management requirements shall be completed in an accurate, timely fashion and appropriately filed. The proper completion of forms is the responsibility of the Construction Manager or SSHO. Completed forms will be kept and maintained by Shaw for a 5-year period. Subcontractors will also be responsible for keeping a copy of the forms pertaining to their activities.

Copies of all pertinent site safety and health forms and logs are provided in Appendix D.

13.1 Employee Training and Medical Certification Records

Before personnel are allowed to work in regulated areas on site, the Construction Manager or SSHO shall verify that the following training documentation is current and available in the project Health and Safety file:

- Respiratory protection training certificate (all personnel required to wear respiratory protection).
- Portable fire extinguisher training (two workers per crew).
- First aid/CPR training (at least two workers on site).
- Site Safety Orientation documentation indicating that employees have received the following training:
  - Review of SSHP (Site Safety and Health Plan Acknowledgment Form [Appendix A]).
  - Site-specific Hazard Communication training (Hazard Communication and Right-To-Know Standards Employee Training Record [Appendix D]).
  - Other training as applicable, such as base procedures and rules.

The SSHO shall also verify that the following medical surveillance documentation is current and available in the project Health and Safety file:

- Annual audiogram evidence for workers who may be exposed to noise greater than 85 decibels.
- Positive physician's medical determination regarding the employee's ability to use respiratory protection for personnel required to wear respiratory protection.

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-6

All personnel (including visitors) using respiratory protection, shall have successfully passed a respirator fit test within the last 12 months, in accordance with Shaw Procedure No. HS601, "Respiratory Protection Program". A document providing proof of a fit test for the specific respirator used shall be available in the project Health and Safety file.

13.2 Daily Safety Log

The SSHO will maintain and complete a daily log for each day's work. The daily log will document each day's safety and health activities in sufficient detail for future reference as needed.

The following items will be developed as applicable and maintained on site by the SSHO as part of the daily safety log:

- Daily safety meeting logs.
- Noise survey data.
- Personnel training and medical certificates.
- Hot Work Permits.
- Air monitoring/sampling data forms.
- Project safety inspections (daily and monthly).
- Subcontractor safety inspections.
- Hazard Communication Program audits.
- Warnings given related to safety infractions.
- AHAs.
- JSAs.
- Accident investigation reports.
- First aid log.
- Confined space entry permits.

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-6

13.3 Safety Inspections/Audits

Shaw's accident prevention program is centered on the following key procedures:

- Investigating, reporting, and reviewing of all near misses, incidents, and accidents.
- Managing reviews of all incident/accident reports, corrective action, and project safety concerns.
- Reviewing of project, operations, and construction activities by safety and health professionals and supervisory personnel.

Safety reviews and inspections are conducted by all tiers of the management structure and are documented. A list of all corrective action items shall be maintained showing the corrective action, responsible person, and the date the action is to be completed. Follow-up inspections are conducted by safety and health personnel to verify that corrective actions or measures have been implemented.

The Construction Manager will inspect the site daily and identify areas of safety concerns or ideas for safety improvement. Crew leaders will also inspect site conditions and activities daily to identify changing conditions or potential hazards. Daily safety inspections shall be documented on the Daily Safety Inspection Report (Appendix D). Identified safety and occupational health deficiencies and suggested corrective measures will be brought to the attention of the Project Manager and HSM.

Safety and occupational health deficiencies shall be tracked on the Safety and Occupational Health Deficiency Tracking Log (Appendix D), which provides the following information:

- Date deficiency identified.
- Description of deficiency.
- Name of person responsible for correcting deficiency.
- Projected resolution date.
- Date actually resolved.

The Construction Manager will immediately notify the HSM of any OSHA or other regulatory agency inspections. (The inspection will not be delayed due to the Government Designated Authority being unavailable.) The Construction Manager shall provide the HSM a copy of any citations or reports issued by the inspector and any corrective action responses to the citation(s) or report(s).

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-6

13.4 Accident Investigation and Reporting

Project personnel are required to report all near misses, injuries, illnesses, and accidents to their immediate supervisor. The Construction Manager or SSHO shall immediately arrange appropriate medical care as required. Once immediate medical care for the injured personnel or other critical emergency procedures has been accomplished, the Construction Manager shall follow the Incident Notification, Reporting, and Management Procedure (Appendix H). The appropriate form(s) to be completed are in Appendix D and include the following:

- Supervisor's Employee Injury/Illness Report Form.
- Authorization for Release of Protected Medical Information.
- Authorization for Treatment for Occupational Injury/Illness.
- Vehicle Accident Report.
- Equipment, Property Damage and General Liability Loss Report.
- Underground Utility Hits Tip Sheet for Incident Investigations.
- Incident Investigation Report.
- Injured Employee Statement.
- Employee Witness Statement.
- Accident Review Board.

All incidents shall be immediately reported to the Project Manager and HSM.

The Construction Manager shall immediately investigate all near misses, injuries, illnesses, and accidents. Corrective actions will be determined and implemented to prevent the recurrence of the accident, and responsibility for implementation of corrective actions will be assigned. The final report and required forms will be submitted within five days of the incident to the HSM.

In the event that an accident results in an employee being sent to a doctor, the Return-to-Work Examination Form (Appendix D) shall be completed by the attending physician, on the date of treatment stating that either:

- Employee may return to full duty work.
- Employee may return to limited duty (with type of limitations).
- Employee is unable to return to work.

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-6

A copy of this release shall accompany the accident report. In addition to the requirement for maintaining a log of OSHA recordable injuries/illnesses, a separate log will be maintained for all first aid treatments not otherwise recordable/reportable.

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-6

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-6

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14.0 REFERENCES

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National Fire Protection Association (NFPA), 2011, *NFPA 70E: Standard for Electrical Safety in the Workplace*.

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USACE, see U.S. Army Corps of Engineers.

U.S. Army Corps of Engineers (USACE), 2007, *Safety and Occupational Health Requirements for Hazardous, Toxic, and Radioactive Waste Activities ER 385-1-92*, Department of the Army, U.S. Army Corps of Engineers, CESO-ZA Safety, Washington, D.C, May 1, 2007.

U.S. Army Corps of Engineers (USACE), 2008, *Safety and Health Requirements, EM 385-1-1*, Department of the Army, U.S. Army Corps of Engineers, CESO-ZA Safety, Washington, D.C, November 15, 2008.

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-6

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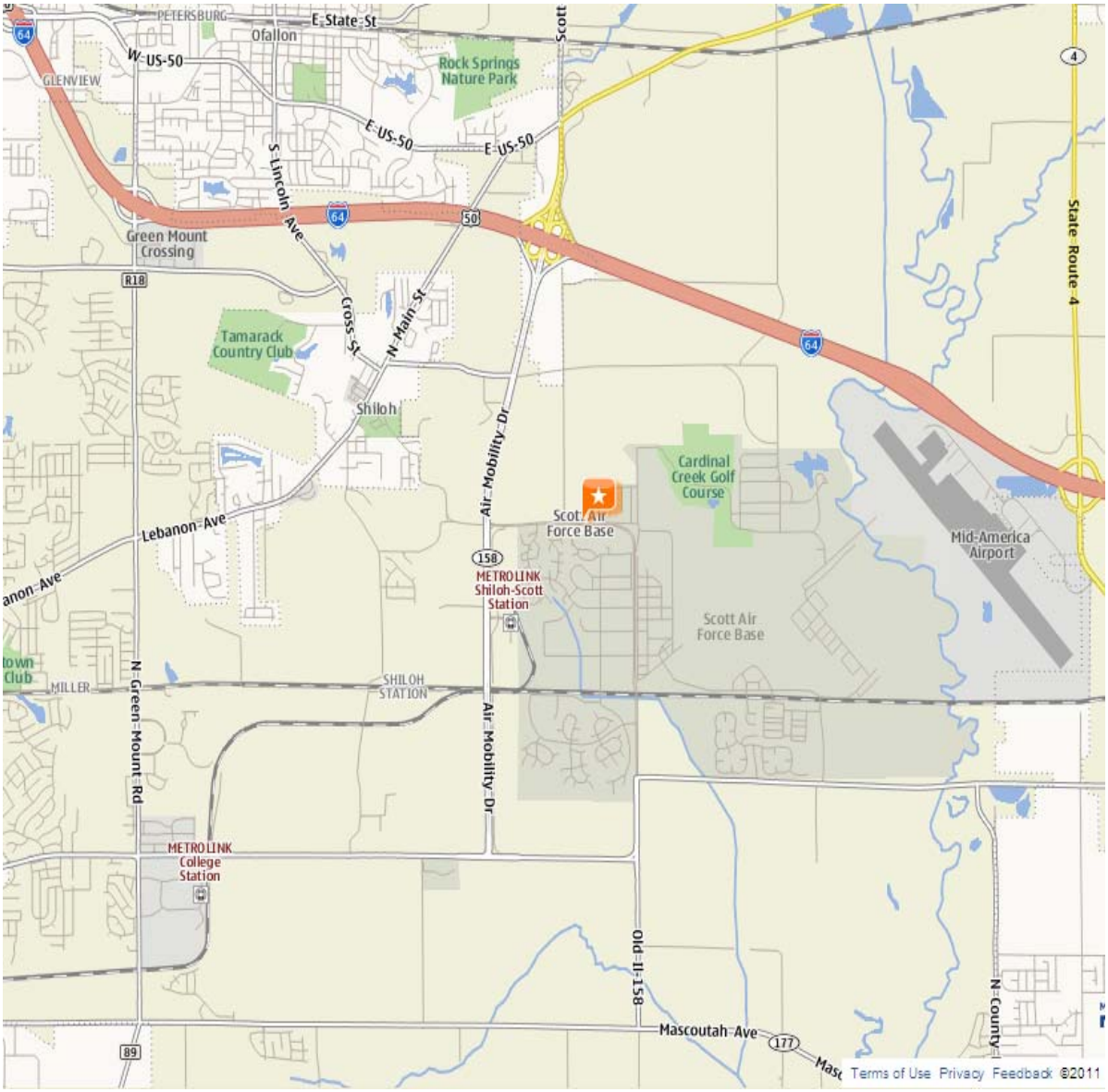
Figures

Figure 1
Site Location Map



Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-6

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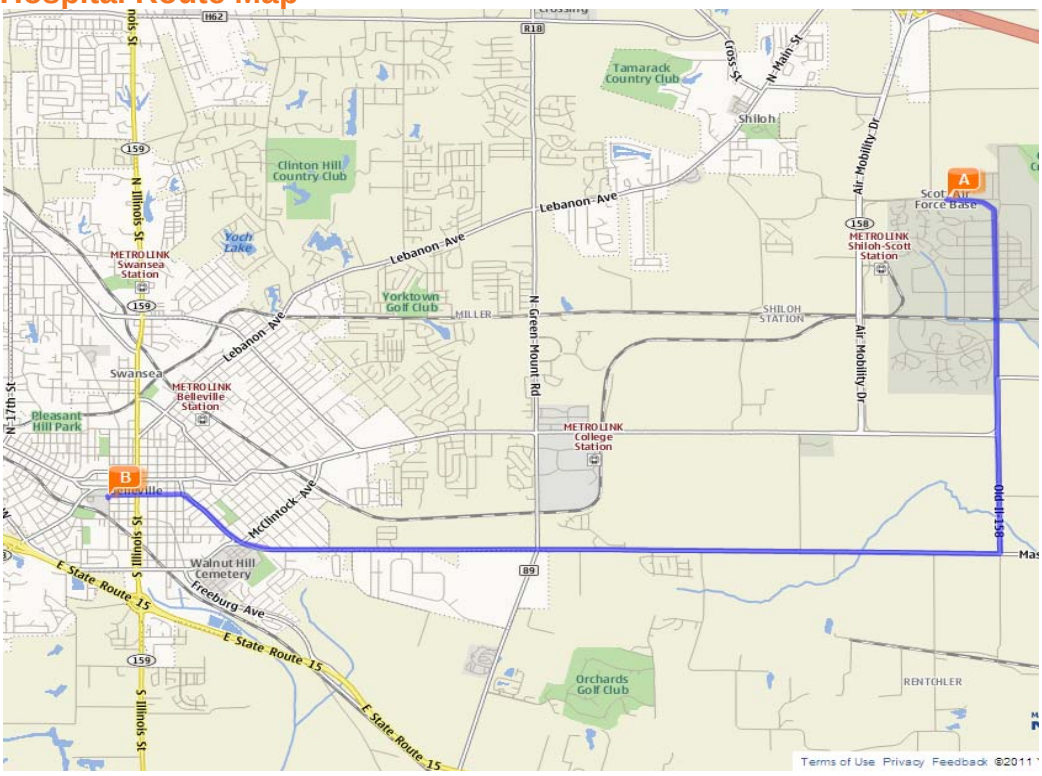
Figure 2
Hospital Route Map



Hospital Route Map from Scott AFB (A) to
(B) St Elizabeth's Hospital

211 South Third Street
Belleville, Illinois 62220
(618) 234-2120

From Scott AFB, go:

1. Head toward Scott Dr on Seibert Rd.
2. 1.2 mi Continue on Scott Dr (permission required).
3. 0.5 mi Continue on Old IL-158.
4. 0.4 mi Continue on IL-161 W.
5. 456 ft Bear left onto Old IL-158.
6. 1.0 mi Continue on IL-158 W.
7. 5.7 mi Turn right onto Mascoutah Ave (IL-158, IL-177).
8. 0.6 mi Continue on Mascoutah Ave.
9. 0.6 mi Continue on E Lincoln St.
10. 118 ft Turn left onto S 3rd St.
11. Your destination at 211 S 3rd St is on the right.

The distance to the hospital is approximately 10.2 miles from the Scott AFB, with a travel time of approximately 20 minutes. (Note: Map will be revised when site trailers are established.)

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-6

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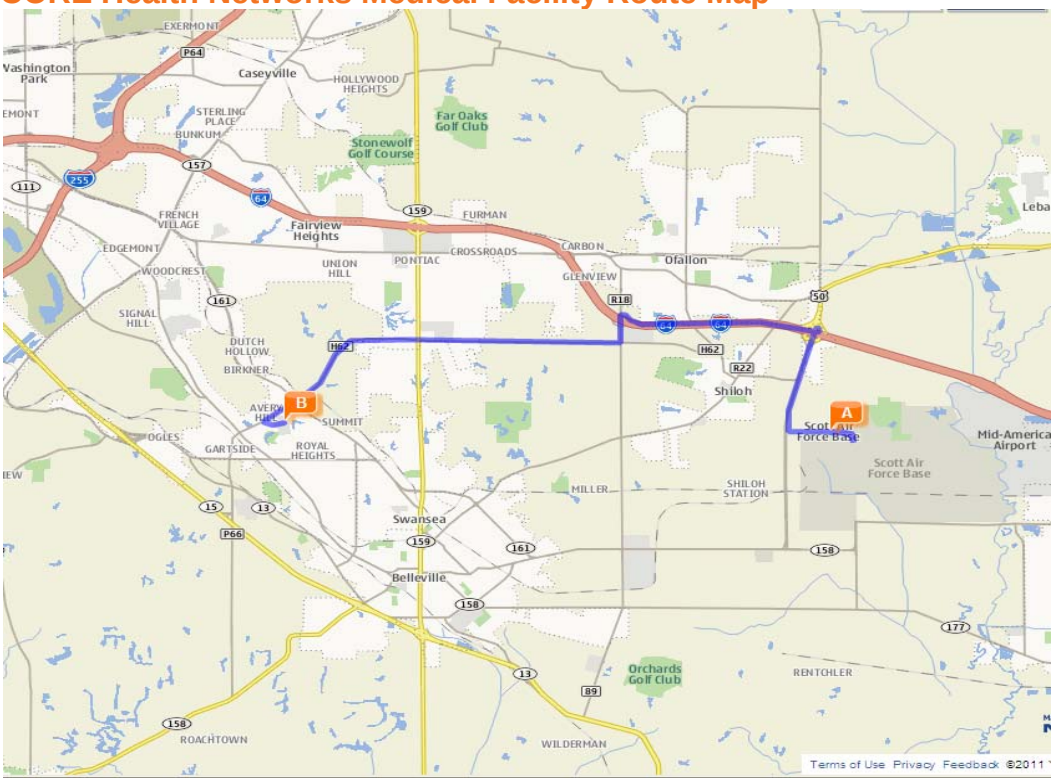
Figure 3
CORE Health Networks Medical Facility Route Map



CORE Health Networks Medical Facility Route Map from Scott AFB (A) to Midwest Occupational Medicine, Ltd, (B)

4550 Memorial Dr.
Belleville, Illinois 62226
(618) 257-0063

From Scott AFB, go:

1. Head toward Scott Dr on Seibert Rd.
2. 0.3 mi Continue on Scott Dr (permission required).
3. 0.4 mi Make a U-turn at W Bucher St onto Scott Dr.
4. 0.7 mi Continue on Seibert Rd.
5. 1.8 mi Turn right onto Air Mobility Dr (IL-158 E).
6. 2.9 mi Take ramp onto I-64 W toward East St Louis.
7. 0.4 mi Take exit #16/O'fallon/Shiloh.
8. 0.5 mi Turn left onto N Green Mount Rd (CR-R18 S).
9. 6.0 mi Turn right onto Frank Scott Pky E (CR-H62).
10. 0.2 mi Turn left onto Dapron Dr.
11. 0.2 mi Bear left onto Memorial Dr.
12. Your destination at 4550 Memorial Dr is on the right.

The trip takes 13.5 mi and 24 mins. (Note: Map will be revised went site trailers are established.)

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-6

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Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-6

Tables

Table 1
Summary Table of Scott Air Force Base Sites, Technical Approach, Performance Objectives, and Site Closure Dates

Site Identification	Site Name	Proposed Performance Objective	Proposed Date of Achieving Performance Objective	Description of Tech Approach	Projected Closeout Date
UK-C500	Building 39	Draft Remedial Investigation (RI)	January 2013	Prepare a Remedial Investigation (RI) Work Plan; perform soil and groundwater characterization. Prepare an RI Report.	Indefinite, depends on U.S. Air Force (USAF) funding and future remedial actions
UK-C501	Scott Club	Draft RI	January 2013	Prepare an RI Work Plan; perform soil and groundwater characterization. Prepare an RI Report.	Indefinite, depends on USAF funding and future remedial actions
UK-C510	South Ditch	Draft RI	January 2013	Prepare an RI Work Plan; perform soil and groundwater characterization. Prepare an RI Report.	Indefinite, depends on USAF funding and future remedial actions

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-6

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Table 2
Minimum Clearance from Energized Overhead Electric Lines

Nominal System Voltage	Minimum Required Clearance
0 to 50 kilovolts	3 meters (10 feet)
51 to 200 kilovolts	4.5 meters (15 feet)
201 to 300 kilovolts	6 meters (20 feet)
301 to 500 kilovolts	7.5 meters (25 feet)
501 to 750 kilovolts	10.5 meters (35 feet)
751 to 1,000 kilovolts	13.5 meters (45 feet)

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-6

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-6

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Table 3
Task Protection Levels

Task	Initial PPE Level	Upgrade PPE Level	Skin Protection	Respiratory Protection	Other PPE
Mobilization and general site activities	Level D	Level D – Modified	Generally none: some activities may require Tyvek® coveralls to prevent insect bites / contact with poisonous plants	Initial - None	Hearing protection >85 dBA, leather work-gloves.
Collect surface soil samples	Level D	Level D – Modified	Sample gloves; disposable boot covers if walking in areas with potential contamination; some activities may require Tyvek® coveralls to prevent insect bites / contact with poisonous plants	Initial - None	Hearing protection >85 dBA, leather work-gloves.
Collect subsurface soil samples	Level D	Level D – Modified	Sample gloves; disposable boot covers if walking in areas with potential contamination; some activities may require Tyvek® coveralls to prevent insect bites / contact with poisonous plants	Initial - None	Hearing protection >85 dBA, leather work-gloves.
Collect surface water and ground water samples	Level D	Level D – Modified	Sample gloves; disposable boot covers if walking in areas with potential contamination; some activities may require Tyvek® coveralls to prevent insect bites / contact with poisonous plants	Initial - None	Hearing protection >85 dBA, leather work-gloves.
Well drilling and well installation	Level D – Modified	Level B	See Section 5.1.4 and Section 5.1.2	Initial - None Upgrade - Level B: if VOCs exceeds action level	Hearing protection >85 dBA, leather work-gloves. 100% fall protection when working at height greater than 6 feet
Surface soil removal	Level D – Modified	Level B Level C	See Section 5.1.4, Section 5.1.2, and Section 5.1.3	Initial – None Upgrade - Level B: if VOCs exceeds action level Upgrade – Level C if dusts exceed action level	Hearing protection >85 dBA, leather work-gloves.
Backfill excavations	Level D	NA	See Section 5.1.5	Initial - None	Hearing protection >85 dBA, leather work-gloves.

Table 3 (continued)
Task Protection Levels

Task	Initial PPE Level	Upgrade PPE Level	Skin Protection	Respiratory Protection	Other PPE
Surveying	Level D	NA	See Section 5.1.5	Initial - None	Hearing protection >85 dBA, leather work-gloves.
Site restoration	Level D	NA	See Section 5.1.5	Initial - None	Hearing protection >85 dBA, leather work-gloves.
Soil borrow material import (loading, transportation, and dumping	Level D	NA	See Section 5.1.5	Initial - None	Hearing protection >85 dBA, leather work-gloves.
Equipment decontamination	Level D – Modified	Level C	See Section 5.1.4 and Section 5.1.3	Initial - None Upgrade - Level C: Full-face air-purifying respirator.	Hearing protection >85 dBA, face-shield, shin/metatarsal protection.

dBA denotes decibels, A-scale..

NA denotes not applicable.

PPE denotes personal protective equipment.

VOC denotes volatile organic compound.

Table 4
Direct Reading Air Monitoring Requirements

Monitoring Device / Contaminant	Monitoring Location/ Personnel	Monitoring Frequency	Action Level	Action
Combustible Gas Indicator/Oxygen Meter (Lower Explosive Limit [LEL]/ oxygen [O_2])	In the work area and near the breathing zone of personnel. In the work area and breathing zone of personnel during well drilling activities. In the work area prior to hot work activities. In the confined space prior to entry. In the work area during fuel spill clean-up activities.	A minimum of twice per hour (LEL) at each well installation location when free-phase LNAPL is expected or observed until activity at that location has been completed. A minimum of once per sampling event (LEL) at each sampling location when free-phase LNAPL is expected or observed (groundwater and subsurface soil/sediment). At any time in any work location where personnel observe odors. Prior to issuing a hot work permit or confined space entry permit. Continuous during fuel spill clean-up activities. At the discretion of the SSHO.	<10% LEL 20 - 22% O_2	Continue work with caution.
			>10% LEL <20% O_2 or >22% O_2	Stop work, evacuate area, and contact HSM.
Carbon Monoxide (CO)	In the work area near the breathing zone of personnel.	A minimum of once per hour when internal combustion engines are being operated in poorly ventilated areas. At the discretion of the SSHO.	<15 ppm CO	Continue work with caution.
			>15 ppm CO	Stop work, evacuate area, and contact HSM.
Hydrogen Sulfide (H_2S)	In the work area near the breathing zone of personnel.	Continuous at each well installation location within 500 feet of a landfill until activity at that location has been completed. At any time in any work locations where personnel observe rotten egg odors. At the discretion of the SSHO.	<1 ppm H_2S	Continue work with caution.
			>1 ppm H_2S	Stop work, evacuate area, and contact HSM.

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-6

Table 4 (continued)
Direct Reading Air Monitoring Requirements

Monitoring Device / Contaminant	Monitoring Location/ Personnel	Monitoring Frequency	Action Level	Action
Vinyl Chloride (VC) Colorimetric Detector Tube	In the work area near the breathing zone of personnel.	Collected at each well if PID Action Level is exceeded	<1 ppm VC	Continue Work With Caution
			>1 ppm VC	Stop work, evacuate area, and contact HSM.
Benzene Colorimetric Detector Tube	In the work area near the breathing zone of personnel.	Collected at each well if PID Action Level is exceeded	<0.25 ppm	Continue Work With Caution
			>0.25 ppm	Stop work, evacuate area, and contact HSM.
Photoionization Detector (volatile organic compounds)	In the breathing zone of personnel during well drilling, well installation, well abandonment, and soil excavation activities. In the breathing zone of personnel during groundwater and subsurface soil/sediment sampling. In the breathing zone of personnel during fuel spill clean-up activities.	A minimum of twice per hour at each well drilling/installation location or soil excavation area where VOC are known or suspected until activity at that location has been completed (continuous when free-phase LNAPL or DNAPL is expected or observed). Hourly at each well abandonment location A minimum of once per sampling event at each sampling location (groundwater and subsurface soil/sediment)/continuous when free-phase LNAPL or DNAPL is expected or observed.	> 2 ppm but < 10 ppm above background, sustained for one minute in the breathing zone	Stop work: evaluate hazard, increase monitoring frequency, provide engineering controls, and upgrade PPE.
			> 10 ppm but < 50 ppm above background, sustained for five seconds in the breathing zone	Stop work, evacuate area, and contact HSM.

Table 4 (continued)
Direct Reading Air Monitoring Requirements

Monitoring Device / Contaminant	Monitoring Location/ Personnel	Monitoring Frequency	Action Level	Action
Photoionization Detector (volatile organic compounds) (continued)		A minimum of twice per hour at each soil removal location until activity at that location has been completed (continuous when free-phase LNAPL or DNAPL is expected or observed). Continuous during fuel spill clean-up activities. At any time in any work location where personnel observe odors. At the discretion of the SSHO.	> 50 ppm above background, sustained for one second in the breathing zone	Stop work, evacuate area, and contact HSM.
Real-time Aerosol Monitor (dust)	In the work zone approximating worker breathing zone area during soil excavation, soil removal, soil loading, and other dust generating activities.	Continuous during soil excavation, soil removal, soil loading, and other dust generating activities. At the discretion of the SSHO.	> 1 mg/m^3 instantaneous	Continue work, apply more engineering controls.
			> 2.5 mg/m^3 time-weighted average	Evacuate area, apply engineering controls, upgrade level of PPE, and contact HSM.

DNAPL denotes dense nonaqueous phase liquid.

HSM denotes Health and Safety Manager. HSM may indicate more prescriptive Action Levels in the SSHP Addenda.

LNAPL denotes light nonaqueous phase liquid.

mg/m^3 denotes milligram(s) per cubic meter.

PPE denotes personal protective equipment.

ppm denotes part(s) per million.

SSHO denotes Site Safety and Health Officer.

Table 5
Emergency Telephone Numbers

Name/Organization	Telephone Numbers
Ambulance Emergency/EMS	911
Scott AFB Fire Department	Emergency – 911 618 -256-5130 Non Emergency –
Scott AFB Security Forces	911
Belleville Police Department	Emergency 911 (618) 234-1218 Non Emergency
St Clair County Sheriff's Department	Emergency 911
Scott underground utility locator service	(618)256-2610
Midwest Occupational Medicine, Ltd (Occupational Health Clinic)	(618) 257-0063
St Elizabeth's Hospital (Hospital)	618-234-2120
CORE Health	(1-877-347-7429)
Agency for Toxic Substances and Disease Registry	(404) 639-0615 (24-hour)
Chemtrec	(888) 344-7233
Poison Control Center	(800) 562-8236
National Response Center	(800) 424-8802
Daniel Cevallos, Jr. AFCEE Contracting Officer (KO)	(210)395-8722
Stephanie Ramon AFCEE/EXW COR	(210)395-8628
Kathleen Romalia (Shaw Project Manager)	(720) 554-8207
Spencer Patterson (Shaw Program Manager)	(720) 377-8806
Dave Mummert, CIH (Shaw CIH)	(419) 425-6129 (office) (419) 348-1544 (cell)
James Vigerust (SSHO Lead)	(505) 262-8736(office) (505) 410-4995 (cell)
Joe Colella (Installation Lead)	(770) 663-1469 (office) (412) 915-1221(cell)
Shaw Notification Hotline	(866) 299-3445

AFCEE denotes Air Force Center for Engineering and the Environment.

CIH denotes Certified Industrial Hygienist.

COR denotes Contracting Officer's Representative.

EMS denotes Emergency Medical Service.

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-6

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Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-6

Appendix A
Site Safety and Health Plan Acknowledgement

Holloman AFB Project
Site-Specific Health & Safety Acknowledgment Form

I understand and agree to follow the Site-Specific Health & Safety Plan (SSHP) for the Holloman AFB Project. I understand that there may be additional safety and health requirements, which may be presented in task-specific Activity Hazard Analyses and Tailgate Safety Meetings. I agree to abide by the requirements of the SSHP and Activity Hazard Analyses for the work that I will perform.

Printed Name	Signature	Representing	Date

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Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-6

Appendix B
Site Safety and Health Plan Amendments and Addenda

Site Specific Health & Safety Plan Amendment Documentation

Project Name: Holloman AFB **Project No. 144106**

Amendment No. __ Date: _____

Amendment Address: _____

Reason For Amendment: _____

Amendment: _____

Scope of Work: _____

Chemical Hazards Specific To The Scope of Work:
_____

Specific AHA Identified: _____

PPE Required: _____

Monitoring Requirements: _____

_____
Completed by:

_____
Approved by:

_____
Approved by:

_____
Approved by:

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Appendix C
Activity Hazard Analyses

APPENDIX C1 ACTIVITY HAZARD ANALYSIS FOR MOBILIZATION/SITE SETUP				
Task Breakdown	**Potential Hazards**	**Critical Safety Practices**	**Personal Protective Clothing and Equipment**	**Monitoring Devices**
Mobilization/ Site Setup	Slips, Trips, Falls	• Clear walkways work areas of equipment, tools, vegetation, excavated material and debris • Mark, identify, or barricade other obstructions		
	Spills	• Clean up spills before initiating maintenance • Review maintenance procedures for safety practices		
	Electrical Shock	• De-energize or shut off utility lines at their source before work begins • Use double insulated or properly grounded electric power-operated tools • Provide an equipment-grounding conductor program or employ ground-fault circuit interrupters • Use qualified electricians to hook up electrical circuits • Inspect all extension cords daily for structural integrity, ground continuity, and damaged insulation • Cover or elevate electric wire or flexible cord passing through work areas to protect from damage • Keep all plugs and receptacles out of water • Use approved water-proof, weather-proof type if exposure to moisture is likely • Inspect all electrical power circuits prior to commencing work • Follow Lockout/Tagout procedure HS315 – Control of Hazardous Energy Sources	Lockout/Tagout Devices	Voltage Meter or Tic Tracer

APPENDIX C1 ACTIVITY HAZARD ANALYSIS FOR MOBILIZATION/SITE SETUP				
Task Breakdown	**Potential Hazards**	**Critical Safety Practices**	**Personal Protective Clothing and Equipment**	**Monitoring Devices**
Mobilization/ Site Setup (continued)	Handling Heavy Objects	• Observe proper lifting techniques • Obey sensible lifting limits (60 lb. Maximum per person manual lifting) • Use mechanical lifting equipment (hand carts, trucks) to move large, awkward loads • Avoid carrying heavy objects above shoulder level • Warm up muscles before engaging in manual lifting		
	Sharp Objects	• Wear cut resistant work gloves when the possibility of lacerations or other injury may be caused by sharp edges or objects • Maintain all hand and power tools in a safe condition	Leather gloves	
	High Noise Levels	• Use hearing protection when exposed to excessive noise levels (greater than 85 dBA over an 8-hour work period) • Do not attempt verbal communication in high noise backgrounds	Ear plugs	
	Struck By/ Against Heavy Equipment	• Wear reflective warning vests when exposed to vehicular traffic • Isolate equipment swing areas • Make eye contact with operators before approaching equipment • Understand and review hand signals • Follow hand signals of ground workers for equipment manipulation when placing/loading equipment into bucket. • Step away from equipment when bucket adjustments are made • Do not attempt verbal communication in high noise backgrounds.	Warning vests, Hard hat, Safety glasses, and Steel toe work boots	

APPENDIX C1 ACTIVITY HAZARD ANALYSIS FOR MOBILIZATION/SITE SETUP				
Task Breakdown	**Potential Hazards**	**Critical Safety Practices**	**Personal Protective Clothing and Equipment**	**Monitoring Devices**
Mobilization/ Site Setup (continued)	Struck-by/Against (Vehicle-traffic)	• Wear reflective warning vests when exposed to vehicular traffic • Barricade or enclose the work areas • Restrict entry to the work areas to authorized personnel during work activities • Wear hard hats, safety glasses with side shields, and steel-toe safety boots at all times • Follow FDOT roadway and traffic design standards manual • Personnel will perform all work tasks and remain inside barriered work zones • Spotters to be utilized as necessary	Warning vests, Hard hat, Safety glasses, and steel toe work boots	
	Pinch Points	• Review equipment adjustment procedures, identify pinch points • Isolate/block pinch points to limit motion when inserting pins, fasteners, closing tackles	Leather gloves	
	Burns associated with loading/unloading equipment on trucks	• Identify heavy objects for loading that may have hot surfaces • Allow objects to cool or cover hot surfaces with non-combustible material to protect workers from burns		
	Ladders	• Inspect ladders before use for mud buildup on treads • Clean mud from boots before climbing on ladders • Follow the three point of contact rule		
	High/Low Ambient Temperature	• Monitor for Heat Stress in accordance with Health and Safety Procedures HS400, HS401 • Provide fluids to prevent worker dehydration		
EQUIPMENT REQUIRED		**INSPECTION REQUIREMENTS**	**TRAINING REQUIREMENTS**	
• Vehicles • Hand tools • Ladders • Forklift/Hand carts		• Daily equipment inspections as per manufacturers requirements • Inspection of all emergency equipment (i.e. first aid kits, fire extinguishers)	• Review AHA with all task personnel • Review Site Specific Safety and Occupational Health Program • Review operations/safety manuals for all equipment utilized	

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APPENDIX C2 ACTIVITY HAZARD ANALYSIS FOR GENERAL SITE ACTIVITIES				
Task Breakdown	**Potential Hazards**	**Critical Safety Practices**	**Personal Protective Clothing and Equipment**	**Monitoring Devices**
Travel to/at project site	Operation of motor vehicles and trucks	All company owned, leased, or rented vehicle operations shall comply with the requirements of Shaw Procedure HS800, *Motor Vehicle Operation: General Requirements*. All company owned, leased, or rented commercial vehicle operations shall comply with the requirements of Shaw Procedure HS810, *Commercial Motor Vehicle Operation And Maintenance*. Subcontractors operating motor vehicles at the site shall comply with all federal, state, and local traffic regulations. Subcontractors shall only use vehicles that are in good condition and safe to operate. Subcontractors shall inspect vehicles routinely used at the site on a weekly basis and submit the inspection documentation to the SSHO. All personnel shall drive defensively and wear seat belts while vehicles are in motion. Backing of vehicles shall be avoided when possible. Extra care shall be taken to back vehicles when unavoidable. When parking vehicles into head in parking spaces, vehicles shall be backed into the space whenever possible. Before backing a vehicle that has been parked, the driver shall physically walk to the back of the vehicle to observe the area before entering the vehicle. Spotters shall be used to back vehicles whenever possible.	Seatbelts	

APPENDIX C2 ACTIVITY HAZARD ANALYSIS FOR GENERAL SITE ACTIVITIES				
Task Breakdown	**Potential Hazards**	**Critical Safety Practices**	**Personal Protective Clothing and Equipment**	**Monitoring Devices**
Unload equipment	Unfamiliarity with: site, general site hazards, project safety rules, chain of command, emergency procedures. Heavy lifting/strains, sprains; Use of mechanical equipment;	All personnel shall attend the site orientation training. No individual employee is permitted to lift any object that weighs over 60 pounds. Proper lifting techniques shall be used. Multiple employees or the use of mechanical lifting devices are required for lifting objects over the 60-pound limit. Only qualified personnel shall be permitted to operate equipment. Forklifts and mechanical equipment shall be inspected daily. Deficiencies in equipment shall be noted on the inspection form. Equipment found to be unsafe shall not be used. All equipment shall be operated at safe speeds and in a safe manner. Equipment operators shall wear safety belts and hearing protection. Ground personnel shall not position themselves between equipment and stationary objects and only approach equipment after a signal from the operator. Personnel are prohibited from entering the swing radius of booms. Equipment load capacities shall not be exceeded. Personnel shall ensure all mechanical guards are in place and functioning properly. All equipment shall be shut down with energies dissipated prior to performing maintenance activities - lock out/tag out procedures may apply. Only qualified mechanics shall work on or repair heavy equipment.		

APPENDIX C2 ACTIVITY HAZARD ANALYSIS FOR GENERAL SITE ACTIVITIES				
Task Breakdown	**Potential Hazards**	**Critical Safety Practices**	**Personal Protective Clothing and Equipment**	**Monitoring Devices**
Mobilization/ Site Setup	Slips, Trips, Falls	• Clear walkways work areas of equipment, tools, vegetation, excavated material and debris • Mark, identify, or barricade other obstructions		
	Spills	• Clean up spills before initiating maintenance • Review maintenance procedures for safety practices		
	Electrical Shock	• De-energize or shut off utility lines at their source before work begins • Use double insulated or properly grounded electric power-operated tools • Provide an equipment-grounding conductor program or employ ground-fault circuit interrupters • Use qualified electricians to hook up electrical circuits • Inspect all extension cords daily for structural integrity, ground continuity, and damaged insulation • Cover or elevate electric wire or flexible cord passing through work areas to protect from damage • Keep all plugs and receptacles out of water • Use approved water-proof, weather-proof type if exposure to moisture is likely • Inspect all electrical power circuits prior to commencing work • Follow Lockout/Tagout procedure HS315 – Control of Hazardous Energy Sources	Lockout/Tagout Devices	Voltage Meter or Tic Tracer

APPENDIX C2 ACTIVITY HAZARD ANALYSIS FOR GENERAL SITE ACTIVITIES				
Task Breakdown	**Potential Hazards**	**Critical Safety Practices**	**Personal Protective Clothing and Equipment**	**Monitoring Devices**
Mobilization/ Site Setup (continued)	Handling Heavy Objects	• Observe proper lifting techniques • Obey sensible lifting limits (60 lb. Maximum per person manual lifting) • Use mechanical lifting equipment (hand carts, trucks) to move large, awkward loads • Avoid carrying heavy objects above shoulder level • Warm up muscles before engaging in manual lifting		
	Sharp Objects	• Wear cut resistant work gloves when the possibility of lacerations or other injury may be caused by sharp edges or objects • Maintain all hand and power tools in a safe condition	Leather gloves	
	High Noise Levels	• Use hearing protection when exposed to excessive noise levels (greater than 85 dBA over an 8-hour work period) • Do not attempt verbal communication in high noise backgrounds	Ear plugs	
	Struck By/ Against Heavy Equipment	• Wear reflective warning vests when exposed to vehicular traffic • Isolate equipment swing areas • Make eye contact with operators before approaching equipment • Understand and review hand signals • Follow hand signals of ground workers for equipment manipulation when placing/loading equipment into bucket. • Step away from equipment when bucket adjustments are made • Do not attempt verbal communication in high noise backgrounds.	Warning vests, Hard hat, Safety glasses, and Steel toe work boots	

APPENDIX C2 ACTIVITY HAZARD ANALYSIS FOR GENERAL SITE ACTIVITIES				
Task Breakdown	**Potential Hazards**	**Critical Safety Practices**	**Personal Protective Clothing and Equipment**	**Monitoring Devices**
Mobilization/ Site Setup (continued)	Struck-by/Against (Vehicle-traffic)	• Wear reflective warning vests when exposed to vehicular traffic • Barricade or enclose the work areas • Restrict entry to the work areas to authorized personnel during work activities • Wear hard hats, safety glasses with side shields, and steel-toe safety boots at all times • Follow FDOT roadway and traffic design standards manual • Personnel will perform all work tasks and remain inside barriered work zones • Spotters to be utilized as necessary	Warning vests, Hard hat, Safety glasses, and steel toe work boots	
	Pinch Points	• Review equipment adjustment procedures, identify pinch points • Isolate/block pinch points to limit motion when inserting pins, fasteners, closing tackles	Leather gloves	
	Burns associated with loading/unloading equipment on trucks	• Identify heavy objects for loading that may have hot surfaces • Allow objects to cool or cover hot surfaces with non-combustible material to protect workers from burns		
	Ladders	• Inspect ladders before use for mud buildup on treads • Clean mud from boots before climbing on ladders • Follow the three point of contact rule		
	High/Low Ambient Temperature	• Monitor for Heat Stress in accordance with Health and Safety Procedures HS400, HS401 • Provide fluids to prevent worker dehydration		

EQUIPMENT REQUIRED	**INSPECTION REQUIREMENTS**	**TRAINING REQUIREMENTS**
• Vehicles • Hand tools • Ladders • Forklift/Hand carts	• Daily equipment inspections as per manufacturers requirements • Inspection of all emergency equipment (i.e. first aid kits, fire extinguishers)	• Review AHA with all task personnel • Review Site Specific Safety and Occupational Health Program • Review operations/safety manuals for all equipment utilized

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APPENDIX C3 ACTIVITY HAZARD ANALYSIS FOR COLLECT SURFACE SOIL SAMPLES				
Task Breakdown	**Potential Hazards**	**Critical Safety Practices**	**Personal Protective Clothing and Equipment**	**Monitoring Devices**
Arrival of new personnel at site.	Unfamiliarity with site, general site hazards, project safety rules, chain of command, and emergency procedures.	All personnel shall attend the site orientation training.		
Unload equipment.	Heavy lifting, strains, and sprains.	No individual employee is permitted to lift any object that weighs over 60 pounds. Proper lifting techniques shall be used. Multiple employees or the use of mechanical lifting devices are required for lifting objects over the 60-pound limit.		
	Intrusive activities.	Follow procedure for Intrusive Activities Permit in the SSHP. Underground utilities shall be located and marked prior to commencing sampling activity.		
	Munitions and Explosives of Concern (MEC).	Personnel shall attend MEC Awareness training.		

APPENDIX C3
ACTIVITY HAZARD ANALYSIS FOR COLLECT SURFACE SOIL SAMPLES

Task Breakdown	Potential Hazards	Critical Safety Practices	Personal Protective Clothing and Equipment	Monitoring Devices
Surface Soil Sampling. (Continued)	Use of sampling tools.	Tools shall be inspected daily and before each use. Damaged tools shall be removed from service.		
	Hazardous atmospheres.	Air monitoring, as described in the SSHP shall be performed in areas where there is the possibility of elevated concentrations of toxic chemicals, flammable vapors, or oxygen-deficient atmospheres. Personnel shall immediately notify the Site Safety and Health Officer (SSHO) if odors are detected.		
	Contaminated air, water, soil, or hazardous chemicals	Physical contact with contaminated media or hazardous chemicals shall be avoided. Personal protective equipment use is required when contact is possible. Personnel who sustain skin contact shall immediately wash the affected area with soap and water (eyes should be irrigated for 15 minutes with potable water) and report the incident to the SSHO.		
	Fire	Smoking shall not be permitted in regulated areas. Vehicles shall not be parked in tall dry grass		
	Miscellaneous site activity.	When possible, personnel shall avoid areas that have hazardous activities in progress. When access must be gained in busy areas, the foremen of the activities in the area shall be notified prior to sampling in the area.	High visibility vests shall be worn when working in areas with high vehicular or heavy equipment traffic.	

EQUIPMENT REQUIRED	INSPECTION REQUIREMENTS	TRAINING REQUIREMENTS
• Vehicles • Hand tools	• Daily equipment inspections as per manufacturers requirements • Inspection of all emergency equipment (i.e. first aid kits, fire extinguishers)	• Review AHA with all task personnel • Review Site Specific Safety and Occupational Health Program • Review operations/safety manuals for all equipment utilized

APPENDIX C4 ACTIVITY HAZARD ANALYSIS FOR COLLECT SUBSURFACE SOIL SAMPLES				
Task Breakdown	**Potential Hazards**	**Critical Safety Practices**	**Personal Protective Clothing and Equipment**	**Monitoring Devices**
Arrival of new personnel at site.	Unfamiliarity with: site, general site hazards, project safety rules, chain of command, and emergency procedures.	All personnel shall attend the site orientation training.		
Location surveys.	Use of hand tools.	Hand tools shall be inspected daily and before each use. Tools, which are damaged, shall be removed from service.		
Materials Handling.	Overexertion	Personnel shall work in a manner and pace to reduce strains and overexertion.		
Soil sampling.	Hazardous atmospheres.	Air monitoring shall be performed in areas where there is the possibility of elevated concentrations of toxic chemicals, flammable vapors, or oxygen deficient atmospheres. Personnel shall immediately notify the SSHO if odors are detected. Engineering controls shall be implemented, when feasible, to control hazardous atmospheres to within acceptable limits. When engineering controls are not adequate, administrative controls or the use of PPE is required.		
	Fire.	Smoking shall not be permitted in regulated areas. Vehicles shall not be parked in tall dry grass.		
	Slips, trips, and falls.	Keep work areas clear and maintain housekeeping. Personnel shall not jump from equipment or elevated surfaces. Personnel shall avoid walking on rough or slippery terrain.		

APPENDIX C4 ACTIVITY HAZARD ANALYSIS FOR COLLECT SUBSURFACE SOIL SAMPLES				
Task Breakdown	**Potential Hazards**	**Critical Safety Practices**	**Personal Protective Clothing and Equipment**	**Monitoring Devices**
Soil sampling (continued).	Contaminated air, water, soil, or hazardous chemicals.	Physical contact with contaminated media or hazardous chemicals shall be avoided. Personal protective equipment use is required when contact is possible/probable. Personnel who sustain skin contact shall immediately wash the affected area with soap and water (eyes should be irrigated for 15 minutes with potable water) and report the incident to the SSHO.		
	Use of acidic preservatives (if required).	Personal protective equipment use, including chemical splash goggles, shall be required. A portable eye wash station shall be readily available in the area where acids are being used. Acids will be used in areas with adequate ventilation. All containers shall be properly labeled.		
	Miscellaneous site activity.	Personnel shall avoid areas, when possible, that have hazardous activities in progress. When access must be gained in busy areas, the foremen of the activities in the area shall be notified - prior to sampling in the area. High visibility vests shall be worn when working in areas with high vehicular or heavy equipment traffic.		
	Heat/cold/severe weather.	Follow procedures outlined in SSHP. Follow procedures outlined in SSHP.		
	Biological.			

EQUIPMENT REQUIRED	**INSPECTION REQUIREMENTS**	**TRAINING REQUIREMENTS**
• Vehicles • Hand tools • Ladders • Forklift/Hand carts	• Daily equipment inspections as per manufacturers requirements • Inspection of all emergency equipment (i.e. first aid kits, fire extinguishers)	• Review AHA with all task personnel • Review SSHP • Review operations/safety manuals for all equipment utilized

APPENDIX C5 ACTIVITY HAZARD ANALYSIS FOR COLLECT SURFACE WATER AND GROUNDWATER SAMPLES				
Task Breakdown	**Potential Hazards**	**Critical Safety Practices**	**Personal Protective Clothing and Equipment**	**Monitoring Devices**
Arrival of new personnel at site.	Unfamiliarity with: site, general site hazards, project safety rules, chain of command, and emergency procedures.	All personnel shall attend the site orientation training.		
Location surveys.	Use of hand tools.	Hand tools shall be inspected daily and before each use. Tools, which are damaged, shall be removed from service.		
Materials Handling.	Overexertion	Personnel shall work in a manner and pace to reduce strains and overexertion.		
Water sampling.	Hazardous atmospheres.	Air monitoring shall be performed in areas where there is the possibility of elevated concentrations of toxic chemicals, flammable vapors, or oxygen deficient atmospheres. Personnel shall immediately notify the SSHO if odors are detected. Engineering controls shall be implemented, when feasible, to control hazardous atmospheres to within acceptable limits. When engineering controls are not adequate, administrative controls or the use of PPE is required.		
	Fire.	Smoking shall not be permitted in regulated areas. Vehicles shall not be parked in tall dry grass.		
	Slips, trips, and falls.	Keep work areas clear and maintain housekeeping. Personnel shall not jump from equipment or elevated surfaces. Personnel shall avoid walking on rough or slippery terrain.		

APPENDIX C5 ACTIVITY HAZARD ANALYSIS FOR COLLECT SURFACE WATER AND GROUNDWATER SAMPLES				
Task Breakdown	**Potential Hazards**	**Critical Safety Practices**	**Personal Protective Clothing and Equipment**	**Monitoring Devices**
Water sampling (continued).	Contaminated air, water, soil, or hazardous chemicals.	Physical contact with contaminated media or hazardous chemicals shall be avoided. Personal protective equipment use is required when contact is possible/probable. Personnel who sustain skin contact shall immediately wash the affected area with soap and water (eyes should be irrigated for 15 minutes with potable water) and report the incident to the SSHO.		
	Use of acidic preservatives (if required).	Personal protective equipment use, including chemical splash goggles, shall be required. A portable eye wash station shall be readily available in the area where acids are being used. Acids will be used in areas with adequate ventilation. All containers shall be properly labeled.		
	Miscellaneous site activity.	Personnel shall avoid areas, when possible, that have hazardous activities in progress. When access must be gained in busy areas, the foremen of the activities in the area shall be notified - prior to sampling in the area. High visibility vests shall be worn when working in areas with high vehicular or heavy equipment traffic.		
	Heat/cold/severe weather.	Follow procedures outlined in SSHP.		
	Biological.	Follow procedures outlined in SSHP.		

EQUIPMENT REQUIRED	**INSPECTION REQUIREMENTS**	**TRAINING REQUIREMENTS**
• Vehicles • Hand tools • Ladders • Forklift/Hand carts	• Daily equipment inspections as per manufacturers requirements • Inspection of all emergency equipment (i.e. first aid kits, fire extinguishers)	• Review AHA with all task personnel • Review SSHP • Review operations/safety manuals for all equipment utilized

APPENDIX C6 ACTIVITY HAZARD ANALYSIS FOR WELL DRILLING				
Task Breakdown	**Potential Hazards**	**Critical Safety Practices**	**Personal Protective Clothing and Equipment**	**Monitoring Devices**
Well Installation	Struck by/ Against Heavy Equipment, Flying Debris, Protruding Objects	• Wear reflective warning vests when exposed to vehicular traffic • Isolate equipment swing areas • Make eye contact with operators before approaching equipment • Barricade or enclose the drilling area • Restrict entry to the work area to authorized personnel during drilling activities • Wear hard hats, safety glasses with side shields, or splash/face shields and goggles, and steel-toe safety boots at all times • Understand and review hand signals	Warning vests, Hard hat, Safety glasses, steel toe work boots	
	Sharp Objects	• Wear cut resistant work gloves when the possibility of lacerations or other injury may be caused by sharp edges or objects • Maintain all hand and power tools in a safe condition • Keep guards in place during use • Observe work area and location of other personnel before lifting or moving objects with sharp edges	Leather gloves	
	Underground/ Overhead Utilities	• Identify all utilities around the site before work commences and cease work immediately if unknown utility markers are uncovered • Use manual excavation within 3 feet of known utilities • Utility clearance shall conform with 29 CFR 1926.955 (high voltage >700 kv) 15 feet phase to ground clearance; 31 feet phase to phase clearance		
	High Noise Levels	• Use hearing protection when exposed to excessive noise levels (greater than 85 dBA over an 8-hour work period) and Assess noise level with sound level meter if possibility exists that level may exceed 85dBA TWA	Ear plugs	Sound Level Meter

APPENDIX C6 ACTIVITY HAZARD ANALYSIS FOR WELL DRILLING				
Task Breakdown	**Potential Hazards**	**Critical Safety Practices**	**Personal Protective Clothing and Equipment**	**Monitoring Devices**
Well Installation (continued)	Handling Heavy Objects	• Observe proper lifting techniques • Obey sensible lifting limits (60 lb. Maximum per person manual lifting) • Use mechanical lifting equipment (hand carts, trucks) to move large, awkward loads • Warm up muscles before engaging in manual lifting activities • Review lifting posture/techniques regularly at safety meetings		
	Caught In/ Between Moving Parts	• Identify and understand parts of equipment which may cause crushing, pinching, rotating or similar injuries • Assure guards are in place to protect from these parts of equipment during operation • Provide and wear proper work gloves when the possibility of crush, pinch, or other injury may be caused by moving/stationary edges or objects • Maintain all equipment in a safe condition • Keep all guards in place during use • De-energize and lock-out machinery before maintenance or service		
	Horseplay	• Prohibit horseplay on all project sites • Review rules about horseplay with subcontract supervisors and workers • Remind workers not to respond/participate in horseplay started by others		

APPENDIX C6 ACTIVITY HAZARD ANALYSIS FOR WELL DRILLING				
Task Breakdown	**Potential Hazards**	**Critical Safety Practices**	**Personal Protective Clothing and Equipment**	**Monitoring Devices**
	Slips, Trips, Falls	• Clear walkways, work areas of equipment, drilling overburden, debris and other materials • Mark, identify, or barricade other obstructions		
	Inhalation and Contact with Hazardous Substances	• Provide workers proper skin, eye and respiratory protection based on the exposure hazards present • Review hazardous properties of site contaminants with workers before operations begin	Tyvek coveralls, nitrile gloves, latex or neoprene boots	
Well Installation (continued)	Fire/ Explosion	• Test well-head atmosphere with combustible gas meter • Eliminate sources of ignition from the work area • Prohibit smoking • Provide ABC (or equivalent) fire extinguishers in all work areas, flammable storage areas, generator and compressor locations • Store flammable liquids in well ventilated areas • Prohibit storage, transfer of flammable liquids in plastic containers • Post "NO SMOKING" signs • Store combustible materials away from flammables • Store all compressed gas cylinders upright, caps in place when not in use • Separate Flammables and Oxidizers by 20 feet minimum	Portable fire extinguishers	LEL/O_2
	High/Low Ambient Temperature	• Monitor for Heat/Cold stress in accordance with Shaw Health and Safety Procedures HS400. HS401 • Provide fluids to prevent worker dehydration		

EQUIPMENT REQUIRED	INSPECTION REQUIREMENTS	TRAINING REQUIREMENTS
• Drill Rig • Hand tools	• Daily equipment inspections as per manufacturers requirements • Inspection of all emergency equipment (i.e. first aid kits, fire extinguishers)	• Review JSA with all task personnel • Review SSHP

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APPENDIX C7 ACTIVITY HAZARD ANALYSIS FOR SOIL EXCAVATION				
Task Breakdown	**Potential Hazards**	**Critical Safety Practices**	**Personal Protective Clothing and Equipment**	**Monitoring Devices**
Excavation of Soil	Underground/ Overhead Utilities	• Identify all utilities around the site before work commences • Cease work immediately if unknown utility markers are uncovered • Use manual excavation within 3 feet of known utilities • Utility clearance shall conform with 29 CFR 1926.955 (high voltage >700 kv) 15 feet phase to ground clearance; 31 feet phase to phase clearance		
	Excavation Wall Collapse	• Construct diversion ditches or dikes to prevent surface water from entering excavation • Provide good drainage of area adjacent to excavation • Collect ground water/rain water from excavation and dispose of properly • Store excavated material at least 2 feet from the edge of the excavation; prevent excessive loading of the excavation face • Provide sufficient stairs, ladders, or ramps when workers enter excavations over 4 feet in depth • Place ladders no more than 25 feet apart laterally • Treat excavations over 4 feet deep as confined spaces • Complete confined space permit entry procedure • Monitor atmosphere for flammable/toxic vapors, and oxygen deficiency • Slope, bench, shore, or sheet excavations over 5 feet deep if worker entry is required • Assign a competent person to inspect, decide soil classification, proper sloping, the correct shoring, or sheeting • Inspect excavations (when personnel entry is required) daily, any time conditions change • Provide at least two means of exit for personnel working in excavations	Hard hat, safety glasses, steel toe work boots	

APPENDIX C7 ACTIVITY HAZARD ANALYSIS FOR SOIL EXCAVATION				
Task Breakdown	**Potential Hazards**	**Critical Safety Practices**	**Personal Protective Clothing and Equipment**	**Monitoring Devices**
Excavation of Soil (Continued)	Struck By/ Against Heavy Equipment	• Wear reflective warning vests when exposed to vehicular traffic • Isolate equipment swing areas • Make eye contact with operators before approaching equipment • Understand and review hand signals	Warning vests, hard hat, safety glasses, steel toe work boots	
	Handling Heavy Objects	• Observe proper lifting techniques • Obey sensible lifting limits (60 lb. maximum per person manual lifting) • Use mechanical lifting equipment (hand carts, trucks) to move large, awkward loads		
	Sharp Objects	• Wear cut resistant work gloves when the possibility of lacerations or other injury may be caused by sharp edges or objects • Maintain all hand and power tools in a safe condition • Keep guards in place during use	Leather gloves	
	Slips, Trips, Falls	• Clear walkways, work areas of equipment, vegetation, excavated material, tools, and debris • Mark, identify, or barricade other obstructions • Evaluate fall hazards above 4 ft.; use fall protection equipment (harness/lanyard), standard guardrails or other fall protection systems when working on elevated platforms above 6 ft. • Use Aheavy duty industrial≅ (type IA) ladders • Install and inspect scaffolds according to manufacturers requirements • Only trained operators are permitted to use aerial lifts • Tie-off all straight/extension ladders or manually hold by co-worker at base • Anchorage points for fall arrest systems must support at least 5,400 pounds for each worker		

APPENDIX C7 ACTIVITY HAZARD ANALYSIS FOR SOIL EXCAVATION				
Task Breakdown	**Potential Hazards**	**Critical Safety Practices**	**Personal Protective Clothing and Equipment**	**Monitoring Devices**
Excavation of Soil (Continued)	High Noise Levels	• Use hearing protection when exposed to excessive noise levels (greater than 85 dBA over an 8-hour work period) • Assess noise level with sound level meter if possibility exists that level may exceed 85dBA TWA	Ear plugs	
	Inhalation and Contact with Hazardous Substances	• Provide workers proper skin, eye and respiratory protection based on the exposure hazards present • Review hazardous properties of site contaminants with workers before operations begin • Monitor breathing zone air to determine levels of contaminants • Dampen soil using light water spray to prevent fugitive dust emissions • Cover stockpiled soil with plastic sheeting to prevent fugitive dust emissions • Conduct air monitoring / sampling to determine exposure levels	Tyvek coveralls, nitrile gloves, neoprene boots	LEL/O_2, PID, Mini-RAM, H_2S Monitor; Air sampling pump
	High/Low Ambient Temperature	• Monitor for Heat/Cold stress in accordance with IT Health and Safety Procedures # HS400, HS401 • Provide fluids to prevent worker dehydration • Follow work/rest schedule	Insulated Clothing (subject to ambient temperature)	Meteorological Equipment
EQUIPMENT REQUIRED		**INSPECTION REQUIREMENTS**	**TRAINING REQUIREMENTS**	
• Vehicles • Hand tools • Ladders • Forklift/Hand carts		• Daily equipment inspections as per manufacturers requirements • Inspection of all emergency equipment (i.e. first aid kits, fire extinguishers)	• Review AHA with all task personnel • Review Site Specific Safety and Occupational Health Program • Review operations/safety manuals for all equipment utilized	

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APPENDIX C8 ACTIVITY HAZARD ANALYSIS FOR BACKFILLING AND COMPACTION				
Task Breakdown	**Potential Hazards**	**Critical Safety Practices**	**Personal Protective Clothing and Equipment**	**Monitoring Devices**
Backfill and Compact Soils	Slips, Trips, Falls	• Clear walkways, work areas of equipment, tools, construction debris and other materials • Mark, identify, or barricade other obstructions • Maintain three point contact when ascending/ descending heavy equipment		
	Handling Heavy Objects	• Observe proper lifting techniques • Obey sensible lifting limits (60 lb. maximum per person manual lifting) • Use mechanical lifting equipment (hand carts, trucks) to move large, awkward loads		
	Struck by/ Against Heavy Equipment, Flying Debris, Protruding Objects	• Wear reflective warning vests when exposed to vehicular traffic • Isolate equipment swing areas • Make eye contact with operators before approaching equipment • Verify proper operation of equipment backup alarms • Barricade or enclose the work area • Restrict work area entry to authorized personnel only during construction activities • Wear hard hats, safety glasses with side shields, and steel-toe safety boots • Understand and review hand signals	Warning vests, Hard hat, Safety glasses, Steel toe work boots	
	Vibration	• Rotate compaction tasks to minimize worker exposure to equipment vibration • Use compactors with vibration dampening devices	leather gloves	
	High Noise Levels	• Use hearing protection when exposed to excessive noise levels (greater than 85 dBA over an 8-hour work period) • Assess noise level with sound level meter if possibility exists that level may exceed 85dBA TWA	Ear plugs	Sound Level Meter

APPENDIX C8 ACTIVITY HAZARD ANALYSIS FOR BACKFILLING AND COMPACTION				
Task Breakdown	**Potential Hazards**	**Critical Safety Practices**	**Personal Protective Clothing and Equipment**	**Monitoring Devices**
Backfill and Compact Soils (Continued)	High/Low Ambient Temperature	• Monitor for Heat/Cold stress in accordance with Shaw Health and Safety Procedures # HS400, HS401 • Provide fluids to prevent worker dehydration	Insulated Clothing (subject to ambient temperature)	Meteorological Equipment

EQUIPMENT REQUIRED	**INSPECTION REQUIREMENTS**	**TRAINING REQUIREMENTS**
• Excavator • Shovels, probes • Dump trucks	• Daily equipment inspections as per manufacturers requirements • Excavation inspection/permit • Inspection of all emergency equipment (i.e.: first aid kits, fire extinguishers)	• Review AHA with all task personnel • Review SSHP. • Review operations/safety manuals for all equipment utilized • Review site specific chemical hazards

APPENDIX C9 AHA FOR SITE SURVEY ACTIVITIES				
Task Breakdown	**Potential Hazards**	**Critical Safety Practices**	**Personal Protective Clothing and Equipment**	**Monitoring Devices**
Survey of Site	Struck By/ Against Motor Vehicles/ Operating Equipment	Wear reflective warning vests when exposed to vehicular traffic Isolate potential equipment swing areas Avoid/isolate survey activities in high traffic areas Make eye contact with vehicle operators before approaching/crossing high traffic areas Understand and review hand signals Emphasize The Buddy System where injury potential exists	Hard hat, safety glasses, steel toe work boots, Safety Vest	
	Slips, Trips, Falls	Clear walkways, work areas of equipment and tools Mark, identify, or barricade other obstructions		
	Handling Heavy Objects	Observe proper lifting techniques Obey sensible lifting limits (60 lb. maximum per person manual lifting) Use mechanical lifting equipment (hand carts, trucks) to move large, awkward loads		
	Sharp Objects	Wear cut resistant work gloves when the possibility of lacerations or other injury may be caused by sharp edges or objects Maintain all hand and power tools in a safe condition Keep guards in place during use Close doors, windows on heavy equipment to prevent injuries from tree branches and other vegetation	Leather gloves	
	Insect/ Animal Bites	Review injury potential with workers Avoid insect nests areas, habitats outside work areas Emphasize The Buddy System where such injury potential exists Use insect repellant to protect against sting injuries		

APPENDIX C9 AHA FOR SITE SURVEY ACTIVITIES				
Task Breakdown	**Potential Hazards**	**Critical Safety Practices**	**Personal Protective Clothing and Equipment**	**Monitoring Devices**
Survey of Site (Continued)	Contact Dermatitis	Wear long sleeve shirts / trousers to avoid skin contact with plants or other skin irritants Identify and review poisonous plants with workers Apply protective cream/lotion to exposed skin to prevent poison ivy or similar reactions	latex boot covers	
	High/Low Ambient Temperature	Monitor for Heat/Cold stress in accordance with Shaw Health and Safety Procedures # HS400, HS401 Provide fluids to prevent worker dehydration	Insulated Clothing (subject to ambient temperature)	Meteorological Equipment
EQUIPMENT REQUIRED		**INSPECTION REQUIREMENTS**	**TRAINING REQUIREMENTS**	
• Hand tools		Daily equipment inspections as per manufacturers requirements Inspection of all emergency equipment (i.e. first aid kits, fire extinguishers)	Review JSA with all task personnel Review SSHP	

APPENDIX C10 AHA FOR SITE RESTORATION				
Task Breakdown	**Potential Hazards**	**Critical Safety Practices**	**Personal Protective Clothing and Equipment**	**Monitoring Devices**
Prepare area, fertilize, and sew grass seed.	Use of tractors/mechanical equipment.	Only qualified personnel shall be permitted to operate equipment. The operator shall read the tractor operator manual prior to use. The operator shall review all safety and operational decals applied to the tractor and implements prior to use. The tractor shall be inspected daily (and documented). Inspection forms are located in Appendix D of the SSHP. Do not use unsafe equipment. Deficiencies in equipment shall be noted on the inspection form. Equipment found to be unsafe shall not be used. Keep all shields and guards in place. Do not operate equipment with missing shields or guards. Shut off engine, remove the key, and be sure implement motion has stopped before dismounting the tractor, performing adjustments, or performing maintenance. Personnel shall not wear loose clothing, and stay clear of moving parts. Be careful of pinch points when coupling and uncoupling equipment. Be careful of power take off (PTO) – make sure guards are in place. Never step over the PTO – walk around the tractor or implement. Avoid tight turns that pinch rotating shafts between the tractor and machine.		

APPENDIX C10 AHA FOR SITE RESTORATION				
Task Breakdown	**Potential Hazards**	**Critical Safety Practices**	**Personal Protective Clothing and Equipment**	**Monitoring Devices**
Prepare area, fertilize, and sew grass seed (continued).	Use of tractors/mechanical equipment (continued).	Wear gloves when manually hooking up equipment. Avoid lateral movement on steep slopes where rollover potential may be high. All equipment shall be operated at safe speeds and in a safe manner. Personnel shall ensure all mechanical guards are in place and functioning properly. All equipment shall be shut down with energies dissipated prior to performing maintenance activities - lock out/tag out procedures may apply. Only qualified mechanics shall work on or repair heavy equipment. All equipment shall have backing alarms. The tractor operator shall wear safety belts. Personnel are only permitted to approach equipment after a signal from the operator. Operate the PTO at the speed recommended for the implement being used.		

APPENDIX C10 AHA FOR SITE RESTORATION				
Task Breakdown	**Potential Hazards**	**Critical Safety Practices**	**Personal Protective Clothing and Equipment**	**Monitoring Devices**
Prepare area, fertilize, and sew grass seed (continued).	Slips, trips, falls. Hand injuries. Bright sun (glare) and eye injuries. Fire.	Personnel shall not jump from equipment. Personnel shall be cautious when walking/working on uneven or slippery surfaces. Heavy equipment operators shall use extra care and maintain three-point contact when climbing into or out of equipment. Items to be handled shall be inspected for sharp edges prior to being handled. Personnel shall wear leather gloves when handling sharp materials. Personnel shall be aware of and avoid pinch point hazards. Eye protection equipment shall be worn as necessary. The tractor shall be shut off before refueling. A 2:A-20B:C fire extinguisher shall be available when re-fueling tractor. Smoking shall not be permitted when fueling. The tractor shall be allowed to cool before refueling. Gasoline shall be stored in safety cans with flash arrestors and spring-loaded vents. The tractor shall be equipped with a 5-B:C fire extinguisher. Vehicle shall not be allowed to idle when parked on grass. A Hudson sprayer, filled with water, shall be available at the work location.		

APPENDIX C10 AHA FOR SITE RESTORATION				
Task Breakdown	**Potential Hazards**	**Critical Safety Practices**	**Personal Protective Clothing and Equipment**	**Monitoring Devices**
Prepare area, fertilize, and sew grass seed (continued).	Noise.	Tractor operator shall wear hearing protection to reduce exposures to below the Occupational Safety and Health Administration limits.		
	Heat stress.	Personnel shall keep hydrated by drinking more water than thirst indicates. The heat stress guidelines in the SSHP shall be followed. Personnel shall pace themselves while performing strenuous work and take adequate breaks in a cool area. Personnel shall take adequate breaks in a cool area.		
	Stinging and biting insects.	Follow procedures outlined in SSHP. Use Deep Woods Off (N,N-Diethyl-m-toluamide [DEET]) and Repel Permanone (permethrins), and/or flowers of sulfur to repel chiggers, mosquitoes, and ticks.		
	Use of fertilizer.	Read material safety data sheet for fertilizer prior to use. The precautionary recommendations by the manufacturer shall be followed. Personnel shall avoid contact with the fertilizer. Personnel shall wash their hands and face immediately after using the fertilizer.		

EQUIPMENT REQUIRED	**INSPECTION REQUIREMENTS**	**TRAINING REQUIREMENTS**
Hearing protection Insect repellant Drinking water	Site inspections (daily)	Site orientation Hazard Communication Heat stress procedures

APPENDIX C11
ACTIVITY HAZARD ANALYSIS FOR SOIL BORROW MATERIAL IMPORT (LOADING, TRANSPORTATION, AND DUMPING

Task Breakdown	Potential Hazards	Critical Safety Practices	Personal Protective Clothing and Equipment	Monitoring Devices
Truck Loading and Equipment Operations	Struck By/ Against Heavy Equipment	• Wear reflective warning vests when exposed to vehicular traffic • Obey posted speed limits • Isolate equipment swing areas • . Make eye contact with operators before approaching equipment . Understand and review hand signals	Warning vests, Hard hat, Safety glasses, Steel toe work boots	
	Slips, Trips, Falls	• Clear walk ways, work areas of equipment, tools and debris • . Mark, identify, or barricade other obstructions		
	Sharp Objects	• Wear cut resistant work gloves when the possibility of lacerations or other injury may be caused by sharp edges or objects • Maintain all hand and power tools in a safe condition • Keep guards in place during use	Leather gloves	
	High Noise Levels	• Use hearing protection when exposed to excessive noise levels (Greater than 85 dBA over an 8-hour work period) • Assess noise level with sound level meter if possibility exists that level may exceed 85dBA TWA • Do not attempt verbal communication in high noise backgrounds	Ear plugs	Sound Level Meter
	Handling Heavy Objects	• Observe proper lifting techniques • Obey sensible lifting limits (60 lb. maximum per person manual lifting) • Use mechanical lifting equipment (hand carts, trucks)to move large, awkward loads		

APPENDIX C11
ACTIVITY HAZARD ANALYSIS FOR SOIL BORROW MATERIAL IMPORT (LOADING, TRANSPORTATION, AND DUMPING

Task Breakdown	Potential Hazards	Critical Safety Practices	Personal Protective Clothing and Equipment	Monitoring Devices
Truck Loading and Equipment Operations (Continued)	Caught In/ Between Moving Parts	• Identify and understand parts of equipment which may cause crushing, pinching, rotating or similar motions • Assure guards are in place to protect from these parts of equipment during operation • Wear proper work gloves when the possibility of pinching, or other injury may be caused by moving/ handling large or heavy objects • Maintain all equipment in a safe condition • Keep all guards in place during use • Avoid moving hydraulic, dump or loading equipment		

EQUIPMENT REQUIRED	INSPECTION REQUIREMENTS	TRAINING REQUIREMENTS
• Excavator • Dump trucks • Shovels	• Daily equipment inspections as per manufacturers requirements • Inspection of all emergency equipment (i.e. first aid kits, fire extinguishers)	• Review AHA with all task personnel • Review operations/safety manuals for all equipment utilized

APPENDIX C12 AHA FOR EQUIPMENT DECONTAMINATION				
Task Breakdown	**Potential Hazards**	**Critical Safety Practices**	**Personal Protective Clothing and Equipment**	**Monitoring Devices**
Arrival of new personnel at site.	Unfamiliarity with site, general site hazards, project safety rules, chain of command, and emergency procedures.	All personnel shall attend the site orientation training.		
Unload equipment.	Heavy lifting, strains, and sprains.	No individual employee is permitted to lift any object that weighs over 60 pounds. Proper lifting techniques shall be used. Multiple employees or the use of mechanical lifting devices are required for lifting objects over the 60-pound limit.		
Equipment decontamination.	Use of pressure or steam washer.	All personnel associated with the use of steam/pressure washers shall wear Level D-Modified personal protective equipment (PPE). Rain gear over Saranex or poly-coated Tyvek® coveralls shall be worn by personnel in addition to Nitrile or polyvinyl chloride (PVC) gloves and PVC or Latex boot covers. Physical contact with contaminated media or hazardous chemicals shall be avoided. Personnel who sustain skin contact shall immediately wash the affected area with soap and report the incident to the Site Safety and Health Officer. Personnel shall wash hands and face at the conclusion of decontamination activities and before breaks.		

APPENDIX C12 AHA FOR EQUIPMENT DECONTAMINATION				
Task Breakdown	**Potential Hazards**	**Critical Safety Practices**	**Personal Protective Clothing and Equipment**	**Monitoring Devices**
Equipment decontamination (continued).	Slips, trips, falls. Pressure/steam washing.	Personnel shall be cautious when walking/working on slippery surfaces. Personnel lifts or scaffolding shall be used to access the tops of large/heavy equipment that must be cleaned. Fall protection shall be used when working at heights greater than six feet. Good house keeping shall be maintained in the decontamination area. Hoses and extension cords shall be kept/used in an orderly fashion. All equipment shall be shut off and a positive means taken to prevent its operation prior to decontamination. All dump beds on trucks shall be blocked if bed is cleaned in raised position. The pressure/steam washer shall be inspected before each use. The manufacturer's instruction manual shall be used to guide the inspection process. Personnel shall be trained in the use of the washing equipment. All personnel working in the equipment decontamination area shall be trained in the emergency shut-off procedures for the equipment being used. The minimum amount of steam/pressure that will complete the job should be used. Pressure washers exceeding 3000 psi shall not be used without the approval of the Certified Industrial Hygienist. The spray from such equipment shall only be directed at surfaces to be cleaned and never at body parts or other personnel. Personnel in the immediate area shall use face shields and metatarsal/shin guards.		

APPENDIX C12 AHA FOR EQUIPMENT DECONTAMINATION				
Task Breakdown	**Potential Hazards**	**Critical Safety Practices**	**Personal Protective Clothing and Equipment**	**Monitoring Devices**
Equipment decontamination (continued).	Pressure/steam washing (continued).	Personnel shall keep a firm grip on the wand and not point it at anything that is not being washed. Pressure washer operators must maintain good footing. The trigger on the wand shall never be wired/fixed open. Operators are to take adequate breaks to avoid fatigue. Hot surfaces shall be avoided. Units shall be shut off and allowed to cool prior to re-fueling.		
	Cold stress.	Personnel shall wear clothing commensurate with the ambient temperature. Personnel shall take breaks as necessary to warm up. Hot beverages shall be provided to personnel during breaks. The additional precautionary measures for cold stress, detailed in the Safety, Health, and Emergency Response Plan, may be applicable.		

APPENDIX C12 AHA FOR EQUIPMENT DECONTAMINATION				
Task Breakdown	**Potential Hazards**	**Critical Safety Practices**	**Personal Protective Clothing and Equipment**	**Monitoring Devices**
Equipment decontamination (continued).	Use of methanol.	Methanol shall be kept in storage cabinets when not in use. Methanol shall only be used in areas where smoking is prohibited and all ignition sources have been removed. Methanol will be used outdoors or in areas with adequate ventilation. Personnel using methanol shall wear safety glasses, Silver Shield gloves, and 100% cotton clothing under Saranex coated Tyvek coveralls. A fire extinguisher and charged water hose shall be available in the immediate area where methanol is being used. Physical contact with methanol shall be avoided. Personnel who sustain skin contact shall immediately wash the affected area with soap and water (eyes should be irrigated for 15 minutes with potable water) and report the incident to the Site Safety and Health Officer. A portable eye wash station shall be readily available in the area where methanol is being used. All containers shall be properly labeled.		
EQUIPMENT REQUIRED		**INSPECTION REQUIREMENTS**	**TRAINING REQUIREMENTS**	
• Hand tools • Pressure Washer		Daily equipment inspections as per manufacturers requirements Inspection of all emergency equipment (i.e. first aid kits, fire extinguishers)	Review JSA with all task personnel Review SSHP Hazard communication	

APPENDIX C13 ACTIVITY HAZARD ANALYSIS FOR DEMOBILIZATION				
Task Breakdown	**Potential Hazards**	**Critical Safety Practices**	**Personal Protective Clothing and Equipment**	**Monitoring Devices**
Demobilization/ Tear Down Site	Slips, Trips, Falls	• Clear walkways work areas of equipment, tools, vegetation, excavated material and debris • Mark, identify, or barricade other obstructions		
	Spills	• Clean up spills before initiating maintenance • Review maintenance procedures for safety practices		
	Electrical Shock	• De-energize or shut off utility lines at their source before work begins • Use double insulated or properly grounded electric power-operated tools • Provide an equipment-grounding conductor program or employ ground-fault circuit interrupters • Use qualified electricians to unhook electrical circuits • Inspect all extension cords daily for structural integrity, ground continuity, and damaged insulation • Cover or elevate electric wire or flexible cord passing through work areas to protect from damage • Keep all plugs and receptacles out of water • Use approved water-proof, weather-proof type if exposure to moisture is likely • Inspect all electrical power circuits prior to commencing work • Follow Lockout/Tagout procedure HS315 – Control of Hazardous Energy Sources	Lockout/Tagout Devices	Voltage Meter or Tic Tracer

APPENDIX C13 ACTIVITY HAZARD ANALYSIS FOR DEMOBILIZATION				
Task Breakdown	**Potential Hazards**	**Critical Safety Practices**	**Personal Protective Clothing and Equipment**	**Monitoring Devices**
Demobilization/ Tear Down Site (continued)	Handling Heavy Objects	• Observe proper lifting techniques • Obey sensible lifting limits (60 lb. Maximum per person manual lifting) • Use mechanical lifting equipment (hand carts, trucks) to move large, awkward loads • Avoid carrying heavy objects above shoulder level • Warm up muscles before engaging in manual lifting		
	Sharp Objects	• Wear cut resistant work gloves when the possibility of lacerations or other injury may be caused by sharp edges or objects • Maintain all hand and power tools in a safe condition	Leather gloves	
	High Noise Levels	• Use hearing protection when exposed to excessive noise levels (greater than 85 dBA over an 8-hour work period) • Do not attempt verbal communication in high noise backgrounds	Ear plugs	
	Struck By/ Against Heavy Equipment	• Wear reflective warning vests when exposed to vehicular traffic • Isolate equipment swing areas • Make eye contact with operators before approaching equipment • Understand and review hand signals • Follow hand signals of ground workers for equipment manipulation when placing/loading equipment into bucket. • Step away from equipment when bucket adjustments are made • Do not attempt verbal communication in high noise backgrounds.	Warning vests, Hard hat, Safety glasses, and Steel toe work boots	

APPENDIX C13 ACTIVITY HAZARD ANALYSIS FOR DEMOBILIZATION				
Task Breakdown	**Potential Hazards**	**Critical Safety Practices**	**Personal Protective Clothing and Equipment**	**Monitoring Devices**
Demobilization/ Tear Down Site (continued)	Struck-by/Against (Vehicle-traffic)	• Wear reflective warning vests when exposed to vehicular traffic • Barricade or enclose the work areas • Restrict entry to the work areas to authorized personnel during work activities • Wear hard hats, safety glasses with side shields, and steel-toe safety boots at all times • Follow FDOT roadway and traffic design standards manual • Personnel will perform all work tasks and remain inside barriered work zones • Spotters to be utilized as necessary	Warning vests, Hard hat, Safety glasses, and steel toe work boots	
	Pinch Points	• Review equipment adjustment procedures, identify pinch points • Isolate/block pinch points to limit motion when inserting pins, fasteners, closing tackles	Leather gloves	
	Burns associated with loading/unloading equipment on trucks	• Identify heavy objects for loading that may have hot surfaces • Allow objects to cool or cover hot surfaces with non-combustible material to protect workers from burns		
	Ladders	• Inspect ladders before use for mud buildup on treads • Clean mud from boots before climbing on ladders • Follow the three point of contact rule		
	High/Low Ambient Temperature	• Monitor for Heat Stress in accordance with Health and Safety Procedures HS400, HS401 • Provide fluids to prevent worker dehydration		

EQUIPMENT REQUIRED	**INSPECTION REQUIREMENTS**	**TRAINING REQUIREMENTS**
• Vehicles • Hand tools • Ladders • Forklift/Hand carts	• Daily equipment inspections as per manufacturers requirements • Inspection of all emergency equipment (i.e. first aid kits, fire extinguishers)	• Review AHA with all task personnel • Review Site Specific Safety and Occupational Health Program • Review operations/safety manuals for all equipment utilized

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APPENDIX C14 AHA FOR REFUELING				
Task Breakdown	**Potential Hazards**	**Critical Safety Practices**	**Personal Protective Clothing and Equipment**	**Monitoring Devices**
Fueling operations with gasoline and diesel	Exposures to fuels. Fire: extinguisher requirements.	Personnel shall periodically review the Material Safety Data Sheets (MSDS) for the fuels that are being used at the project. The handling and use of fuels shall be performed in well-ventilated areas – preferably outside of buildings. Personnel shall avoid skin and eye contact with fuels. Safety glasses and disposable nitrile gloves shall be worn while handling fuels. A small eyewash bottle shall be readily available when fueling equipment. If personnel get fuel in their eyes, then the eyes shall be irrigated with the entire contents of the eye wash bottle and then the employee shall seek medical assistance. If personnel sustain skin contact with fuels, then the affected area shall be immediately washed with soap and water. If fuel contact with clothing is made, then clothing shall be removed and changed immediately. A 2-A:10-B:C fire extinguisher shall be readily available when fueling equipment at any location on site. Personnel who intend to extinguish small fires shall be trained in the use of fire extinguishers. Equipment and property are of secondary concern in a fire situation - personnel shall never try to extinguish a fire if there is any doubt that it can be extinguished safely.		

APPENDIX C14 AHA FOR REFUELING				
Task Breakdown	**Potential Hazards**	**Critical Safety Practices**	**Personal Protective Clothing and Equipment**	**Monitoring Devices**
Fueling operations (continued).	Fire: elimination of ignition sources – hot surfaces.	All vehicles and equipment shall be shut down prior to fueling. Small equipment, such as generators, compressors, light plants, etc. shall be allowed to cool prior to re-fueling. Equipment with the fuel cap near the engine or near other hot surfaces shall also be allowed to cool prior to re-fueling.		
	Fire: elimination of ignition sources – arcs/sparks/open flames.	Smoking shall not be allowed within 50 feet of fueling operations. Personnel shall visually survey the immediate area for open flames and other ignition sources prior to commencing fueling operations. Personnel are prohibited from using cell-phones or two-way radios during all fueling operations.		
	Fire: elimination of ignition sources – static electricity.	Personnel shall never fill portable fuel cans that are in the bed of a pickup truck or in the trunk of an automobile. Filling fuel containers on plastic pickup truck bed-liners can cause static electric discharges, which may ignite the fuel. The fuel can(s) shall be removed from the truck bed or automobile trunk and placed on the ground before adding fuel. Electrical continuity shall be maintained between the portable fuel can and the tank being filled. A bonding cable shall be used to maintain continuity between the metal fuel container and the equipment fuel tank. Allowing free-fall of fuel into the tank is prohibited.		

APPENDIX C14 AHA FOR REFUELING				
Task Breakdown	**Potential Hazards**	**Critical Safety Practices**	**Personal Protective Clothing and Equipment**	**Monitoring Devices**
Fueling operations (continued).	Fire: elimination of ignition sources – static electricity. (continued)	Personnel shall not re-enter vehicles while fueling is underway due to the static electric charge generated between clothing and vehicle seats. If you absolutely have to get in your vehicle while the gas is pumping, make sure you get out, close the door touching the metal, before you pull the nozzle out. This way the static from your body will be discharged before you remove the nozzle.		
	Storage and transportation: saddle tanks in pick-up trucks.	Gasoline shall not be transported in portable saddle tanks – only diesel fuel shall be transported in saddle tanks. All portable saddle tanks mounted in pick-up trucks shall be manufactured to meet U.S. Department of Transportation (DOT) specifications. Portable saddle tanks shall be securely mounted to the pick-up truck, as recommended by the manufacturer. Saddle tanks shall be properly marked (see 49 Code of Federal Regulation 172.101) with the proper shipping name and labeled for "No Smoking." No more than 110 gallons of diesel fuel may be transported in a saddle tank unless all the DOT Hazardous Material Regulations are complied with, such as proper packaging, completing shipping papers, placarding, and the appropriate HM 126 Training (as well as having been provided emergency response information and training.) Caps on saddle tanks shall be securely closed. Saddle tanks shall be inspected weekly to check for leaks. Drivers must be notified that they are transporting hazardous materials.		

APPENDIX C14 AHA FOR REFUELING				
Task Breakdown	**Potential Hazards**	**Critical Safety Practices**	**Personal Protective Clothing and Equipment**	**Monitoring Devices**
Fueling operations (continued).	Storage and transportation: five-gallon cans in pick-up trucks.	Gasoline shall be stored and transported in properly marked/labeled five-gallon safety cans (equipped with self-venting cap and flash arrestor). Gasoline cans shall be secured to prevent movement during transportation. No more than six 5 gallon containers of gasoline may be transported in vehicles (back of pick-up trucks or trailers) at the same time unless all the DOT Hazardous Material Regulations are complied with, such as proper packaging, completing shipping papers, placarding (as required), and the appropriate HM 126 Training (as well as having been provided emergency response information and training.) The total quantity of hazardous materials may never exceed 400 pounds total. Hazardous materials must be secured prior to transporting. Drivers must be notified that they are transporting hazardous materials.		
	Storage of gasoline on-site.	Portable gasoline cans must be stored within the flammable materials storage cabinet.		
Other concerns	Spills.	All spills shall be immediately cleaned-up. All spills shall be reported to the Shaw Project Manager.		

EQUIPMENT REQUIRED	**INSPECTION REQUIREMENTS**	**TRAINING REQUIREMENTS**
Five-gallon safety cans (equipped with self-venting cap and flash arrestor	Verify MSDSs for fuels are available in vehicles transporting fuels	Hazard communication Materials of Trade

APPENDIX C15 AHA FOR RIGGING AND LIFTING WITH HYDRAULIC EQUIPMENT				
Task Breakdown	**Potential Hazards**	**Critical Safety Practices**	**Personal Protective Clothing and Equipment**	**Monitoring Devices**
Travel on and off project site (vehicular).	Vehicle Operation.			
Arrival of new personnel at site. Movement of personnel on-site. Prepare for equipment operations, including inspections. Perform equipment operations. Handle equipment and materials. Equipment maintenance.	Newly hired personnel and visitors. Unfamiliarity with: site, general (chemical, physical, environmental) site hazards, project safety rules and hazard control procedures, chain of command, and emergency procedures.	All personnel working on hazardous, toxic, and radioactive waste (HTRW) shall submit HAZWOPER training certificates (40-hour, 8-hour [if applicable], supervisor [if applicable]) to the Site Safety and Health Officer (SSHO). All personnel shall attend a site safety orientation. All site workers shall receive HAZWOPER three-day OJT. After personnel are trained in the contents of the Site Safety and Health Plan (SSHP), they shall sign the SSHP Acknowledgment Form. All training certifications held by personnel shall also be made available and kept in on-site personnel files. Review emergency procedures and evacuation plans.		
Complete Lift Plan Worksheet (Hydraulic Equipment). Rig materials or equipment.	Medical qualifications.	All personnel working on HTRW shall submit current physician's certificate stating that employee is participating in an appropriate medical surveillance program meeting 29 Code of Federal Regulation (CFR) 1910.120.		
Hold pre-lift meeting. Lift materials or equipment.	Allergies.	All personnel should complete the Known Allergies Questionnaire (voluntary only).		

APPENDIX C15 AHA FOR RIGGING AND LIFTING WITH HYDRAULIC EQUIPMENT				
Task Breakdown	**Potential Hazards**	**Critical Safety Practices**	**Personal Protective Clothing and Equipment**	**Monitoring Devices**
See principal steps above.	Complacency.	All personnel shall attend the daily Plan of the Day meetings to re-focus themselves to hazards, emergency procedures and equipment, operational aspects, and change(s) in site/work conditions. Procedures shall be conveyed to control these hazards.		
	Failure to properly plan daily activities.	A Job Safety Analysis (JSA), as required by Shaw Environmental & Infrastructure, Inc. Procedure No. HS045, "Job Safety Analysis (JSA)," shall be prepared by the crew prior to commencing daily activities. The JSA shall be used as a component of the morning Tailgate Safety Meeting. The JSA shall be revised at any time throughout the workday when new tasks are initiated, unforeseen circumstances arise, or if working conditions change. Personnel shall implement Hazard Assessment Resolution Program.		
	Heavy lifting, strains, and sprains.	No individual employee is permitted to lift any object that weighs over 60 pounds. Proper lifting techniques shall be used. Multiple employees or the use of mechanical lifting devices are required for lifting objects over the 60-pound limit.		
	Slips, trips, and falls.	Keep work areas clear and maintain housekeeping. Do not jump from equipment or elevated surfaces. Daily housekeeping will be implemented at the end of each workday. Use three-point contact rule for entering/exiting trucks and equipment. Use extra caution when walking on wet, muddy, frosty, icy, or snow-covered surfaces. Maintain proper illumination in work areas. Fall protection must be provided and used when personnel are exposed to fall hazards greater than six feet.		

APPENDIX C15 AHA FOR RIGGING AND LIFTING WITH HYDRAULIC EQUIPMENT				
Task Breakdown	**Potential Hazards**	**Critical Safety Practices**	**Personal Protective Clothing and Equipment**	**Monitoring Devices**
	Use of mechanical equipment.	Only qualified personnel shall be permitted to operate equipment. Mechanical equipment shall be inspected daily. Deficiencies in equipment shall be noted on the inspection form. Equipment found to be unsafe shall be taken out of serviced. All equipment shall be operated at safe speeds and in a safe manner. Equipment operators shall wear safety belts and hearing protection (as necessary). Ground personnel shall not position themselves between equipment and stationary objects (stay out of swing radius). Personnel are only permitted to approach equipment after a signal from the operator.		
	Hand injuries.	Items to be handled shall be inspected for sharp edges, splinters, burrs, rough surfaces, etc. prior to being handled. Personnel shall wear leather gloves when handling materials with sharp edges, splinters, burrs, rough surfaces, etc. Personnel shall be aware of and avoid pinch point hazards.		
	Fire.	Fire extinguishers shall be available in work areas. The SSHO shall establish smoking areas. Smoke only in designated areas. Only discard cigarette butts in proper receptacles – never discard cigarette butts onto the ground. Engines shall be shut off before refueling. A 2-A:40-B:C fire extinguisher shall be available when refueling at the project site. Smoking shall not be permitted within 50 feet of fueling operations.		

APPENDIX C15 AHA FOR RIGGING AND LIFTING WITH HYDRAULIC EQUIPMENT				
Task Breakdown	**Potential Hazards**	**Critical Safety Practices**	**Personal Protective Clothing and Equipment**	**Monitoring Devices**
See principal steps above.	Chemical hazards.	Perform decontamination as specified in the HASP. The Exclusion Zones and Contamination Reduction Zones shall be set-up and appropriately marked with signage. Avoid contact with contaminated materials. Wear PPE, as specified in the SSHP. The SSHO will perform chemical air monitoring, as specified in the SSHP. Verify emergency eyewash stations have been inspected, cleaned, filled, and in service. Notify all personnel of the emergency eyewash station locations. Project personnel will follow instructions on specific AHA's or as instructed by the SSHO. Project personnel will use appropriate PPE in accordance with the SSHP and as indicated on specific AHA's or as instructed by the SSHO. Barriers such as fences and ropes will be put in place to limit the access to Controlled Areas as specified in the SSHP. Signs will be used to alert persons of specific hazards as specified in the SSHP. Engineering controls (i.e., spraying material with water, calcium chloride solution) will be used as required by the SSHP or as instructed by the SSHO to reduce dust emission. Notify the SSHO if odors are detected.		

APPENDIX C15 AHA FOR RIGGING AND LIFTING WITH HYDRAULIC EQUIPMENT				
Task Breakdown	**Potential Hazards**	**Critical Safety Practices**	**Personal Protective Clothing and Equipment**	**Monitoring Devices**
See principal steps above.	Insect bites and stings.	Review injury and illness potential with workers. Inspect work areas for bee nests and activity prior to commencing work in that area. Wear PPE, such as disposable coveralls, to keep insects away from the skin. Expect to encounter insects when working in warm weather – especially at locations with vegetation present. Use protective insect repellents containing DEET to prevent insect bites, unless individual allergies and sensitivities prevent its use. Check limbs/body for insects/ insect bites upon removing PPE and again during showering. Consider applying Permethrin (Repel Permanone or equivalent) preparations to clothing to repel ticks, chiggers, mosquitoes, and/or spiders. Immediately notify supervisor or SSHO of insect bites, stings, irritations, rashes, or flu-like symptoms.		
	Contact dermatitis from poisonous and irritating plants (poison ivy, poison oak, and poison sumac).	Learn to identify poisonous and irritating plants. Identify workers who are known especially sensitive to poisonous and irritating plants and plan work accordingly. Check around work areas to identify if poisonous and irritating plants are present. Wear long-sleeve shirts/trousers or Tyvek® coveralls to avoid skin contact with plants or other skin irritants. Apply protective cream/lotion to exposed skin to prevent poison ivy or similar reactions. Immediately notify the SSHO if you suspect you contacted an irritating plant. Avoid unnecessary clearing of plant/vegetation areas. Follow additional procedures outlined in the SSHP.		

APPENDIX C15 AHA FOR RIGGING AND LIFTING WITH HYDRAULIC EQUIPMENT				
Task Breakdown	**Potential Hazards**	**Critical Safety Practices**	**Personal Protective Clothing and Equipment**	**Monitoring Devices**
	Severe weather, heat stress, and cold stress.	The SSHO will monitor weather conditions each day in order to plan and prepare for hazardous conditions. The SSHO will identify a suitable storm shelter at each work location. The SSHO will verify that the tornado shelter is accessible and available. Work activities will be suspended prior to weather conditions becoming hazardous so that workers have ample time to seek shelter. Upon seeing lightning or hearing thunder, outdoor activities shall be suspended and personnel shall be evacuated to safe areas (inside vehicles, buildings, or tornado shelters as appropriate). Follow additional procedures outlined in the SSHP. Monitor for heat stress in accordance with Shaw E & I Procedure No. HS400, "Heat Stress" and the requirements of the SSHP. Monitor for cold stress in accordance with Shaw E & I Procedure No. HS401, "Cold Stress" and the requirements of the SSHP. Drink plenty of water and minimal carbonated or caffeine-containing beverages. Perform physiological monitoring as needed. Personnel shall take required breaks to cool down/warm-up as needed. Personnel shall wear insulated clothing based the ambient temperature and wind chill conditions.		
	Struck by and against: • Vehicles • Equipment • Flying debris/projectiles • Splashes.	Wear PPE with high visibility vests when walking or working near moving equipment or vehicles. Stay off roads and streets unless necessary; walk on left side of roads facing on-coming traffic. Personnel shall not be permitted in the swing radius of the equipment. Personnel shall maintain a safe distance from operations. Do not assume equipment and vehicle operators have seen you unless operator have made eye contact with you and signaled to you. Warning signs and signalmen may be necessary.		

APPENDIX C15 AHA FOR RIGGING AND LIFTING WITH HYDRAULIC EQUIPMENT				
Task Breakdown	**Potential Hazards**	**Critical Safety Practices**	**Personal Protective Clothing and Equipment**	**Monitoring Devices**
See principal steps above.	Use of operational chemicals.	Read and follow MSDS for each chemical used. Do not use any chemical that you have not been trained to safely use. Provide ventilation as necessary. Wear proper PPE. Properly label all containers.		
	Noise.	All personnel shall wear hearing protection when exposed to high noise levels. All personnel shall wear hearing protection when operating powered hand tools or noisy equipment. Personnel working in vicinity of noisy tools or equipment shall wear hearing protection. Noise dosimetry shall be performed to verify hearing protection is adequate.		
	Electrical.	Ground-fault circuit interrupters shall be used on all power tools and extension cords. Extension cords, power tools, and lighting equipment shall be inspected before each use, protected from damage, and kept out of wet areas. Keep extension cords off of ground surface. Only qualified electricians are permitted to work on electrical circuits. Electricians must follow NFPA 70 E (2009) when working on electrical circuits.		

APPENDIX C15 AHA FOR RIGGING AND LIFTING WITH HYDRAULIC EQUIPMENT				
Task Breakdown	**Potential Hazards**	**Critical Safety Practices**	**Personal Protective Clothing and Equipment**	**Monitoring Devices**
	Tools.	Select the proper tool – do not improvise. Inspect all power and hand tools before each use (do not use damaged tools). Tools shall be appropriate for the task and maintained in good condition. Only trained and authorized personnel will use hand and power tools. Check your position, footing, and grip before tool use. Avoid distraction, keep your focus, and concentrate on the job. Personnel shall maintain a steady pace when using tools and take adequate rest periods. Keep electric cords untangled and out of the way of rotating tools. Use double-insulated power tools when possible. Protect electric tools with ground fault circuit interrupters (GFCI). Minimum PPE will include safety glasses with side-shields, hard hat, safety-toed work boots, and cut-resistant gloves. Store tools carefully to prevent damage to them and to make the proper tool easier to locate.		
	Dust.	Control dust by maintaining equipment operation rates. Control dust by applying water and/or calcium chloride. Personnel shall stay out of dust and work from upwind when possible. Perform dust monitoring to verify dust control is effective.		

APPENDIX C15 AHA FOR RIGGING AND LIFTING WITH HYDRAULIC EQUIPMENT				
Task Breakdown	**Potential Hazards**	**Critical Safety Practices**	**Personal Protective Clothing and Equipment**	**Monitoring Devices**
	Rigging and lifting with hydraulic equipment.	Determine weight of object to be lifted; never lift any object if weight is unknown. Calculate lift/load capacities using manuals and load capacity charts. Lift supervisor will complete a Lift Plan Worksheet (Hydraulic Equipment) and hold pre-lift meeting prior to attempting lift. Assign operator, rigger, tagline, and signal man responsibilities as necessary. Review lift hand signals with operator, signaler, supervisor, and workers. Select appropriate rigging equipment for the type of lift. Review rigging techniques, position of load, tag lines with workers involved in rigging activities. Perform required daily inspections, of wire ropes, rigging hardware, and attachments. Rigging shall be inspected before each use. Inspect rigging devices to verify slings, straps are free from defects and rated for the lift weight. Deficiencies shall be noted on the inspection form.		

APPENDIX C15 AHA FOR RIGGING AND LIFTING WITH HYDRAULIC EQUIPMENT				
Task Breakdown	**Potential Hazards**	**Critical Safety Practices**	**Personal Protective Clothing and Equipment**	**Monitoring Devices**
See principal steps above.	Rigging and lifting with hydraulic equipment (continued).	Rigging found to be unsafe shall not be used, tagged, and taken out of service. Prohibit use of rigging equipment with missing documentation tags. Verify inspection and maintenance information for hydraulic equipment. Perform daily inspection of mechanical, hydraulic operations of equipment. Establish and isolate swing radius of equipment, rigging and load. Inspect for stability of surfaces beneath the hydraulic excavating equipment. All personnel shall be kept clear when material is being hoisted Hoisting of materials shall be done by use of a shackle that will prevent accidental disengagement. Taglines shall be used for controlling unguided materials. An operational test of equipment and rigging will be conducted in presence of GDA to verify performance. Re-perform operational test if repairs, major maintenance or reconfiguration is required on hydraulic equipment or attachments. Test lift objects for center of gravity. Ensure tag-lines are free of knots and defects. Prohibit looping / winding tag lines around hands or body. Prohibit positioning or moving load using tag lines. Loads shall be lifted at minimum height and carried as low as possible during traveling. Loads shall not be lifted over personnel. Never stand under a suspended load. Maintain adequate clearances from electrical sources. Do not hoist personnel with hydraulic equipment or ride on hoisted load.		

EQUIPMENT REQUIRED	INSPECTION REQUIREMENTS	TRAINING REQUIREMENTS
Personal Protective Equipment Level D: Hard Hat Safety Glasses Safety-Toed Boots Work Gloves ANSI Class 2 reflective warning vests Modified Level D: Refer to SSHP. Equipment: Air monitoring instruments Fire Extinguishers Emergency Eyewash First Aid Kit Insect repellant with DEET Repel Permanone Fall protection Drinking water Weather radio Water truck Rigging	Competent Person (CP) / Qualified Person (QP): CP/SSHO _____ Alternate SSHO/CP _____ QP/First Aid and CPR _____ QP/First Aid and CPR _____ CP/Rigger _____ Training Requirements:	HAZWOPER 40-Hour Site safety orientation Emergency procedures Hazard communication Applicable AHAs Qualified equipment operators Lifting/back safety Fall protection Fire extinguisher use Biological hazard identification and control Tornado shelter location Lightning safety procedures Daily site safety inspection (SSHO) Check training, and medical certifications against personnel roster Mechanized equipment (daily) Overhead and underground utilities Rigging (before each use) Housekeeping (daily) Fire extinguisher (weekly) Vehicle inspection daily Equipment and tools inspection daily and before use Survey areas for poisonous plants, insects, and animals Check body for ticks Verify tornado shelter is available

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APPENDIX C16 ACTIVITY HAZARD ANALYSIS FOR Visual Site Inspection and Surveys				
Task Breakdown	**Potential Hazards**	**Critical Safety Practices**	**Personal Protective Clothing and Equipment**	**Monitoring Devices**
Arrival of new personnel at site	Unfamiliarity with: site, general site hazards, project safety rules, chain of command, and emergency procedures.	• All personnel shall attend the site orientation training.	Warning vests, Hard hat, Safety glasses, and Steel toe work boots	
Visual site inspections and surveys	Slips, Trips, Falls	• Clear walkways work areas of equipment, tools, vegetation, excavated material and debris • Mark, identify, or barricade other obstructions		
	Electrical Shock	• De-energize or shut off utility lines at their source before work begins • Use double insulated or properly grounded electric power-operated tools • Provide an equipment-grounding conductor program or employ ground-fault circuit interrupters • Use qualified electricians to hook up electrical circuits • Inspect all extension cords daily for structural integrity, ground continuity, and damaged insulation • Cover or elevate electric wire or flexible cord passing through work areas to protect from damage • Keep all plugs and receptacles out of water • Use approved water-proof, weather-proof type if exposure to moisture is likely • Inspect all electrical power circuits prior to commencing work • Follow Lockout/Tagout procedure HS315 – Control of Hazardous Energy Sources		

APPENDIX C16 ACTIVITY HAZARD ANALYSIS FOR Visual Site Inspection and Surveys				
Task Breakdown	**Potential Hazards**	**Critical Safety Practices**	**Personal Protective Clothing and Equipment**	**Monitoring Devices**
Visual site inspections and surveys.	Poor planning.	• Complete Job Safety Analysis for each task, as specified in Shaw Environmental & Infrastructure, Inc. Procedure No. HS045, "Job Safety Analysis (JSA)." Use Hazard Assessment Resolution Program frequently – for each task to be completed.		
	Heavy lifting, strains, and sprains.	• No individual employee is permitted to lift any object that weighs over 60 pounds. Proper lifting techniques shall be used. Multiple employees or the use of mechanical lifting devices are required for lifting objects over the 60-pound limit.		
	Struck-by/against.	• Wear reflective warning vests when exposed to vehicular traffic. Personnel working on or near roads and only remain on road long enough to complete work. Personnel walking along roadway shall stay off roadway as far as possible and walk on the side facing traffic.	Warning vests, Hard hat, Safety glasses, and Steel toe work boots	
	Munitions and Explosives of Concern (MEC) / Unexploded Ordnance (UXO).	Personnel shall attend site-specific MEC Awareness (and recognition) Training prior to the commencement of any site activities.	Warning vests, Hard hat, Safety glasses, and steel toe work boots	

APPENDIX C16 ACTIVITY HAZARD ANALYSIS FOR Visual Site Inspection and Surveys				
Task Breakdown	**Potential Hazards**	**Critical Safety Practices**	**Personal Protective Clothing and Equipment**	**Monitoring Devices**
Visual site inspections and surveys (continued)	Hand injuries	• Review equipment adjustment procedures, identify pinch points • Isolate/block pinch points to limit motion when inserting pins, fasteners, closing tackles	Leather gloves	
	Burns associated with loading/unloading equipment on trucks	• Identify heavy objects for loading that may have hot surfaces • Allow objects to cool or cover hot surfaces with non-combustible material to protect workers from burns		
	Insect bites/West Nile virus.	• Wear PPE and tape joints to keep insects away from the skin. Use protective insect repellents containing N,N-diethyl-m-toluamide, such as, Deep Woods OFF, 3M Ultrathon, or equivalent and clothing insecticide preparations containing permethrins (Repel Permanone or equivalent) to prevent insect bites. Check limbs/body for insects/insect bites before showering. Notify Site Safety and Health Officer (SSHO) of flu-like symptoms.		
	Contact dermatitis and poison ivy.	• Check around work areas to identify if poison ivy is present. Wear long-sleeve shirts/trousers or Tyvek® coveralls to avoid skin contact with plants or other skin irritants. Learn to identify poisonous plants. • Avoid unnecessary clearing of plant/vegetation areas. • Cover vegetation with plastic (visqueen) where sampling position raises exposure potential. Apply protective cream / lotion to exposed skin to prevent poison ivy or similar reactions. Identify workers known to contract poison ivy.		

APPENDIX C16 ACTIVITY HAZARD ANALYSIS FOR Visual Site Inspection and Surveys				
Task Breakdown	**Potential Hazards**	**Critical Safety Practices**	**Personal Protective Clothing and Equipment**	**Monitoring Devices**
	Severe weather.	• The SSHO will monitor weather conditions each day in order to plan and prepare for hazardous conditions. The SSHO will identify a suitable tornado shelter at each work location. Work activities will be suspended prior to weather conditions becoming hazardous so that workers have ample time to seek shelter. Upon seeing lightning or hearing thunder, outdoor activities shall be suspended and personnel shall be evacuated to safe areas (inside vehicles, buildings, or tornado shelters as appropriate). Follow procedures outlined in the APP.		
	Hazardous atmospheres	• Personnel shall immediately notify the SSHO if odors are detected.		
	Ladders	• Inspect ladders before use for mud buildup on treads • Clean mud from boots before climbing on ladders • Follow the three point of contact rule		
	High/Low Ambient Temperature	• Monitor for Heat Stress in accordance with Health and Safety Procedures HS400, HS401 • Provide fluids to prevent worker dehydration		
	Fire	• Smoking shall be permitted in designated areas. Vehicles shall not be parked in tall dry grass. • Engines shall be shut off before refueling. • 2A 20-B:C fire extinguisher shall be available when refueling. • Smoking shall not be permitted near fueling areas. Gasoline shall be stored in safety cans with flash arrestors and spring-loaded vents.		

EQUIPMENT REQUIRED	INSPECTION REQUIREMENTS	TRAINING REQUIREMENTS
Survey instrumentation Fire extinguishers Emergency eyewash First aid kit Deep-Woods Off or Ultrathon Repel Permanone Drinking water Weather radio or AM/FM radio	Daily site safety inspection (SSHO) – James Vigerust Daily site safety inspection (QCO) – Check Known Allergies Questionnaire Housekeeping (daily) Fire extinguisher (weekly) Vehicle inspection daily Equipment and tools inspection daily and before use Survey areas for poisonous plants, insects, and animals Check body for ticks Verify tornado shelter available • Monitor approaching storms	Competent Person (CP) / Qualified Person (QP): James Vigerust – CP/SSHO James Vigerust – QP/First Aid and CPR Training Requirements: Site safety orientation HAZWOPER 40-Hour MEC Awareness Lifting/back safety Fire extinguisher use Emergency procedures Biological hazard identification and control Tornado shelter locations National Lightning Safety Institute Lightning Safety procedures

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Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-6

Appendix D
Safety & Health Forms

AIR MONITORING DATA RECORD

Location: _____ **Project No.:** _____ **Date:** _____

Instrument: Mfg/Model/Serial No.: _____ **Calibrated by:** _____

COMBUSTIBLE GAS/OXYGEN/CARBON MONOXIDE METER CALIBRATION

Time	Battery Charged (Y/N)	Zero Checked (Y/N)			Calibration Standard	Calibration Standard			Actual Meter Reading			Ambient Air Re-Zero Check		
		LEL (0%)	O_2 (20.8%)	CO (0 ppm)		% LEL	% O_2	ppm CO	% LEL	% O_2	ppm CO	LEL (0%)	O_2 (20.8%)	CO (0 ppm)

PHOTOIONIZATION DETECTER/FLAME IONIZATION DETECTER CALIBRATION

Time	Battery Charged (Y/N)	Calibration Standard	Calibration Standard Concentration (ppm)	Expected Meter Reading (ppm)	Actual Meter Reading (ppm)	Comments

REAL TIME AIR MONITORING RESULTS

Date	Instrument Operator	Time	Monitoring Results		Action Level Exceeded (Y or N)	Location/Activity	Corrective Actions
			Compound	Concentration			

Comments: _____

Calibration Q.C.: Calibrations are to be within 5% for validity.
Abbreviations: CO = carbon monoxide, %LEL = percent of the lower explosive limit, O_2 = oxygen

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AIR SAMPLING DATA RECORD

SAMPLING INFORMATION

Date of Sampling		Project Name	
Type of Sample Personal/Area		Project Number	
Employee Sampled		Operation/Task Monitored	
Employee Number			
Employee Social Security Number		Location of Air Sampling	
Employee Job Title		Person Performing Sampling/Employee #	

SAMPLING & PUMP CALIBRATION DATA

PROJECT SPECIFIC SAMPLE IDENTIFICATION NUMBER:

Air Pump Manufacturer/ Model/Number:								Ambient Air Temperature:		
Pre-sampling Calibration Flow Rate (mL/min)				Post-sampling Calibration Flow Rate (mL/min)				Final Sample Flow Rate (mL/min)		
1st flow rate	2nd flow rate	3rd flow rate	Pre-average flow rate	1st flow rate	2nd flow rate	3rd flow rate	Post-average flow rate	Pre-average flow rate	Post-average flow rate	Final average flow rate

Pump start time:	Pump stop time:	Total pump run-time (minutes):	Final average flow rate (mL/min):	Total sample volume (liters):

Analytes sampled for:	Analyte #1: _____ NIOSH Method # _____	Analyte #2: _____ NIOSH Method # _____	Analyte #3: _____ NIOSH Method # _____
Date Sample Shipped to Laboratory:	Remarks:		

HAZARD CONTROL MEASURES (check all that apply):

Respirator	☐ None	☐ Half-face APR	☐ Full-face APR	☐ PAPR	☐ Supplied-air (specify):	
Coveralls	☐ None	☐ Cotton	☐ Nomex	☐ Tyvek®	☐ Poly-coated Tyvek®	☐ Saranex
Gloves	☐ None	☐ Cotton	☐ Leather	☐ Sample	☐ Nitrile	☐ Other:
Boots	☐ Work	☐ Tyvek®	☐ Latex	☐ PVC	☐ Neoprene	☐ Other:
Engineering	☐ None	☐ Negative Air	☐ Ventilation		☐ Other:	

LABORATORY INFORMATION:

Laboratory Used (Name/Address/Telephone/Contact):

ANALYTICAL RESULTS:

Analyte #1	Analyte #2	Analyte #3

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Project Location: _____
Client: _____
Project Number: _____

OPTIONAL ALLERGY/SENSITIVITY QUESTIONNAIRE

This information is requested so that you may be assigned work duties, which minimize your exposure to elements that may cause you to have a threatening medical reaction and will be used only in case of an emergency. Your voluntary cooperation is appreciated so that we can operate a safe working environment.

Name: _____ Contractor Name: _____

Date: _____ Contract/Project No.: _____

Are you allergic/sensitive to bee stings?	Yes ☐	No ☐
If yes, do you carry a bee sting kit? _____		
Are you allergic/sensitive to other insect bites?	Yes ☐	No ☐
Are you allergic/sensitive to animal/reptile bites?	Yes ☐	No ☐
Are you allergic/sensitive to any plant materials?	Yes ☐	No ☐
Are you allergic/sensitive to any cloths or fibers?	Yes ☐	No ☐
Are you allergic/sensitive to latex?	Yes ☐	No ☐
Are you allergic/sensitive to any powders?	Yes ☐	No ☐
Are you allergic/sensitive to any medications?	Yes ☐	No ☐
If yes, which medications? _____		
Are you allergic/sensitive to any metals?	Yes ☐	No ☐
Are you allergic/sensitive to pollens?	Yes ☐	No ☐
Are you allergic/sensitive to dusts	Yes ☐	No ☐
Are you allergic/sensitive to foods (i.e., peanuts, etc.)	Yes ☐	No ☐
Are you aware of any known chemical or petroleum sensitivities?	Yes ☐	No ☐
Are you allergic/sensitive to smoke?	Yes ☐	No ☐
Are you allergic/sensitive to smog/ozone?	Yes ☐	No ☐
Have you ever had an asthmatic attack?	Yes ☐	No ☐
Have you ever experienced exercise induced asthma?	Yes ☐	No ☐

Please comment on any of the above questions or provide special instructions that we should provide to a physician in the case of an emergency.

_____

_____

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Project Location: _____
Client: _____
Project Number: _____

AMBIENT AIR TEMPERATURE LOG

Thermometer Location: _____ Date: _____

Time (hours)	Temp. (°F)	Time (hours)	Temp. (°F)
0000 (Midnight)	_____	1200 (Noon)	_____
0100	_____	1300	_____
0200	_____	1400	_____
0300	_____	1500	_____
0400	_____	1600	_____
0500	_____	1700	_____
0600	_____	1800	_____
0700	_____	1900	_____
0800	_____	2000	_____
0900	_____	2100	_____
1000	_____	2200	_____
1100	_____	2300	_____

Comments: _____

_____

_____

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AIR COMPRESSOR SAFETY INSPECTION CHECKLIST

Project Name: _____

Project Number: _____

Equipment I.D. No.: _____ Equipment Name: _____

Week of: _____

Portable Air Compressors (29 CFR 1910.94(a)(6), EM 385-1-1 Section 20 (B))	**Yes**	**No**	**N/A**
1. Has inspection and performance test been completed?			
2. Have air tanks been tested and certified?			
3. Are records of inspection and test available?			
4. Does discharge from any valve create a hazard?			
5. Is the air pressure gauge in working order?			
6. Is the tank equipped with a safety relief valve?			
7. Is equipment that is subject to whipping or rotation if released provided with an automatic shut-off?			
8. Are safety lashings provided at connections to tools and hose and all quick make-up connections of hose?			
9. Will the compressor automatically shut off before discharge pressure exceeds the maximum working pressure?			
10. Is the compressor located so that flammable, toxic vapors, gases, or dust will not be drawn into the intakes?			
11.No valve shall be installed on the air intake pipe of a compressor with an atmospheric intake?			
12. Is the discharge piping from the compressor to the receiver as large as the discharge opening on the compressor?			
13. Is there a convenient stop valve between the air tank and each stationary piece of equipment?			
14. Are air receivers properly installed and in the proper locations?			
15. Does the air tank have an accessible drain valve?			
Remarks:			

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COLORIMETRIC DETECTOR TUBE LOG

Project Name: _____ Project Number: _____

Date: _____ Sampled by: _____

Pump Type, Mfg/Model/Serial Number: _____

Time	Detector Tube Type/ (Expiration Date)	Measurable Range	Pump Leak Test (Y/N)	Pump Strokes	Measured Concentration	Comments

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ENTRY PERMIT FOR
PERMIT-REQUIRED CONFINED SPACE (PRCS)

Project/Location _____ Project No._____

Location of PRCS _____ Identity of PRCS _____

Describe Hazards of PRCS (Chemical and Physical) _____

_____

Purpose This Permit Authorized _____

CHECKLIST	YES	DOES NOT APPLY
All lines leading to and from the space have been blinded or disconnected.		
Electrical service disconnected or locked out.		
All grounding and bonding cables in place.		
All lighting, fittings, power equipment, and extension cords are rated for anticipated atmosphere.		
Ground Fault Circuit Interrupter (GFCI) checked and functioning.		
All ignition sources have been isolated.		
All respiratory equipment and alarms checked and functional.		
All safety harnesses and lifelines checked.		
All required PPE checked and in use.		
Have all entrants, attendants, and entry supervisors received appropriate training?		
Attendant(s) trained in non-entry rescue procedures.		
Rescue service has been identified and will be available for entry rescue.		
Has rescue service passed evaluation?		
Appropriate rescue equipment available and checked.		
Mechanical ventilation system in use and effective.		
All tests have been completed and indicate that entrance requirements have been met.		
Appropriate warning signs have been posted and unauthorized personnel have been excluded from the PRCS.		
IF ANSWER TO ANY OF THE ABOVE QUESTIONS IS *NO*, ENTRY IS NOT PERMITTED.		

PERSONAL PROTECTIVE EQUIPMENT (Circle)

EYE/FACE
Chemical Goggles Face Shield Safety Glasses

EXTREMITIES
Hard Hat Hoods Boot Covers

Gloves (Material _____)

Boots (Material _____)

RESPIRATORY
SCBA Supplied Air Egress System

Air Purifying (Cartridge _____)

Powered Air Purifying (Cartridge _____)

OTHER
Hearing Protection Harness & Lifeline
Chest or Parachute

RESCUE EQUIPMENT
Mechanical Extraction Device
First Aid Kit SCBA
Other (Specify)_____

COMMUNICATION METHOD
Lifeline "Tug" Signals
Air-powered Horn Signals
Other_____

OTHER PERMITS ISSUED FOR WORK IN PRCS: _____

OTHER HAZARD CONTROL PROCEDURES OR INSTRUCTIONS: _____

RESCUE PROCEDURES: _____

TEST DATA
OXYGEN, FLAMMABILITY, AND TOXIC CONTAMINANT(S)

Time	Percent Oxygen	Percent LEL	_____ (Other)	_____ (Other)	_____ (Other)	_____ (Other)	_____ (Other)	Tester's Initials	Comments

TESTER'S SIGNATURE:

AUTHORIZED ENTRANTS

_____ _____
_____ _____
_____ _____
_____ _____
_____ _____
_____ _____
_____ _____

AUTHORIZED ATTENDANT(S)

_____
_____
_____

RESCUE PERSONNEL

_____
_____
_____

Diagram the confined space indicate location of manways and ventilators. Indicate location(s) where tests conducted.

) (Man-way
∞ Ventilator
X Test Location

ACCEPTABLE ENTRY CONDITIONS

1. Entry Permit completely filled out
2. Oxygen between 19.5 and 23.5%
3. Combustible gases below 10% LEL
4. Permissible Levels of toxic gases (list):
5. Other: _____

PRCS SAFE FOR ENTRY _____

Date/Time _____ / _____

Name of Entry Supervisor _____ Signature _____

Current Entry Supervisor (if different) _____

Entry Permit Expires (no longer than 1 shift): Date/Time _____ / _____

ENTRY PERMIT CANCELED

Date/Time _____ / _____ Signature _____

Reason (√) ☐ Work Complete ☐ Authorized Conditions Not Met ☐ Incident

PROBLEMS DURING ENTRY AND RESOLUTION. Please Describe: _____

RECLASSIFICATION TO NON-PERMIT-REQUIRED CONFINED SPACE

Describe hazard removal methods, without use of ventilation. _____

TESTING VERIFICATION SHOWN AT TIME _____ ON TEST DATA CHART ABOVE.

DATE/TIME / ENTRY SUPERVISOR SIGNATURE

REVIEWED BY:

_____ _____

Health and Safety Representative Signature Date

Project Location: _____
Client: _____
Project Number: _____

DAILY SAFETY INSPECTION REPORT

Inspector name: _____ Date: _____

Supervisor: _____ SSHO: _____

General Project Activities Description: _____

_____

_____

Safety conditions and/or deficiencies:	Corrective actions to be completed:

Note: The status of corrective actions is to be tracked through closure on the Safety and Occupational Health Deficiency Tracking Log.

Signature: _____ Signature: _____
(Supervisor) (Safety Representative)

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Direct-Push Rig Inspection Checklist

Project Name/Number: _____
Make/Model Number: _____
Equipment Number: _____
Hours/Mileage: _____

Rig clean and free of soils, oils, and other debris.		Tracks in good condition.	
All hydraulic fittings and hoses free of damage, tightened, and not leaking.		Tires fully inflated and in good condition.	
Rig controls clearly labeled and in working condition.		Back-up alarm working.	
Rig Kill Switch in working order.		First Aid Kit accessible and stocked.	
All of the Rig's connections tightened and leak-free.		Fire Extinguisher accessible and fully charged.	
Parking brake functions properly.		Eye Wash full and accessible.	
Steering controls in working order and clear of obstacles.		Hearing protection available and is being used during hammering.	
Copy of the manual for all drilling equipment available.		All overhead and underground hazards identified.	

√ = OK
N/A = Not Applicable
X = Defective

These items are to be checked each shift before operating this piece of equipment.
Report all items requiring repair to supervisor.

Notes:
Operator/Inspector: Date:

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Drilling Equipment and Operations Inspection Daily	Contractor:
Drill Rig Manufacturer/Model:	Hours/Mileage:
Inspection Completed By:	Equipment No.:
Project Number:	Date:

Answer each question by checking the appropriate column (Yes, No, or NA). If "no" is checked, an explanation should be provided in the space available. This checklist is to be completed daily by the drilling contractor and reviewed by the Site Safety and Health Officer (SSHO).

Daily Drill Rig Inspection	Yes	No	NA
1. Are applicable drilling materials/supplies Material Safety Data Sheets available at the site and attached to the AHA?	☐	☐	☐
Explanation: _____			
2. Are daily safety meetings attended by the crew and are JSAs being completed daily by the crew?	☐	☐	☐
Explanation: _____			
3. Are all warning and control labels on drill rig clean and legible?	☐	☐	☐
Explanation: _____			
4. Are both "kill switches" installed by the manufacturer in operable condition and all workers at the drill site familiar with their location and how to activate them?	☐	☐	☐
Explanation: _____			
5. Are drive shafts, belts, chain drives, and universal joints guarded to prevent accidental insertion of hand, fingers, or tools?	☐	☐	☐
Explanation: _____			
6. Are all hydraulic fittings and hoses free of damage, tightened, and not leaking (including panel)?	☐	☐	☐
Explanation: _____			
7. Do high-pressure hoses have a safety (chain, cable, or strap) at each end of the hose connection to prevent whipping in the event of a failure (safety lashing)?	☐	☐	☐
Explanation: _____			
8. Is the rig clean and free of soils, oils, and other debris?	☐	☐	☐
Explanation: _____			
9. Is the rig free of any miscellaneous leaks?	☐	☐	☐
Explanation: _____			
10. Do controls operate smoothly; cables and lifting devices do not operate erratically to overcome resistance?	☐	☐	☐
Explanation: _____			
11. Do controls have freedom of movement, not blocked, or locked in an action position?	☐	☐	☐
Explanation: _____			
12. Are all safety devices not bypassed or neutralized?	☐	☐	☐
Explanation: _____			
13. Are all cables free of kinks, frayed wires, "bird cages," and worn or missing sections?	☐	☐	☐

Explanation: _____

Daily Drill Rig Inspection (continued)	Yes	No	NA
14. Are wire rope, sockets, splices, thimbles, and clips adequate and properly applied?	☐	☐	☐
Explanation: _____			
15. Are cables terminated on the working end with a proper eye splice, either swaged coupling or using cable clamps?	☐	☐	☐
Explanation: _____			
16. Are cable clamps installed with the saddle on the live or load side? Clamps should not be alternated and should be of the correct size and number for the cable size to which it is installed. Are clamps complete with no missing parts?	☐	☐	☐
Explanation: _____			
17. Are hooks, safety latches, shackles, rings, etc., in good condition?	☐	☐	☐
Explanation: _____			
18. Are safety latches functional and completely span the entire throat of the hook and have a positive action to close the throat except when manually displaced for connecting or disconnecting a load?	☐	☐	☐
Explanation: _____			
19. Are wedge sockets and hoisting plugs in good condition and properly installed?	☐	☐	☐
Explanation: _____			
20. Have all personnel entered their names on the site log today?	☐	☐	☐
Explanation: _____			
21. Is electronic communication effective for the field crews and checked daily?	☐	☐	☐
Explanation: _____			
22. Has the exclusion zone been set-up with a radius equal to or greater than the boom height?	☐	☐	☐
Explanation: _____			
23. Is a 15-minute supply of fresh water available at the work site (eyewash station)?	☐	☐	☐
Explanation: _____			
24. Is an emergency first aid kit immediately available at the work site?	☐	☐	☐
Explanation: _____			
25. Is potable water available to employees?	☐	☐	☐
Explanation: _____			
26. Are 3M Ultrathon or equivalent (DEET preparation) and Repel Permanone available?	☐	☐	☐
Explanation: _____			
27. Are two 2-A:40-B:C fire extinguishers in good working order (i.e., charged, inspected, and serviced up to date) and present at the work site?	☐	☐	☐
Explanation: _____			
28. Are employees on or near drilling equipment complying with the requirement to wear hearing protection?	☐	☐	☐
Explanation: _____			

Drilling Equipment and Operations Inspection Daily	Contractor:
Project Number:	Date:

Daily Drill Rig Inspection (continued)	Yes	No	NA
29. Are personnel being monitored for temperature stress?	☐	☐	☐
Explanation: _____			
30. Are personnel prohibited from drinking, chewing, smoking, taking medications, or other hand-to-mouth contact while in a regulated exclusion zone?	☐	☐	☐
Explanation: _____			
31. Is proper fall protection provided and used for personnel working over 6 feet in height?	☐	☐	☐
Explanation: _____			
32. Are outriggers extended prior to and whenever the mast is raised off its cradle? Hydraulic outriggers must maintain pressure to continuously support and stabilize the drill rig even when unattended.	☐	☐	☐
Explanation: _____			
33. Are outriggers properly supported on the ground surface to prevent settling into the soil?	☐	☐	☐
Explanation: _____			
34. Are slings, chokers, and lifting devices inspected before using and in proper working order? Are rated capacities legible for the type of configuration to be used? Are damaged units removed from service and properly tagged? Is a competent rigger available for all rigging?	☐	☐	☐
Explanation: _____			
35. Are shackles and clevises in proper working order and pins and screws fully inserted before placing under load?	☐	☐	☐
Explanation: _____			
36. Are hoists being used only for their designed intent, are not loaded beyond their rated capacity, and are steps being taken to prevent two-blocking of hoists?	☐	☐	☐
Explanation: _____			
37. Are the rig's manufacturer's procedures being followed if rope becomes caught in, or objects get pulled into, a cathead?	☐	☐	☐
Explanation: _____			
38. Are drill rods not being run or rotated through rod slipping devices? No more than 1 foot (0.3 meter) of drill rod column shall be hoisted above the top of the drill mast. Drill rod tool joints shall not be made up, tightened, or loosened while the rod column is supported by a rod-slipping device.	☐	☐	☐
Explanation: _____			
39. Is there use of side-feed swivel collars on drill rods restricted to those collars that are retained by either a manufacturer-designed stabilizer or a stabilizer approved by a Professional Engineer?	☐	☐	☐
Explanation: _____			
40. Are rotating parts of the drill string, rod, and augers free of sharp projections or hooks that could entrap clothing of foreign objects?	☐	☐	☐
Explanation: _____			

Daily Drill Rig Inspection (continued)	Yes	No	NA
41. Is the work area around the drill rig kept clear of trip hazards?	☐	☐	☐
Explanation: _____			
42. Are walking surfaces kept free of slippery materials?	☐	☐	☐
Explanation: _____			
43. Are open excavations and mud or circulation pit barricaded or fenced? Is the discharge of drilling fluids being channeled away from the work area to prevent the ponding of water?	☐	☐	☐
Explanation: _____			
44. Does the operator verbally alert employees and visually verify employees are clear from dangerous parts of equipment before starting or engaging equipment?	☐	☐	☐
Explanation: _____			
45. Are personnel not wearing loose-fitting clothing, jewelry, or other items that could get caught in moving machinery?	☐	☐	☐
Explanation: _____			
46. Are augers being cleaned only when the rotating mechanism is in neutral and the auger stopped? Are long-handled shovels only being used to remove cutting from the auger?	☐	☐	☐
Explanation: _____			
47. Are open boreholes being capped and flagged?	☐	☐	☐
Explanation: _____			
48. Is a daily inspection of the drilling area being performed and documented by the driller?	☐	☐	☐
Explanation: _____			
49. Is the air hose free of damage, tightened, and not leaking?	☐	☐	☐
Explanation: _____			
Supplemental Inspection Items (from manufacturer's recommendations)			
50. Are hydraulic fluid levels OK according to manufacturer's recommendations?	☐	☐	☐
Explanation: _____			
51. Are motor oil levels OK according to manufacturer's recommendations?	☐	☐	☐
Explanation: _____			
52. Are coolant levels OK according to manufacturer's recommendations?	☐	☐	☐
Explanation: _____			
53. Are air cleaner systems OK according to manufacturer's recommendations?	☐	☐	☐
Explanation: _____			
54. Are belt and pulley systems OK according to manufacturer's recommendations?	☐	☐	☐
Explanation: _____			
55. Are all guards in place and adjusted properly?	☐	☐	☐
Explanation: _____			
56. Is tub oil level OK (if equipped)?	☐	☐	☐
Explanation: _____			

57. Are hydraulic stabilizer pads OK? ☐ ☐ ☐
Explanation: _____

58. Are welder and generator oil levels OK according to manufacturer's recommendations? ☐ ☐ ☐
Explanation: _____

59. Are fuel levels adequate to run a complete shift? ☐ ☐ ☐
Explanation: _____

60. Are pull down cables inspected and in good condition? ☐ ☐ ☐
Explanation: _____

61. Are pull down cables properly adjusted? ☐ ☐ ☐
Explanation: _____

62. Are pull down cables properly lubricated? ☐ ☐ ☐
Explanation: _____

63.
Explanation: _____

64.
Explanation: _____

65.
Explanation: _____

66.
Explanation: _____

67.
Explanation: _____

68.
Explanation: _____

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The Foundation of Our Targeting Zero Environment Mission

Shaw's E&I Group will achieve its goal of "Targeting Zero" accidents and injuries while working as a team to provide a workplace that is free from recognized hazards.

Vision

We will be recognized and respected as the leading company in our industry and as the standard by which our competitors are benchmarked by providing the leadership, guidance and operations excellence necessary to identify and control all recognized hazards in the workplace.

Values

Leadership – provide the necessary tools to identify and control all hazards in the workplace.
Commitment – we will never be satisfied that we have done enough.
Pride – all employees will own the safety process.
Dedication – to strive for continual improvement.
Appreciation – to embrace the safety of our employees.

Operating Principles

- Safety is a core value.
- We plan work to ensure it is done safely.
- We are a safety team.
- We follow good safety practices in all work that we do.
- We will actively demonstrate our commitment to safety.
- All accidents are preventable.
- We will not perform any job that cannot be performed safely.
- We will not compromise safety in the interest of time or comfort.
- We will constantly review our performance to ensure continuous improvement.
- We will encourage employees to commit to safety as a lifestyle and carry the culture of "Targeting Zero" home with them.

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Shaw® Shaw E & I

Medical Forms
Authorization for Treatment of Occupational Injury/Illness

Employee Name: _____

Social Security #: _____ Injury: ☐ Illness: ☐

Job Title: _____ Incident Date: _____

Project/Location: _____ Location of Accident/Exposure: _____

Telephone Number: _____ H&S Representative: _____

Illness/Injury Description: _____

TO TREATING PHYSICIAN:

In the case of occupational injury/illness, please examine the employee and render necessary conservative treatment directly related to the occupational injury/illness.

Light Duty Work: It is the policy of our company to provide work assignments, whenever possible, for employees with physical activity restrictions resulting from an occupational injury/illness. If the employee will be subject to a restriction, please contact **CORE Health Networks** before releasing the employee, so that a light duty assignment may be arranged.

Medically Unfit to Return to Work: It is the policy of our company to assist employees unable to return to work, due to an injury/illness, in obtaining needed medical care and other available benefits. Medical findings are also used to help evaluate unsafe conditions that may have led to the incident. Please help us assist our employees by contacting **CORE Health Networks** with your findings as soon as possible, preferably before the employee leaves your office, but not later than the close of business on the day of initial treatment.

CORE Health Networks:	Telephone: 1-877-347-7429	Fax: (225) 295-4846
Please Send Reports To	**CORE Health Networks *and***	**The Shaw Group, Inc. Corporate Claims Department**
Both of the Following:	12091 Bricksome Ave Suite B Baton Rouge, LA 70816	4171 Essen Lane Baton Rouge, LA 70809

Please Send Bills To: **The Shaw Group, Inc. Corporate Claims Department**
4171 Essen Lane
Baton Rouge, LA 70809

DOCTOR, Please provide:

Medical Diagnosis: _____

Treatment Provided: _____

Recommended Work Limitation/Restriction: _____

Return Visit Needed: No ☐ Yes ☐ Date if Yes _____ First Aid Only ☐

Physician Name: _____ Physician Telephone: _____

Physician Signature: _____ Date: _____

You must call CORE Health Networks for all occupational injuries/illnesses requiring outside medical treatment: 1-877-347-7429.

Fax completed form to CORE Health Networks (225) 295-4846.

Send Bills to Shaw Corporate Claims Department

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Shaw® Shaw E & I

Injured Employee Statement

MUST BE COMPLETED WITHIN 24 HOURS OF THE INCIDENT

This form should be completed by the injured employee involved in the incident. Describe only the facts for which you have personal knowledge. If you have no knowledge of a particular question, write "no knowledge."

Company: _____

Exact Location of Incident/Accident: _____

Name of Injured Employee: _____

Date of Incident/Accident: _____ Time _____ am pm

Date of this Statement: _____ Time _____ am pm

Time your shift begins? _____ am pm Ends? _____ am pm

Name of Known Witnesses:

Name: _____

Name: _____

Name: _____

Name: _____

Your Immediate Supervisor's Name: _____

If not employed by Shaw E&I, enter name of company and phone number: _____

Have you had prior injury similar to this injury? _____

Was it while you were at work? _____

What date did the prior injury occur? _____

Stating only factual information, describe in detail what happened and include any applicable events leading to the Incident/Accident:

_____

_____

_____

_____

I certify that, to the best of my knowledge, all of the above information is complete, accurate and factual. I acknowledge that the intentional falsification or altering of facts or making misleading statements may be grounds for disciplinary action.

_____ _____

Signature/Date Print Name

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Shaw® Shaw E & I

Medical Forms
Authorization for Release of Protected Medical Information

Printed Name: _____ Date of Birth: _____

Address: _____

Social Security #: _____ Home Telephone: _____

Authority to Release Protected Health Information
I hereby authorize the release of medical information, identified in this authorization form, and provide such information to:

CORE Health Networks
12091 Bricksome Ave Suite B
Baton Rouge, LA 70816
Phone: (877) 347-7429
Fax: (225) 295-4846

AND

The Shaw Group Inc.
4171 Essen Lane
Baton Rouge, Louisiana 70809
Phone: 225-932-2500
Fax: 225-932-2636

The information to be released includes the following:

Complete health record	Discharge summary	Progress notes
History and physical exam	Consultation reports	X-ray films / images
Laboratory test results	X-ray & Image reports	Itemized bill
Diagnosis & treatment codes	Complete billing record	

Other (specify) _____

Purpose of the Requested Disclosure of Protected Health Information

I am authorizing the release of my protected health information.

Drug and/or Alcohol Abuse, and/or Psychiatric, and/or HIV/AIDS Records Release

I understand if my medical or billing record contains information in reference to, psychiatric care, sexually transmitted disease, hepatitis B or C testing, previous drug and/or alcohol abuse and/or other sensitive information, I agree to its release.

Check One: ☐ **Yes** ☐ **No**

I understand if my medical or billing record contains information in reference to HIV/AIDS (Human Immunodeficiency Virus/Acquired Immunodeficiency Syndrome) testing and/or treatment I agree to its release.

Check One: ☐ **Yes** ☐ **No**

Right to Revoke Authorization

Except to the extent that action has already been taken in reliance on this authorization, the authorization may be revoked at any time by submitting a written notice to ***The Corporate Claims Dept.*** **at** ***The Shaw Group Inc., 4171 Essen Lane, Baton Rouge, Louisiana, 70809***. Unless revoked, this authorization will expire at which time completion of treatment for the injury or illness has been accomplished.

Re-disclosure

I understand the information disclosed by this authorization may be subject to re-disclosure by the recipient and no longer be protected by the Health Insurance Portability and Accountability Act of 1996.

Signature of Patient or Personal Representative Who May Request Disclosure

I understand that I do not have to sign this authorization. However, if health care services are being provided to me for the purpose of providing information to a third-party (*e.g.,* fitness-for-work test), I understand that services may be denied if I do not authorize the release of information related to such health care services to the third-party. I can inspect or copy the protected health information to be used or disclosed. **I hereby release and discharge.** ***The Shaw Group Inc.*** **of any liability and the undersigned will hold** ***The Shaw Group Inc.*** **harmless for complying with this Authorization.**

Signature: _____ Date: _____

Description of relationship if not patient: _____

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Shaw® Shaw E & I

Medical Forms
Return-to-Work Examination Form

Exam Date: _____ / _____ / _____ **Employee Name:** _____

Birth Date: _____ / _____ / _____ **Social Security #:** _____ - _____ - _____

Job Title: _____ **Sex:** ☐ Male ☐ Female

Examining Provider: **Please complete this form and fax to CORE Health Networks at (225) 295-4846. Please contact CORE Health Networks at (877) 347-7429 to report status of employee post-treatment.**

Diagnosis: _____

Treatment Plan: _____

Medications: _____

Physical Therapy: _____

Other: _____

☐ May return to full duty work effective ___/___/

☐ May return to limited duty from ___/___/___ to ___/___/

☐ Unable to return to work from ___/___/___ to ___/___/

WORK LIMITATIONS:

☐ Restricted lifting/pushing/pulling: maximum weight in lbs: _____ (Company limits all lifting to ≤ 60 lbs).

☐ Work only with right/left hand.

☐ Restricted repetitive motion right/left hand.

☐ Sitting job only.

☐ Restricted operation of moving equipment.

☐ Other: _____

FOLLOW-UP PLAN:

☐ Release from care.

☐ Schedule for follow-up appointment on ___/___/___.

Time _____ AM/PM

☐ Referral to _____

Appointment date ___/___/___ Time _____ AM/PM

Comments: _____

_____ _____ _____

Examiner's Name (*print)* Examiner's Signature Date

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Shaw® Shaw E & I

Supervisor's Employee Injury/Illness Report Form

EMPLOYEE INFORMATION		
Employees Social Security Number	Claim Number	
Employee's Name:	Home Phone Number:	
Home Address:		Business Line Code:
Male ☐ Female ☐	Date of Birth:	Hire Date:
Dependents:	Dependents under 18:	Marital Status:
Occupation:		Department Name:
State Hired:	Currently Weekly Wage:	Hourly Wage:
Hours/Days Worked Per Week:	Days Per Week:	Hours Worked Per Day:
Employment Status:	Employee Report No.: NA	Employee ID No.: NA
Salaried Continued:	Paid for Date of Injury:	Education No. of Years:
Ever injured on the Job:	Supervisors Name and Phone:	

EMPLOYER INFORMATION	
Employer Name: **The Shaw Group, Inc.**	Work Location:
Project Name:	Project Number:
Contract Name:	Contract Number:
Contact Name: **Troy Allen**	Telephone Number: **1-800-747-3322**
Employer SIC:	Employer Location Code:
Employer FED ID:	Employer Code: NA
Nature of Business:	
Policy Number:	

ACCIDENT INFORMATION	
Date and Time of Injury:	
Did the Accident Occur at the Work Location	If no, where did the accident occur? NA
Accident Address:	
Nature of Accident:	
Give a Full Description of the Accident (Be as factually complete as possible):	
Are Other WC Claims Involved" No	Date and Time Reported to Employer:
Person Reported To:	

WITNESS INFORMATION
Were There Any Witnesses?
If Yes, List Names and How to Contact Them:

INJURY INFORMATION	
Which Part of the Body Was Injured? (*e.g.*, Head, Neck, Arm, Leg)	
What was the Nature of the Injury? (*e.g.*, Fracture, Sprain, Laceration)	
Part of the Body Location? (*e.g.*, Left, Right, Upper, Lower)	
Injury Description:	
Source of Injury:	Is Employee Hospitalized?
Lost Time:	If Yes, What was First Full Day Out:
Date Last Day Worked:	Date Disability Began: NA
Date Returned to Work:	Estimated Return Date: NA

MEDICAL INFORMATION		
ER Treated & Released:	Hospitalized:	Phy./Clinic:
Hospital – Name, Address, Phone Number:	Was Employee Transported via Ambulance: Yes No	
NA		
Clinic – Name, Address, Phone Number:		

ADDITIONAL COMMENTS AND INFORMATION

REPORT PREPARED BY	
Name:	Title:
Signature:	Phone Number:

REPORT ALL WORKER'S COMPENSATION INJURIES TO SHAW CLAIMS DEPARTMENT
FAX REPORT WITHIN 24 HOURS OF INCIDENT TO **225-932-2636**.
Phone all injuries/illnesses to **Shaw Notification Hotline/Helpdesk 1-866-299-3445**

Shaw® Shaw E & I

Incident Investigation Report

*** Must Be Completed Within 72 HOURS & Relevant Support Documentation Must Be Attached/ Submitted***

Investigation Date _____ Date of Incident _____

Employee Name _____ Supervisor Name _____

Project Number _____ Project Name _____

Contract Number _____ Contract Name _____

Location of Incident _____

Incident Classification

Injury	☐ First Aid	Vehicle	☐ Chargeable	DOT	☐ DOT Vehicle
	☐ OSHA Recordable		☐ Non-chargeable		☐ DOT Reportable
	☐ Lost Workday				
	☐ Restricted Workday	Near Miss	☐	General Liability	☐

Description (Provide facts, describe how incident occurred, provide diagram [on back] or photos)

_____

_____

_____

Analysis (What unsafe acts or conditions contributed to the incident?)

_____

_____

_____

Corrective Action(s) (List corrective action items, responsible person, scheduled completion date)

_____

_____

_____

Witness Names (Complete Attachment 6 – Employee Witness Statement)

_____

_____

_____

Investigated By: _____ _____ _____

Print Name Signature Date

Project/Location Mgr.: _____ _____ _____

Print Name Signature Date

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Shaw® Shaw E & I

Employee Witness Statement

MUST BE COMPLETED WITHIN 24 HOURS OF THE INCIDENT

This form should be completed by every employee working in the crew of the injured employee and by every other employee with knowledge of events or circumstances involved in the incident.

This information is being solicited from you so that the company can accurately assess the reported incident to avoid similar occurrences in the future. Describe only the facts for which you have personal knowledge. If you have no knowledge of the incident, write "no knowledge."

Company: _____

Exact Location of Incident/Accident: _____

Name of Injured Employee: _____

Date of Incident/Accident: _____ Time _____ am pm

Date of this Statement: _____ Time _____ am pm

Time your shift begins? _____ am pm Ends _____ am pm

Witness Information:

Name: _____

Home Phone No.: _____

Home Address: _____

County: _____ Zip: _____

Witness' Supervisor Name: _____

If not employed by Shaw E&I, enter name of company: _____

Company Phone Number: _____

Did you see the Incident/Accident? _____

How far from you (approx., in feet) did the Incident/Accident occur? _____

Stating only factual information, describe in detail what happened and include any applicable events leading to the Incident/Accident:

_____

_____

_____

_____

I certify that, to the best of my knowledge, all of the above information is complete, accurate, and factual. I acknowledge that the intentional falsification or altering of facts or making misleading statements may be grounds for disciplinary action.

_____ _____

Witness Signature/Date Print Name

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Shaw® Shaw E & I

Accident Review Board

DATE:	LOCATION:
BOARD MEMBERS:	
ACCIDENT DATE:	EMPLOYEE(S) INVOLVED IN INCIDENT:
INVESTIGATION COMPLETE: YES ☐ NO ☐	ACCIDENT CLASSIFICATION:

The following information must be provided by the Accident Review Board for this incident (print):

SUPERVISOR: _____ **PROJECT/LOCATION MGR.:** _____

POTENTIAL CAUSE OF ACCIDENT:

ACTION BY BOARD*:

* All actions by the Accident Review Board are subject to final review by the Human Resources and Legal Departments.

ACCEPTED:

_____ _____

(Employee Signature) (Supervisor Signature)

APPROVED: REJECTED FOR:

_____ _____

(Project/Location Manager)

APPROVED: REJECTED FOR:

_____ _____

(Business Line Health and Safety Manager or Designee)

APPROVED: REJECTED FOR:

_____ _____

(Business Line Vice President)

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Shaw® Shaw E & I

Vehicle Accident Report

ACCIDENT DESCRIPTION

This report is to be initiated by the employee involved in the accident or his/her direct supervisor. Please answer all questions completely. This report must be forwarded to the appropriate health and safety representative within 24 HOURS of the accident. Attach police report.

ACCIDENT DATE _____ TIME _____ ☐ A.M. or ☐ P.M.
LOCATION OF ACCIDENT (CITY, STATE) _____
DESCRIPTION OF ACCIDENT _____
_____
_____
WITNESS _____ PHONE NO. _____
ADDRESS _____ CITY _____ STATE _____ ZIP _____
POLICE OFFICER'S NAME AND BADGE # _____ DEPARTMENT _____

COMPANY VEHICLE

DRIVER _____ DRIVERS LICENSE NO. _____ STATE _____
ADDRESS _____ CITY _____ STATE _____ ZIP _____
WORK PHONE NO. _(_____)_____ S.S. NO. _____ PROJECT NAME/NO. _____
VEHICLE NO. _____ YEAR _____ MAKE _____ MODEL _____ LICENSE PLATE NO. _____
STATE _____ VEHICLE OWNER: ☐ COMPANY ☐ LEASED/RENTED ☐ PRIVATE VEHICLE
VEHICLE TYPE: ☐ COMMERCIAL MOTOR VEHICLE ☐ NON-COMMERCIAL
IF NOT COMPANY-OWNED: OWNER _____ PHONE NO _(____)_____
ADDRESS _____ CITY _____ STATE _____ ZIP _____
VEHICLE DAMAGE _____
NO. OF VEHICLES TOWED FROM SCENE _____ NUMBER OF INJURIES _____ NUMBER OF FATALITIES _____
WERE HAZARDOUS MATERIALS RELEASED? ☐ NO ☐ YES IF YES, DESCRIBE MATERIALS _____
_____

OTHER VEHICLE

DRIVER _____ DRIVERS LICENSE NO. _____ STATE _____
ADDRESS _____ CITY _____ STATE _____ ZIP _____
PHONE NO. _(_____)_____ S.S. NO. _____
OWNER'S NAME (☐ CHECK IF SAME AS DRIVER) _____
ADDRESS _____ CITY _____ STATE _____ ZIP _____
INSURAMCE COMPANY _____ POLICY NO.: _____
AGENT'S NAME _____ PHONE NO.: _(_____)_____
ADDRESS _____ CITY _____ STATE _____ ZIP _____
VEHICLE YEAR. _____ MAKE _____ MODEL _____ PLATE NO. _____ STATE _____
VEHICLE I.D. NO. _____
VEHICLE DAMAGE _____

PASSENGERS ☐ NO ☐ YES INJURIES ☐ NO ☐ YES (If yes, list names and telephone numbers below)

_____
_____
_____

Shaw® Shaw E & I

Vehicle Accident Report

WEATHER: ❑ Clear ❑ Cloudy ❑Fog ❑Rain ❑Sleet ❑Snow Other ___
PAVEMENT: ❑Asphalt ❑Steel ❑Concrete ❑Wood ❑Gravel/Dirt
❑Brick/Stone Other _____
CONDITION: ❑Dry ❑Wet ❑Icy ❑Pot Holes Other _____
TRAFFIC CONTROL: ❑Traffic Light ❑Stop Sign ❑Railroad ❑No Intersection ❑No Control
ROADWAY: No. of Lanes Each Direction: _____ ❑Residential ❑Divided Highway ❑Undivided Highway

Draw and name <u>roadways</u> showing <u>each vehicle</u>, <u>direction of travel</u>, and <u>point of impact</u>. Indicate travel before the accident with a solid line, and post-accident movement with a broken line.

SYMBOLS:

Your Vehicle ①

Other Vehicle(s) ②③

Pedestrian

Stop Sign

Yield

Railroad ‡

ADDITIONAL INFORMATION: _____

Employee _____ (Print) _____ (Signature) _____ (Date)

Supervisor _____ (Print) _____ (Signature) _____ (Date)

H&S Rep. _____ (Print) _____ (Signature) _____ (Date)

<u>Attach police report to vehicle accident report</u>

Report must be faxed to Corporate Claims Department (Fax: 225-932-2636) within <u>24 hours</u>, or not later than next business day.

Report all vehicle accidents to Shaw Notification Hotline/Helpdesk (Phone: 1-866-299-3445)

Shaw® Shaw E & I

Equipment, Property Damage, and General Liability and Loss Report

This report is to be completed for all losses or damage to company property in excess of $2,500.00 and all third party damage, regardless of value, resulting from company activities.

PROJECT/LOCATION: _____ PROJECT NO.: _____ DATE: _____

PROGRAM NAME: _____ TASK ORDER NUMBER: _____

ADDRESS: _____

HOW DID DAMAGE OR LOSS OCCUR: _____

_____

_____

DESCRIPTION AND VALUE ($) OF DAMAGED/LOST/STOLEN PROPERTY: _____

_____

LOCATION OF DAMAGED/LOST/STOLEN PROPERTY (Before Loss): _____

_____

DATE AND TIME OF DAMAGE, LOSS, OR THEFT: Date: _____ Time: _____ a.m./p.m.

OWNER OF DAMAGED/LOST/STOLEN PROPERTY:

Name _____ Phone No. (____) _____

Address _____ City _____

Employer and Address _____

INJURED PARTIES (Also complete a Supervisor's Employee Injury Report if a Company Employee):

Name _____ Phone No. (____) _____

Address _____ City _____

Employer and Address _____

Description of Injury _____

WITNESSES:

1. Name _____ Phone No. (____) _____

   Home Address _____ City _____

   Employer and Address _____

2. Name _____ Phone No. (____) _____

   Home Address _____ City _____

   Employer and Address _____

WERE PICTURES TAKEN? ☐ YES ☐ NO

WERE POLICE NOTIFIED? ☐ YES ☐ NO DEPT. _____ REPORT NO. _____

COMPLETED BY: _____ _____ _____
(Print) (Signature) (Date)

PROJECT/LOCATION MANAGER: _____ _____ _____
(Print) (Signature) (Date)

REPORT MUST BE FAXED TO:
CORPORATE CLAIMS DEPARTMENT (FAX: 225-932-2636)
WITHIN 24 HOURS, OR NOT LATER THAN NEXT BUSINESS DAY

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EMERGENCY EYEWASH STATION/FIRE EXTINGUISHER INSPECTION CHECKLIST

Location: _____ Project Number: _____

Client: _____ Date: _____

Inspected by: _____

EMERGENCY EYEWASH STATIONS

Inspection Points	Unit #1	Unit #2
Is unit in assigned location?		
Is unit full of water?		
Is unit location well marked?		
Is access to unit unobstructed?		
Is unit in sanitary condition?		
Has water been changed with disinfectant added within the last six months?		
Has inspection tag on unit been signed and dated?		

PORTABLE FIRE EXTINGUISHERS

Inspection Points	Unit #	Unit #	Unit #	Unit #	Unit #
Fire extinguisher is in assigned location?					
Access to fire extinguisher is not obstructed?					
Fire extinguisher is fully charged?					
Lock-pin in place?					
Service tag attached and serviced within past year?					
Has inspection tag on unit been signed and dated?					

√ = OK N/A = Not Applicable X = Defective Comments: _____

This page intentionally left blank.

EMPLOYEE NOTIFICATION OF INDUSTRIAL HYGIENE MONITORING RESULTS

Employee Name _____ SS# _____

Project Name _____ Project No. _____

Project Manager _____

Substance Monitored _____ Date Monitored _____ Sample Number _____

Results _____ mg/m^3 _____ ppm Other _____

Exposure Standard _____ mg/m^3 _____ ppm Other _____

Protective Equipment Used _____

For instance where exposures were found to be in excess of an exposure limit, the following corrective action steps (engineer administrative, job techniques, etc.) are being taken to reduce potential future exposures:

H&S Representative: _____ _____ _____

Name Printed Signature Date

Employee monitored: _____ _____ _____

Name Printed Signature Date

This page intentionally left blank.

Employee Physiological Monitoring Record For Heat Stress

Employee Name _____ Date _____ Employee SS# _____

PPE used during performance of work: _____ Shift Start Time _____ Location _____

Shift Stop Time _____ Job Number _____

Site Safety & Health Officer _____ Supervisor _____

Temperatures

A. Initial Reading
- 1. Ambient Air Temp. °F _____
- 2. Baseline Body Temp. °F _____
- 3. Time Temp. Taken _____

B. After First Work Period
- 1. Ambient Air Temp. °F _____
- 2. Body Temp. °F _____
- 3. Length of work period _____

C. After Second Work Period
- 1. Ambient Air Temp. °F _____
- 2. Body Temp. °F _____
- 3. Length of work period _____

D. After Third Work Period
- 1. Ambient Air Temp. °F _____
- 2. Body Temp. °F _____
- 3. Length of work period _____

E. After Fourth Work Period
- 1. Ambient Air Temp. °F _____
- 2. Body Temp. °F _____
- 3. Length of work period _____

Heart Rate

A. Initial Reading
- 1. Baseline Heart Rate _____ Beats per minute

B. After First Work Period
- 1. Heart Rate _____ Beats per minute

C. After Second Work Period
- 1. Heart Rate _____ Beats per minute

D. After Third Work Period
- 1. Heart Rate _____ Beats per minute

E. After Fourth Work Period
- 1. Heart Rate _____ Beats per minute

- Baseline Body Temperature and Heart Rate to be taken at project site location at beginning of shift before engaging in physical activity.
- Heart Rate – Each individual will count his/her radial (wrist) pulse as early as possible during each rest period. If the heart rate of any individual exceeds 75 percent of their calculated maximum heart rate (MHR = 200 – age) at the beginning of the rest period, then the work cycle will be decreased by one-third. The rest period will remain the same. An individual is not permitted to return to work until his/her sustained heart rate is below 75 percent of their calculated MHR.
- Temperature – Each individual will measure his/her temperature with a thermometer for one minute as early as possible in the first rest period. If the temperature exceeds 99.6°F at the beginning of the rest period, then the work cycle will be decreased by one-third. The rest period will remain the same.
  An individual is not permitted to return to work if her/her temperature exceeds 100.4 °F. Note: due to the lack of accuracy in measuring body temperatures, heart rate is probably a better measurement of heat stress and should be weighted accordingly.
- This completed form should be retained in project file.

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EMPLOYEE REQUEST FOR MATERIAL SAFETY DATA SHEET (MSDS)

Project Name: _____ Project Number: _____

Employee Name: (Please Print) _____

Employee Number: _____

Job Title/Location: _____

Department/Work Area: _____

I am requesting a copy of the MSDS(s) for the following chemical(s):

(Chemical name, Common name, Trade name)

1. _____

2. _____

3. _____

_____ _____

Signature Date

I have received a copy of the above MSDS(s) I requested.

_____ _____

Signature Date

cc: Local Health and Safety Representative

This page intentionally left blank.

Equipment No: _____ **Date:** _____

Equipment Type: _____ **Location:** _____

Equipment Hrs: _____ **Supervisor:** _____

Shaw™
Shaw Environmental & Infrastructure, Inc.

DAILY EQUIPMENT INSPECTION

List Quantities And Kinds of Fluids Added In Space At Bottom Of Sheet

ITEM		OK	Add	N/A	Comments
1	Check Engine Oil Level And Engine Compartment For Trash, Debris, etc.	☐	☐	☐	☐
2	Check Hydraulic Oil Level, Cap And Vent.	☐	☐	☐	☐
3	Check Radiator Coolant Level And Radiator Fins For Dirt, Leaves, etc.	☐	☐	☐	☐
4	Check Transmission Oil Level (Dozers) or Swing Case (Excavators).	☐	☐	☐	☐
5	Check Oil Level in Frame Joint Bearing, Consult Manual. (Volvo A-40 only)	☐	☐	☐	☐
6	Check For Oil or Coolant Leaks.	☐	☐	☐	☐
7	Check Wheels / Tires / Tracks For Damage, Cuts And Proper Inflation PSI._____	☐	☐	☐	☐
8	Check Ground Engaging Implements, Cutting Edges, Teeth, Blade, etc.	☐	☐	☐	☐
9	Inspect Visible Hydraulic Hoses / Lines For Scuffs, Wear, Leaks, etc.	☐	☐	☐	☐
10	Inspect ROPS, FOPS, For Any Obvious Signs Of Loose Mounts, etc.	☐	☐	☐	☐
11	Check All Guages, Lights, Controls, Backup Alarms, Horn, etc.	☐	☐	☐	☐
12	Inspect Operators Compartment For Debris And Fire Extinguisher Charge. Check Floor For Build-up Of Dirt Around Pedals. Inspect Seat Belts, Lap Bar, Etc. Clean The Windows And Note Any Cracks.	☐	☐	☐	☐
13	Do a Walk Around Inspection Looking For Obvious Signs Of Future Problem Areas. Check Grab Handles and Step Treads, etc.	☐	☐	☐	☐
14	Check Operation Of All Systems, Boom, Bucket, Dump Bed, Grapple, Shears. Look for Leaks, Damage, Warning Signs, Excess Slack, Obvious Wear, etc.	☐	☐	☐	☐
15	Check Under The Machine For Any Loose Or Hanging Objects, Leaks, Or Anything Out Of The Ordinary.	☐	☐	☐	☐
16	Check Fuel Level And Cap Condition, Fill Tank Prior To Beginning Daily Operation.	☐	☐	☐	☐
17	**Lube All Moving Parts**, Such As Blade, Bucket, Stick, Connecting Links Equalizer bar, Cylinder Pins And Any Point That Is Subject To Grease Being Pushed Or Worn Out Due To Daily Use. Consult Manual For Grease Points.	☐	☐	☐	☐
18	Check Breathing Air Sustem (If Used). Make Sure Bottle Is Full And Mask / Hose Assembly Is Clean And In Good Working Condition Before Each Use.	☐	☐	☐	☐
19	**Verify The Presence Of The Operations / Maintenance Manual.**	☐	☐	☐	☐

Report All Damage To Supervisor Immediately

COMMENTS:

USE LINE NUMBER, BE SPECIFIC, NOTIFY REGIONAL MAINTENANCE COORDINATOR IF IMMEDIATE ATTENTION IS NEEDED.

EMPLOYEE NAME: **EMPLOYEE NUMBER:**

THESE SHEETS ARE TO BE RETAINED ON THE PROJECT FOR REVIEW BY ESG PERSONNEL.

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EXCAVATION INSPECTION

THIS INSPECTION IS TO BE COMPLETED BY THE COMPETENT PERSION EACH DAY THAT EMPLOYEES WILL BE ENTERING AN EXCAVATION

Project Name: _____ Project No.: _____

Date: _____ Time: _____ Competent Person: _____

Soil Classification (see Soil Classification Worksheet): _____

Excavation Depth: _____ Excavation Width: _____

Type of Protective System Used: _____

		√		
		Yes	No	N/A
1.	General:			
	Surface encumbrances removed or supported			
	Employees protected from loose rock or soil that could pose a hazard by falling or rolling into the excavation			
	Hard hats, steel-toed boots, and safety glasses worn by all employees.			
	Spoils, materials, and equipment set back at least two (2) feet from the edge of the excavation.			
	Walkways over excavation 6 feet or more above lower levels are equipped with standard guardrails.			
	Warning vest or other highly visible clothing provided and worn by all employees exposed to public vehicular traffic.			
	Employees required to stand away from vehicles being loaded or unloaded.			
	Warning system established and utilized when mobile equipment is operating near excavation edge.			
	Employees prohibited from going under suspended loads.			
2.	Utilities:			
	Initiate “One-Call Utility Protection” at least 48-hours in advance of intrusive activity.			
	Utility company’s contacted and/or utility locations delineated.			
	Underground installations protected, supported, or removed while excavation is open.			
3.	Means of Access and Egress:			
	Lateral travel to means of egress no greater than 25 feet in trench excavations 4 feet or more in depth.			
	Ladders used in excavations secured and extended three (3) feet above the edge of the trench.			
	Structural ramps used by employees designed by a competent person.			
	Structural ramps used for equipment designed by a registered professional engineer.			

EXCAVATION INSPECTION (Page 2 of 2) Date:

		√		
		Yes	No	N/A
4.	Wet Conditions:			
	Precautions taken to protect from the accumulation of water.			
	Water removal equipment monitored by a competent person.			
	Surface water or runoff diverted or controlled to prevent accumulation in the excavation.			
	Inspections made after every rainstorm or other hazard-increasing occurrence.			
5.	Hazardous Atmosphere			
	Atmosphere within the excavation tested where there is a reasonable possibility of an oxygen deficient, combustible, or otherwise hazardous atmosphere.			
	Adequate precautions taken to protect employee from exposure to a hazardous atmosphere.			
	Testing conducted to ensure that the atmosphere remains safe.			
	Emergency equipment, such as breathing apparatus, safety harness and line, and basket stretcher readily available where hazardous atmosphere does exist.			
6.	Support Systems:			
	Materials and/or equipment for support systems selected based on soil analysis, trench depth, and expected loads.			
	Materials and equipment used for protective systems inspected and in good condition.			
	Damaged materials & equipment used for protective systems inspected by a Registered Professional Engineer after repairs and before being placed back into service.			
	Protective systems installed without exposing employees to the hazards of cave-ins, collapses, or from being struck by materials or equipment.			
	Members of support systems securely fastened to prevent failure.			
	Support systems provided to insure stability of adjacent structures, buildings, roadways, sidewalks, walls, etc.			
	Excavations below the level of the base or footings approved by a registered professional engineer.			
	Removal of support systems progresses from the bottom, and members are released slowly as to note any indication of possible failure.			
	Excavation of material to a level of greater than 2 feet below the bottom of the support system and only if the system is designed to support the loads calculated for the full depth.			
	Shield system placed to prevent lateral movement.			
	Employees are prohibited from remaining in shield system during vertical movement.			
7.	Remarks:			
	_____			
	_____			

FIRST AID KIT INSPECTION LOG
(Inventory Kit)

Location: _____ Project Name: _____

Project Number: _____ Client: _____ Date: _____

Inspected by: _____ SSHO Approval Signature: _____

Contents	Fixed Location Kit		Vehicular Kit*			
				Actual Quantity		
	Minimum Required Quantity	Actual Quantity	Required Quantity	Vehicle 1 ID	Vehicle 2 ID	Vehicle 3 ID
Telfa Bandage Compress, 4"x4"	4		2			
Adhesive Bandages, 1"x3-3/8"	25		25			
Ammonia Inhalants	2		1			
Triangular Bandage 40" x 40" x 56"	1		-			
Eye Covering with Means of Attachment	1		-			
Eye Flush, 1oz.	2		2			
Absorbent Compress 24 sq. in.	1		1			
Antiseptic Wipes 1" x 1"	10		5			
Antiseptic Swabs 0.14 fl. oz.	10		5			
Antiseptic Towelettes 24 sq. in.	10		-			
Sterile Pad 3" x 3"	4		2			
Burn Treatment 0.14 fl. Oz.	6		1			
Roller Bandage 4" x 6 yd.	1		-			
Roller Bandage 2" x 6 yd.	2		-			
Kwik-Kold Ice Pak	2		-			
Adhesive Tape, 1" x 5 yd.	2		1			
Scissors and Forceps Kit	1		-			
Tick Removal Kit	1		-			
Emergency Blanket	1		-			
Disposable Gloves	4 pair		2 pair			
Flashlight	1		-			
Cotton-tip Applicators	10		-			
Disposable mouth-to-mouth Resuscitators	2		1			
Multi-Trauma Dressings 8"x10"	2		-			
2" Bandage Compress 2" x 36"	4		-			
3" Bandage Compress 3" x 60"	2		-			
4" Bandage Compress 4" x 72"	1		-			
Supervisor's Employee Injury Report	1		1			
Inventory Kit	1		-			

* Readily available "vehicle-size" first aid kits may be purchased at the local department store to fulfill vehicle kit stocking requirements. The kit contents do not need to be inspected as long as the shrink-wrap sanitary covering is intact.

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HAZARD COMMUNICATION AND RIGHT-TO-KNOW STANDARDS
EMPLOYEE TRAINING RECORD

Project Name: _____ Project Number: _____

		INITIAL:
1.	I have been informed about the Hazard Communication Program, Material Safety Data Sheets (MSDS), their use and location, and the procedures to obtain copies.	
2.	I have been informed that some of my work may involve exposure to toxic substances, the hazards of which will be reviewed with me in tailgate safety meetings or site-specific training.	
3.	I have been informed about the right of employees to have access to relevant exposure and medical records, and the procedures for requesting access.	
4.	I understand that the company must act upon a request in a reasonable amount of time so as to avoid interruption of normal work operations.	
5.	I have been provided access to the applicable regulations governing hazard communication, and access to employee exposure and medical records.	

PRINT NAME: _____

SIGNATURE: _____

EMPLOYEE NUMBER: _____

DATE: _____

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HAZCOM PROGRAM ACKNOWLEDGMENT FORM

Project Name: _____ Project Number: _____

1. I have been informed about the Hazard Communication Program, Material Safety Data Sheets (MSDS), their use and location, and the procedures to obtain copies.

2. I have been informed that some of my work may involve exposure to toxic substances, the hazards of which will be reviewed with me in tailgate safety meetings or site-specific training.

3. I have been informed about the right of employees to have access to relevant exposure and medical records, and the procedures for requesting access.

4. I understand that the company must act upon a request in a reasonable amount of time so as to avoid interruption of normal work operations.

5. I have been provided access to the applicable regulations governing hazard communication, and access to employee exposure and medical records.

Printed Name	Signature	Representing	Date

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HEPATITIS B AND TETANUS VACCINATION DECLINATION

Due to the potential for you to have occupational exposure to potentially infectious materials in your work, the company will provide, and encourages you to accept, vaccinations for Hepatitis B and Tetanus. Information to assist you in this decision is provided below.

Tetanus

- Bacterial disease causing muscle spasms, seizures, and "lockjaw"
- Single injection vaccination has few side effects
- Minimal loss in protection if the vaccination is given at the time of an exposure/injury rather than in advance

Hepatitis B

- Viral infection of the liver
- About 9,500 occupational cases occur annually, mostly in health care workers, with about 200 deaths
- Three-injection vaccination has few side effects
- Vaccination is 90 percent effective for at least 7 years when given prior to exposure
- Vaccination is 70 to 88 percent effective when given within 1 week of exposure
- Can survive in the environment for 24 to 48 hours after drying
- Risk of infection from one cut or puncture wound from a contaminated object:
  - Hepatitis B virus 6 to 30 percent
  - Human Immunodeficiency Virus (AIDS) 0.5 percent

If you wish to talk to a company doctor before making your decision, please ask the Health and Safety Manager to make arrangements for you. *If you choose to decline vaccination at this time, you must print and sign your name, and date the bottom of this form.*

I understand that due to my occupational exposure to blood or other potentially infectious materials I may be at risk of acquiring Hepatitis B Virus (HBV) infection.

I have been given the opportunity to receive the Hepatitis B vaccine, at no charge to myself. However, I decline Hepatitis B vaccination at this time. I understand that by declining this vaccine, I continue to be at risk of acquiring Hepatitis B, a serious disease.

If in the future I continue to have occupational exposure to blood or other potentially infectious materials and I want to be vaccinated with the Hepatitis B vaccine, I can receive this vaccination series at no charge to me.

Name (print) _____

Signature _____ Date _____

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HOT WORK PERMIT

Project Name _____ Project # _____

Good for This Date Only ____/____/____ Time From _____ To _____

Hot Work Area _____

Specific Work to be Done _____

Personal Protective Equipment Required: _____

_____

Emergency Equipment Required: _____

_____

CHECKLIST	INITIAL	
	YES	DOES NOT APPLY
Area personnel have been informed of work to be performed.		
All tanks, lines, valves are disconnected, blinded, or blocked out.		
Electrical service has been locked out and tagged.		
Equipment and all attached piping has been cleaned and purged with: (check blank) Water _____ Steam _____ Inert gas _____ Air		
All grounding/bonding wire in place.		
Surrounding equipment and operations are safe for hot work.		
No open vessels, lines or combustible items within 35 feet of hot work area.		
Fully charged and appropriate fire extinguisher easily accessible.		
Fire watch has been provided.		
No flammable gases greater than 10% LEL in hot work area.		
Compressed gas cylinders kept upright and secured.		
Air monitoring required.		

AIR MONITORING (If Required)						
STATE EXACT LOCATION OF TEST	TIME	% LOWER EXPLOSION LIMIT	% OXYGEN	OTHER TEST _____	OTHER TEST _____	INITIAL

Special Instructions: _____

_____

Completed by: _____ _____ _____

Printed Name Signature Date

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INTRUSIVE ACTIVITIES PERMIT	Permit Number

Project Name: _____ Project Number: _____

Clearance is permitted for intrusive activity at: _____

The attached map indicates the limits of the permitted intrusive activity. The area __has __has not been staked or clearly marked.

Utilities Locate Service Reference Number: _____

Limits of Work Permitted		
Description of permitted work:		
Specific location of permitted work:		
Precautions or comments:		
Date Clearance Permitted:	Date Clearance Terminated:	
Request Initiated By:	Phone No.	Organization

Permission to proceed with intrusive activity granted:

_____ _____

Field Supervisor/Project Manager Date

Permission to proceed with intrusive activity granted:

_____ _____

Site Safety and Health Officer Date

I agree to perform work within the limits of this permit:

_____ _____

Supervisor/Foreman/Contractor Date

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LIFT PLAN WORKSHEET

General Information

Date:_____ Project No:_____

Location: _____ Crane Owner:_____

Item to be Lifted:_____ Equipment No:_____

Item Weight:_____(lbs) _____(lbs)
Actual Calculated Weight (from below)

If actual weight is not known, the item weight must be determined by one of the following methods:
Manufacturer Data Sheet
Truck Weigh Ticket (only for single piece loads)
Calculated Weight

Standard weight per cubic foot of this material: _____

Dimension of item/material: L _____ x W _____ x H _____ = _____ cu. ft.

Cubic feet of item _____ x Standard Weight _____ =
Calculated Weight

Lifting Responsibility

Lift Supervisor:_____ Employee No:_____
(Required for lifts over 75% of capacity)

Lift Supervisor:_____ _____
Print Name Signature

Crane Operator:_____ _____
Print Name Signature

Rig:_____ _____
Print Name Signature

Rigging Personnel:_____ _____
Print Name Signature

Tag Line 1: _____ _____
Print Name Signature

Tag Line 2: _____ _____
Print Name Signature

Crane Capacity Determination

Item Weight: _____

Block Weight: + _____

Stowed Jib: + _____

Spreader Bar Weight: + _____

Sling Weight: + _____

Accessories: + _____

Other: + _____

Lift Total: = _____

Anticipated Maximum Boom Extension: _____ feet

Anticipated Minimum Boom Angle: _____ °

Anticipated Maximum Load Radius: _____ feet

Based on the above configuration, this crane can safely lift * _____ lbs.

*The crane capacity must exceed the lift total while also taking the following into account:

- Crane/Boom Lift Point (i.e. main boom or jib)
- Quadrant of Operation (over front or 360°)
- Line Pull & Reeving Requirements (parts of line required)
- Crane is level and on fully extended outriggers; or
- Within "On Rubber" Capacity chart if not fully extended or a pick and carry lift is required.

Rigging Capacity Determination

_____ x _____ = _____

Item weight (from page 1) | Sling angle factor | Implied Sling Load

Sling capacity must be determined based on the following items:

- When using multiple slings, the sling with the least lifting capacity must be capable of lifting the load.
- Hitch (vertical, basket, chock)
- Number of sling legs for calculation purpose; never use more than 3 legs.
- Sling angle

NOTE: Sling angle factors can be found in Attachment 4.

Rigging Accessories

Shackles: Number _____ Size _____ Capacity

Other: Number _____ Size _____ Capacity

Implied Sling Load: _____ Sling Capacity:

NOTE: Implied sling load must not exceed sling capacity.

Pre-Lift Checklist

- ☐ rigger has inspected all rigging
- ☐ equipment operator has inspected equipment
- ☐ wind conditions acceptable
- ☐ other weather conditions acceptable
- ☐ keep all unnecessary personnel clear of the lift area
- ☐ no personnel allowed down slope during operations done safely
- ☐ use all PPE properly (hard hats, boots, etc.)
- ☐ weight of lift remains unchanged
- ☐ pre-lift meeting with all personnel
- ☐ personnel are qualified
- ☐ equipment in accordance with plan
- ☐ no hazardous conditions in lift area
- ☐ equipment is properly set up
- ☐ signal person assigned if necessary
- ☐ Lift Supervisor (LS) to ensure job
- ☐ LS to stop job if unsafe condition
- ☐ LS to stabilize job if accident occurs

Critical lifts require drawings of lift configuration. Use box below or attach drawing to worksheet.

Lifting Approvals

Lifts which exceed 25 tons or greater outlined on this lift planning worksheet require the approval of a competent civil, structural/mechanical engineer.

_____ _____

Print Name Signature

This page intentionally left blank.

Project Location: _____
Client: _____
Project Number: _____

LOCKOUT LOG

AUTHORIZED EMPLOYEE	DATE	EQUIPMENT NAME	EQUIPMENT NUMBER	REASON FOR LOCKOUT

This page intentionally left blank.

LOCKOUT/TAGOUT FOR COMPRESSED AIR AND GASES

Project Name: _____ Project Number: _____

Job: _____

Device: _____

Location: _____

Authorized Person: _____

Site Supervisors: _____

PREPARATION FOR SHUTDOWN

1. Determine types and shutoff location.
2. Determine if there is more than one energy source.
3. Determine magnitude of compressed air, gas, steam, water, or fluids.
4. Notify affected employees in the area that equipment will be locked out for maintenance.
5. Shutoff main supply to machine.

LOCKOUT/TAGOUT

6. Lock and tag main supply in the OFF position.
7. Bleed line and verify that no air or gases remain in the equipment.
8. Repair equipment.

RETURN TO SERVICE

9. Be sure all connections are made and any unused tools and equipment are removed.
10. Remove lock if necessary to verify proper operations.
11. Remove tag.
12. Notify employees in the area that the equipment is available.

Signature:

Authorized Person: _____

Site Supervisor: _____

This page intentionally left blank.

LOCKOUT/TAGOUT FOR ELECTRICAL EQUIPMENT

Project Name: _____ Project Number: _____

Job: _____

Device: _____

Location: _____

Authorized Person: _____

Site Supervisors: _____

PREPARATION FOR SHUTDOWN

1. Determine power type and shutoff location.
2. Determine if there is more than one energy source.
3. Determine magnitude of power (voltage).
4. Notify affected employees in the area that equipment will be locked out for maintenance.
5. Shutoff power sources to machine.

LOCKOUT/TAGOUT

6. Lock and tag main switches in the OFF position, remove fuses.
7. Verify that no power is available to the equipment using a voltmeter, if necessary.
8. Drain devices such as capacitor banks.
9. Verify that these devices have no stored energy by use of the voltmeter.
10. Repair equipment.

RETURN TO SERVICE

11. Be sure all connections are made and any unused tools and equipment are removed.
12. Remove lock if necessary to verify machine is repaired. The maintenance employee, while verifying the machine is repaired cannot leave the immediate area.
13. Remove tag from machine.
14. Notify employees in the area that the equipment is available.

Signature:

Authorized Person: _____

Site Supervisor: _____

This page intentionally left blank.

LOCKOUT/TAGOUT FOR HYDRAULIC EQUIPMENT

Project Name: _____ Project Number: _____

Job: _____

Device: _____

Location: _____

Authorized Person: _____

Site Supervisors: _____

PREPARATION FOR SHUTDOWN

1. Determine power type and shutoff location.
2. Determine if there is more than one energy source.
3. Determine magnitude of energy (pressure).
4. Notify affected employees in the area that equipment will be locked out for maintenance.
5. Shutoff main hydraulic to equipment.

LOCKOUT/TAGOUT

6. Lock and tag main supply in the OFF position.
7. Drain fluids from shutoff valves to equipment.
8. Verify that the hydraulic fluid is disconnected.
9. Block ram or items controlled by the hydraulic system using the appropriate blocking.
10. Repair equipment.

RETURN TO SERVICE

11. Be sure all connections are made and any unused tools and equipment are removed.
12. Remove lock if necessary to verify machine is repaired. Maintenance employee cannot leave the immediate area, while verifying the machine is repaired.
13. Remove tag from machine.
14. Notify employees in the area that the equipment is available.

Signature:

Authorized Person: _____

Site Supervisor: _____

This page intentionally left blank.

LOCKOUT/TAGOUT FOR STEAM, WATER, AND FLUID LINES

Project Name: _____ Project Number: _____

Job: _____

Device: _____

Location: _____

Authorized Person: _____

Site Supervisors: _____

PREPARATION FOR SHUTDOWN

1. Determine types and shutoff location.
2. Determine if there is more than one energy source.
3. Determine magnitude of compressed air or gas.
4. Notify affected employees in the area that equipment will be locked out for maintenance.
5. Disconnect/shutoff main steam, water, or fluid lines to equipment.

LOCKOUT/TAGOUT

6. Lock and tag main supply (i.e. chaining through valve handle with lock) in the OFF position with a bleeder open on the load side.
7. Drain fluids from shutoff valves to equipment.
8. Repair equipment.

RETURN TO SERVICE

9. Be sure all connections are made and any unused tools and equipment are removed.
10. Remove lock if necessary to verify machine is repaired. The maintenance employee cannot leave the immediate area, while verifying the machine is repaired.
11. Remove tag from machine.
12. Notify employees in the area that the equipment is available.

Signature:

Authorized Person: _____

Site Supervisor: _____

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LOCKOUT/TAGOUT PROCEDURE FOR SPECIFIC EQUIPMENT

Project Name: _____ Project Number: _____

Equipment:		
Cat. No. and Location:		
Serial Number (if available):		
Electrical:	Voltage:	Location:
Describe:		
Air (Type):		Location:
Describe:		
Gases (Type):		Location:
Describe:		
Steam (Type):		Location:
Describe:		
Water:		Location:
Describe:		
Fluids:		Location:
Describe:		
Hydraulic:		Location:
Describe:		
Stored Energy – Capacitors, Springs, Etc.:		
Describe:		

LOG DATA AND RETURN TO SITE-SUPERVISOR

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Near Miss Report

Employee Name (optional): _____

Shaw Location: _____ **Date of Report:** _____

Near Miss

POTENTIAL LOSS		
◉ Injury	◯ Illness	◯ Property Damage
Describe potential loss:		

Incident

EVENTS
Describe event:

Causes

SUBSTANDARD ACTS/PRACTICES	SUBSTANDARD CONDITIONS
◯ Failure to warn	◯ Inclement weather
◯ Failure to secure	◯ Inadequate guards or barriers
◯ Operating at improper speed	◯ Inadequate or improper protective equipment
◯ Making safety devices inoperable	◯ Defective tools, equipment or materials
◯ Removing safety devices	◯ Congestion or restricted action
◯ Using defective equipment	◯ Inadequate warning system
◯ Using equipment improperly	◯ Fire and explosion hazards
◯ Failing to use PPE properly	◯ Poor housekeeping; disorderly workplace
◯ Improper loading	◯ Hazardous environmental conditions: gases,
◯ Improper placement	◯ Dusts, smokes, fumes, vapors
◯ Improper lifting	◯ Noise exposures
◯ Improper position for task	◯ High or low temperature exposures
◯ Servicing equipment in operation	◯ Other
Describe immediate cause(s):	

IMPROVEMENT ACTIONS		
1		
2		
3		
Person responsible for follow-up:	Expected completion date:	Actual completion date:
Verified by:	Validated by:	
Supervisor Name:		
Signature:		

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Noise Dosimeter
Field Data Log

Project Name _____ Project# _____

Date _____ Calibrated by _____

Survey Location _____

Dosimeter Serial No.	Employee Name	Job Description	Calibration dBA (pre)	Dose	Lavg	Lmax	Time	Calibration dBA (post)	Comments

Comments _____

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Noise Survey
Field Data Log

Project Name _____ Project# _____

Date _____ Calibrated by _____

Survey Location _____

Sound Level Meter Serial No.	Employee Name/ Equipment Name	Job Description/ Equipment Location	Time	Calibration dBA (pre-survey)	dBA/ Distance from Source	dBA/ Distance from Source	dBA/ Distance from Source	Calibration dBA (post-survey)	Comments

Comments _____

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PROJECT SAFETY INSPECTION REPORT

DATE _____

BUSINESS LINE: _____

PROJECT NAME/NUMBER: _____

PROGRAM MANAGER: _____ PROJECT MANAGER: _____

GENERAL PROJECT DESCRIPTION: _____

SITE ACTIVITIES AT TIME OF INSPECTION: _____

_____

_____

INTERVIEWED EMPLOYEE: _____

SAFETY ISSUE: _____

CORRECTIVE ACTION: _____

_____

ASSIGNED TO: _____ FOLLOW-UP DATE: _____

CORRECTION VERIFIED BY: _____ DATE: _____

INTERVIEWED EMPLOYEE: _____

SAFETY ISSUE: _____

CORRECTIVE ACTION: _____

_____

ASSIGNED TO: _____ FOLLOW-UP DATE: _____

CORRECTION VERIFIED BY: _____ DATE: _____

INSPECTION COMPLETED BY: _____ DATE: _____

HEALTH AND SAFETY REVIEW BY: _____ DATE: _____

PROJECT SAFETY INSPECTION REPORT

PROJECT _____ DATE _____

	YES	NO	N/A
FIRST AID			
1. Are first aid kit locations identified and accessible?			
2. Are emergency eye wash/safety showers available and inspected monthly?			
3. Are first aid kits inspected weekly?			
4. Is a qualified first aid/CPR provider on-site?			
PERSONAL PROTECTIVE EQUIPMENT			
1. Have levels of personnel protection been established?			
2. Are respirators decontaminated, inspected, and stored according to standard procedures?			
3. Have employees been fit-tested?			
4. Is defective personal protective equipment tagged and taken out of service?			
5. Does compressed breathing air meet CGA Grade "D" minimum?			
6. Are there sufficient sizes and quantities of protective equipment?			
7. At a minimum, are employees utilizing safety glasses, hard hats, and steel toe boots?			
FIRE PREVENTION			
1. Are employees smoking only in designated outdoor areas?			
2. Are fire lanes established and maintained?			
3. Are flammable liquid dispensing systems bonded?			
4. Are approved safety cans available for storage of flammable liquids?			
5. Has the local fire department been contacted?			
6. Are fire extinguishers available and inspected monthly?			
7. Are flammables and combustibles properly stored?			
8. Are flammable storage cabinets available and used when needed?			
AIR MONITORING			
1. Is required air monitoring being conducted?			
2. Are air monitoring instruments calibrated daily?			
3. Are air monitoring logs up to date?			
4. Are instrument user manuals available?			
5. Are instruments being maintained?			
6. Are employees notified of personal sampling results within 5 days of receipt?			
WELDING AND CUTTING			
1. Are fire extinguishers present at welding and cutting operations?			
2. Are confined spaces evaluated prior to and during cutting and welding operations?			
3. Have Hot Work Permits been completed?			
4. Are proper helmets, goggles, aprons, and gloves available for welding and cutting operations?			
5. Are welding machines properly grounded?			
6. Are oxygen and fuel gas cylinders stored a minimum of 20 feet apart?			
7. Are only trained personnel permitted to operate welding and cutting equipment?			
8. Are gas cylinders transported in a secured vertical position with caps in place?			
HAND AND POWER TOOLS			
1. Are defective hand and power tools tagged and taken out of service?			
2. Is eye protection available and used when operating power tools?			
3. Are guards and safety devices in place on power tools?			
4. Are power tools inspected before each use?			
5. Are nonsparking tools available when necessary?			

PROJECT SAFETY INSPECTION REPORT

PROJECT _____ DATE _____

	YES	NO	N/A
HAND AND POWER TOOLS (continued)			
6. Is the correct tool being used for the job?			
MOTOR VEHICLES			
1. Are vehicles regularly inspected?			
2. Are personnel licensed for the vehicles they operate?			
3. Are unsafe vehicles tagged and reported to supervision?			
4. Is vehicle's safety equipment operating properly?			
5. Are loads secure?			
6. Are vehicle occupants using safety belts?			
7. Are current insurance cards and blank accident report forms located in vehicles?			
EMERGENCY PLANS			
1. Are emergency telephone numbers posted?			
2. Have emergency escape routes been designated?			
3. Are employees familiar with the emergency signal?			
4. Has the emergency route to the hospital been established and posted?			
5. Is a vehicle on site that can transport injured employees to the hospital?			
MATERIALS HANDLING			
1. Are materials stacked and stored to prevent sliding or collapsing?			
2. Are tripping hazards identified?			
3. Are semi-trailers chocked?			
4. Are fixed jacks used under semi-trailers?			
5. Are riders prohibited on materials handling equipment?			
6. Are approved manlifts provided for the lifting of personnel?			
7. Are personnel in manlifts wearing approved fall protection devices?			
FIRE PROTECTION			
1. Has a fire alarm system been established?			
2. Do employees know the location and use of all fire extinguishers?			
3. Are fire extinguisher locations posted?			
4. Are combustible materials segregated from open flames?			
5. Have fire extinguishers been professionally inspected during the last year?			
6. Are fire extinguishers visually inspected monthly?			
ELECTRICAL			
1. Is electrical equipment and wiring properly guarded and maintained in good condition?			
2. Are extension cords kept out of wet areas?			
3. Is damaged electrical equipment tagged and taken out of service?			
4. Have underground electrical lines been identified by proper authorities?			
5. Has a lockout/tagout system been established?			
6. Are GFCIs being used on all temporary electrical systems and as needed?			
7. Are extension cords being inspected daily (i.e., group pin in place, no unapproved splices)?			
8. Are warning signs exhibited on high voltage equipment (250V or greater)?			
9. Is adequate distance maintained from overhead electrical lines?			
10. Are switches, circuit breakers, and switchboards installed in wet locations enclosed in weatherproof enclosures?			

PROJECT SAFETY INSPECTION REPORT

PROJECT _____ DATE _____

	YES	NO	N/A
CRANES AND RIGGING			
1. Are cranes inspected daily prior to use?			
2. Are crane swing areas barricaded or demarked?			
3. Is all rigging equipment tagged with an identification number and rated capacity?			
4. Is rigging equipment inspection documented?			
5. Are slings, chains, and rigging inspected before each use?			
6. Are damaged slings, chains, and rigging tagged and taken out of service?			
7. Are slings padded or protected from sharp corners?			
8. Do employees keep clear of suspended loads?			
9. Are rated load capacities and special hazard warnings posted on crane?			
10. Are the records of annual crane inspection available?			
11. Has accessible areas within the swing radius of the rear of the crane been barricaded?			
12. Do crane operators have required training/certification?			
COMPRESSED GAS CYLINDERS			
1. Are breathing air cylinders charged only to prescribed pressures?			
2. Are like cylinders segregated and stored in well-ventilated areas?			
3. Is smoking prohibited in cylinder storage areas?			
4. Are cylinders stored secure and upright?			
5. Are cylinders protected from snow, rain, etc.?			
6. Are cylinder caps in place before cylinders are moved?			
7. Are fuel gas and oxygen cylinders stored a minimum of 20 feet apart?			
8. Are propane cylinders stored and used only outside of buildings?			
SCAFFOLDING			
1. Is scaffolding placed on a flat, firm surface?			
2. Are scaffold planks free of mud, ice, grease, etc.?			
3. Is scaffolding inspected before each use?			
4. Are defective scaffold parts taken out of service?			
5. Have employees completed scaffold user training?			
6. On scaffolds where platforms are overlapped, is planking overlapped a minimum of 12 inches?			
7. Does scaffold planking extend over end supports between 6 to 18 inches (dependent upon platform length)?			
8. Are employees restricted from working on scaffolds during storms and high winds?			
9. Are all pins in place and wheels locked?			
10. Is required perimeter guarding (top rail, mid rail, and toe board) present?			
11. Has a competent person been designated to oversee scaffold construction?			
12. Are employees prohibited from moving mobile scaffold horizontally while employees are on them?			
13. Are all scaffold components manufactured by the same company?			
WALKING AND WORKING SURFACES			
1. Are ladders regularly inspected?			
2. Are accessways, stairways, ramps, and ladders clean of ice, mud, snow, or debris?			
3. Are ladders being used in a safe manner?			
4. Are ladders kept out of passageways, doors, or driveways?			
5. Are broken or damaged ladders tagged and taken out of service?			
6. Are metal ladders prohibited in electrical service?			

WALKING AND WORKING SURFACES (continued)			
7. Are stairways and floor openings guarded?			
8. Are safety feet installed on straight and extension ladders?			
9. Is general housekeeping being maintained?			
10. Are ladders tied off?			
11. Are handrails and side rails installed along the unprotected sides of stairways having 4 or more risers or rising more than 30 inches?			
SITE SAFETY PLAN			
1. Is a site safety plan available on site or accessible to all employees?			
2. Does the safety plan accurately reflect site conditions and tasks?			
3. Have potential hazards been described to employees on site?			
4. Is there a designated safety official on site?			
5. Have all employees signed the safety plan acknowledgment form?			
SITE POSTERS			
1. Are the following posters displayed in a prominent and accessible area?			
A. Minimum Wage			
B. OSHA Job Protection			
C. Equal Employment Opportunity			
2. Are all required state-specific posters displayed?			
SITE CONTROL			
1. Are work zones clearly marked?			
2. Are support trailers located to minimize exposure from a potential release?			
3. Are support trailers accessible for approach by emergency vehicles?			
4. Is the site properly secured during and after work hours?			
5. Is an exclusion zone sign-in/sign-out log maintained?			
6. Are only employees with current training and physicals permitted in exclusion zone?			
HEAVY EQUIPMENT			
1. Is heavy equipment inspected as prescribed by the manufacturer?			
2. Is defective heavy equipment tagged and taken out of service?			
3. Are project roads and structures inspected for load capacities and proper clearances?			
4. Is heavy equipment shut down for fueling and maintenance?			
5. Are backup alarms installed and working on mobile equipment?			
6. Have qualified equipment operators been designated?			
7. Are riders prohibited on heavy equipment?			
8. Are guards and safety appliances in place and used?			
9. Are operators using the "three point" system when mounting/dismounting equipment?			
EXCAVATION			
1. Has a "competent person" been designated to oversee excavation activities?			
2. Prior to opening excavations, are utilities located and marked?			
3. Has a professional engineer evaluated all excavations greater than 20 feet deep?			
4. Is there rescue equipment on site and accessible to the excavation area?			
5. Is excavated material placed a minimum of 24 inches from the excavation?			
6. Are the sides of excavations sloped or shored to prevent cave ins?			
EXCAVATION (continued)			
7. Have excavations greater than 4 feet deep been monitored for hazardous atmospheres (i.e., LEL/O_2 deficiency)?			
8. Are ladders or ramps used in excavations over 4 feet deep?			
9. Are means of egress available so as to require no more than 25 feet of lateral travel?			

PROJECT SAFETY INSPECTION REPORT

PROJECT _____ DATE _____

	YES	NO	N/A
10. Are barriers, i.e., guardrails or fences, placed around excavations near pedestrian or vehicle thoroughfares?			
11. Is excavation inspected daily by competent persons and documented?			
CONFINED SPACES			
1. Have employees been trained in the hazards of confined spaces?			
2. Are confined space permits posted at entrance to confined space?			
3. Is a copy of the confined space entry procedure available?			
4. Has a rescue plan been established?			
5. Is an entry supervisor present at each permit-required entry?			
6. Are required extraction/fall protection devices being used?			
DECONTAMINATION			
1. Are decontamination stations set up on site?			
2. Is decontamination water properly contained and disposed of?			
3. Are all pieces of equipment inspected for proper decontamination before leaving the site?			
4. Are shin/metatarsal guards being used during power washing activities?			
HAZARD COMMUNICATION			
1. Is there a copy of the HAZCOM procedure on site?			
2. Are their MSDSs for required materials/chemicals present on site?			
3. Are all containers properly labeled, as to content, hazard?			
4. Have employees been trained in accordance with the HAZCOM procedure?			
5. Do employees (including subcontractors) know and understand the effects of exposure from the chemicals on site?			
6. Have all personnel signed the HAZCOM acknowledgment form?			
7. Is there an updated list of chemicals maintained on site?			
TRAINING			
1. Are tailgate safety meetings being conducted daily?			
2. Are current training/medical records maintained on site?			
DOCUMENTATION			
1. Is an OSHA 300 Log maintained on site and posted during the months of February, March, and April?			
2. Are accident report forms available?			
3. Is a copy of health and safety policy and procedures available on site?			

PROJECT SAFETY INSPECTION REPORT

PROJECT _____ DATE _____

ALL NEGATIVE RESPONSES	CORRECTIVE ACTION	ASSIGNED TO	DATE ASSIGNED	DATE COMPLETED	VERIFIED BY

DESCRIBE POSITIVE SAFETY OBSERVATIONS

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REAL TIME AEROSOL MONITORING LOG

Project Name: _____ Project No. _____

Date: _____

Sampled By	Instrument Type (Mfg./Model/Serial No.)	Battery Charged (Y/N)	Zeroed (Y/N)	Sample Time		Sample Readings (mg/m^3)			Comments
				Start	Finish	TWA	Shift Average	Direct	

General Weather Conditions _____

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RESCUE SERVICE EVALUATION

INITIAL EVALUATION

Project/Location _____ Project No. _____

Identity of PRCS _____

Name of Rescue Service _____

Address _____

Contact Person/Phone Number _____

Required Response Time _____ Estimated Response Time _____

Availability of Rescue Service _____

PERFORMANCE EVALUATION (Observe Test Rescue and Answer Following Questions)	YES	NO
Have all members of the service been trained in the potential hazards of the permit space(s), or of a representative permit space(s) from which rescue may be needed?		
Can team members recognize the signs, symptoms, and consequences of exposure to any hazardous atmospheres that may be present in the permit space(s)?		
Is every team member provided with, and properly trained in, the use and need for PPE which may be required to perform permit space rescues?		
Is every team member properly trained to perform his/her functions and make rescues, and to use any rescue equipment, such as ropes and backboards, that may be needed in a rescue attempt?		
Are team members trained in the first aid and medical skills needed to treat victims overcome or injured by the types of hazards that may be encountered in the permit space(s)?		
Do all team members perform their functions safely and efficiently?		
Do rescue service personnel focus on their own safety before considering the safety of the victim?		
Can the rescue service properly test the atmosphere of the identified PRCS?		
Can the rescue personnel identify information pertinent to the rescue from entry permits, hot work permits, and MSDSs?		
Has the rescue service been informed of any hazards to personnel that may arise from outside the space, such as those that may be caused by future work near the space?		
Can the rescue service safely perform rescue(s) from the identified PRCS?		
Does the rescue service have a plan for rescue from the identified PRCS?		
Is the plan adequate for all types of rescue operations that may be needed?		

I certify that the evaluated rescue service is equipped and capable of providing rescue services during entry activities for the identified PRCS.

Evaluator:

_____ _____ _____

Name Signature Date

I acknowledge our responsibility to provide rescue services during entry activities for the identified PRCS.

Rescue Service Representative:

_____ _____ _____

Name Signature Date

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Safety and Occupational Health Deficiency Tracking Log

Section and Item #	Date Deficiency Identified	Description of Deficiency or Comment	Recommended Action	Person Responsible for Correcting Deficiency	Projected Resolution Date	Date Deficiency Actually Resolved

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SAFETY MEETING / TRAINING LOG

- ☐ Tailgate (daily)
- ☐ Activity Hazard Analysis (prior to new task or operation)
- ☐ Job Safety Analysis (prior to new task or operation)
- ☐ Site Safety Orientation (new personnel)
- ☐ Supervisor's (monthly)
- ☐ Supervisor's (weekly)
- ☐ UXO Awareness
- ☐ Asbestos Awareness
- ☐ Health and Safety Plan Addendum: _____
- ☐ Other: _____

Date/Time: _____ Client: _____

Location: _____ Job No.: _____

Meeting/training conducted by: _____

Work Activities: _____

Safety / Training Topics Presented

Chemical Hazards: _____

Physical Hazards: _____

Specific Safety Topic(s): _____

_____

Specific Training Covered: _____

_____

Attendees

Name Printed and Employee Number:	Signature:

SAFETY MEETING / TRAINING LOG
(Continued)

Date: ____________________ Job No.:____________________

Attendees

Name Printed and Employee Number:	Signature:

SITE ENTRY LOG

Date: _____ Client: _____

Location: _____ Job No.: _____

Name	Representing	Time In	Time Out

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SOILS CLASSIFICATION WORKSHEET

The following worksheet outlines the visual and manual tests that the competent person must perform at least once, and each time soil conditions change. At least one visual and one manual test must be performed; however, performing several tests is recommended so that the condition of the excavation is thoroughly examined.

Project Name: _____ Project Number: _____

Date: _____ Time: _____

Where was the sample taken from? _____

I.	**Visual Tests:** *One or more visual tests are required for each classification and each time conditions change*		
1.	Estimate range of particle sizes:	a. primarily fine-grained = cohesive material b. primarily coarse-grained = granular material	
2.	Observe excavated soil:	a. clumps = cohesive material b. breaks up easily = granular material	
3.	Observe sides and adjacent surface area of opened excavation:	a. crack like openings = fissured material b. soil spills off vertical sides = possible fissured material	
4.	Previous excavation activities:	a. previously disturbed soil	b. not previously disturbed soil
5.	Observe opened side of excavation:	a. layered systems c. estimate degree of slope of layers:	b. layers sloped towards excavation _____
6.	Water condition:	a. evidence of surface water c. depth of water table:	b. water seeping from sides _____
7.	Vibration present:	a. Area adjacent to excavation	b. Area within excavation
II.	**Manual Tests** – *One or more manual tests are required for classification and each time soil conditions change*		
1.	Plastically – soil is cohesive if following is true:	a. mold soil samples into a small ball b. roll ball into thread ___ " diameter c. pick up 2" length of ___ " thread by one end without breaking	
2.	Dry Soil Strength:	a. crumbles on its own or with moderate pressure = granular b. falls into clumps which break into smaller clumps that are only broken with difficulty = clay with gravel, sand, or silt. c. breaks into clumps which do not break into smaller clumps and can only be broken with difficulty with no visual indication of fissures = unfissured.	
3.	Thumb penetration test: *(These tests are to be run on a large clump of material as soon as it is excavated).*	a. can be easily indented by the thumb but penetrated by thumb only with great effort = Type a b. easily penetrated several inches by thumb and molded by light finger pressure = Type c	
4.	Unconfined Compressive Strength: *(Saturated Soil Needed)*	a. Pocket Penetrometer reading (take 10 readings and average) 0 – 0.5 = Type C, 0.5 – 1.5 = Type B, 1.5 – 2.0 – Type A b. Shear Vane reading X2: 0 – 0.5 = Type C, 0.5 – 1.5 = Type B, 1.5 – 2.0 = Type A	
5.	Drying Test: (A dry soil sample 1" thick X 6" diameter is needed)	a. develops cracks = fissured material dries without cracks and breaks by hand with considerable force significant b. cohesive content = unfissured cohesive material c. sample breaks easily by hand = fissured cohesive or granular material d. easily pulverized dry clumps by hand or by stepping on them = granular e. don't pulverize easily = fissured cohesive.	

Soil Classification: Type A Type B Type C Stable Rock Other _____

Competent Person: _____ (Print Name) _____ (Signature) _____ (Date)

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Sound Level Meter/Noise Dosimeter Calibration Log

Project Name _____ Project# _____

Date _____ Calibrated by _____

Instrument: Manufacturer/Model Number _____

Time	Battery Charged (Y/N)	Sound Level Meter/Dosimeter Serial No.	Calibration Standard dBA	Span Setting (if applicable)	Meter Scale Setting (if applicable)	Zeroed (Y/N)	Expected Meter Reading	Actual Meter Reading	Comments

Comments _____

This page intentionally left blank.

Project: _____

Project Number: _____

TRAINING ACKNOWLEDGMENT FORM

By signing this certificate, you are acknowledging that you have completed the following formal training courses that meet OSHA's requirements:

Training	Date Completed
24-Hour HAZWOPER	_____
40-Hour HAZWOPER	_____
8-Hour Refresher	_____
8-Hour Supervisor	_____

Site-specific Training: I have been provided and have completed the site-specific training. The Site Safety and Health Officer conducted the training.

_____
Employee/Visitor Initials

Respiratory Protection: I have been trained in accordance with the criteria in Shaw Environmental, Inc.'s/my Employer's Respiratory Protection Program. I have been trained in the proper work procedures and use and limitations of the respirator(s) I will potentially wear. I have been trained in and will abide by the facial hair policy.

_____
Employee/Visitor Initials

Respirator Fit-test Training: I have been trained in the proper selection, fit, use, care, cleaning, and maintenance, and storage of the respirator(s) that I will potentially wear. I have been fit-tested in accordance with the criteria in Shaw Environmental, Inc.'s/my Employer's Respiratory Protection Program and have received a satisfactory fit. I have been assigned my individual respirator. I have been taught how to properly perform positive and negative pressure fit-check upon donning negative pressure respirators each time.

_____
Employee/Visitor Initials

Medical Examination: I have had a medical examination within the last twelve months which was paid for by my employer. The examination included: health history, pulmonary function tests and may have included an evaluation of a chest x-ray. A physician made a determination regarding my physical capacity to perform work tasks on the project while wearing protective equipment including a respirator. I was personally provided a copy and informed of the results of that examination. The Site Safety and Health Officer evaluated the medical certification provided by the physician and signed the appropriate blank below. The physician determined that there:

Were no limitations to performing the required work tasks:

_____
Employee/Visitor Initials

Were identified physical limitations to performing the required work tasks:

_____
Employee/Visitor Initials

[Employee's] [Visitor's] Signature _____

Date _____

Printed Name _____

Site Safety and Health Officer Signature _____

Date _____

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U.S. ARMY CORPS OF ENGINEERS
Safety Inspection Checklist for Construction Equipment
(Including Cranes, Derricks, and Hoisting Equipment)

Project Name:	Project Number:	Client:
Project	Contractor	Contract No.
Type and Make of Equipment	Model	Serial No.

Before any machinery or mechanized equipment is placed in use it shall be inspected and tested by a competent mechanic and certified to be in good operating condition. Records of tests and inspections shall be maintained as part of the active contract File at Project or Resident Office. Checklist set forth herein requires the application of EM 385-1-1, US Army Corps of Engineers Safety and Health Requirements Manual, September 1996. The appropriate EM paragraph to be applied is listed at the end of each testing requirement.

CHECKLIST	Yes	No	N/A
1. Are adequate and serviceable fire extinguishers provided? (09.E.01 through 09.E.03)			
2. Are all wire rope cables in good condition? (15.B.01 and 15.B.02)			
3. Are wire rope, sockets, splices, thimbles, and clips and adequate and properly applied? (15.B.03 through 15.B.08)			
4. Are hooks, safety nooks, shackles, rings, etc., in good condition?			
5. Are necessary platforms, foot-walks, etc., provided? (22.A.01 and 22.A.02)			
6. Are access steps, platforms, etc., provided with non-slip surfaces? (21.A.13)			
7. Is operator protected against the elements, falling or flying objects, swinging loads, and similar hazards? (16.B.10, 16.B.11, and 21.A.11)			
8. Are all glasses in operator's compartment safety glass and in good repair? (16.B.10 and 18.A.07)			
9. Is suitable access provided at lubrication points? (16.B.13)			
10. Do all modifications, extensions, replacement parts, and/or repairs to equipment maintain the same factor of safety as original designed equipment? (16.A.18)			
11. Are drums for load lines equipped with at least one positive holding device, applied directly to the motor shaft or some part of the train gear?			
12. Is there sufficient cable to allow three full wraps of cable on drums at all working positions? (16.C.10)			
13. Are adequate headlights, taillights, and turn signals provided and are they in proper operating condition (16.A.07 and 18.A.02 through 18.A.04)			
14. Are all approved brakes on wheeled equipment and in good operating condition? (16.A.07, 18.A.02, and 18.A.05)			
15. Do windshields have wipers in proper operating condition? (16.A.07, 18.A.02, and 18.A.06)			

This form has been amended by ECC to update the references to the September 1996 edition of EM 385-1-1.

CHECKLIST	Yes	No	N/A
16. Are rear view mirrors provided? (18.A.02 and 18.A.06)			
17. Are operating levers equipped with latch and other devices to prevent accidental starting? (18.A.10)			
18. Is engine equipped with power-operated starting device in operative condition? (18.A.06)			
19. Do all pressure vessels have valid inspection certificates? (20.A.03)			
20. Are reverse signal alarms on equipment? (16.B.01)			
21. Are belts, gears, shafts, electrical contacts, etc., adequately guarded? (16.B.03)			
22. Are all hot pipes and surfaces suitably guarded? (16.B.03)			
23. Are fuel tanks located so that spills or overflows will not come in contact with engine or exhaust? (16.B.04)			
24. Are exhausts and discharges so directed as not to endanger workmen or obstruct view of operator? (16.B.05)			
25. Are guards in place on equipment with drop type skip pans? (16.B.03)			
26. Are adequate seats provided for all riders? (16.A.07 and 18.C.01)			
27. Are tires in serviceable condition? Are testing/inspections documented? (18.A.02)			
28. Are steering linkage and tie rod in good operating condition? Are testing/inspections documented? (18.A.02)			
29. Are dump bodies provided with holding device or other suitable device for locking body in raised position? (18.A.10)			
30. Are tailgate dumping devices so arranged that operator will be in the clear while dumping loads? (18.A.10)			
31. Are trip handles provided on tailgates to facilitate handling? (18.A.10)			
32. Is the air hose free from leaks or defects? (20.B.03)			
33. Are safety lashings for quick make-up type connections provided? (20.A.16)			
34. Is an acceptable spark arrestor installed and working?			
35. Do heating devices comply with references?			
36. Does welding equipment comply with code requirements? (10.A.10 and 10.E.01)			
37. Is equipment adequately grounded? (10.E.04 and 10.E.07)			
38. Do electrical components comply with code? (10.E.01)			
39. Are required pressure, temperature, or relief gages and valves installed and operable? (20.A.10 through 20.A.13 and 20.B.02)			
40. Are approved seat belts and rollover protection provided? (16.B.08, 16.B.12, and 18.B.02)			
41. Is recommended preventive maintenance being followed? (16.A.08 and 18.A.02)			
42. Do helicopter cranes meet construction requirements (16.J.01)			
43. Does hydraulic equipment meet special safety conditions (11.H.08, 11.H.09, and 13.A.09)			
44. Is concrete equipment fitted with adequate safety devices? (27.A.04)			

This form has been amended by ECC to update the references to the September 1996 edition of EM 385-1-1.

CHECKLIST	Yes	No	N/A
45. Are elevating and rotating work platforms in conformance with ANSI A92.2? (22.K.01)			
46. Do conveyors, cableways, and related equipment conform to ANSI 320.01?			
47. Are pile drivers equipped with all appropriate safety devices? (16.L)			
48. Do material hoists conform to ANSI A10.5? (16.K.01)			
49. Do passenger elevators conform to ANSI A10.4? Do temporary hoists conform to ANSI A10.22: (21.H)			
50. Do hand and power tools comply with applicable ANSI standards (13.A through 13.G)			
51. Is high voltage sign posted?			
52. Is equipment fitted with positive stops for rotation when near power lines? (11.E and 16.D.06)			
53. Is there any visible evidence of damage to boom? (16.C.12 and Appendix H)			
54. Is the boom position indicator operating and visible to operator? (16.D.01 and 16.D.04)			
55. Have all operators had a current physical examination? (1.C and 16.C.04)			
56. Is breaking equipment capable of effectively braking, lowering, and safely holding a load of at least the full rated load as required?			

Remarks:

Certification: I hereby certify that this item of equipment is in good operating condition and that it meets all above requirements except as noted in the remarks.

_____ _____

Signature of Competent Mechanic Date

_____ _____

Signature of Superintendent/Quality Control Engineer Date

This form has been amended by ECC to update the references to the September 1996 edition of EM 385-1-1.

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UTILITY MARK-OUT DOCUMENTATION

Project Name: _____ Location: _____
FTL Name: _____ Date: _____
Utility Called: _____ Confirmation #: _____
Subcontractor: _____ Task/Activity: _____
County of work: _____ Municipality of work: _____

Before work is done on any site, contact the appropriate local utility locating service (One Call, Miss Dig, Uloco, etc.) or a local utility contractor to have sub grade utilities marked. NOTE: Boring locations to be placed not in the public right of way are typically not marked out by the public utility mark out, and a private utility locate service must be engaged. Indicate to the utility locator the nearest intersecting street for the site: _____

_____ Confirmation No: _____.

List utility firms (public and private) and the utility they will mark.

Utility Marker Emergency Telephone Numbers Major Utilities Marked by Color Code			
Name of Utility Company	Utility	Color Code	Emergency Telephone Number
	Water	Blue	
	Gas	Yellow	
	Electric	Red	
	Telephone/Cable/ Communication	Orange	
	Sewer	Green	
"ALL UNDERGROUND UTILITIES MAY NOT BE LOCATED BY THE LOCAL UTILITY SERVICE." Accordingly, you must list other known utilities in the area that the "One Call" service will not contact:			

Attach photos of the area prior to placing boreholes.
Take photos of the area indicating minimum 5 feet hand dig, post hole dig, probe, GPR, or other.
NOTE: For any borehole, should 5 feet minimum clearance not be obtained, you must contact Business Line VP or equivalent (Operations Director or other on the Federal Business Line) and obtain a variance.

Completed by:

_____ _____ _____
Name Signature Date

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Equipment Services Group

VEHICLE INSPECTION

UNIT NO: _____ **DATE:** _____
MILEAGE: _____ **CURRENT PROJECT NO:** _____
VEHICLE TYPE: _____ **LICENSE NUMBER:** _____
INSPECTED BY: _____ **FUEL FRONT:** _____
EMPLOYEE NUMBER: _____ **FUEL REAR:** _____

For Authorized Repairs On Donlen Vehicles, Call 1-800-323-1483

RETAIN THIS INSPECTION DOCUMENT IN PROJECT FILES

PRE-TRIP **Yes / No** **DAILY (USACE Project)** **Yes / No**

N / A = NOT APPLICABLE **C** = COMMENTS **O** = OKAY **N** = NEEDS ATTENTION

_____	Exterior / Interior Clean	_____	Engine Oil, Oil Pressure
_____	Lights: Head-Tail-Turn-Stop-Emergency-Backup	_____	Transmission Oil & Drive Line
_____	Operating Controls / Gauges	_____	Radiator / Cooling System
_____	Battery / Starter / Horn	_____	Exhaust / Muffler
_____	Air Conditioner / Heater / Defroster	_____	Front Axle / Steering / Suspension System
_____	Back-up Alarm (Trucks)	_____	Donlen Coupon Book
_____	Windshield, Other Glass, Wipers / Washers	_____	First Aid Kit
_____	Mirrors: Inside-Outside (Convex - trucks)	_____	Fire Extinguisher (mounted/accessible/charged)
_____	Insurance Card & Accident Report Kit	_____	Emergency Flares or Reflective Markers
_____	Emergency Phone Number List	_____	Tires / Wheels / Rims
_____	Map to Urgent Care Facility & Hospital	_____	Spare Tire, Jack, Lug Wrench
_____	Current Registration, Plates	_____	Frame / Bumpers
_____	Service Brakes, Emergency/Parking Brakes	_____	Seat Belts (One for Each Passenger)
_____	Trailer Aux Brake Controller/Electrical Connection	_____	Visible Damage to Body
_____	Coupling Devices/Safety Chain Anchor Point	_____	Driver Safety Notification Sticker
_____	Wheel Chocks (When Equipped With Trailer)	_____	Other, Please Enter Comments Below

Was Unit Serviced? Y / N **DATE** **MILES**

COMMENTS: _____

I am authorized to operate this vehicle. _____ Initials

I am licensed to operate this vehicle. _____ Initials

INSPECTORS SIGNATURE: _____ **DATE:** _____

REPORT ALL DEFICIENCIES TO YOUR SUPERVISOR

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Zero Accident Pledge

Shaw® Shaw Environmental, Inc.

We, the undersigned personnel of the _____ Project are committed to a goal of **ZERO ACCIDENTS** for the duration of the project.

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Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-6

Appendix E
Hazardous Chemical Inventory List and Material Safety Data Sheets

Chemical Inventory
November 1, 2011

Argon
Bentonite
Bleach
Calcium Hydroxide (Hydrated Lime)
Diesel Fuel
Fire extinguisher
Gasoline
Gear lubricant
Grease
Hand cleaner
Hydraulic oil
Hydrochloric Acid
Argon (cryogenic liquified gas)
Hydrogen peroxide (20% - 60% sol)
Isobutylene
Liquinox
Motor oil
Portland cement
Potassium permanganate
Silica sand

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Section 1 - Chemical Product and Company Identification 61

Material Name: Argon
CAS Number: 7440-37-1
Chemical Formula: Ar
Structural Chemical Formula: Ar
EINECS Number: 231-147-0
ACX Number: X1002784-0
Synonyms: Argon; ARGON; ARGON-40
General Use: To provide an inert i.e. non reactive, non oxidizing atmosphere for gas welding; usually TIG and MIG welding.
Used in incandescent and fluorescent tubes, also with mixtures of neon for neon lights. Argon alone produces a bluish-purplish light.
As an inerting gas in rectifier tubes; in thermometers above mercury; in lasers; in chromatography and ionization chambers and particle counters.

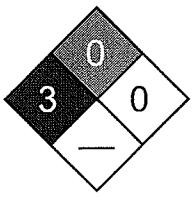
Section 2 - Composition / Information on Ingredients

Name	CAS	%
argon	7440-37-1	>99

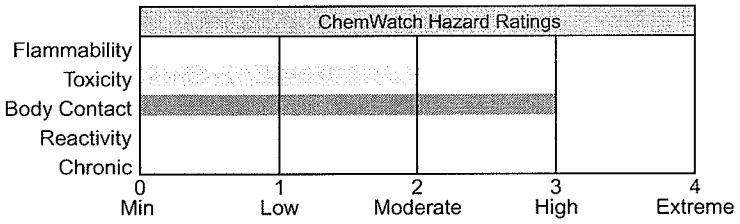
OSHA PEL **NIOSH REL**

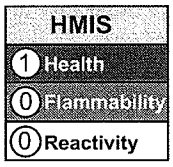
ACGIH TLV

Section 3 - Hazards Identification



Fire Diamond





ANSI Signal Word
Warning!


Compressed Gas

☆☆☆☆☆ Emergency Overview ☆☆☆☆☆

Odorless, colorless gas. Stored as a compressed gas which may cause frostbite. Other Acute Effects: simple asphyxiant.

Potential Health Effects

Target Organs: central nervous system (CNS) (gas as an indirect effect of lack of oxygen), skin (liquid)
Primary Entry Routes: inhalation, skin contact
Acute Effects
Inhalation: The gas is a simple asphyxiant (precludes access to oxygen) and inhalation may cause loss of consciousness.
Material is highly volatile and may quickly form concentrated atmosphere in confined or unventilated area. Vapor is heavier than air and may displace and replace air in breathing zone, acting as a simple asphyxiant. This may happen with little warning of overexposure.
Symptoms of asphyxia (suffocation) may include headache, dizziness, shortness of breath, muscular weakness, drowsiness and ringing in the ears.

If the asphyxia is allowed to progress, there may be nausea and vomiting, further physical weakness and unconsciousness and, finally, convulsions, coma and death. Significant concentrations of the non-toxic gas reduce the oxygen level in the air. As the amount of oxygen is reduced from 21 to 14 volume %, the pulse rate accelerates and the rate and volume of breathing increase. The ability to maintain attention and think clearly is diminished and muscular coordination is somewhat disturbed. As oxygen decreases from 14-10% judgement becomes faulty; severe injuries may cause no pain. Muscular exertion leads to rapid fatigue. Further reduction to 6% may produce nausea and vomiting and the ability to move may be lost.

Permanent brain damage may result even after resuscitation at exposures to this lower oxygen level. Below 6% breathing is in gasps and convulsions may occur. Inhalation of a mixture containing no oxygen may result in unconsciousness from the first breath and death will follow in a few minutes.

Eye: The gas is non-irritating and non-toxic.

The liquid is capable of causing severe cold burns and is capable of causing severe damage with loss of sight.

Skin: The gas is non-irritating and non-toxic.

Vaporizing liquid causes rapid cooling and contact may cause cold burns, frostbite.

Ingestion: Overexposure is unlikely in this form.

Considered an unlikely route of entry in commercial/industrial environments.

Carcinogenicity: NTP - Not listed; IARC - Not listed; OSHA - Not listed; NIOSH - Not listed; ACGIH - Not listed; EPA - Not listed; MAK - Not listed.

Chronic Effects: No data found.

Section 4 - First Aid Measures

Inhalation: Remove to fresh air.

Lay patient down. Keep warm and rested.

If breathing is shallow or has stopped, ensure clear airway and apply resuscitation. Transport to hospital or doctor.

Eye Contact: In case of contact with liquid: promptly flush eyes with tepid water. Seek medical attention immediately.

Skin Contact: In case of cold burns (frost-bite): Bathe the affected area immediately in cold water for 10 to 15 minutes, immersing if possible and without rubbing.

Do not apply hot water or radiant heat. Apply a clean, dry dressing.

Transport to hospital or doctor.

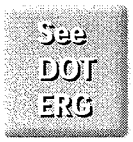
Ingestion: Not applicable.

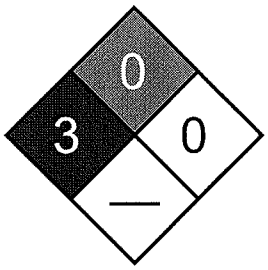
After first aid, get appropriate in-plant, paramedic, or community medical support.

Note to Physicians: Treat symptomatically.

Give oxygen therapy following asphyxiation.

Section 5 - Fire-Fighting Measures





Fire Diamond

Flash Point: Will not burn

Autoignition Temperature: Nonflammable

LEL: Not applicable

UEL: Not applicable

Extinguishing Media: There is no restriction on the type of extinguisher which may be used.

Use fire fighting procedures suitable for surrounding area.

General Fire Hazards/Hazardous Combustion Products: Noncombustible. Heating may cause expansion or decomposition leading to violent rupture of containers.

Fire Incompatibility: Very inert, chemically.

Fire-Fighting Instructions: Contact fire department and tell them location and nature of hazard.

Product is not combustible. No special firefighting procedures required.

Use fire fighting procedures suitable for surrounding area.

Wear breathing apparatus plus protective gloves. May be washed to drain with large quantities of water.

Cool fire-exposed containers with water spray from a protected location.

If safe to do so, remove containers from path of fire.

Section 6 - Accidental Release Measures

Small Spills: Increase ventilation. Avoid breathing vapors and contact with skin and eyes.

Apply leak detection solution to suspected sites in lines and equipment.

Stop leak if safe to do so.

Large Spills: Clear area of personnel.

Wear breathing apparatus plus protective gloves. May be washed to drain with large quantities of water.

Increase ventilation.
Stop leak if safe to do so.
Remove leaking cylinders to a safe place if possible. Release pressure under safe, controlled conditions by opening the valve.
Regulatory Requirements: Follow applicable OSHA regulations (29 CFR 1910.120).

Section 7 - Handling and Storage

Handling Precautions: Avoid breathing vapors and contact with skin and eyes. Avoid sources of heat.
Avoid physical damage to containers.
Use in a well-ventilated area.
Keep containers securely sealed when not in use.
Prevent concentration in hollows and sumps. DO NOT enter confined spaces until atmosphere has been checked.
Recommended Storage Methods: Check that containers are clearly labeled. Cylinder. Ensure the use of equipment rated for cylinder pressure.
Ensure the use of compatible materials of construction.
Valve protection cap to be in place until cylinder is secured, connected.
Cylinder must be properly secured either in use or in storage.
Cylinder valve must be closed when not in use or when empty.
Segregate full from empty cylinders.
WARNING: Suckback into cylinder may result in rupture.
Use back-flow preventive device in piping.
Regulatory Requirements: Follow applicable OSHA regulations.

Section 8 - Exposure Controls / Personal Protection

Engineering Controls: General exhaust is adequate under normal operating conditions. Air-line hood.
If risk of overexposure exists, wear air supplied breathing apparatus.
Provide adequate ventilation in warehouse or closed storage areas.
Personal Protective Clothing/Equipment:
Eyes: Safety glasses with side shields; or as required, chemical goggles.
Contact lenses pose a special hazard; soft lenses may absorb irritants and all lenses concentrate them.
Hands/Feet: Wear chemical protective gloves, eg. PVC. Wear safety footwear.
Other: Overalls. Eyewash unit.

Section 9 - Physical and Chemical Properties

Appearance/General Info: Colorless, odorless compressed gas. Constitutes approximately 0.93% of dry atmospheric air. An element characterized by its extreme lack of chemical reactivity. Permanent gas: Critical temperature; -122.4 °C. Critical pressure: 4864 kPa.

Physical State: Compressed gas
Vapor Density (Air=1): 1.38
Formula Weight: 39.95
Specific Gravity (H_2O=1, at 4 °C): Not applicable
Evaporation Rate: > 1
pH: Not applicable
pH (1% Solution): Not applicable
Boiling Point: -185.8 °C (-302 °F)
Freezing/Melting Point: -192.2 °C (-313.96 °F)
Volatile Component (% Vol): 100
Decomposition Temperature (°C): Not applicable
Water Solubility: Slightly soluble in water

Section 10 - Stability and Reactivity

Stability/Polymerization/Conditions to Avoid: Product is considered stable. Hazardous polymerization will not occur.
Storage Incompatibilities: Very inert, chemically.

Section 11 - Toxicological Information

No relevant toxicological data found at time of research.

See *RTECS* CF 2300000, for additional data.

Section 12 - Ecological Information

Environmental Fate: No data found.
Ecotoxicity: No data found.

Section 13 - Disposal Considerations

Disposal: Return empty containers to supplier.

Section 14 - Transport Information

DOT Hazardous Materials Table Data (49 CFR 172.101):

Shipping Name and Description: Argon, compressed
ID: UN1006
Hazard Class: 2.2 - Non-flammable compressed gas
Packing Group:
Symbols:
Label Codes: 2.2 - Non-Flammable Gas
Special Provisions:
Packaging: **Exceptions:** 306 **Non-bulk:** 302 **Bulk:** 314, 315
Quantity Limitations: **Passenger aircraft/rail:** 75 kg **Cargo aircraft only:** 150 kg
Vessel Stowage: **Location:** A **Other:**

Section 15 - Regulatory Information

EPA Regulations:
RCRA 40 CFR: Not listed
CERCLA 40 CFR 302.4: Not listed
SARA 40 CFR 372.65: Not listed
SARA EHS 40 CFR 355: Not listed
TSCA: Listed

Section 16 - Other Information

Disclaimer: Judgments as to the suitability of information herein for the purchaser's purposes are necessarily the purchaser's responsibility. Although reasonable care has been taken in the preparation of such information, Genium Group, Inc. extends no warranties, makes no representations, and assumes no responsibility as to the accuracy or suitability of such information for application to the purchaser's intended purpose or for consequences of its use.

BAROID DRILLING FLUIDS
BENTONITE PELLETS 3\8 INCH **Revised: 01/03/2008**

MSDS Contents

HALLIBURTON

MATERIAL SAFETY DATA SHEET

PRODUCT TRADE NAME: BENTONITE PELLETS 3\8 INCH

REVISION DATE: 03-JAN-2008

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

PRODUCT TRADE NAME: BENTONITE PELLETS 3\8 INCH

SYNONYMS: NONE

CHEMICAL FAMILY: MINERAL

APPLICATION: WEIGHT ADDITIVE

MANUFACTURER/SUPPLIER:
BAROID FLUID SERVICES
PRODUCT SERVICE LINE OF HALLIBURTON
P.O. BOX 1675
HOUSTON, TX 77251

TELEPHONE: (281) 871-4000

EMERGENCY TELEPHONE: (281) 575-5000

PREPARED BY: CHEMICAL COMPLIANCE

TELEPHONE: 1-580-251-4335

E-MAIL: FDUNEXCHEM@HALLIBURTON.COM

2. COMPOSITION/INFORMATION ON INGREDIENTS

SUBSTANCE	CAS NUMBER	PERCENT

CRYSTALLINE SILICA, CRISTOBALITE	14464-46-1	0 - 1%
CRYSTALLINE SILICA, TRIDYMITE	15468-32-3	0 - 1%
CRYSTALLINE SILICA, QUARTZ	14808-60-7	<3
BENTONITE	1302-78-9	60 - 100%

SUBSTANCE	ACGIH TLV-TWA	OSHA PEL-TWA
CRYSTALLINE SILICA, CRISTOBALITE	0.025 MG/M3	1/2 X 10 MG/M3/ %SiO2 + 2
CRYSTALLINE SILICA, TRIDYMITE	0.05 MG/M3	1/2 X 10 MG/M3/ %SiO2 + 2
CRYSTALLINE SILICA, QUARTZ	0.025 MG/M3	10 MG/M3/ %SiO2 + 2
BENTONITE	NOT APPLICABLE	NOT APPLICABLE

MORE RESTRICTIVE EXPOSURE LIMITS MAY BE ENFORCED BY SOME STATES, AGENCIES, OR OTHER AUTHORITIES.

3. HAZARDS IDENTIFICATION

HAZARD OVERVIEW:

CAUTION!

ACUTE HEALTH HAZARD: MAY CAUSE EYE AND RESPIRATORY IRRITATION.

DANGER!

CHRONIC HEALTH HAZARD:
BREATHING CRYSTALLINE SILICA CAN CAUSE LUNG DISEASE, INCLUDING SILICOSIS AND LUNG CANCER. CRYSTALLINE SILICA HAS ALSO BEEN ASSOCIATED WITH SCLERODERMA AND KIDNEY DISEASE.

THIS PRODUCT CONTAINS QUARTZ, CRISTOBALITE, AND/OR TRIDYMITE WHICH MAY BECOME AIRBORNE WITHOUT A VISIBLE CLOUD. AVOID BREATHING DUST. AVOID CREATING DUSTY CONDITIONS. USE ONLY WITH ADEQUATE VENTILATION TO KEEP EXPOSURES BELOW RECOMMENDED EXPOSURE LIMITS. WEAR A NIOSH CERTIFIED, EUROPEAN STANDARD EN 149, OR EQUIVALENT RESPIRATOR WHEN USING THIS PRODUCT. REVIEW THE MATERIAL SAFETY DATA SHEET (MSDS) FOR THIS PRODUCT, WHICH HAS BEEN PROVIDED TO YOUR EMPLOYER.

4. FIRST AID MEASURES

INHALATION:
IF INHALED, REMOVE FROM AREA TO FRESH AIR. GET MEDICAL ATTENTION IF RESPIRATORY IRRITATION DEVELOPS OR IF BREATHING BECOMES DIFFICULT.

SKIN: WASH WITH SOAP AND WATER. GET MEDICAL ATTENTION IF IRRITATION PERSISTS.

EYES:
IN CASE OF CONTACT, IMMEDIATELY FLUSH EYES WITH PLENTY OF WATER FOR AT LEAST 15 MINUTES AND GET MEDICAL ATTENTION IF IRRITATION PERSISTS.

INGESTION: UNDER NORMAL CONDITIONS, FIRST AID PROCEDURES ARE NOT REQUIRED.

NOTES TO PHYSICIAN: TREAT SYMPTOMATICALLY.

5. FIRE FIGHTING MEASURES

FLASH POINT/RANGE (F): NOT DETERMINED
FLASH POINT/RANGE (C): NOT DETERMINED
FLASH POINT METHOD: NOT DETERMINED

AUTOIGNITION TEMPERATURE (F): NOT DETERMINED

AUTOIGNITION TEMPERATURE (C): NOT DETERMINED

FLAMMABILITY LIMITS IN AIR - LOWER (%): NOT DETERMINED
FLAMMABILITY LIMITS IN AIR - UPPER (%): NOT DETERMINED

FIRE EXTINGUISHING MEDIA: ALL STANDARD FIREFIGHTING MEDIA.

SPECIAL EXPOSURE HAZARDS: NOT APPLICABLE.

SPECIAL PROTECTIVE EQUIPMENT FOR FIRE-FIGHTERS: NOT APPLICABLE.

NFPA RATINGS:
HEALTH 0
FLAMMABILITY 0
REACTIVITY 0

HMIS RATINGS:
HEALTH 0*
FLAMMABILITY 0
REACTIVITY 0

6. ACCIDENTAL RELEASE MEASURES

PERSONAL PRECAUTIONARY MEASURES:
USE APPROPRIATE PROTECTIVE EQUIPMENT. AVOID CREATING AND BREATHING DUST.

ENVIRONMENTAL PRECAUTIONARY MEASURES: NONE KNOWN.

PROCEDURE FOR CLEANING / ABSORPTION:
COLLECT USING DUSTLESS METHOD AND HOLD FOR APPROPRIATE DISPOSAL. CONSIDER POSSIBLE TOXIC OR FIRE HAZARDS ASSOCIATED WITH CONTAMINATING SUBSTANCES AND USE APPROPRIATE METHODS FOR COLLECTION, STORAGE AND DISPOSAL.

7. HANDLING AND STORAGE

HANDLING PRECAUTIONS:
THIS PRODUCT CONTAINS QUARTZ, CRISTOBALITE, AND/OR TRIDYMITE WHICH MAY BECOME AIRBORNE WITHOUT A VISIBLE CLOUD. AVOID BREATHING DUST. AVOID CREATING DUSTY CONDITIONS. USE ONLY WITH ADEQUATE VENTILATION TO KEEP EXPOSURE BELOW RECOMMENDED EXPOSURE LIMITS. WEAR A NIOSH CERTIFIED, EUROPEAN STANDARD EN 149, OR EQUIVALENT RESPIRATOR WHEN USING THIS PRODUCT. MATERIAL IS SLIPPERY WHEN WET.

STORAGE INFORMATION:

USE GOOD HOUSEKEEPING IN STORAGE AND WORK AREAS TO PREVENT ACCUMULATION OF DUST.

CLOSE CONTAINER WHEN NOT IN USE. DO NOT REUSE EMPTY CONTAINER.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

ENGINEERING CONTROLS:
USE APPROVED INDUSTRIAL VENTILATION AND LOCAL EXHAUST AS REQUIRED TO MAINTAIN EXPOSURES BELOW APPLICABLE EXPOSURE LIMITS LISTED IN SECTION 2.

RESPIRATORY PROTECTION:
WEAR A NIOSH CERTIFIED, EUROPEAN STANDARD EN 149, OR EQUIVALENT RESPIRATOR WHEN USING THIS PRODUCT.

HAND PROTECTION: NORMAL WORK GLOVES.

SKIN PROTECTION:
WEAR CLOTHING APPROPRIATE FOR THE WORK ENVIRONMENT. DUSTY CLOTHING SHOULD BE LAUNDERED BEFORE REUSE. USE PRECAUTIONARY MEASURES TO AVOID CREATING DUST WHEN REMOVING OR LAUNDERING CLOTHING.

EYE PROTECTION: WEAR SAFETY GLASSES OR GOGGLES TO PROTECT AGAINST EXPOSURE.

OTHER PRECAUTIONS: NONE KNOWN.

9. PHYSICAL AND CHEMICAL PROPERTIES

PHYSICAL STATE: SOLID

COLOR: VARIOUS

ODOR: ODORLESS

pH: 8 - 10

SPECIFIC GRAVITY @ 20 C (WATER=1): 2.55

DENSITY @ 20 C (LBS./GALLON): 62

BULK DENSITY @ 20 C (LBS/FT3): 71

BOILING POINT/RANGE (F): NOT DETERMINED
BOILING POINT/RANGE (C): NOT DETERMINED

FREEZING POINT/RANGE (F): NOT DETERMINED
FREEZING POINT/RANGE (C): NOT DETERMINED

VAPOR PRESSURE @ 20 C (MMHg): NOT DETERMINED

VAPOR DENSITY (AIR=1): NOT DETERMINED

PERCENT VOLATILES: NOT DETERMINED

EVAPORATION RATE (BUTYL ACETATE=1): NOT DETERMINED

SOLUBILITY IN WATER (G/100 ML): INSOLUBLE

SOLUBILITY IN SOLVENTS (G/100 ML): NOT DETERMINED

VOCS (LBS./GALLON): NOT DETERMINED

VISCOSITY, DYNAMIC @ 20 C (CENTIPOISE): NOT DETERMINED

VISCOSITY, KINEMATIC @ 20 C (CENTISTROKES): NOT DETERMINED

PARTITION COEFFICIENT/n-OCTANOL/WATER: NOT DETERMINED

MOLECULAR WEIGHT (G/MOLE): NOT DETERMINED

10. STABILITY AND REACTIVITY

STABILITY DATA: STABLE

HAZARDOUS POLYMERIZATION: WILL NOT OCCUR

CONDITIONS TO AVOID: NONE ANTICIPATED

INCOMPATIBILITY (MATERIALS TO AVOID): HYDROFLUORIC ACID.

HAZARDOUS DECOMPOSITION PRODUCTS:
AMORPHOUS SILICA MAY TRANSFORM AT ELEVATED TEMPERATURES TO TRIDYMITE (870 C) OR CRISTOBALITE (1470 C).

ADDITIONAL GUIDELINES: NOT APPLICABLE

11. TOXICOLOGICAL INFORMATION

PRINCIPLE ROUTE OF EXPOSURE: EYE OR SKIN CONTACT, INHALATION.

INHALATION:
INHALED CRYSTALLINE SILICA IN THE FORM OF QUARTZ OR CRISTOBALITE FROM OCCUPATIONAL SOURCES IS CARCINOGENIC TO HUMANS (IARC, GROUP 1). THERE IS SUFFICIENT EVIDENCE IN EXPERIMENTAL ANIMALS FOR THE CARCINOGENICITY OF TRIDYMITE (IARC, GROUP 2A).

BREATHING SILICA DUST MAY CAUSE IRRITATION OF THE NOSE, THROAT, AND RESPIRATORY PASSAGES. BREATHING SILICA DUST MAY NOT CAUSE NOTICEABLE INJURY OR ILLNESS EVEN THOUGH PERMANENT LUNG DAMAGE MAY BE OCCURRING. INHALATION OF DUST MAY ALSO HAVE SERIOUS CHRONIC HEALTH EFFECTS (SEE "CHRONIC EFFECTS/CARCINOGENICITY" SUBSECTION BELOW).

SKIN CONTACT: MAY CAUSE MECHANICAL SKIN IRRITATION.

EYE CONTACT: MAY CAUSE EYE IRRITATION.

INGESTION: NONE KNOWN

AGGRAVATED MEDICAL CONDITIONS:
INDIVIDUALS WITH RESPIRATORY DISEASE, INCLUDING BUT NOT LIMITED TO ASTHMA AND BRONCHITIS, OR SUBJECT TO EYE IRRITATION, SHOULD NOT BE EXPOSED TO QUARTZ DUST.

CHRONIC EFFECTS/CARCINOGENICITY:

SILICOSIS:
EXCESSIVE INHALATION OF RESPIRABLE CRYSTALLINE SILICA DUST MAY CAUSE A PROGRESSIVE, DISABLING, AND SOMETIMES-FATAL LUNG DISEASE CALLED SILICOSIS.

SYMPTOMS INCLUDE COUGH, SHORTNESS OF BREATH, WHEEZING, NON-SPECIFIC CHEST ILLNESS, AND REDUCED PULMONARY FUNCTION. THIS DISEASE IS EXACERBATED BY SMOKING. INDIVIDUALS WITH SILICOSIS ARE PREDISPOSED TO DEVELOP TUBERCULOSIS.

CANCER STATUS:
THE INTERNATIONAL AGENCY FOR RESEARCH ON CANCER (IARC) HAS DETERMINED THAT CRYSTALLINE SILICA INHALED IN THE FORM OF QUARTZ OR CRISTOBALITE FROM OCCUPATIONAL SOURCES CAN CAUSE LUNG CANCER IN HUMANS (GROUP 1 - CARCINOGENIC TO HUMANS) AND HAS DETERMINED THAT THERE IS SUFFICIENT EVIDENCE IN EXPERIMENTAL ANIMALS FOR THE CARCINOGENICITY OF TRIDYMITE (GROUP 2A - POSSIBLE CARCINOGEN TO HUMANS). REFER TO IARC MONOGRAPH 68, SILICA, SOME SILICATES AND ORGANIC FIBRES (JUNE 1997) IN CONJUNCTION WITH THE USE OF THESE MINERALS. THE NATIONAL TOXICOLOGY PROGRAM CLASSIFIES RESPIRABLE CRYSTALLINE SILICA AS "KNOWN TO BE A HUMAN CARCINOGEN". REFER TO THE 9TH REPORT ON CARCINOGENS (2000). THE AMERICAN CONFERENCE OF GOVERNMENTAL INDUSTRIAL HYGIENISTS (ACGIH) CLASSIFIES CRYSTALLINE SILICA, QUARTZ, AS A SUSPECTED HUMAN CARCINOGEN (A2).

THERE IS SOME EVIDENCE THAT BREATHING RESPIRABLE CRYSTALLINE SILICA OR THE DISEASE SILICOSIS IS ASSOCIATED WITH AN INCREASED INCIDENCE OF SIGNIFICANT DISEASE ENDPOINTS SUCH AS SCLERODERMA (AN IMMUNE SYSTEM DISORDER MANIFESTED BY SCARRING OF THE LUNGS, SKIN, AND OTHER INTERNAL ORGANS) AND KIDNEY DISEASE.

OTHER INFORMATION:
FOR FURTHER INFORMATION CONSULT "ADVERSE EFFECTS OF CRYSTALLINE SILICA EXPOSURE" PUBLISHED BY THE AMERICAN THORACIC SOCIETY MEDICAL SECTION OF THE AMERICAN LUNG ASSOCIATION, AMERICAN JOURNAL OF RESPIRATORY AND CRITICAL CARE MEDICINE, VOLUME 155, PAGES 761-768 (1997).

TOXICITY TESTS:
ORAL TOXICITY: NOT DETERMINED
DERMAL TOXICITY: NOT DETERMINED
INHALATION TOXICITY: NOT DETERMINED
PRIMARY IRRITATION EFFECT: NOT DETERMINED

CARCINOGENICITY:
REFER TO IARC MONOGRAPH 68, SILICA, SOME SILICATES AND ORGANIC FIBRES (JUNE 1997).

GENOTOXICITY: NOT DETERMINED

REPRODUCTIVE / DEVELOPMENTAL TOXICITY: NOT DETERMINED

12. ECOLOGICAL INFORMATION

MOBILITY (WATER/SOIL/AIR): NOT DETERMINED

PERSISTENCE/DEGRADABILITY: NOT DETERMINED

BIO-ACCUMULATION: NOT DETERMINED

ECOTOXICOLOGICAL INFORMATION:

ACUTE FISH TOXICITY: NOT DETERMINED

ACUTE CRUSTACEANS TOXICITY:NOT DETERMINED

ACUTE ALGAE TOXICITY: NOT DETERMINED

CHEMICAL FATE INFORMATION: NOT DETERMINED

OTHER INFORMATION: NOT APPLICABLE

13. DISPOSAL CONSIDERATIONS

DISPOSAL METHOD:
BURY IN A LICENSED LANDFILL ACCORDING TO FEDERAL, STATE, AND LOCAL REGULATIONS.

CONTAMINATED PACKAGING: FOLLOW ALL APPLICABLE NATIONAL OR LOCAL REGULATIONS.

14. TRANSPORT INFORMATION

LAND TRANSPORTATION:
DOT: NOT RESTRICTED
CANADIAN TDG: NOT RESTRICTED
ADR: NOT RESTRICTED

AIR TRANSPORTATION:
ICAO/IATA: NOT RESTRICTED

SEA TRANSPORTATION:
IMDG: NOT RESTRICTED

OTHER SHIPPING INFORMATION:
LABELS: NONE

15. REGULATORY INFORMATION

US REGULATIONS:

US TSCA INVENTORY: ALL COMPONENTS LISTED ON INVENTORY.

EPA SARA TITLE III EXTREMELY HAZARDOUS SUBSTANCES: NOT APPLICABLE

EPA SARA (311,312) HAZARD CLASS:
ACUTE HEALTH HAZARD
CHRONIC HEALTH HAZARD

EPA SARA (313) CHEMICALS:
THIS PRODUCT DOES NOT CONTAIN A TOXIC CHEMICAL FOR ROUTINE ANNUAL "TOXIC CHEMICAL RELEASE REPORTING" UNDER SECTION 313 (40 CFR 372).

EPA CERCLA/SUPERFUND REPORTABLE SPILL QUANTITY: NOT APPLICABLE.

EPA RCRA HAZARDOUS WASTE CLASSIFICATION:
IF PRODUCT BECOMES A WASTE, IT DOES NOT MEET THE CRITERIA OF A HAZARDOUS WASTE AS DEFINED BY THE US EPA.

CALIFORNIA PROPOSITION 65:
THE CALIFORNIA PROPOSITION 65 REGULATIONS APPLY TO THIS PRODUCT.

MA RIGHT-TO-KNOW LAW: ONE OR MORE COMPONENTS LISTED.

NJ RIGHT-TO-KNOW LAW: ONE OR MORE COMPONENTS LISTED.

PA RIGHT-TO-KNOW LAW: ONE OR MORE COMPONENTS LISTED.

CANADIAN REGULATIONS:

CANADIAN DSL INVENTORY: ALL COMPONENTS LISTED ON INVENTORY.

WHMIS HAZARD CLASS:
D2A: VERY TOXIC MATERIALS CRYSTALLINE SILICA

16. OTHER INFORMATION

THE FOLLOWING SECTIONS HAVE BEEN REVISED SINCE THE LAST ISSUE OF THIS MSDS:
NOT APPLICABLE

ADDITIONAL INFORMATION:
FOR ADDITIONAL INFORMATION ON THE USE OF THIS PRODUCT, CONTACT YOUR LOCAL HALLIBURTON REPRESENTATIVE.

FOR QUESTIONS ABOUT THE MATERIAL SAFETY DATA SHEET FOR THIS OR OTHER HALLIBURTON PRODUCTS, CONTACT CHEMICAL COMPLIANCE AT:
1-580-251-4335.

DISCLAIMER STATEMENT:
THIS INFORMATION IS FURNISHED WITHOUT WARRANTY, EXPRESSED OR IMPLIED, AS TO ACCURACY OR COMPLETENESS. THE INFORMATION IS OBTAINED FROM VARIOUS SOURCES INCLUDING THE MANUFACTURER AND OTHER THIRD PARTY SOURCES. THE INFORMATION MAY NOT BE VALID UNDER ALL CONDITIONS NOR IF THIS MATERIAL IS USED IN COMBINATION WITH OTHER MATERIALS OR IN ANY PROCESS. FINAL DETERMINATION OF SUITABILITY OF ANY MATERIAL IS THE SOLE RESPONSIBILITY OF THE USER.

ADVANCED BLENDING
DETERGENT, BLEACH LAUNDRY FEDERAL STOCK 7930-01-236-7280 **Revised: 07/04/1999**

MSDS Contents

MATERIAL SAFETY DATA SHEET

MAY BE USED TO COMPLY WITH OSHA'S HAZARD COMMUNICATION STANDARD, 29 CFR 1910.1200. STANDARD MUST BE CONSULTED FOR SPECIFIC REQUIREMENTS.

U.S. DEPARTMENT OF LABOR

OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION (NON-MANDATORY FORM)

FORMS APPROVED OMB NO.: 1218-0072

N/A-NOT APPLICABLE
N/D-NOT DETERMINED
N/E-NOT ESTIMATED

IDENTITY (AS USED ON LABEL AND LIST):
DETERGENT, BLEACH LAUNDRY FEDERAL STOCK # 7930-01-236-7280

NOTE:
BLANK SPACES ARE NOT PERMITTED. IF ANY ITEM IS NOT APPLICABLE, OR NO INFORMATION IS AVAILABLE, THE SPACE MUST BE MARKED TO INDICATE THAT.

SECTION 1. COMPANY IDENTIFICATION

MANUFACTURER'S NAME: ADVANCED BLENDING

ADDRESS:
645 TOWER DR.
KENNEDALE, TX 76060

EMERGENCY TELEPHONE NUMBER: 817-572-7722 (8-5 PM EST)

NUMBER FOR INFORMATION: SAME

DATE PREPARED: 7/4/99

CONTRACT NUMBER: TC GS 07F-J0119

SECTION 2. HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

HAZARDOUS COMPONENTS (SPECIFIC CHEMICAL IDENTITY; COMMON NAMES)	OSHA PEL	ACGIH TLV	OTHER LIMITS
NO HAZARDOUS COMPONENTS.			

SECTION 3. HAZARDOUS INFORMATION

THIS PRODUCT IS NOT CLASSIFIED AS A HAZARDOUS MATERIAL BY THE U.S. DEPARTMENT OF TRANSPORTATION.

SECTION 4. PHYSICAL CHARACTERISTICS

BOILING POINT: ND

SPECIFIC GRAVITY (H2O = 1): ND

VAPOR PRESSURE (MMHg.): ND

MELTING POINT: NA

VAPOR DENSITY (AIR = 1): ND

EVAPORATION RATE (BUTYL ACETATE = 1): ND

SOLUBILITY IN WATER: COMPLETE

APPEARANCE & ODOR: WHITE POWDER.

SECTION 5. FIRE & EXPLOSION & HAZARD DATA

FLASH POINT (METHOD USED): NA

FLAMMABLE LIMITS: NA
LEL: NA
UEL: NA

EXTINGUISHING MEDIA:
NOT COMBUSTIBLE. WATER SPRAY, DRY CHEMICAL, CO2 OR FOAM MAY BE USED IN AREAS WHERE PRODUCT IS STORED.

SPECIAL FIRE FIGHTING PROCEDURES:
PRODUCT PRESENTS NO UNUSUAL FIRE HAZARD AND REQUIRES NO SPECIAL PROCEDURES.

UNUSUAL FIRE AND EXPLOSION HAZARDS: NONE KNOWN

SECTION 6. REACTIVITY DATA

STABILITY: STABLE

CONDITIONS TO AVOID: STRONG ACIDS

INCOMPATIBILITY (MATERIALS TO AVOID): STRONG ACIDS

HAZARDOUS DECOMPOSITION OR BYPRODUCTS: NONE

HAZARDOUS POLYMERIZATION: WILL NOT OCCUR

CONDITIONS TO AVOID: N/A

SECTION 7. HEALTH HAZARD DATA

ROUTES OF ENTRY:
EYES (X)
INHALATION (X)
SKIN (X)
INGESTION (X)

HEALTH HAZARD (ACUTE & CHRONIC):
MAY BE IRRITATING TO EYES OR SKIN WITH SOME INDIVIDUALS.

CARCINOGENICITY: NONE
NTP:
IARC MONOGRAPHS:
OSHA REGULATED:

SECTION 8. FIRST AID MEASURES

INGESTION: IF INGESTED IN LARGE QUANTITIES, SEEK MEDICAL ATTENTION.

EYES:
IMMEDIATELY FLUSH WITH A DIRECTED STREAM OF WATER FOR AT LEAST 15 MINUTES
HOLDING THE EYELID APART THE ENSURE COMPLETE IRRIGATION OF THE EYE.

SECTION 9. PRECAUTIONS FOR SAFE HANDLING & USE

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED:
IF SPILLED, STEPS SHOULD BE TAKEN TO CONTAIN SPILL, CLEAN AREA OF SPILL
IMMEDIATELY. FOLLOW PROTECTIVE MEASURES PROVIDED UNDER CONTROL MEASURES IN
SECTION 9.

PRECAUTIONS TO BE TAKEN IN HANDLING OR STORING:
FOR BEST PRODUCT PERFORMANCE STORE IN COOL, DRY AREA.

OTHER PRECAUTIONS: KEEP OUT OF THE REACH OF CHILDREN.

SECTION 10. CONTROL MEASURES

RESPIRATORY PROTECTION (SPECIFY TYPE): NONE

VENTILATION:
LOCAL EXHAUST: NA
SPECIAL: NA
MECHANICAL (GENERAL): NA

OTHER: NA

PROTECTIVE GLOVES: NA

EYE PROTECTION: REQUIRED

OTHER PROTECTIVE CLOTHING OR EQUIPMENT: NONE

WORK/HYGIENIC PRACTICES:
CLEAN ALL SPILLS IMMEDIATELY. OBSERVE PERSONAL HYGIENE.

SECTION 11. TOXICOLOGICAL INFORMATION

PRODUCT MAY BE CONSIDERED ALKALINE.

SECTION 12. ECOLOGICAL INFORMATION

THERE IS LIMITED INFORMATION AVAILABLE ON THE ENVIRONMENTAL FATE AND EFFECTS OF THIS MATERIAL. IT IS MISCIBLE IN WATER. THIS COMPOUND IS ALKALINE AND MAY RAISE THE pH OF SURFACE WATERS WITH LOW BUFFERING CAPACITY IF SPILLED. DUE CAUTION SHOULD BE EXERCISED TO PREVENT THE ACCIDENTAL RELEASE OF THIS MATERIAL TO THE ENVIRONMENT. IN CONCENTRATED FORM THIS PRODUCT MAY SHOW TRACE LEVELS OF TOXICITY TO AQUATIC ORGANISMS.

SECTION 13. DISPOSAL CONSIDERATIONS

DISPOSE OF ALL WASTE AND CONTAMINATED EQUIPMENT IN ACCORDANCE WITH ALL APPLICABLE FEDERAL, STATE AND LOCAL HEALTH AND ENVIRONMENTAL REGULATIONS.

SECTION 14. TRANSPORTATION INFORMATION

THIS PRODUCT IS NOT REGULATED.

SECTION 15. REGULATORY INFORMATION

WE REQUEST THAT YOU MAKE ALL INFORMATION IN THIS MATERIAL SAFETY DATA SHEET AVAILABLE TO ALL EMPLOYEES.

SARA/TITLE III HAZARD CATEGORIES:
IF THE WORD "YES" APPEARS NEXT TO ANY CATEGORY, THIS PRODUCT MAY BE REPORTABLE BY YOU UNDER THE REQUIREMENTS OF 40 CFR 370. PLEASE CONSULT THOSE REGULATIONS FOR DETAILS.
IMMEDIATE (ACUTE) HEALTH: YES
DELAYED (CHRONIC) HEALTH: NO
FIRE HAZARD: NO
REACTIVE HAZARD: NO
SUDDEN RELEASE OF PRESSURE: NO

HMIS HAZARD RATINGS:
HEALTH HAZARD 1

FIRE HAZARD 0
REACTIVITY 0

INTERNATIONAL REGULATIONS: CONSULT THE REGULATIONS OF THE IMPORTING COUNTRY.

SECTION 16. OTHER INFORMATION

MSDS LEGEND:
CAS = CHEMICAL ABSTRACTS SERVICE REGISTRY NUMBER
CEILING LIMIT = CEILING LIMIT (15 MINUTES)
OSHA = OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION
TLV = THRESHOLD LIMIT VALUE (ACGIH)
ACGIH = AMERICAN CONFERENCE OF GOVERNMENTAL INDUSTRIAL HYGIENISTS

IMPORTANT:
THE INFORMATION PRESENTED HEREIN, WHILE NOT GUARANTEED, WAS PREPARED BY COMPETENT TECHNICAL PERSONNEL AND IS TRUE AND ACCURATE TO THE BEST OF OUR KNOWLEDGE. WHILE OUR TECHNICAL PERSONNEL WILL BE HAPPY TO RESPOND TO QUESTIONS REGARDING SAFE HANDLING AND USE PROCEDURES, SAFE HANDLING AND USE REMAINS THE RESPONSIBILITY OF THE USER. NO SUGGESTIONS FOR USE ARE INTENDED AS, AND NOTHING HEREIN SHALL BE CONSTRUED AS A RECOMMENDATION TO INFRINGE ANY EXISTING PATENTS OR VIOLATE ANY FEDERAL, STATE, OR LOCAL LAWS, RULES, REGULATIONS OR ORDINANCES.

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Genium group inc.
1171 RiverFront Center, Amsterdam, NY 12010
(518) 842-4111

Issue Date: 2006-06

Section 1 - Chemical Product and Company Identification 61

Material Name: Calcium Hydroxide **CAS Number:** 1305-62-0
Chemical Formula: CaH_2O_2
Structural Chemical Formula: $Ca(OH)_2$
EINECS Number: 215-137-3
ACX Number: X1000175-3
Synonyms: BELL MINE; BIOCALC; CALCIUM DIHYDROXIDE; CALCIUM HYDRATE; CALCIUM HYDROXIDE; CALVIT; CALVITAL; CARBOXIDE; CAUSTIC LIME; HYDRATED LIME; KALKHYDRATE; KEMIKAL; LIMBUX; LIME; LIME MILK; LIME WATER; MILK OF LIME; SLAKED LIME
General Use: Laboratory reagent. A large volume industrial chemical. Manufacture of calcium salts. A binder in mortar, plaster, cement and in building and paving materials. A component in drilling muds, pesticides, fireproof coatings, water paints. As an acid neutralizing agent in water and sewage treatment. Disinfectant. As a flux in steel production; in manufacture of paper pulp. Depilatory, dehairing hides. Poultry food additive - shell forming agent. In purification of sugar.

Section 2 - Composition / Information on Ingredients

Name	CAS	%
calcium hydroxide	1305-62-0	>95

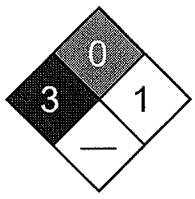
OSHA PEL
TWA: 15 mg/m^3 (total), 5 mg/m^3 (respirable).

NIOSH REL
TWA: 5 mg/m^3.

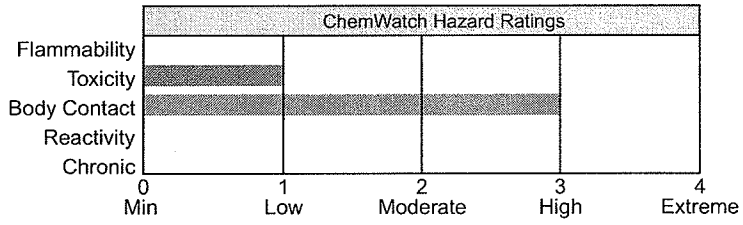
ACGIH TLV
TWA: 5 mg/m^3.

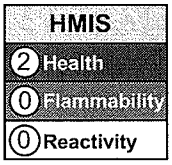
EU OEL
TWA: 5 mg/m^3.

Section 3 - Hazards Identification



Fire Diamond





ANSI Signal Word
Danger!


Corrosive

☆☆☆☆☆ Emergency Overview ☆☆☆☆☆

Odorless, colorless or white crystals or powder. Corrosive, causes severe burns to eyes/skin/respiratory tract.
Chronic Effects: repeated skin contact can cause dermatitis.

Potential Health Effects

Target Organs: eyes, skin, mucous membranes
Primary Entry Routes: inhalation, ingestion, eye contact, skin contact
Acute Effects
Inhalation: The dust may be discomforting if inhaled.
Reactions may not occur on exposure but response may be delayed with symptoms only appearing many hours later.
Minor exposures / slow dissolution in body fluids in the upper respiratory tract and lungs may produce delayed severe irritation or burning sensation.
Severe acute dust inhalation may produce laryngitis and pulmonary edema.

Eye: The dust may be extremely discomforting to the eyes and is capable of causing pain and severe conjunctivitis.
Corneal injury may develop, with possible permanent impairment of vision, if not promptly and adequately treated.
The material may produce severe irritation to the eye causing pronounced inflammation. Repeated or prolonged exposure to irritants may produce conjunctivitis.

Skin: The material is moderately discomforting to the skin and may cause drying of the skin which may lead to dermatitis or if exposure is prolonged may cause blisters or burns.
Solution of material in moisture on the skin or in perspiration may markedly increase skin corrosion and accelerate tissue destruction.
Open cuts, abraded or irritated skin should not be exposed to this material.
The material may accentuate any pre-existing skin condition.

Ingestion: Considered an unlikely route of entry in commercial/industrial environments.
Small amounts or low dose rates are regarded as practically non-harmful.
The material is highly discomforting and may be harmful if swallowed in large quantity.

Carcinogenicity: NTP - Not listed; IARC - Not listed; OSHA - Not listed; NIOSH - Not listed; ACGIH - Not listed; EPA - Not listed; MAK - Not listed.

Chronic Effects: Chronic exposure symptom is narrowing of the esophagus, with difficulty in swallowing. This may happen after weeks, months or years of exposure.

Section 4 - First Aid Measures

Inhalation: Remove to fresh air.
Encourage patient to blow nose to ensure clear breathing passages. Rinse mouth with water. Consider drinking water to remove dust from throat.
Seek medical attention if irritation or discomfort persist.

Eye Contact: Immediately hold the eyes open and flush continuously for at least 15 minutes with fresh running water. Ensure irrigation under eyelids by occasionally lifting the upper and lower lids.
Transport to hospital or doctor without delay. Removal of contact lenses after an eye injury should only be undertaken by skilled personnel.

Skin Contact: Immediately remove all contaminated clothing, including footwear (after rinsing with water).
Wash affected areas thoroughly with water (and soap if available).
Seek medical attention in event of irritation.

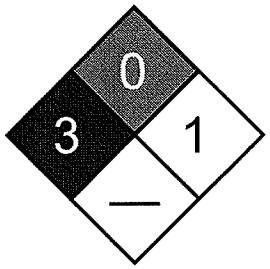
Ingestion: Rinse mouth out with plenty of water. DO NOT induce vomiting.
Observe the patient carefully. Never give liquid to a person showing signs of being sleepy or with reduced awareness; i.e. becoming unconscious.
Give water (or milk) to rinse out mouth. Then provide liquid slowly and as much as casualty can comfortably drink.
Transport to hospital or doctor without delay.

After first aid, get appropriate in-plant, paramedic, or community medical support.

Note to Physicians: For acute or short-term repeated exposures to highly alkaline materials:
1.Respiratory stress is uncommon but presents occasionally because of soft tissue edema.
2.Unless endotracheal intubation can be accomplished under direct vision, cricothyroidotomy or tracheotomy may be necessary.
3.Oxygen is given as indicated.
4.The presence of shock suggests perforation and mandates an intravenous line and fluid administration.
5.Alkali corrosives cause damage by liquefaction necrosis whereby the saponification of fats and solubilization of proteins allow deep penetration into the tissue.
Alkalis continue to cause damage after exposure.
INGESTION:
1.Milk and water are the preferred dilutents. No more than 2 glasses of water should be given to an adult.
2.Neutralizing agents should never be given since exothermic heat reaction may compound injury.
* Catharsis and emesis are absolutely contra-indicated.
* Activated charcoal does not absorb alkali.
* Gastric lavage should not be used.
Supportive care involves the following.
1. Withhold oral feedings initially.
2. If endoscopy confirms transmucosal injury start steroids only within the first 48 hours.
3. Carefully evaluate the amount of tissue necrosis before assessing the need for surgical intervention.
4. Patients should be instructed to seek medical attention whenever they develop difficulty in swallowing (dysphagia).
SKIN AND EYE:
Injury should be irrigated for 20-30 minutes. Eye injuries require saline.

Section 5 - Fire-Fighting Measures

Flash Point: Nonflammable
Autoignition Temperature: Not applicable
LEL: Not applicable
UEL: Not applicable
Extinguishing Media: There is no restriction on the type of extinguisher which may be used.
General Fire Hazards/Hazardous Combustion Products: Noncombustible.
Not considered to be a significant fire risk; however, containers may burn.
In a fire may decompose on heating and produce toxic/corrosive fumes.
Fire Incompatibility: Reacts violently with maleic anhydride, phosphorus, acids.
Reacts with aluminum/zinc producing flammable, explosive hydrogen gas.
Fire-Fighting Instructions: Contact fire department and tell them location and nature of hazard.
Wear breathing apparatus plus protective gloves for fire only. Prevent, by any means available, spillage from entering drains or waterways.
Use fire fighting procedures suitable for surrounding area.
Do not approach containers suspected to be hot.
Cool fire-exposed containers with water spray from a protected location.
If safe to do so, remove containers from path of fire.
Equipment should be thoroughly decontaminated after use.



Fire Diamond

Section 6 - Accidental Release Measures

Small Spills: Clean up all spills immediately. Avoid contact with skin and eyes.
Wear impervious gloves and safety glasses.
Use dry clean-up procedures and avoid generating dust.
Place spilled material in clean, dry, sealable, labeled container.
Large Spills: Clear area of personnel and move upwind.
Contact fire department and tell them location and nature of hazard.
Control personal contact by using protective equipment.
Stop leak if safe to do so.
Use dry clean-up procedures and avoid generating dust.
Collect recoverable product into labeled containers for recycling.
Collect residues and place in labeled polyethylene bag.
Wash area down with large quantity of water and prevent runoff into drains.
After clean-up operations, decontaminate and launder all protective clothing and equipment before storing and reusing.
If contamination of drains or waterways occurs, advise emergency services.
Regulatory Requirements: Follow applicable OSHA regulations (29 CFR 1910.120).

Section 7 - Handling and Storage

Handling Precautions: Use good occupational work practices. Observe manufacturer's storing and handling recommendations.
Atmosphere should be regularly checked against established exposure standards to ensure safe working conditions are maintained.
Avoid all personal contact, including inhalation.
Avoid generating and breathing dust.
Wear personal protective equipment when handling.
Use in a well-ventilated area.
Avoid contact with incompatible materials.
When handling, DO NOT eat, drink or smoke.
Keep containers securely sealed when not in use.
Avoid physical damage to containers.
Always wash hands with soap and water after handling. Work clothes should be laundered separately.
Launder contaminated clothing before reuse.
Recommended Storage Methods: Multi-ply paper bag with sealed plastic liner or heavy gauge plastic bag. Check that all containers are clearly labeled and free from leaks. Packing as recommended by manufacturer.
Regulatory Requirements: Follow applicable OSHA regulations.

Section 8 - Exposure Controls / Personal Protection

Engineering Controls: Use in a well-ventilated area.

General exhaust is adequate under normal operating conditions.
If exposure to workplace dust is not controlled, respiratory protection is required; wear NIOSH-approved dust respirator.
Provide adequate ventilation in warehouse or closed storage areas.

Personal Protective Clothing/Equipment:

Eyes: Safety glasses with side shields; or as required, chemical goggles.
Contact lenses pose a special hazard; soft lenses may absorb irritants and all lenses concentrate them.

Hands/Feet: Barrier cream. Wear physical protective gloves, eg. leather or Cotton gloves or PVC gloves.
Wear safety footwear.

Respiratory Protection:

Exposure Range >5 to 50 mg/m^3: Air Purifying, Negative Pressure, Half Mask
Exposure Range >50 to 500 mg/m^3: Air Purifying, Negative Pressure, Full Face
Exposure Range >500 to 5000 mg/m^3: Supplied Air, Constant Flow/Pressure Demand, Full Face
Exposure Range >5000 to unlimited mg/m^3: Self-contained Breathing Apparatus, Pressure Demand, Full Face
Cartridge Color: dust/mist filter (use P100 or consult supervisor for appropriate dust/mist filter)

Other: Overalls. Eyewash unit. Ensure there is ready access to a safety shower.

Glove Selection Index:

NATURAL RUBBER..... Best selection
NATURAL+NEOPRENE..... Best selection

Section 9 - Physical and Chemical Properties

Appearance/General Info: White or off white amorphous odorless powder with bitter, alkaline taste; insoluble in alcohol. Readily absorbs carbon dioxide from the air to form calcium carbonate; and loses water when heated strongly to form calcium oxide. Soluble in glycerol, sugar or ammonium chloride solutions. Soluble in acids with evolution of heat. Bulk density: 400-500 kg/m^3. Grades available: Builders Lime, technical, Pure, BP sterilized.

Physical State: Divided solid
Vapor Pressure (kPa): Negligible
Vapor Density (Air=1): Not applicable
Formula Weight: 74.10
Specific Gravity (H_2O=1, at 4 °C): 2.2-2.3
Evaporation Rate: Non-volatile
pH: Not applicable
pH (1% Solution): 12.4 (saturated)
Boiling Point: Decomposes
Freezing/Melting Point: 580 °C (1076 °F) (loses water)
Volatile Component (% Vol): Nil
Decomposition Temperature (°C): 580
Water Solubility: 0.185 g/100 cc at 0 °C

Section 10 - Stability and Reactivity

Stability/Polymerization/Conditions to Avoid: Product is considered stable. Hazardous polymerization will not occur.
Storage Incompatibilities: Avoid storage with acids, maleic anhydride, ammonium salts, nitromethane, nitroethane, nitropropane, nitroparaffins, phosphorus.
Forms salts with nitroparaffins in the presence of water which are explosive when dried.
DO NOT use aluminum or galvanized containers.

Section 11 - Toxicological Information

Toxicity
Oral (rat) LD_{50}: 7340 mg/kg

Irritation
Eye (rabbit): 10 mg - SEVERE

See *RTECS* EW 2800000, for additional data.

Section 12 - Ecological Information

Environmental Fate: No data found.
Ecotoxicity: Aquatic toxicity: 92 ppm/7 hr/trout/toxic/fresh water 240 ppm/24 hr/mosquito fish/TL_m/fresh water

Section 13 - Disposal Considerations

Disposal: Recycle wherever possible. Consult manufacturer for recycling options.
Follow applicable federal, state, and local regulations.
Bury residue in an authorized landfill.
Decontaminate empty containers.

Section 14 - Transport Information

DOT Hazardous Materials Table Data (49 CFR 172.101):

Shipping Name and Description: None

Section 15 - Regulatory Information

EPA Regulations:

RCRA 40 CFR: Not listed
CERCLA 40 CFR 302.4: Not listed
SARA 40 CFR 372.65: Not listed
SARA EHS 40 CFR 355: Not listed
TSCA: Listed

Section 16 - Other Information

Disclaimer: Judgments as to the suitability of information herein for the purchaser's purposes are necessarily the purchaser's responsibility. Although reasonable care has been taken in the preparation of such information, Genium Group, Inc. extends no warranties, makes no representations, and assumes no responsibility as to the accuracy or suitability of such information for application to the purchaser's intended purpose or for consequences of its use.

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Material Safety Data Sheet Collection
Genium group inc.
1171 RiverFront Center, Amsterdam, NY 12010
(518) 842-4111

Diesel Fuel Oil No. 2-D
DIE1400

Issue Date: 2006-06

Section 1 - Chemical Product and Company Identification 61

Material Name: Diesel Fuel Oil No. 2-D **CAS Number:** 68334-30-5
Chemical Formula: Un
Structural Chemical Formula: Unspecified; variable
EINECS Number: 269-822-7
ACX Number: X1012054-0
Synonyms: AUTOMOTIVE DIESEL OIL; DIESEL FUEL; DIESEL FUEL OIL NO. 2-D; DIESEL OIL (PETROLEUM); DIESEL OILS; DIESEL TEST FUEL; FUELS,DIESEL; OLEJ NAPEDOWY III; SANTOS MOOMBA DISTILLATE
Derivation: Fuel oil may be a distilled fraction of petroleum, a residuum from refinery operations, a crude petroleum or a blend of two or more of these.
General Use: This medium viscosity residual fuel oil has both light and heavy grades, and is used in furnaces and boilers of utility and industrial power plants, ships, locomotives, and metallurgical operations.

Section 2 - Composition / Information on Ingredients

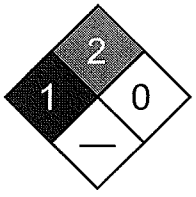
Name	CAS	%
Diesel fuel oil no. 2-D	68334-30-5	ca 100% vol;

diesel fuels consist primarily of aliphatic (64% vol), aromatic (35% vol), and olefinic (1-2% vol) hydrocarbons.
Trace Impurities: May contain sulfur (< 0.5), benzene (<100 ppm), and additives such as sulfurized esters.

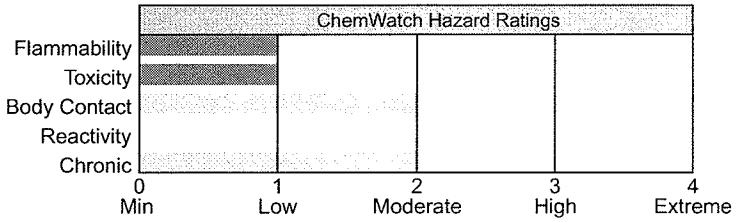
OSHA PEL **NIOSH REL**

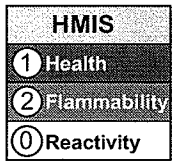
ACGIH TLV
TWA: 100 mg/m^3; skin.

Section 3 - Hazards Identification



Fire Diamond





ANSI Signal Word
Warning!


Flammable

☆☆☆☆☆ Emergency Overview ☆☆☆☆☆

Brown, slightly viscous liquid; kerosene-like odor. Irritating to skin/respiratory tract. Other Acute Effects: headache, nausea, vomiting, diarrhea, CNS depression, tachycardia, cyanosis, pulmonary edema, liver/kidney injury. Flammable.

Potential Health Effects

Target Organs: Skin, CNS, cardiovascular system (CVS), respiratory system, liver, kidneys
Primary Entry Routes: Inhalation, ingestion, skin contact/absorption
Acute Effects
Inhalation: Euphoria, respiratory irritation, cardiac dysrhythmia, increased respiration rates, cyanosis, pulmonary edema, hemoptysis (spitting up blood from the respiratory tract), respiratory arrest, renal (kidney) and liver injury, and CNS toxicity can result from inhalation of diesel fuel oil no. 2-D mist or vapor.
Eye: Contact may result in irritation.
Skin: Contact may cause irritation, systemic effects, and block the sebaceous (oil) glands, resulting in a rash of acne-like pimples and spots, usually on the arms and legs.

Ingestion: Gastrointestinal irritation, vomiting, diarrhea, and in severe cases, CNS depression progressing to coma and death and other systemic effects can result. Aspiration can result in transient CNS depression or excitement, hypoxia, infection, pneumatocele (abnormal cavities in lungs) formation, and chronic lung dysfunction.

Carcinogenicity: NTP - Not listed; IARC - Group 3, Not classifiable as to carcinogenicity to humans; OSHA - Not listed; NIOSH - Not listed; ACGIH - Not listed; EPA - Not listed; MAK - Not listed.

Medical Conditions Aggravated by Long-Term Exposure: None reported.

Chronic Effects: Prolonged or repeated skin contact causes dermatitis and possible systemic toxicity. Prolonged or repeated inhalation can cause CNS and peripheral nervous system damage.

Section 4 - First Aid Measures

See DOT ERG

Inhalation: Remove exposed person to fresh air and support breathing as needed.

Eye Contact: *Do not* allow victim to rub or keep eyes tightly shut. Gently lift eyelids and flush immediately and continuously with flooding amounts of water for at least 15 minutes. Consult a physician or ophthalmologist if pain and/or irritation develops.

Skin Contact: Quickly remove contaminated clothing. Rinse with flooding amounts of water followed by washing the exposed area with soap and water. For reddened or blistered skin, consult a physician.

Ingestion: Never give anything by mouth to an unconscious or convulsing person. Have the *conscious and alert* person drink 1 to 2 glasses of water. Contact a poison control center. Because of aspiration risk, *do not* induce vomiting unless the poison control center advises otherwise.

After first aid, get appropriate in-plant, paramedic, or community medical support.

Note to Physicians: Gastric lavage is contraindicated due to aspiration risk. Instead, consider administration of charcoal or milk. If ingestion amount is large, gastric emptying in the alert patient can be accomplished through administration of Syrup of Ipecac. Treat overexposure symptomatically and supportively.

Section 5 - Fire-Fighting Measures

See DOT ERG

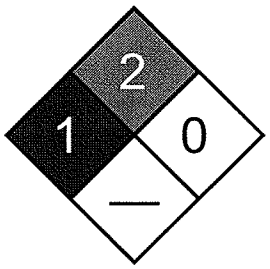
Flash Point: 100.4 °F (38 °C), Closed Cup

Autoignition Temperature: 351-624 °F (177-329 °C)

LEL: 1.3% v/v

UEL: 75% v/v

Flammability Classification: OSHA Class II Combustible Liquid



Fire Diamond

Extinguishing Media: Use dry chemical, carbon dioxide, foam, low velocity water fog or spray. Use a smothering technique to extinguish fire. Water may be ineffective in putting out a fire involving diesel fuel oil no. 2-D, and a solid water stream may spread the flames; however, a water spray may be used to cool fire-exposed containers, and flush spills away from ignition sources.

General Fire Hazards/Hazardous Combustion Products: Heating diesel fuel oil no. 2-D to decomposition can produce acrid smoke and irritating vapors. Vapor or mist can form explosive mixtures in air. In still air, the heavier-than-air vapors of diesel fuel oil no. 2-D from a large source may travel along low-lying surfaces to distant sources of ignition and flash back to the material source. Containers may explode in heat of fire.

Fire-Fighting Instructions: *Do not* release runoff from fire control methods to sewers or waterways. Because fire may produce toxic thermal decomposition products, wear a self-contained breathing apparatus (SCBA) with a full facepiece operated in pressure-demand or positive-pressure mode.

Section 6 - Accidental Release Measures

See DOT ERG

Spill/Leak Procedures: Eliminate all ignition sources (no smoking, flares, sparks or flames in immediate area). Ground all equipment used when handling this product. *Do not* touch or walk through spilled material. Stop leak if you can do it without risk. Prevent entry into waterways, sewers, basements or confined areas. A fire fighting foam may be used to suppress vapors. Absorb or cover with dry earth, sand or other non-combustible material and transfer to containers. Use clean non-sparking tools to collect absorbed material.

Small Spills: Absorb diesel fuel oil no. 2-D with vermiculite, earth, sand or similar material.

Large Spills: For large spills, consider downwind evacuation of at least 1000 ft (300 m). Dike far ahead of liquid spill for later disposal. *Do not* release into sewers or waterways. Ground all equipment. Use non-sparking tools. Spills can be absorbed with materials such as peat, activated carbon, polyurethane foam, or straw. Sinking agents, gelling agents, dispersants, and mechanical systems can also be use to treat oil spills.

Regulatory Requirements: Follow applicable OSHA regulations (29 CFR 1910.120).

Section 7 - Handling and Storage

Handling Precautions: Avoid vapor or mist inhalation, and skin and eye contact. Use only with ventilation sufficient to reduce airborne concentrations to non-hazardous levels (see Sec. 2). Wear protective gloves (or use barrier cream), and clothing (see Sec. 8). Keep away from heat and ignition sources. Ground and bond all containers during transfers to prevent static sparks. Use non-sparking tools to open and close containers. .

Never eat, drink, or smoke in work areas. Practice good personal hygiene after using this material, especially before eating, drinking, smoking, using the toilet, or applying cosmetics.

Recommended Storage Methods: Store in tightly closed container in cool, well-ventilated area, away from heat, ignition sources and incompatibles (see Sec. 10). Periodically inspect stored materials. Equip drums with self-closing valves, pressure vacuum bungs, and flame arrestors.

Regulatory Requirements: Follow applicable OSHA regulations. Also 29 CFR 1910.106 for Class II Combustible Liquid.

Section 8 - Exposure Controls / Personal Protection

Engineering Controls: To prevent static sparks, electrically ground and bond all containers and equipment used in shipping, receiving, or transferring operations. Provide general or local exhaust ventilation systems to maintain airborne concentrations as low as possible. Local exhaust ventilation is preferred because it prevents contaminant dispersion into the work area by controlling it at its source.

Administrative Controls: Enclose operations and/or provide local exhaust ventilation appropriately designed for flammable mist and vapor at the site of chemical release. Where possible, transfer diesel fuel oil no. 2-D from drums or other storage containers directly to process containers. Minimize sources of ignition in surrounding low-lying areas.

Personal Protective Clothing/Equipment: Wear chemically protective gloves, boots, aprons, and gauntlets. Wear protective eyeglasses, per OSHA eye- and face-protection regulations (29 CFR 1910.133). Contact lenses are not eye protective devices. Appropriate eye protection must be worn instead of, or in conjunction with contact lenses.

Respiratory Protection: Seek professional advice prior to respirator selection and use. Follow OSHA respirator regulations (29 CFR 1910.134) and, if necessary, wear a MSHA/NIOSH-approved respirator. Select respirator based on its suitability to provide adequate worker protection for given working conditions, level of airborne contamination, and presence of sufficient oxygen. For emergency or nonroutine operations (cleaning spills, reactor vessels, or storage tanks), use an SCBA. *Warning! Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.* If respirators are used, OSHA requires a written respiratory protection program that includes at least: medical certification, training, fit-testing, periodic environmental monitoring, maintenance, inspection, cleaning, and convenient, sanitary storage areas.

Other: Separate contaminated work clothes from street clothes. Launder before reuse. Remove this material from your shoes and clean personal protective equipment. Make emergency eyewash stations, safety/quick-drench showers, and washing facilities available in work area.

Section 9 - Physical and Chemical Properties

Appearance/General Info: Brown, slightly viscous; kerosene-like odor.

Physical State: Liquid

Odor Threshold: 0.7 ppm

Vapor Pressure (kPa): < 0.1 mm Hg at 68 °F (20 °C)

Vapor Density (Air=1): > 6

Formula Weight: N/A

Specific Gravity (H_2O=1, at 4 °C): < 0.86

Boiling Point: 340-676 °F (171-358 °C)

Freezing/Melting Point: -29.2 °F (-34 °C)

Viscosity: 1.9-4.1 centistoke at 104 °F (40 °C)

Surface Tension: 23-32 dynes/cm at 68 °F (20 °C)

Water Solubility: Insoluble

Section 10 - Stability and Reactivity

Stability/Polymerization/Conditions to Avoid: Diesel fuel oil no. 2-D is stable at room temperature in closed containers under normal storage and handling conditions. Hazardous polymerization cannot occur. Exposure to heat and ignition sources.

Storage Incompatibilities: Include strong oxidizing agents.

Hazardous Decomposition Products: Thermal oxidative decomposition of diesel fuel oil no. 2-D can produce low molecular weight hydrocarbons, hydrocarbon derivatives, carbon oxides (CO_x), and sulfur oxides (SO_x).

Section 11 - Toxicological Information

Acute Oral Effects:
Rat, oral, LD_{50}: 7500 mg/kg.
Acute Skin Effects:
Rabbit, skin, LD: > 5 mL/kg.
Irritation Effects:
Rabbit, skin, standard Draize test: 500 µL/24 hr, resulted in severe reaction.
Other Effects:
Rat, inhalation: 2 g/m^3/6 hr/3 weeks, intermittently, resulted in changes in blood erythrocyte (RBC) count, and focal fibrosis (pneumonoconiosis) and other changes in the lung, thorax or respiration.
Rat, inhalation: 400 $\mu g/m^3$/16 hr/2.5 years, intermittently, caused other changes in the blood, and biochemical effects - transaminases.
Rabbit, skin: 80 mL/kg/12 days, continuously, resulted in other changes in the liver, kidney, ureter, and bladder, and death.

See *RTECS* HZ1800000, for additional data.

Section 12 - Ecological Information

Environmental Fate: Diesel fuel oil no. 2-D will evaporate from water or soil. In surface water, it may partition from the water column to suspended sediments. Biodegradation may occur in soil and water.
Ecotoxicity: Juvenile American shad, salt water TL_m: 204 mg/L/24 hr; mallard duck, LD_{50}=20 mg/kg.

Section 13 - Disposal Considerations

Disposal: Contact your supplier or a licensed contractor for detailed recommendations. Follow applicable Federal, state, and local regulations.

Section 14 - Transport Information

DOT Hazardous Materials Table Data (49 CFR 172.101):

Note: This material has multiple possible HMT entries. Choose the appropriate one based on state and condition of specific material when shipped.

Shipping Name and Description: Diesel fuel
ID: NA1993
Hazard Class: 3 - Flammable and combustible liquid
Packing Group: III - Minor Danger
Symbols: D - Domestic transportation
Label Codes: None
Special Provisions: 144, B1, IB3, T4, TP1, TP29
Packaging: **Exceptions:** 150 **Non-bulk:** 203 **Bulk:** 242
Quantity Limitations: **Passenger aircraft/rail:** 60 L **Cargo aircraft only:** 220 L
Vessel Stowage: **Location:** A **Other:**

Shipping Name and Description: Diesel fuel
ID: UN1202
Hazard Class: 3 - Flammable and combustible liquid
Packing Group: III - Minor Danger
Symbols: I - International transportation
Label Codes: 3 - Flammable Liquid
Special Provisions: 144, B1, IB3, T2, TP1
Packaging: **Exceptions:** 150 **Non-bulk:** 203 **Bulk:** 242
Quantity Limitations: **Passenger aircraft/rail:** 60 L **Cargo aircraft only:** 220 L
Vessel Stowage: **Location:** A **Other:**

Section 15 - Regulatory Information

EPA Regulations:
RCRA 40 CFR: Not listed
CERCLA 40 CFR 302.4: Not listed
SARA 40 CFR 372.65: Not listed
SARA EHS 40 CFR 355: Not listed
TSCA: Listed

Section 16 - Other Information

Disclaimer: Judgments as to the suitability of information herein for the purchaser's purposes are necessarily the purchaser's responsibility. Although reasonable care has been taken in the preparation of such information, Genium Group, Inc. extends no warranties, makes no representations, and assumes no responsibility as to the accuracy or suitability of such information for application to the purchaser's intended purpose or for consequences of its use.

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ANSUL FIRE PROTECTION
ABC FIRE EXTINGUISHER Revised: 11/06/2002

MSDS Contents

CRL ONLINE

MATERIAL SAFETY DATA SHEET

COMPANY NAME: ANSUL FIRE PROTECTION

ADDRESS: ONE STANTON ST.
CITY / STATE / ZIP: MARINETTE / WI / 54143

US-CHEMTREC PHONE (I): (800) 424-9300
US-CHEMTREC PHONE (II): (703) 527-3887
CAN-CANUTEC PHONE: (613) 996-6666

VENDOR UPDATE: 11/6/2002

DATE PREPARED: 11/6/2002

MSDS NUMBER: 2025AV; 2100AH

I. CHEMICAL PRODUCT IDENTIFICATION

PRODUCT NAME: ABC FIRE EXTINGUISHER

HMIS RATINGS:
HEALTH 1 SLIGHT
FLAMMABILITY 0 MINIMAL
INSTABILITY/REACTIVITY 0 MINIMAL

NFPA RATINGS:

II. COMPOSITION, INFORMATION ON INGREDIENTS

CHEMICAL INGREDIENTS	CAS. NUMBER	% BY WEIGHT
MUSCOVITE MICA	12001-26-2	

NOTES:

MAGNESIUM ALUMINUM SILICATE (ATTAPULGITE CLAY)	8031-18-3
MONOAMMONIUM PHOSPHATE	7722-76-1
AMMONIUM SULFATE	7783-20-2
METHYL HYDROGEN POLYSILOXANE	63148-57-2
YELLOW PIGMENT	5468-75-7

NOTES:

CHEMICAL INGREDIENTS	ACGIH TLV TWA/STEL	OSHA PEL TWA/STEL	OTHER TWA/STEL	LD50	LC50
MUSCOVITE MICA	20 MILLION PARTICLES PER CUBIC FOOT			NO DATA AVAILABLE	
MAGNESIUM ALUMINUM SILICATE (ATTAPULGITE CLAY)	10 MG/M3			NO DATA AVAILABLE	
MONOAMMONIUM PHOSPHATE				ORAL (RAT): 5750 MG/KG	
AMMONIUM SULFATE				ORAL (RAT): 3000 MG/KG	
METHYL HYDROGEN POLYSILOXANE				NO DATA AVAILABLE	
YELLOW PIGMENT				NO DATA AVAILABLE	

NOTES:

OTHER:

TLV:
OSHA NUISANCE DUST LIMIT OF 15 MG/M3 OR ACGIH NUISANCE DUST VALUE OF 10 MG/M3 FOR THE EIGHT HOUR TIME-WEIGHTED AVERAGE.

CHEMICAL LISTED AS CARCINOGEN OR POTENTIAL:
NTP: NO
IARC MONOGRAPH: NO

OSHA: NO

III. HAZARDS IDENTIFICATION PRIMARY ROUTE OF ENTRY

EYES: MILDLY IRRITATING FOR A SHORT PERIOD OF TIME.

SKIN: MAY BE MILDLY IRRITATING.

INGESTION: NOT AN EXPECTED ROUTE OF ENTRY.

INHALATION:
TREAT AS A MINERAL DUST, IRRITANT TO THE RESPIRATORY TRACT.

SIGNS AND SYMPTOMS OF EXPOSURE:
ACUTE OVEREXPOSURE: TRANSIENT COUGH, SHORTNESS OF BREATH.
CHRONIC OVEREXPOSURE: CHRONIC FIBROSIS OF THE LUNG, PNEUMOCONIOSIS.

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: REACTIVE AIRWAY.

IV. FIRST AID MEASURES

EYES:
FLUSH WITH LARGE AMOUNTS OF WATER; IF IRRITATION PERSIST, SEEK MEDICAL ATTENTION.

SKIN:
WASH WITH SOAP AND WATER; IF IRRITATION PERSISTS, SEEK MEDICAL ATTENTION.

INGESTION:
IF PATIENT IS CONSCIOUS, GIVE LARGE AMOUNTS OF WATER AND INDUCE VOMITING.
SEEK MEDICAL HELP.

INHALATION:
REMOVE VICTIM TO FRESH AIR. SEEK MEDICAL ATTENTION IF DISCOMFORT CONTINUES.

V. FIRE FIGHTING MEASURES

FLASH POINT: NONE

UNUSUAL FIRE OR EXPLOSION HAZARDS: NONE - THIS IS AN EXTINGUISHING AGENT

FIRE FIGHTING PROCEDURES: NONE

VI. ACCIDENTAL RELEASE MEASURES

CONTAINMENT/CLEANUP: SWEEP UP.

VII. HANDLING AND STORAGE

OTHER:

SHOULD BE STORED IN ORIGINAL CONTAINER OR ANSUL FIRE EXTINGUISHER.

OTHER PRECAUTIONS: DO NOT MIX AGENTS.

VIII. EXPOSURE CONTROLS/PERSONAL PROTECTION

EYES: RECOMMENDED AS MECHANICAL BARRIER FOR PROLONGED EXPOSURE.

SKIN:
N/A
IF IRRITATION OCCURS, LONG SLEEVES AND IMPERVIOUS GLOVES SHOULD BE WORN.

RESPIRATORY:
DUST MASK WHERE DUSTINESS IS PREVALENT, OR TLV EXCEEDED. MECHANICAL FILTER RESPIRATOR IF EXPOSURE IS PROLONGED.

ENGINEERING:
LOCAL EXHAUST: DISCRETIONARY
MECHANICAL (GENERAL): RECOMMENDED.

IX. PHYSICAL AND CHEMICAL PROPERTIES

APPEARANCE: YELLOW COLORED POWDER

BOILING POINT: N/A

SOLUBILITY IN WATER: SLIGHT

SPECIFIC GRAVITY: N/A

VAPOR PRESSURE: N/A

VAPOR DENSITY: N/A

VOLATILE CONTENT: N/A

X. STABILITY AND REACTIVITY

STABILITY: STABLE

HAZARDOUS POLYMERIZATION: WILL NOT OCCUR

HAZARDOUS DECOMPOSITION PRODUCTS: NH3 AND/OR POx MAY BE EVOLVED.

INCOMPATIBLE PRODUCTS:
STRONG ALKALIS, MG, OXIDIZERS THAT CAN RELEASE CHLORINE PER NFPA 43A.

CONDITIONS TO AVOID: N/A

XI. TOXICOLOGICAL INFORMATION

XII. ECOLOGICAL INFORMATION

ECOTOXICITY:

XIII. DISPOSAL CONSIDERATIONS

DISPOSAL METHOD:
DISPOSE OF IN COMPLIANCE WITH LOCAL, STATE, AND FEDERAL REGULATIONS.

XIV. TRANSPORT INFORMATION

XV. REGULATORY INFORMATION

SUPPLEMENTAL STATE COMPLIANCE INFORMATION:

XVI. OTHER INFORMATION

WARRANTY INFORMATION:
THIS INFORMATION IS OFFERED IN GOOD FAITH AS TYPICAL VALUES AND NOT AS A PRODUCT SPECIFICATION. NO WARRANTY, EXPRESSED OR IMPLIED, IS HEREBY MADE. THE RECOMMENDED INDUSTRIAL HYGIENE AND SAFE HANDLING PROCEDURES ARE BELIEVED TO BE GENERALLY APPLICABLE. HOWEVER, EACH USER SHOULD REVIEW THESE RECOMMENDATIONS IN THE SPECIFIC CONTEXT OF THE INTENDED USE AND DETERMINE WHETHER THEY ARE APPROPRIATE.

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Gasoline

Material Safety Data Sheet Collection
Genium group inc.
1171 RiverFront Center, Amsterdam, NY 12010
(518) 842-4111

Issue Date: 2006-06

Unleaded Petrol
AUT5000

Section 1 - Chemical Product and Company Identification 61

Material Name: Unleaded Petrol **CAS Number:** 8006-61-9
Chemical Formula: Mixture of hydrocarbons
EINECS Number: 232-349-1
ACX Number: X1003056-5
Synonyms: AUTOMOTIVE GASOLINE, LEAD-FREE; GASOLINE; MOTOR FUEL; MOTOR SPIRITS; NATURAL GASOLINE; PETROL; UNLEADED PETROL
General Use: Lead free motor fuel for internal combustion engines, 2-stroke and 4-stroke.

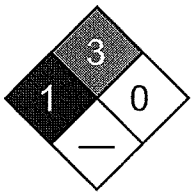
Section 2 - Composition / Information on Ingredients

Name	CAS	%
gasoline	8006-61-9	>90
benzene	71-43-2	5 max.

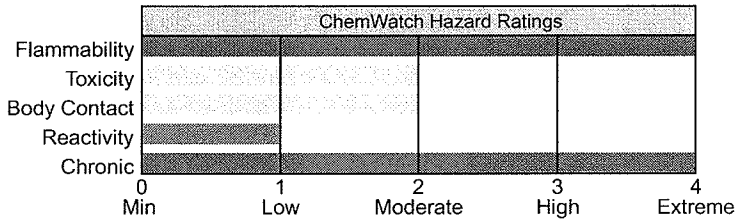
OSHA PEL **NIOSH REL**

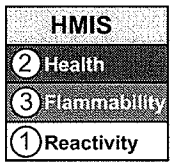
ACGIH TLV
TWA: 300 ppm, 890 mg/m^3;
STEL: 500 ppm, 1480 mg/m^3.

Section 3 - Hazards Identification



Fire Diamond





ANSI Signal Word
Danger!


Flammable

☆☆☆☆☆ Emergency Overview ☆☆☆☆☆

Clear liquid; distinctive odor. Irritating to eyes/skin/respiratory tract. Other Acute Effects: dizziness, drunkenness, unconsciousness. Chronic Effects: dermatitis. Possible cancer hazard. Flammable.

Potential Health Effects

Target Organs: skin, eye, respiratory system, central nervous system (CNS)
Primary Entry Routes: inhalation, ingestion, skin contact

Acute Effects

Inhalation: The vapor is discomforting to the upper respiratory tract and may be harmful if exposure is prolonged. Inhalation hazard is increased at higher temperatures. Acute effects from inhalation of high concentrations of vapor are pulmonary irritation, including coughing, with nausea; central nervous system depression - characterized by headache and dizziness, increased reaction time, fatigue and loss of coordination. If exposure to highly concentrated solvent atmosphere is prolonged this may lead to narcosis, unconsciousness, even coma and possible death. WARNING: Intentional misuse by concentrating/inhaling contents may be lethal. High inhaled concentrations of mixed hydrocarbons may produce narcosis characterized by nausea, vomiting and lightheadedness. Inhalation of aerosols may produce severe pulmonary edema, pneumonitis and pulmonary hemorrhage. Inhalation of petroleum hydrocarbons consisting substantially of low molecular weight species may produce irritation of mucous membranes, incoordination, giddiness, nausea, vertigo, confusion, headache, appetite loss, drowziness, tremors and anesthetic stupor. Massive exposures may produce central nervous system depression with sudden collapse and deep coma; fatalities have been recorded. Irritation of the brain and/or apneic anoxia may produce convulsions. Although recovery following overexposure is generally complete, cerebral micro- hemorrhage of focal post-inflammatory scarring may produce eleptiform seizures some months after the exposure. Pulmonary episodes may include chemical pneumonitis with edema and hemorrhage. The lighter hydrocarbons may produce kidney and neurotoxic effects. Liquid paraffins may produce anesthesia and depressant actions leading to weakness, dizziness, slow and shallow respiration, unconsciousness, convulsions and death. C_{5-7} paraffins may also produce polyneuropathy. Aromatic hydrocarbons accumulate in lipid-rich tissues (typically the brain, spinal cord and peripheral nerves) and may produce functional impairment manifested by nonspecific symptoms such as nausea, weakness, fatigue, vertigo; severe exposures may produce inebriation or unconsciousness. Many of the petroleum hydrocarbons are cardiac sensitizers and may cause ventricular fibrillations.

Eye: The liquid may produce eye discomfort and is capable of causing temporary impairment of vision and/or transient eye inflammation, ulceration. The vapor is discomforting to the eyes. Petroleum hydrocarbons may produce pain after direct contact with the eyes. Slight, but transient, disturbances of the corneal epithelium may also result. The aromatic fraction may produce irritation and lachrymation. The material may produce moderate eye irritation leading to inflammation. Repeated or prolonged exposure to irritants may produce conjunctivitis.

Skin: The material is moderately discomforting to the skin if exposure is prolonged. The material contains a component that may be absorbed through the skin and may cause drying of the skin, which may lead to dermatitis from repeated exposures over long periods. Toxic effects may result from skin absorption. Open cuts, abraded or irritated skin should not be exposed to this material. The material may accentuate any pre-existing dermatitis condition.

Ingestion: Considered an unlikely route of entry in commercial/industrial environments. The liquid may produce gastrointestinal discomfort and may be harmful if swallowed. Ingestion may result in nausea, pain and vomiting. Vomit entering the lungs by aspiration may cause potentially lethal chemical pneumonitis. Ingestion of petroleum hydrocarbons may produce irritation of the pharynx, esophagus, stomach and small intestine with edema and mucosal ulceration. Resulting symptoms include a burning sensation in the mouth and throat. Large amounts may produce narcosis with nausea and vomiting, weakness or dizziness, slow and shallow respiration, swelling of the abdomen, unconsciousness and convulsions. Myocardial injury may produce arrhythmias, ventricular fibrillation and electrocardiographic changes. Central nervous system depression may also occur. Light aromatic hydrocarbons produce a warm, sharp, tingling sensation on contact with taste buds and may anesthetize the tongue. Aspiration into the lungs may produce coughing, gagging, and a chemical pneumonitis with pulmonary edema and hemorrhage.

Carcinogenicity: NTP - Not listed; IARC - Group 2B, Possibly carcinogenic to humans; OSHA - Not listed; NIOSH - Listed as carcinogen; ACGIH - Class A3, Animal carcinogen; EPA - Not listed; MAK - Not listed.

Chronic Effects: Chronic solvent inhalation exposures may result in nervous system impairment and liver and blood changes. Prolonged or continuous skin contact with the liquid may cause defatting with drying, cracking, irritation and dermatitis following. Chronic poisoning may occur from vapor inhalation or skin absorption. The most significant toxic effect is insidious and irreversible injury to the blood-forming tissue by benzene. Leukemia may develop. Chronic exposure may cause headache, fatigue, loss of appetite and lassitude with incipient blood effects including anemia and blood changes. Gasoline "sniffing" has caused severe nerve damage. Repeated or prolonged exposure to mixed hydrocarbons may produce narcosis with dizziness, weakness, irritability, concentration and/or memory loss, tremor in the fingers and tongue, vertigo, olfactory disorders, constriction of visual field, paresthesias of the extremities, weight loss and anemia and degenerative changes in the liver and kidney. Chronic exposure by petroleum workers to the lighter hydrocarbons has been associated with visual disturbances, damage to the central nervous system, peripheral neuropathies (including numbness and paresthesias), psychological and neurophysiological deficits, bone marrow toxicities (including hypoplasia, possibly due to benzene) and hepatic and renal involvement. Chronic dermal exposure to petroleum hydrocarbons may result in defatting which produces localized dermatoses. Surface cracking and erosion may also increase susceptibility to infection by microorganisms.

Section 4 - First Aid Measures

Inhalation: Remove to fresh air. Lay patient down. Keep warm and rested.
If breathing is shallow or has stopped, ensure clear airway and apply resuscitation. Transport to hospital, or doctor.

See DOT ERG

Eye Contact: Immediately hold the eyes open and wash continuously for at least 15 minutes with fresh running water. Ensure irrigation under eyelids by occasionally lifting the upper and lower lids. Transport to hospital or doctor without delay. Removal of contact lenses after an eye injury should only be undertaken by skilled personnel.

Skin Contact: Immediately remove all contaminated clothing, including footwear (after rinsing with water). Wash affected areas thoroughly with water (and soap if available). Seek medical attention in event of irritation.

Ingestion: Contact a Poison Control Center. If swallowed, do NOT induce vomiting. Give a glass of water.

After first aid, get appropriate in-plant, paramedic, or community medical support.

Note to Physicians: For acute or short term repeated exposures to petroleum distillates or related hydrocarbons:

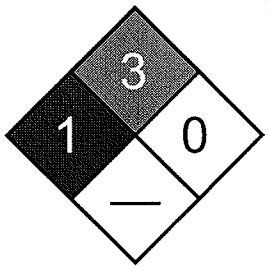
1. Primary threat to life from pure petroleum distillate ingestion and/or inhalation is respiratory failure.
2. Patients should be quickly evaluated for signs of respiratory distress (e.g. cyanosis, tachypnea, intercostal retraction, obtundation) and given oxygen. Patients with inadequate tidal volumes or poor arterial blood gases (pO_2 <50 mm Hg or pCO_2 >50 mm Hg) should be intubated.
3. Arrhythmias complicate some hydrocarbon ingestion and/or inhalation and electrocardiographic evidence of myocardial injury has been reported; intravenous lines and cardiac monitors should be established in obviously symptomatic patients. The lungs excrete inhaled solvents, so that hyperventilation improves clearance.
4. A chest x-ray should be taken immediately after stabilization of breathing and circulation to document aspiration and detect the presence of pneumothorax.
5. Epinephrine (adrenalin) is not recommended for treatment of bronchospasm because of potential myocardial sensitization to catecholamines.
Inhaled cardioselective bronchodilators (e.g. Alupent, Salbutamol) are the preferred agents, with aminophylline a second choice.
6. Lavage is indicated in patients who require decontamination; ensure use of cuffed endotracheal tube in adult patients.

Section 5 - Fire-Fighting Measures

Flash Point: -43 °C
Autoignition Temperature: 280 °C
LEL: 1.4% v/v
UEL: 7.6% v/v

See DOT ERG

Extinguishing Media: Foam. Dry chemical powder.
Bromochlorodifluoromethane (BCF) (where regulations permit). Carbon dioxide.



Fire Diamond

General Fire Hazards/Hazardous Combustion Products: Liquid and vapor are highly flammable. Severe fire hazard when exposed to heat, flame and/or oxidizers. Vapor forms an explosive mixture with air. Severe explosion hazard, in the form of vapor, when exposed to flame or spark. Vapor may travel a considerable distance to source of ignition. Heating may cause expansion/decomposition with violent rupture of containers. On combustion, may emit toxic fumes of carbon monoxide (CO).

Fire Incompatibility: Avoid contamination with oxidizing agents, i.e. nitrates, oxidizing acids, chlorine bleaches, pool chlorine etc., as ignition may result.

Fire-Fighting Instructions: Alert fire department and tell them location and nature of hazard. May be violently or explosively reactive. Wear breathing apparatus plus protective gloves. Prevent, by any means available, spillage from entering drains or water ways. If safe, switch off electrical equipment until vapour fire hazard removed. Use water delivered as a fine spray to control fire and cool adjacent area. Avoid spraying water onto liquid pools. Do not approach containers suspected to be hot. Cool fire exposed containers with water spray from a protected location. If safe to do so, remove containers from path of fire.

Section 6 - Accidental Release Measures

Small Spills: Remove all ignition sources. Clean up all spills immediately. Avoid breathing vapors and contact with skin and eyes. Control personal contact by using protective equipment. Contain and absorb small quantities with vermiculite or other absorbent material. Wipe up. Collect residues in a flammable waste container.

See DOT ERG

Large Spills: Clear area of personnel and move upwind. Alert fire department and tell them location and nature of hazard. May be violently or explosively reactive. Wear breathing apparatus plus protective gloves. Prevent, by any means available, spillage from entering drains or water ways. No smoking, naked lights or ignition sources. Increase ventilation. Stop leak if safe to do so.
Water spray or fog may be used to disperse/absorb vapor. Contain spill with sand, earth or vermiculite. Use only

spark-free shovels and explosion proof equipment. Collect recoverable product into labeled containers for recycling. Absorb remaining product with sand, earth or vermiculite. Collect solid residues and seal in labelled drums for disposal. Wash area and prevent runoff into drains.
If contamination of drains or waterways occurs, advise emergency services.
Regulatory Requirements: Follow applicable OSHA regulations (29 CFR 1910.120).

Section 7 - Handling and Storage

Handling Precautions: Avoid generating and breathing mist. Avoid all personal contact, including inhalation. Wear protective clothing when risk of exposure occurs. Use in a well-ventilated area. Prevent concentration in hollows and sumps. DO NOT enter confined spaces until atmosphere has been checked. Avoid smoking, bare lights, heat or ignition sources. When handling, DO NOT eat, drink or smoke. Vapor may ignite on pumping or pouring due to static electricity. DO NOT use plastic buckets. Ground and secure metal containers when dispensing or pouring product. Use spark-free tools when handling. Avoid contact with incompatible materials. Keep containers securely sealed. Avoid physical damage to containers. Always wash hands with soap and water after handling. Work clothes should be laundered separately. Use good occupational work practices. Observe manufacturer's storing and handling recommendations. Atmosphere should be regularly checked against established exposure standards to ensure safe working conditions.
Recommended Storage Methods: Metal can, metal drum. Packing as recommended by manufacturer. Check all containers are clearly labeled and free from leaks.
Regulatory Requirements: Follow applicable OSHA regulations.

Section 8 - Exposure Controls / Personal Protection

Engineering Controls: CARE: Use of a quantity of this material in confined space or poorly ventilated area, where rapid build-up of concentrated atmosphere may occur, could require increased ventilation and/or protective gear. Use in a well-ventilated area. If inhalation risk of overexposure exists, wear a NIOSH approved organic-vapor respirator. Correct respirator fit is essential to obtain adequate protection. In confined spaces where there is inadequate ventilation, wear full-face air supplied breathing apparatus. Provide adequate ventilation in warehouse or closed storage areas.
Personal Protective Clothing/Equipment:
Eyes: Safety glasses with side shields; or as required, chemical goggles.
Contact lenses pose a special hazard; soft lenses may absorb irritants and all lenses concentrate them.
Hands/Feet: Barrier cream with polyethylene gloves or PVC gloves. Safety footwear. Do NOT use this product to clean the skin.
Respiratory Protection:
Exposure Range >300 to 1000 ppm: Air Purifying, Negative Pressure, Half Mask
Exposure Range >1000 to 15,000 ppm: Air Purifying, Negative Pressure, Full Face
Exposure Range >15,000 to 300,000 ppm: Supplied Air, Constant Flow/Pressure Demand, Full Face
Exposure Range >300,000 to unlimited ppm: Self-contained Breathing Apparatus, Pressure Demand, Full Face
Cartridge Color: black
Other: Overalls. Ensure that there is ready access to eye wash unit. Ensure there is ready access to an emergency shower.

Section 9 - Physical and Chemical Properties

Appearance/General Info: Purple, highly flammable, volatile liquid with characteristic sharp odor. Floats on water. Consists of a complex mixture of hydrocarbons with small amounts of residual benzene from the refining operations.

Physical State: Liquid
Odor Threshold: 0.005 ppm
Vapor Pressure (kPa): 53.33 at 20 °C
Vapor Density (Air=1): > 2
Formula Weight: Not applicable.
Specific Gravity (H_2O=1, at 4 °C): 0.72-0.735 at 15 °C
Evaporation Rate: Fast

pH: Not applicable
pH (1% Solution): Not applicable.
Boiling Point: 38.89 °C (102 °F)
Freezing/Melting Point: Not available
Volatile Component (% Vol): 100
Decomposition Temperature (°C): Not available.
Water Solubility: Insoluble

Section 10 - Stability and Reactivity

Stability/Polymerization/Conditions to Avoid: Presence of incompatible materials. Product is considered stable. Hazardous polymerization will not occur.
Storage Incompatibilities: Avoid storage with oxidizers.

Section 11 - Toxicological Information

Toxicity
Oral (rat) LD_{50}: 18800 mg/kg

Irritation
Skin (rabbit): 500 mg/24h mild

Section 12 - Ecological Information

Environmental Fate: No data found.
Ecotoxicity: No data found.
Biochemical Oxygen Demand (BOD): 8%, 5 days

Section 13 - Disposal Considerations

Disposal: Consult manufacturer for recycling options and recycle where possible. Follow all applicable federal, state, and local laws. Incinerate residue at an approved site. Recycle containers where possible, or dispose of in an authorized landfil.
BEWARE: Empty solvent, paint, lacquer and flammable liquid drums present a severe explosion hazard if cut by flame torch or welded. Even when thoroughly cleaned or reconditioned, the drum seams may retain sufficient solvent to generate an explosive atmosphere in the drum.

Section 14 - Transport Information

DOT Hazardous Materials Table Data (49 CFR 172.101):

Shipping Name and Description: Gasoline
ID: UN1203
Hazard Class: 3 - Flammable and combustible liquid
Packing Group: II - Medium Danger
Symbols:
Label Codes: 3 - Flammable Liquid
Special Provisions: 139, B33, B101, T8
Packaging: **Exceptions:** 150 **Non-bulk:** 202 **Bulk:** 242
Quantity Limitations: **Passenger aircraft/rail:** 5 L **Cargo aircraft only:** 60 L
Vessel Stowage: **Location:** E **Other:**

Section 15 - Regulatory Information

EPA Regulations:
RCRA 40 CFR: Not listed
CERCLA 40 CFR 302.4: Not listed
SARA 40 CFR 372.65: Not listed
SARA EHS 40 CFR 355: Not listed
TSCA: Listed

Section 16 - Other Information

Disclaimer: Judgments as to the suitability of information herein for the purchaser's purposes are necessarily the purchaser's responsibility. Although reasonable care has been taken in the preparation of such information, Genium Group, Inc. extends no warranties, makes no representations, and assumes no responsibility as to the accuracy or suitability of such information for application to the purchaser's intended purpose or for consequences of its use.

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BENCH PRODUCTS
HAND CLEANER DEGREASER **Revised: 01/02/1991**

MSDS Contents

BENCH PRODUCTS INC.

MATERIAL SAFETY DATA SHEET

REVISED 1/2/91

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MANUFACTURER'S NAME: BENCH PRODUCTS

ADDRESS: 4124 SO. 500 W.
SALT LAKE CITY, UT 84123

EMERGENCY PHONE: 801-261-3666
801-268-6320

TRADE NAME: SPARKLENE HAND CLEANER DEGREASER

HAZARDOUS INGREDIENTS

PAINTS, SOLVENTS PRESERVATIVES	(0)	TLV UNITS	ALLOYS AND METALS	(0)	TLV UNITS
PIGMENTS	(0)		BASE METAL	(0)	
CATALYST	(0)		ALLOYS	(0)	
VEHICLE	(0)		METALLIC COATINGS	(0)	
SOLVENTS	(0)		FILLER MATERIAL AND COATINGS	(0)	
ADDITIVES	(0)		OTHERS	(0)	
OTHERS	(0)				

HAZARDOUS MIXTURES OF OTHER LIQUIDS, SOLIDS OR GASES (%) (0) TLV UNITS

CONTAINS:
NONIONIC SURFACTANT & GANTREZ AN119 WHICH CONTAINS BENZENE BUT THIS FORMULA CONTAINS LESS THAN 1/10%

PHYSICAL DATA

BOILING POINT (F): NA

SPECIFIC GRAVITY (WATER = 1): NA

VAPOR PRESSURE (MMHG): NA

VOLATILE (% BY VOLUME): NA

VAPOR DENSITY (AIR=1): NA

EVAPORATION RATE (=1): NA

SOLUBILITY IN WATER: 100%

APPEARANCE AND ODOR: LIGHT BLUE LIQUID WITH LEMON FRAGRANCE.

FIRE AND EXPLOSION

FLASH POINT (METHOD USED):

FLAMMABILITY LIMITS: NOT FLAMMABLE

EXTINGUISHING MEDIA: NOT FLAMMABLE

SPECIAL FIRE PROCEDURES: NONE

UNUSUAL FIRE AND EXPLOSION HAZARDS: NONE

HEALTH HAZARD DATA

THRESHOLD LIMIT VALUE: NOT ESTABLISHED

EFFECTS OF OVER EXPOSURE: NONE

EMERGENCY AND FIRST AID PROCEDURES:

EXTERNAL:
FLUSH WITH WATER FOR 15 MINUTES, CALL PHYSICIAN IF IRRITATION PERSISTS.

INTERNAL:
GIVE LARGE QUANTITIES OF MILK OR WATER, CALL A PHYSICIAN.

REACTIVITY DATA

STABILITY: UNSTABLE ( )
STABLE (X)

CONDITIONS TO AVOID:
MIXING WITH ALKALINE PRODUCTS.

INCOMPATIBILITY: (MATERIALS TO AVOID):
COMPATIBLE WITH MOST OTHER HOUSEHOLD CLEANERS.

HAZARDOUS DECOMPOSITION PRODUCTS: NONE.

HAZARDOUS POLYMERIZATION:
MAY OCCUR ( )
MAY NOT OCCUR (X)

CONDITIONS TO AVOID:
MIXING WITH ALKALINE PRODUCTS.

SPILL OR LEAK PROCEDURES

STEPS TO BE TAKEN IN CASE OF MATERIAL SPILL: RINSE AREA WITH WATER.

WASTE DISPOSAL METHOD:
IN LAND FILL IN ACCORDANCE TO ALL STATE AND LOCAL REGULATIONS.

SPECIAL PROTECTION INFORMATION

RESPIRATORY PROTECTION (SPECIFY TYPE): NOT NORMALLY NEEDED.

VENTILATION: (NA) LOCAL EXHAUST: (NA)
MECHANICAL: (NA)
SPECIAL: (NA)
OTHER: (NA)

PROTECTIVE GLOVES: REGULAR HOUSEHOLD RUBBER GLOVES.

EYE PROTECTION: SIMPLE GOGGLES CAN BE USED.

OTHER PROTECTIVE EQUIPMENT: NONE

SPECIAL PRECAUTIONS

OTHER PRECAUTIONS:
AVOID CONTACT WITH MUCOUS MEMBRANES.

BENCH PRODUCTS INC.

HAND CLEANER DEGREASER

THIS HEAVY DUTY CLEANER HAS BEEN FORMULATED WITH A UNIQUE BLEND OF WETTING AGENTS, DETERGENTS AND GENTLE SURFACTANTS TO HELP REMOVE GROUND IN DIRT AND GREASE. FORTIFIED WITH SPECIAL EMMOLLIENTS TO HELP THE SKIN.

PRODUCT SPECIFICATIONS:

COLOR:	ORANGE
ODOR :	ALMOND
FLASH POINT:	NONE
P.H.	5
DENSITY	8.4 LBS PER GALLON
STORAGE STABILITY:	EXCELLENT. 1 YEAR MINIMUM

FREEZING STABILITY:
WILL FREEZE. USABLE AFTER THAWING WITH NO CHANGE IN PERFORMANCE.
AGITATE AFTER THAWING AND BEFORE USE.

PHOSPHATE FREE	YES
BIODEGRADABLE	YES

DIRECTIONS:

WET HANDS WITH WATER, APPLY A SMALL AMOUNT TO HANDS AND WORK INTO A LATHER; RINSE CLEAN WITH WATER.

CAUTION:
KEEP AWAY FROM CHILDREN, IF SWALLOWED GIVE A GLASSFUL OF WATER, CALL A PHYSICIAN. IF CONTACT WITH EYES, FLUSH WITH WATER FOR 15 MINUTES, CALL A PHYSICIAN.

PACKAGING:	SPARKLENE:	GALLONS (6 PER CASE)
	PRIVATE LABEL:	GALLONS (6 PER CASE)
		5 GALLON PAILS, 55 GALLON DRUMS.

WARRANTY:
CUSTOMER SATISFACTION GUARANTEED. ALL PRODUCTS ARE GUARANTEED FOR ONE YEAR FROM THE DATE OF INVOICE. ANY RETURNED PRODUCT SHOULD BE AVAILABLE AT THE DISTRIBUTORS WAREHOUSE FOR INSPECTION. LIABILITY TO THE MANUFACTURER IS LIMITED TO THE OPTION OF REPLACEMENT OF GOODS OR CREDIT OF INVOICE.

DISCLAIMER:
MANUFACTURER OR SELLER MAKES NO WARRANTY EXPRESS OR IMPLIED CONCERNING THE USE OF THIS PRODUCT OTHER THAN FOR THE PURPOSE INDICATED ON THE LABEL. MANUFACTURER OR SELLER IS NOT LIABLE FOR ANY INJURY OR DAMAGE CAUSED BY THIS PRODUCT DUE TO MISUSE, MISHANDLING OR ANY APPLICATION NOT SPECIFICALLY DESCRIBED AND RECOMMENDED ON THE LABEL.

BENCH PRODUCTS INC., SALT LAKE CITY, UTAH 84123

76 LUBRICANTS
UNOBA MOLY XD GREASE 2 Revised: 01/01/2002

MSDS Contents

76 UNOBA MOLY XD GREASE 2

(MSDS #5477020000)

MATERIAL SAFETY DATA SHEET

76 LUBRICANTS COMPANY
A DIVISION OF TOSCO CORPORATION

76 UNOBA MOLY XD GREASE 2

1. PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME: 76 UNOBA MOLY XD GREASE 2

PRODUCT CODE: 5477020000

SAP CODE:

INTENDED USE: GREASE

CHEMICAL FAMILY: PETROLEUM HYDROCARBON

RESPONSIBLE PARTY:
PHILLIPS 66 COMPANY
LUBRICANTS DIVISION
P.O. BOX 25376
SANTA ANA, CA 92799-5376

FOR ADDITIONAL MSDSS: 800-762-0942

TECHNICAL INFORMATION:
THE INTENDED USE OF THIS PRODUCT IS INDICATED ABOVE. IF ANY ADDITIONAL USE IS KNOWN, PLEASE CONTACT US AT THE TECHNICAL INFORMATION NUMBER LISTED.

EMERGENCY OVERVIEW:

24 HOUR EMERGENCY TELEPHONE NUMBERS:
SPILL, LEAK, FIRE OR ACCIDENT:
CALL CHEMTREC:
NORTH AMERICA: (800) 424-9300

OTHERS: (703) 527-3887 (COLLECT)

CALIFORNIA POISON CONTROL SYSTEM: (800) 356-3129

HEALTH HAZARDS/PRECAUTIONARY MEASURES:
AVOID CONTACT WITH EYES, SKIN AND CLOTHING. WASH THOROUGHLY AFTER HANDLING.

PHYSICAL HAZARDS/PRECAUTIONARY MEASURES:
KEEP AWAY FROM ALL SOURCES OF IGNITION.

APPEARANCE: BLACK

PHYSICAL FORM: SEMI-SOLID

ODOR: CHARACTERISTIC PETROLEUM

NFPA HAZARD CLASS:
HEALTH 1 (SLIGHT)
FLAMMABILITY 1 (SLIGHT)
REACTIVITY 0 (LEAST)

HMIS HAZARD CLASS: NOT EVALUATED

2. COMPOSITION/INFORMATION ON INGREDIENTS

HAZARDOUS COMPONENTS	% WEIGHT	EXPOSURE GUIDELINE LIMITS	AGENCY	TYPE
DEASPHALTED RESIDUUM C24 CAS#: 64741-95-3	30-50	(SEE: OIL MIST, IF GENERATED)		
MOLYBDENUM DISULFIDE CAS#: 1317-33-5	1-5	(SEE: MOLYBDENUM, INSOLUBLE COMPOUNDS (AS Mo))		
ZINC COMPOUND CAS#: PROPRIETARY	<1	NOT ESTABLISHED		

OTHER COMPONENTS	% WEIGHT	EXPOSURE GUIDELINE LIMITS	AGENCY	TYPE
LUBRICANT BASE OIL (PETROLEUM) CAS#: VARIOUS	50-70	(SEE: OIL MIST, IF GENERATED)		
ADDITIVES CAS#: PROPRIETARY	5-13	NOT ESTABLISHED		

REFERENCE	EXPOSURE GUIDELINE LIMITS	AGENCY	TYPE
MOLYBDENUM, INSOLUBLE COMPOUNDS (AS Mo) CAS#: NONE	10 MG/M3	ACGIH	TWA
	3 MG/M3	ACGIH	TWA-RESP.
	15 MG/M3	OSHA	TWA-TOT.
OIL MIST, IF GENERATED CAS#: NONE	5 MG/M3	ACGIH	TWA
	10 MG/M3	ACGIH	STEL
	5 MG/M3	OSHA	TWA
	2500 MG/M3	NIOSH	IDLH

ALL COMPONENTS ARE LISTED ON THE TSCA INVENTORY

THE BASE OIL FOR THIS PRODUCT CAN BE A MIXTURE OF ANY OF THE FOLLOWING HIGHLY REFINED PETROLEUM STREAMS:
CAS 64741-88-4; CAS 64741-89-5; CAS 64741-96-4; CAS 64741-97-5;
CAS 64742-01-4; CAS 64742-52-5; CAS 64742-53-6; CAS 64742-54-7;
CAS 64742-55-8; CAS 64742-56-9; CAS 64742-57-0; CAS 64742-62-7;
CAS 64742-63-8; CAS 64742-65-0; CAS 72623-85-9; CAS 72623-86-0;
CAS 72623-87-1

NOTE:
STATE, LOCAL OR OTHER AGENCIES OR ADVISORY GROUPS MAY HAVE ESTABLISHED MORE STRINGENT LIMITS. CONSULT AN INDUSTRIAL HYGIENIST OR SIMILAR PROFESSIONAL, OR YOUR LOCAL AGENCIES, FOR FURTHER INFORMATION.

3. HAZARDS IDENTIFICATION

POTENTIAL HEALTH EFFECTS:

EYE:
CONTACT MAY CAUSE MILD EYE IRRITATION INCLUDING STINGING, WATERING, AND REDNESS.

SKIN:
CONTACT MAY CAUSE MILD SKIN IRRITATION INCLUDING REDNESS, AND A BURNING SENSATION. PROLONGED OR REPEATED CONTACT CAN WORSEN IRRITATION BY CAUSING DRYING AND CRACKING OF THE SKIN LEADING TO DERMATITIS (INFLAMMATION). NO HARMFUL EFFECTS FROM SKIN ABSORPTION ARE EXPECTED.

INHALATION (BREATHING):
NO DATA AVAILABLE. HOWEVER, INHALATION IS NOT AN EXPECTED ROUTE OF EXPOSURE.

INGESTION (SWALLOWING): LOW DEGREE OF TOXICITY BY INGESTION.

SIGNS AND SYMPTOMS:
EFFECTS OF OVEREXPOSURE MAY INCLUDE IRRITATION OF THE NOSE AND THROAT, IRRITATION OF THE DIGESTIVE TRACT, IRRITATION OF THE RESPIRATORY TRACT, NAUSEA AND DIARRHEA.

CANCER:
INADEQUATE EVIDENCE AVAILABLE TO EVALUATE THE CANCER HAZARD OF THIS MATERIAL. SEE SECTION 11 FOR CARCINOGENICITY INFORMATION OF INDIVIDUAL COMPONENTS, IF ANY.

TARGET ORGANS: NO DATA AVAILABLE FOR THIS MATERIAL.

DEVELOPMENTAL: NO DATA AVAILABLE FOR THIS MATERIAL.

PRE-EXISTING MEDICAL CONDITIONS:
CONDITIONS AGGRAVATED BY EXPOSURE MAY INCLUDE SKIN DISORDERS.

4. FIRST AND MEASURES

EYE:
IF IRRITATION OR REDNESS DEVELOPS, MOVE VICTIM AWAY FROM EXPOSURE AND INTO FRESH AIR. FLUSH EYES WITH CLEAN WATER. IF SYMPTOMS PERSIST, SEEK MEDICAL ATTENTION.

SKIN:
WIPE MATERIAL FROM SKIN AND REMOVE CONTAMINATED SHOES AND CLOTHING. CLEANSE

AFFECTED AREA(S) THOROUGHLY BY WASHING WITH MILD SOAP AND WATER AND, IF NECESSARY, A WATERLESS SKIN CLEANSER. IF IRRITATION OR REDNESS DEVELOPS AND PERSISTS, SEEK MEDICAL ATTENTION.

INHALATION (BREATHING):
FIRST AID IS NOT NORMALLY REQUIRED. IF BREATHING DIFFICULTIES DEVELOP, MOVE VICTIM AWAY FROM SOURCE OF EXPOSURE AND INTO FRESH AIR. SEEK IMMEDIATE MEDICAL ATTENTION.

INGESTION (SWALLOWING):
FIRST AID IS NOT NORMALLY REQUIRED; HOWEVER, IF SWALLOWED AND SYMPTOMS DEVELOP, SEEK MEDICAL ATTENTION.

NOTE TO PHYSICIANS:
HIGH-PRESSURE HYDROCARBON INJECTION INJURIES MAY PRODUCE SUBSTANTIAL NECROSIS OF UNDERLYING TISSUE DESPITE AN INNOCUOUS APPEARING EXTERNAL WOUND. OFTEN THESE INJURIES REQUIRE EXTENSIVE EMERGENCY SURGICAL DEBRIDEMENT AND ALL INJURIES SHOULD BE EVALUATED BY A SPECIALIST IN ORDER TO ASSESS THE EXTENT OF INJURY.

5. FIRE FIGHTING MEASURES

FLAMMABLE PROPERTIES:

FLASHPOINT: 450 DEG. F/232 DEG. C (COC)

OSHA FLAMMABILITY CLASS: NOT APPLICABLE

LEL%: 0.9
UEL%: 7.0

AUTOIGNITION TEMPERATURE: NO DATA

BURN RATE (SOLIDS): NO DATA

UNUSUAL FIRE & EXPLOSION HAZARDS:
THIS MATERIAL MAY BURN, BUT WILL NOT IGNITE READILY.

EXTINGUISHING MEDIA:
DRY CHEMICAL, CARBON DIOXIDE, FOAM, WATER, SAND, OR EARTH IS RECOMMENDED. CARBON DIOXIDE CAN DISPLACE OXYGEN. USE CAUTION WHEN APPLYING CARBON DIOXIDE IN CONFINES SPACES.

FIRE FIGHTING INSTRUCTIONS:
FOR FIRES BEYOND THE INCIPIENT STAGE, EMERGENCY RESPONDERS IN THE IMMEDIATE HAZARD AREA SHOULD WEAR BUNKER GEAR. WHEN THE POTENTIAL CHEMICAL HAZARD IS UNKNOWN, IN ENCLOSED OR CONFINED SPACES, OR WHEN EXPLICITY REQUIRED BY DOT, A SELF CONTAINED BREATHING APPARATUS SHOULD BE WORN. IN ADDITION, WEAR OTHER APPROPRIATE PROTECTIVE EQUIPMENT AS CONDITIONS WARRANT (SEE SECTION 8).

ISOLATE IMMEDIATE HAZARD AREA, KEEP UNAUTHORIZED PERSONNEL OUT. CONTAIN SPILL IF IT CAN BE DONE WITH MINIMAL RISK. MOVE UNDAMAGED CONTAINERS FROM IMMEDIATE HAZARD AREA IF IT CAN BE DONE WITH MINIMAL RISK.

COOL EQUIPMENT EXPOSED TO FIRE WITH WATER, IF IT CAN BE DONE WITH MINIMAL RISK.

6. ACCIDENTAL RELEASE MEASURES

THIS MATERIAL MAY BURN, BUT WILL NOT IGNITE READILY. KEEP ALL SOURCES OF IGNITION AWAY FROM SPILL/RELEASE. STAY UPWIND AND AWAY FROM SPILL. NOTIFY PERSONS DOWN WIND OF THE SPILL/RELEASE, ISOLATE IMMEDIATE HAZARD AREA AND KEEP UNAUTHORIZED PERSONNEL OUT. CONTAIN SPILL IF IT CAN BE DONE WITH MINIMAL RISK. WEAR APPROPRIATE PROTECTIVE EQUIPMENT INCLUDING RESPIRATORY PROTECTION AS CONDITIONS WARRANT (SEE SECTION 8).

PREVENT SPILLED MATERIAL FROM ENTERING SEWERS, STORM DRAINS, OTHER UNAUTHORIZED DRAINAGE SYSTEMS, AND NATURAL WATERWAYS. NOTIFY FIRE AUTHORITIES AND APPROPRIATE FEDERAL, STATE, AND LOCAL AGENCIES. CLEANUP UNDER EXPERT SUPERVISION IS ADVISED. MINIMIZE DUST GENERATION. SWEEP UP AND PACKAGE APPROPRIATELY FOR DISPOSAL. IF SPILL OF ANY AMOUNT IS MADE INTO OR UPON NAVIGABLE WATERS, THE CONTIGUOUS ZONE, OR ADJOINING SHORELINES, NOTIFY THE NATIONAL RESPONSE CENTER (PHONE NUMBER 800-424-8802).

7. HANDLING AND STORAGE

HANDLING:
THE USE OF APPROPRIATE RESPIRATORY PROTECTION IS ADVISED WHEN CONCENTRATIONS EXCEED ANY ESTABLISHED EXPOSURE LIMITS (SEE SECTIONS 2 AND 8).

DO NOT WEAR CONTAMINATED CLOTHING OR SHOES. USE GOOD PERSONAL HYGIENE PRACTICES.

HIGH PRESSURE INJECTION OF HYDROCARBON FUELS, HYDRAULIC OILS OR GREASES UNDER THE SKIN MAY HAVE SERIOUS CONSEQUENCES EVEN THOUGH NO SYMPTOMS OR INJURY MAY BE APPARENT. THIS CAN HAPPEN ACCIDENTALLY WHEN USING HIGH PRESSURE EQUIPMENT SUCH AS HIGH PRESSURE GREASE GUNS, FUEL INJECTION APPARATUS OR FROM PINHOLE LEAKS IN TUBING OF HIGH PRESSURE HYDRAULIC OIL EQUIPMENT.

"EMPTY" CONTAINERS RETAIN RESIDUE AND MAY BE DANGEROUS. DO NOT PRESSURIZE, CUT, WELD, BRAZE, SOLDER, DRILL, GRIND, OR EXPOSE SUCH CONTAINERS TO HEAT, FLAME, SPARKS, OR OTHER SOURCES OF IGNITION. THEY MAY EXPLODE AND CAUSE INJURY OR DEATH. "EMPTY" DRUMS SHOULD BE COMPLETELY DRAINED, PROPERLY BUNGED, AND PROMPTLY SHIPPED TO THE SUPPLIER OR A DRUM RECONDITIONER. ALL CONTAINERS SHOULD BE DISPOSED OF IN AN ENVIRONMENTALLY SAFE MANNER AND IN ACCORDANCE WITH GOVERNMENTAL REGULATIONS.

BEFORE WORKING ON OR IN TANKS WHICH CONTAIN OR HAVE CONTAINED THIS MATERIAL, REFER TO OSHA REGULATIONS, ANSI Z49.1 AND OTHER REFERENCES PERTAINING TO CLEANING, REPAIRING, WELDING, OR OTHER CONTEMPLATED OPERATIONS.

STORAGE:
KEEP CONTAINER(S) TIGHTLY CLOSED. USE AND STORE THIS MATERIAL IN COOL, DRY, WELL-VENTILATED AREAS AWAY FROM HEAT AND ALL SOURCES OF IGNITION. STORE ONLY IN APPROVED CONTAINERS. KEEP AWAY FROM ANY INCOMPATIBLE MATERIAL (SEE SECTION 10). PROTECT CONTAINER(S) AGAINST PHYSICAL DAMAGE.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

ENGINEERING CONTROLS:
IF CURRENT VENTILATION PRACTICES ARE NOT ADEQUATE TO MAINTAIN AIRBORNE CONCENTRATIONS BELOW THE ESTABLISHED EXPOSURE LIMITS (SEE SECTION 2), ADDITIONAL VENTILATION OR EXHAUST SYSTEMS MAY BE REQUIRED.

PERSONAL PROTECTIVE EQUIPMENT (PPE):

RESPIRATORY:

INHALATION IS NOT AN EXPECTED ROUTE OF EXPOSURE. HOWEVER, A NIOSH CERTIFIED AIR PURIFYING RESPIRATOR WITH A TYPE 95 (R OR P) PARTICULATE FILTER MAY BE USED UNDER CONDITIONS WHERE AIRBORNE CONCENTRATIONS ARE EXPECTED TO EXCEED EXPOSURE LIMITS (SEE SECTION 2).

PROTECTION PROVIDED BY AIR PURIFYING RESPIRATORS IS LIMITED (SEE MANUFACTURER'S RESPIRATOR SELECTION GUIDE). USE A POSITIVE PRESSURE AIR SUPPLIED RESPIRATOR IF THERE IS POTENTIAL FOR UNCONTROLLED RELEASE, EXPOSURE LEVELS ARE NOT KNOWN, OR ANY OTHER CIRCUMSTANCES WHERE AIR PURIFYING RESPIRATORS MAY NOT PROVIDE ADEQUATE PROTECTION.

A RESPIRATORY PROTECTION PROGRAM THAT MEETS OSHA'S 29 CFR 1910.134 AND ANSI Z88.2 REQUIREMENTS MUST BE FOLLOWED WHENEVER WORKPLACE CONDITIONS WARRANT A RESPIRATOR'S USE.

SKIN:
THE USE OF GLOVES IMPERVIOUS TO THE SPECIFIC MATERIAL HANDLED IS ADVISED TO PREVENT SKIN CONTACT, POSSIBLE IRRITATION, AND ABSORPTION (SEE GLOVE MANUFACTURER LITERATURE FOR INFORMATION ON PERMEABILITY).

EYE/FACE:
APPROVED EYE PROTECTION TO SAFEGUARD AGAINST POTENTIAL EYE CONTACT, IRRITATION, OR INJURY IS RECOMMENDED. DEPENDING ON CONDITIONS OF USE, A FACE SHIELD MAY BE NECESSARY.

OTHER PROTECTIVE EQUIPMENT:
A SOURCE OF CLEAN WATER SHOULD BE AVAILABLE IN THE WORK AREA FOR FLUSHING EYES AND SKIN. IMPERVIOUS CLOTHING SHOULD BE WORN AS NEEDED.

9. PHYSICAL AND CHEMICAL PROPERTIES

NOTE:
UNLESS OTHERWISE STATED, VALUES ARE DETERMINED AT 20 DEG. C (68 DEG. F) AND 760 MMHg (1 ATM).

BURN RATE (SOLIDS ONLY): NO DATA

APPEARANCE: BLACK

PHYSICAL STATE: SEMI-SOLID

ODOR: CHARACTERISTIC PETROLEUM

VAPOR PRESSURE (MMHg): <0.01

VAPOR DENSITY (AIR = 1): >5

BOILING POINT/RANGE: NO DATA

FREEZING/MELTING POINT: 365 DEG. F/185 DEG. C

SOLUBILITY IN WATER: NEGLIGIBLE

SPECIFIC GRAVITY: 0.90 @ 60 DEG. F

PERCENT VOLATILE: NEGLIGIBLE

EVAPORATION RATE (nBuAc = 1): <0.01

BULK DENSITY: 7.50 LBS/GAL

FLASHPOINT: 450 DEG. F / 232 DEG. C (COC)

FLAMMABLE/EXPLOSIVE LIMITS (%):
LEL: 0.9
UEL: 7.0

10. STABILITY AND REACTIVITY

STABILITY:
STABLE UNDER NORMAL AMBIENT AND ANTICIPATED STORAGE AND HANDLING CONDITIONS OF TEMPERATURE AND PRESSURE.

CONDITIONS TO AVOID:
EXTENDED EXPOSURE TO HIGH TEMPERATURES CAN CAUSE DECOMPOSITION.

MATERIALS TO AVOID (INCOMPATIBLE MATERIALS):
AVOID CONTACT WITH STRONG OXIDANTS SUCH AS LIQUID CHLORINE, CONCENTRATED OXYGEN, SODIUM HYPOCHLORITE OR CALCIUM HYPOCHLORITE.

HAZARDOUS DECOMPOSITION PRODUCTS:
COMBUSTION CAN YIELD MAJOR AMOUNTS OF OXIDES OF CARBON AND MINOR AMOUNTS OF OXIDES OF SULFUR AND NITROGEN. OXIDES OF MOLYBDENUM MAY ALSO BE FORMED.

HAZARDOUS POLYMERIZATION: WILL NOT OCCUR.

11. TOXICOLOGICAL INFORMATION

LUBRICANT BASE OIL (PETROLEUM (CAS# VARIOUS):

CARCINOGENICITY:
THE PETROLEUM BASE OILS CONTAINED IN THIS PRODUCT HAVE BEEN HIGHLY REFINED BY A VARIETY OF PROCESSES INCLUDING SOLVENT EXTRACTION, HYDROTREATING, AND DEWAXING TO REMOVE AROMATICS AND IMPROVE PERFORMANCE CHARACTERISTICS. NONE OF THE OILS USED ARE LISTED AS A CARCINOGEN BY NTP, IARC, OR OSHA.

DEASPHALTED RESIDUUM.. C24 (CAS# 64741-95-3):

CARCINOGENICITY:
SKIN APPLICATION OF A SIMILAR MATERIAL, VACUUM TOWER BOTTOMS, PRODUCED EQUIVOCAL RESULTS IN MOUSE TUMOR BIOASSAYS, BUT NEGATIVE RESULTS IN BOTH SKIN TUMOR INITIATION AND PROMOTION STUDIES. UNTREATED VACUUM DISTILLATES HAVE BEEN IDENTIFIED AS A CARCINOGEN BY IARC.

12. ECOLOGICAL INFORMATION

NOT EVALUATED AT THIS TIME

13. DISPOSAL CONSIDERATIONS

THIS MATERIAL, IF DISCARDED AS PRODUCED, IS NOT A RCRA "LISTED" OR "CHARACTERISTIC" HAZARDOUS WASTE. USE WHICH RESULTS IN CHEMICAL OR PHYSICAL CHANGE OR CONTAMINATION MAY SUBJECT IT TO REGULATION AS A HAZARDOUS WASTE. ALONG WITH PROPERLY CHARACTERIZING ALL WASTE MATERIALS, CONSULT STATE AND LOCAL REGULATIONS REGARDING THE PROPER DISPOSAL OF THIS MATERIAL.

14. TRANSPORT INFORMATION

NOTE: NOT CLASSIFIED AS HAZARDOUS

15. REGULATORY INFORMATION

EPA SARA 311/312 (TITLE III HAZARD CATEGORIES):
ACUTE HEALTH: NO
CHRONIC HEALTH: NO
FIRE HAZARD: NO
PRESSURE HAZARD: NO
REACTIVE HAZARD: NO

SARA 313 AND 40 CFR 372:
THIS MATERIAL CONTAINS THE FOLLOWING CHEMICALS SUBJECT TO THE REPORTING REQUIREMENTS OF SARA 313 AND 40 CFR 372:

COMPONENT	CAS NUMBER	WEIGHT %
ZINC COMPOUND	PROPRIETARY	<1

CALIFORNIA PROPOSITION 65:

WARNING:
THIS MATERIAL CONTAINS THE FOLLOWING CHEMICALS WHICH ARE KNOWN TO THE STATE OF CALIFORNIA TO CAUSE CANCER, BIRTH DEFECTS OR OTHER REPRODUCTIVE HARM, AND ARE SUBJECT TO THE REQUIREMENTS OF CALIFORNIA PROPOSITION 65 (CA HEALTH & SAFETY CODE SECTION 25249.5):

COMPONENT	EFFECT
RESIDUAL FUEL OILS	SKIN CANCER

CARCINOGEN IDENTIFICATION:
THIS MATERIAL HAS NOT BEEN IDENTIFIED AS A CARCINOGEN BY NTP, IARC, OR OSHA, SEE SECTION 11 FOR CARCINOGENICITY INFORMATION OF INDIVIDUAL COMPONENTS, IF ANY.

EPA (CERCLA) REPORTABLE QUANTITY: NONE

16. OTHER INFORMATION

ISSUE DATE: 01/01/02

PREVIOUS ISSUE DATE: 05/31/01

PRODUCT CODE: 5477020000

REVISED SECTIONS: NONE

PREVIOUS PRODUCT CODE: 5477020000

MSDS NUMBER: 5477020000

DISCLAIMER OF EXPRESSED AND IMPLIED WARRANTIES:

THE INFORMATION PRESENTED IN THIS MATERIAL SAFETY DATA SHEET IS BASED ON DATA BELIEVED TO BE ACCURATE AS OF THE DATE THIS MATERIAL SAFETY DATA SHEET WAS PREPARED. HOWEVER, NO WARRANTY OF MERCHANTABILITY, FITNESS FOR ANY PARTICULAR PURPOSE, OR ANY OTHER WARRANTY IS EXPRESSED OR IS TO BE IMPLIED REGARDING THE ACCURACY OR COMPLETENESS OF THE INFORMATION PROVIDED ABOVE, THE RESULTS TO BE OBTAINED FROM THE USE OF THIS INFORMATION OR THE PRODUCT, THE SAFETY OF THIS PRODUCT, OR THE HAZARDS RELATED TO ITS USE. NO RESPONSIBILITY IS ASSUMED FOR ANY DAMAGE OR INJURY RESULTING FROM ABNORMAL USE OR FROM ANY FAILURE TO ADHERE TO RECOMMENDED PRACTICES. THE INFORMATION PROVIDED ABOVE, AND THE PRODUCT, ARE FURNISHED ON THE CONDITION THAT THE PERSON RECEIVING THEM SHALL MAKE THEIR OWN DETERMINATION AS TO THE SUITABILITY OF THE PRODUCT FOR THEIR PARTICULAR PURPOSE AND ON THE CONDITION THAT THEY ASSUME THE RISK OF THEIR USE. IN ADDITION, NO AUTHORIZATION IS GIVEN NOR IMPLIED TO PRACTICE ANY PATENTED INVENTION WITHOUT A LICENSE.

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76 LUBRICANTS
EXTRA DUTY GEAR LUBE (ALL GRADES) **Revised: 02/22/2005**

MSDS Contents

MSDS CODE: 720080

STATUS: FINAL

DATE OF ISSUE: 22-FEB-2005

76 LUBRICANTS

MATERIAL SAFETY DATA SHEET

76 EXTRA DUTY GEAR LUBE (ALL GRADES)

1. PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME: 76 EXTRA DUTY GEAR LUBE (ALL GRADES)

PRODUCT CODE: 47601, 47602, 47603, 47604, 47605, 47606, 47607, 47609

INTENDED USE: GEAR LUBRICANT

SYNONYMS:
76 EXTRA DUTY GEAR LUBE 2EP
76 EXTRA DUTY GEAR LUBE 3EP
76 EXTRA DUTY GEAR LUBE 4EP
76 EXTRA DUTY GEAR LUBE 5EP
76 EXTRA DUTY GEAR LUBE 6EP
76 EXTRA DUTY GEAR LUBE 7EP
76 EXTRA DUTY GEAR LUBE 8EP
76 EXTRA DUTY GEAR LUBE 9EP

CHEMICAL FAMILY: PETROLEUM HYDROCARBON

RESPONSIBLE PARTY:
76 LUBRICANTS
A DIVISION OF CONOCO PHILLIPS
600 N. DAIRY ASHFORD
HOUSTON, TEXAS 77079-1175

CUSTOMER SERVICE: 888-766-7676

TECHNICAL INFORMATION: 800-435-7761

THE INTENDED USE OF THIS PRODUCT IS INDICATED ABOVE. IF ANY ADDITIONAL USE
IS KNOWN, PLEASE CONTACT US AT THE TECHNICAL INFORMATION NUMBER LISTED.

EMERGENCY OVERVIEW:

24 HOUR EMERGENCY TELEPHONE NUMBERS:
SPILL, LEAK, FIRE OR ACCIDENT CALL CHEMTREC:
NORTH AMERICA: (800) 424-9300
OTHERS: (703) 527-3887 (COLLECT)

CALIFORNIA POISON CONTROL SYSTEM: (800) 356-3219

HEALTH HAZARDS/PRECAUTIONARY MEASURES:
AVOID CONTACT WITH EYES, SKIN AND CLOTHING. WASH THOROUGHLY AFTER HANDLING.

PHYSICAL HAZARDS/PRECAUTIONARY MEASURES:
KEEP AWAY FROM ALL SOURCES OF IGNITION.

APPEARANCE: CLEAR AND BRIGHT

PHYSICAL FORM: LIQUID

ODOR: CHARACTERISTIC PETROLEUM

NFPA 704 HAZARD CLASS:
HEALTH 1 (SLIGHT)
FLAMMABILITY 1 (SLIGHT)
INSTABILITY 0 (LEAST)

HMIS HAZARD CLASS:
HEALTH 1 (SLIGHT)
FLAMMABILITY 1 (SLIGHT)
PHYSICAL HAZARDS 0 (LEAST)

2. COMPOSITION / INFORMATION ON INGREDIENTS

NON-HAZARDOUS COMPONENTS:

COMPONENT	CAS NO	PERCENT (%)	ACGIH	OSHA	NIOSH	OTHER
LUBRICANT BASE OIL (PETROLEUM)	VARIOUS	97-98	5 MG/M3 TWA 10 MG/M3 STEL	5 MG/M3 TWA	2500 MG/M3 IDLH	AS OIL MIST, IF GENERATED 5 MG/M3 NOHSC TWA
ADDITIVES	PROP-RIETARY	2-3	NE	NE	NE	NE

ALL COMPONENTS ARE LISTED ON THE TSCA INVENTORY.

THE BASE OIL FOR THIS PRODUCT CAN BE A MIXTURE OF ANY OF THE FOLLOWING HIGHLY
REFINED PETROLEUM STREAMS:
CAS 64741-88-4; CAS 64741-89-5; CAS 64741-96-4; CAS 64741-97-5;
CAS 64742-01-4; CAS 64742-52-5; CAS 64742-53-6; CAS 64742-54-7;
CAS 64742-55-8; CAS 64742-56-9; CAS 64742-57-0; CAS 64742-62-7;
CAS 64742-63-8; CAS 64742-65-0; CAS 72623-83-7; CAS 72623-85-9;
CAS 72623-86-0; CAS 72623-87-1

NOTE:
STATE, LOCAL OR OTHER AGENCIES OR ADVISORY GROUPS MAY HAVE ESTABLISHED MORE

STRINGENT LIMITS. CONSULT AN INDUSTRIAL HYGIENIST OR SIMILAR PROFESSIONAL, OR YOUR LOCAL AGENCIES, FOR FURTHER INFORMATION.

1%=10,000 PPM.
NE=NOT ESTABLISHED

3. HAZARDS IDENTIFICATION

POTENTIAL HEALTH EFFECTS:

EYE:
CONTACT MAY CAUSE MILD EYE IRRITATION INCLUDING STINGING, WATERING, AND REDNESS.

SKIN:
CONTACT MAY CAUSE MILD SKIN IRRITATION INCLUDING REDNESS, AND A BURNING SENSATION. PROLONGED OR REPEATED CONTACT CAN WORSEN IRRITATION BY CAUSING DRYING AND CRACKING OF THE SKIN LEADING TO DERMATITIS (INFLAMMATION). NO HARMFUL EFFECTS FROM SKIN ABSORPTION ARE EXPECTED.

INHALATION (BREATHING):
NO INFORMATION AVAILABLE. STUDIES BY OTHER EXPOSURE ROUTES SUGGEST A LOW DEGREE OF TOXICITY BY INHALATION.

INGESTION (SWALLOWING): NO HARMFUL EFFECTS EXPECTED FROM INGESTION.

SIGNS AND SYMPTOMS:
EFFECTS OF OVEREXPOSURE MAY INCLUDE IRRITATION OF THE EYES, IRRITATION OF THE NOSE AND THROAT, IRRITATION OF THE DIGESTIVE TRACT, IRRITATION OF THE RESPIRATORY TRACT, NAUSEA, DIARRHEA.

CANCER:
INADEQUATE EVIDENCE AVAILABLE TO EVALUATE THE CANCER HAZARD OF THIS MATERIAL. SEE SECTION 11 FOR CARCINOGENICITY INFORMATION OF INDIVIDUAL COMPONENTS, IF ANY.

TARGET ORGANS: NO DATA AVAILABLE FOR THIS MATERIAL.

DEVELOPMENTAL: NO DATA AVAILABLE FOR THIS MATERIAL.

PRE-EXISTING MEDICAL CONDITIONS:
CONDITIONS AGGRAVATED BY EXPOSURE MAY INCLUDE SKIN DISORDERS, RESPIRATORY (ASTHMA-LIKE) DISORDERS.

4. FIRST AID MEASURES

EYE:
IF IRRITATION OR REDNESS DEVELOPS, MOVE VICTIM AWAY FROM EXPOSURE AND INTO FRESH AIR. FLUSH EYES WITH CLEAN WATER. IF SYMPTOMS PERSIST, SEEK MEDICAL ATTENTION.

SKIN:
REMOVE CONTAMINATED SHOES AND CLOTHING AND CLEANSE AFFECTED AREA(S) THOROUGHLY BY WASHING WITH MILD SOAP AND WATER. IF IRRITATION OR REDNESS DEVELOPS AND PERSISTS, SEEK MEDICAL ATTENTION.

INHALATION (BREATHING):
IF RESPIRATORY SYMPTOMS DEVELOP, MOVE VICTIM AWAY FROM SOURCE OF EXPOSURE AND INTO FRESH AIR. IF SYMPTOMS PERSIST, SEEK MEDICAL ATTENTION. IF VICTIM

IS NOT BREATHING, CLEAR AIRWAY AND IMMEDIATELY BEGIN ARTIFICIAL RESPIRATION.
IF BREATHING DIFFICULTIES DEVELOP, OXYGEN SHOULD BE ADMINISTERED BY QUALIFIED
PERSONNEL. SEEK IMMEDIATE MEDICAL ATTENTION.

INGESTION (SWALLOWING):
FIRST AID IS NOT NORMALLY REQUIRED; HOWEVER, IF SWALLOWED AND SYMPTOMS
DEVELOP, SEEK MEDICAL ATTENTION.

NOTES TO PHYSICIAN:
HIGH-PRESSURE HYDROCARBON INJECTION INJURIES MAY PRODUCE SUBSTANTIAL
NECROSIS OF UNDERLYING TISSUE DESPITE AN INNOCUOUS APPEARING EXTERNAL WOUND.
OFTEN THESE INJURIES REQUIRE EXTENSIVE EMERGENCY SURGICAL DEBRIDEMENT AND
ALL INJURIES SHOULD BE EVALUATED BY A SPECIALIST IN ORDER TO ASSESS THE
EXTENT OF INJURY.

ACUTE ASPIRATIONS OF LARGE AMOUNTS OF OIL-LADEN MATERIAL MAY PRODUCE A
SERIOUS ASPIRATION PNEUMONIA. PATIENTS WHO ASPIRATE THESE OILS SHOULD BE
FOLLOWED FOR THE DEVELOPMENT OF LONG-TERM SEQUELAE. INHALATION EXPOSURE TO
OIL MISTS BELOW CURRENT WORKPLACE EXPOSURE LIMITS IS UNLIKELY TO CAUSE
PULMONARY ABNORMALITIES.

5. FIRE-FIGHTING MEASURES

FLAMMABLE PROPERTIES:

FLASH POINT: >399 DEG. F / 204 DEG. C

OSHA FLAMMABILITY CLASS: NOT APPLICABLE

NFPA FLAMMABILITY CLASS: NO DATA

LEL%: NO DATA
UEL%: NO DATA

AUTOIGNITION TEMPERATURE: NO DATA

UNUSUAL FIRE & EXPLOSION HAZARDS:
THIS MATERIAL MAY BURN, BUT WILL NOT IGNITE READILY. VAPORS ARE HEAVIER THAN
AIR AND CAN ACCUMULATE IN LOW AREAS. IF CONTAINER IS NOT PROPERLY COOLED, IT
CAN RUPTURE IN THE HEAT OF A FIRE.

EXTINGUISHING MEDIA:
DRY CHEMICAL, CARBON DIOXIDE, FOAM, OR WATER SPRAY IS RECOMMENDED. WATER OR
FOAM MAY CAUSE FROTHING OF MATERIALS HEATED ABOVE 212 DEG. F CARBON DIOXIDE
CAN DISPLACE OXYGEN. USE CAUTION WHEN APPLYING CARBON DIOXIDE IN CONFINED
SPACES.

FIRE FIGHTING INSTRUCTIONS:
FOR FIRES BEYOND THE INCIPIENT STAGE, EMERGENCY RESPONDERS IN THE IMMEDIATE
HAZARD AREA SHOULD WEAR BUNKER GEAR. WHEN THE POTENTIAL CHEMICAL HAZARD IS
UNKNOWN, IN ENCLOSED OR CONFINED SPACES, OR WHEN EXPLICITLY REQUIRED BY DOT,
A SELF CONTAINED BREATHING APPARATUS SHOULD BE WORN. IN ADDITION, WEAR OTHER
APPROPRIATE PROTECTIVE EQUIPMENT AS CONDITIONS WARRANT (SEE SECTION 8).

ISOLATE IMMEDIATE HAZARD AREA, KEEP UNAUTHORIZED PERSONNEL OUT. STOP
SPILL/RELEASE IF IT CAN BE DONE WITH MINIMAL RISK. MOVE UNDAMAGED CONTAINERS
FROM IMMEDIATE HAZARD AREA IF IT CAN BE DONE WITH MINIMAL RISK.

WATER SPRAY MAY BE USEFUL IN MINIMIZING OR DISPERSING VAPORS AND TO PROTECT
PERSONNEL. COOL EQUIPMENT EXPOSED TO FIRE WITH WATER, IF IT CAN BE DONE WITH
MINIMAL RISK. AVOID SPREADING BURNING LIQUID WITH WATER USED FOR COOLING
PURPOSES.

6. ACCIDENTAL RELEASE MEASURES

THIS MATERIAL MAY BURN, BUT WILL NOT IGNITE READILY. KEEP ALL SOURCES OF IGNITION AWAY FROM SPILL/RELEASE.

STAY UPWIND AND AWAY FROM SPILL/RELEASE. NOTIFY PERSONS DOWN WIND OF THE SPILL/RELEASE, ISOLATE IMMEDIATE HAZARD AREA AND KEEP UNAUTHORIZED PERSONNEL OUT. STOP SPILL/RELEASE IF IT CAN BE DONE WITH MINIMAL RISK. WEAR APPROPRIATE PROTECTIVE EQUIPMENT INCLUDING RESPIRATORY PROTECTION AS CONDITIONS WARRANT (SEE SECTION 8).

PREVENT SPILLED MATERIAL FROM ENTERING SEWERS, STORM DRAINS, OTHER UNAUTHORIZED DRAINAGE SYSTEMS, AND NATURAL WATERWAYS. DIKE FAR AHEAD OF SPILL FOR LATER RECOVERY OR DISPOSAL. SPILLED MATERIAL MAY BE ABSORBED INTO AN APPROPRIATE ABSORBENT MATERIAL.

NOTIFY FIRE AUTHORITIES AND APPROPRIATE FEDERAL, STATE, AND LOCAL AGENCIES. IMMEDIATE CLEANUP OF ANY SPILL IS RECOMMENDED. IF SPILL OF ANY AMOUNT IS MADE INTO OR UPON NAVIGABLE WATERS, THE CONTIGUOUS ZONE, OR ADJOINING SHORELINES, NOTIFY THE NATIONAL RESPONSE CENTER (PHONE NUMBER 800-424-8802).

7. HANDLING AND STORAGE

HANDLING:
DO NOT ENTER CONFINED SPACES SUCH AS TANKS OR PITS WITHOUT FOLLOWING PROPER ENTRY PROCEDURES SUCH AS ASTM D-4276 AND 29 CFR 1910.146. THE USE OF APPROPRIATE RESPIRATORY PROTECTION IS ADVISED WHEN CONCENTRATIONS EXCEED ANY ESTABLISHED EXPOSURE LIMITS (SEE SECTIONS 2 AND 8).

DO NOT WEAR CONTAMINATED CLOTHING OR SHOES. USE GOOD PERSONAL HYGIENE PRACTICES.

"EMPTY" CONTAINERS RETAIN RESIDUE AND MAY BE DANGEROUS. DO NOT PRESSURIZE, CUT, WELD, BRAZE, SOLDER, DRILL, GRIND, OR EXPOSE SUCH CONTAINERS TO HEAT, FLAME, SPARKS, OR OTHER SOURCES OF IGNITION. THEY MAY EXPLODE AND CAUSE INJURY OR DEATH. "EMPTY" DRUMS SHOULD BE COMPLETELY DRAINED, PROPERLY BUNGED, AND PROMPTLY SHIPPED TO THE SUPPLIER OR A DRUM RECONDITIONER. ALL CONTAINERS SHOULD BE DISPOSED OF IN AN ENVIRONMENTALLY SAFE MANNER AND IN ACCORDANCE WITH GOVERNMENTAL REGULATIONS.

HIGH PRESSURE INJECTION OF HYDROCARBON FUELS, HYDRAULIC OILS OR GREASES UNDER THE SKIN MAY HAVE SERIOUS CONSEQUENCES EVEN THOUGH NO SYMPTOMS OR INJURY MAY BE APPARENT. THIS CAN HAPPEN ACCIDENTALLY WHEN USING HIGH PRESSURE EQUIPMENT SUCH AS HIGH PRESSURE GREASE GUNS, FUEL INJECTION APPARATUS OR FROM PINHOLE LEAKS IN TUBING OF HIGH PRESSURE HYDRAULIC OIL EQUIPMENT.

BEFORE WORKING ON OR IN TANKS WHICH CONTAIN OR HAVE CONTAINED THIS MATERIAL, REFER TO OSHA REGULATIONS, ANSI Z49.1, AND OTHER REFERENCES PERTAINING TO CLEANING, REPAIRING, WELDING, OR OTHER CONTEMPLATED OPERATIONS.

STORAGE:
KEEP CONTAINER(S) TIGHTLY CLOSED. USE AND STORE THIS MATERIAL IN COOL, DRY, WELL-VENTILATED AREAS AWAY FROM HEAT AND ALL SOURCES OF IGNITION. STORE ONLY IN APPROVED CONTAINERS. KEEP AWAY FROM ANY INCOMPATIBLE MATERIAL (SEE SECTION 10). PROTECT CONTAINER(S) AGAINST PHYSICAL DAMAGE.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

ENGINEERING CONTROLS:
IF CURRENT VENTILATION PRACTICES ARE NOT ADEQUATE TO MAINTAIN AIRBORNE CONCENTRATIONS BELOW THE ESTABLISHED EXPOSURE LIMITS (SEE SECTION 2), ADDITIONAL ENGINEERING CONTROLS MAY BE REQUIRED.

PERSONAL PROTECTIVE EQUIPMENT (PPE):

RESPIRATORY:
A NIOSH CERTIFIED AIR PURIFYING RESPIRATOR WITH A TYPE 95 (R OR P) PARTICULATE FILTER MAY BE USED UNDER CONDITIONS WHERE AIRBORNE CONCENTRATIONS ARE EXPECTED TO EXCEED EXPOSURE LIMITS (SEE SECTION 2).

PROTECTION PROVIDED BY AIR PURIFYING RESPIRATORS IS LIMITED (SEE MANUFACTURER'S RESPIRATOR SELECTION GUIDE). USE A NIOSH APPROVED SELF-CONTAINED BREATHING APPARATUS (SCBA) OR EQUIVALENT OPERATED IN A PRESSURE DEMAND OR OTHER POSITIVE PRESSURE MODE IF THERE IS POTENTIAL FOR AN UNCONTROLLED RELEASE, EXPOSURE LEVELS ARE NOT KNOWN, OR ANY OTHER CIRCUMSTANCES WHERE AIR PURIFYING RESPIRATORS MAY NOT PROVIDE ADEQUATE PROTECTION.

A RESPIRATORY PROTECTION PROGRAM THAT MEETS OSHA'S 29 CFR 1910.134 AND ANSI Z88.2 REQUIREMENTS MUST BE FOLLOWED WHENEVER WORKPLACE CONDITIONS WARRANT A RESPIRATOR'S USE.

SKIN:
THE USE OF GLOVES IMPERVIOUS TO THE SPECIFIC MATERIAL HANDLED IS ADVISED TO PREVENT SKIN CONTACT AND POSSIBLE IRRITATION (SEE MANUFACTURERS LITERATURE FOR INFORMATION ON PERMEABILITY).

EYE/FACE:
APPROVED EYE PROTECTION TO SAFEGUARD AGAINST POTENTIAL EYE CONTACT, IRRITATION, OR INJURY IS RECOMMENDED. DEPENDING ON CONDITIONS OF USE, A FACE SHIELD MAY BE NECESSARY.

OTHER PROTECTIVE EQUIPMENT:
A SOURCE OF CLEAN WATER SHOULD BE AVAILABLE IN THE WORK AREA FOR FLUSHING EYES AND SKIN. IMPERVIOUS CLOTHING SHOULD BE WORN AS NEEDED.

SUGGESTIONS FOR THE USE OF SPECIFIC PROTECTIVE MATERIALS ARE BASED ON READILY AVAILABLE PUBLISHED DATA. USERS SHOULD CHECK WITH SPECIFIC MANUFACTURERS TO CONFIRM THE PERFORMANCE OF THEIR PRODUCTS.

9. PHYSICAL AND CHEMICAL PROPERTIES

NOTE:
UNLESS OTHERWISE STATED, VALUES ARE DETERMINED AT 20 DEG. C (68 DEG. F) AND 760 MMHg (1 ATM).

APPEARANCE: CLEAR AND BRIGHT

PHYSICAL FORM: LIQUID

ODOR: CHARACTERISTIC PETROLEUM

ODOR THRESHOLD: NO DATA

pH: NOT APPLICABLE

VAPOR PRESSURE (MMHg): <1

VAPOR DENSITY (AIR=1): >1

BOILING POINT: NO DATA

MELTING/FREEZING POINT: <5 DEG. F / -15 DEG. C

SOLUBILITY IN WATER: NEGLIGIBLE

PARTITION COEFFICIENT (n-OCTANOL/WATER): NO DATA

SPECIFIC GRAVITY: 0.87-0.91

BULK DENSITY: 7.3-7.6
BULK DENSITY UNITS: LBS/GAL

VISCOSITY CST @ 100 DEG. C: 8.8-65
VISCOSITY CST @ 40 DEG. C: 60-1100

PERCENT VOLATILE: NEGLIGIBLE

EVAPORATION RATE (nBuAc=1): <1

FLASH POINT: >399 DEG. F / 204 DEG. C

LEL%: NO DATA
UEL%: NO DATA

AUTOIGNITION TEMPERATURE: NO DATA

10. STABILITY AND REACTIVITY

STABILITY:
STABLE UNDER NORMAL AMBIENT AND ANTICIPATED STORAGE AND HANDLING CONDITIONS OF TEMPERATURE AND PRESSURE.

CONDITIONS TO AVOID:
EXTENDED EXPOSURE TO HIGH TEMPERATURES CAN CAUSE DECOMPOSITION.

MATERIALS TO AVOID (INCOMPATIBLE MATERIALS):
AVOID CONTACT WITH STRONG OXIDIZING AGENTS, STRONG ACIDS, STRONG BASES.

HAZARDOUS DECOMPOSITION PRODUCTS:
COMBUSTION CAN YIELD CARBON, NITROGEN AND SULFUR OXIDES.

HAZARDOUS POLYMERIZATION: WILL NOT OCCUR.

11. TOXICOLOGICAL INFORMATION

CHRONIC DATA:

LUBRICANT BASE OIL (PETROLEUM) - CAS: VARIOUS:

CARCINOGENICITY:
THE PETROLEUM BASE OILS CONTAINED IN THIS PRODUCT HAVE BEEN HIGHLY REFINED BY A VARIETY OF PROCESSES INCLUDING SOLVENT EXTRACTION, HYDROTREATING, AND DEWAXING TO REMOVE AROMATICS AND IMPROVE PERFORMANCE CHARACTERISTICS. ALL OF THE OILS MEET THE IP-346 CRITERIA OF LESS THAN 3 PERCENT PAH'S AND THEREFORE NONE ARE LISTED AS A CARCINOGEN BY NTP, IARC, OR OSHA.

ACUTE DATA:

LUBRICANT BASE OIL (PETROLEUM) - CAS: VARIOUS
DERMAL LD50: >2 G/KG
LC50: NO INFORMATION AVAILABLE
ORAL LD50: >5 G/KG

ADDITIVES - CAS: PROPRIETARY:
DERMAL LD50: NO INFORMATION AVAILABLE
LC50: NO INFORMATION AVAILABLE
ORAL LD50: NO INFORMATION AVAILABLE

12. ECOLOGICAL INFORMATION

NOT EVALUATED AT THIS TIME.

13. DISPOSAL CONSIDERATIONS

THIS MATERIAL UNDER MOST INTENDED USES WOULD BECOME USED OIL DUE TO CONTAMINATION BY PHYSICAL OR CHEMICAL IMPURITIES. RECYCLE ALL USED OIL. WHILE BEING RECYCLED, USED OIL IS REGULATED BY 40 CFR 279. USE RESULTING IN CHEMICAL OR PHYSICAL CHANGE OR CONTAMINATION MAY ALSO SUBJECT IT TO REGULATION AS HAZARDOUS WASTE. UNDER FEDERAL REGULATIONS, USED OIL IS A SOLID WASTE MANAGED UNDER 40 CFR 279. HOWEVER, IN CALIFORNIA, USED OIL IS MANAGED AS HAZARDOUS WASTE UNTIL TESTED TO SHOW IT IS NOT HAZARDOUS. CONSULT STATE AND LOCAL REGULATIONS REGARDING THE PROPER HANDLING OF USED OIL. IN THE CASE OF USED OIL, THE INTENT TO DISCARD IT MAY CAUSE THE USED OIL TO BE REGULATED AS HAZARDOUS WASTE.

CONTENTS SHOULD BE COMPLETELY USED AND CONTAINERS EMPTIED PRIOR TO DISCARD. RINSATE MAY BE CONSIDERED A RCRA HAZARDOUS WASTE AND MUST BE DISPOSED OF WITH CARE AND IN COMPLIANCE WITH FEDERAL, STATE AND LOCAL REGULATIONS. LARGE EMPTY CONTAINERS, SUCH AS DRUMS, SHOULD BE RETURNED TO THE DISTRIBUTOR OR A DRUM RECONDITIONER. TO ASSURE PROPER DISPOSAL OF SMALL EMPTY CONTAINERS, CONSULT WITH STATE AND LOCAL REGULATIONS AND DISPOSAL AUTHORITIES.

14. TRANSPORTATION INFORMATION

DOT PROPER SHIPPING NAME: NOT REGULATED

NOTE:
MATERIAL IS UNREGULATED UNLESS IN CONTAINER OF 3500 GALLONS OR MORE, THEN PROVISIONS OF 49 CFR PART 130 APPLY FOR LAND SHIPMENT.

IMDG SHIPPING DESCRIPTION: NOT REGULATED

ICAO/IATA SHIPPING DESCRIPTION: NOT REGULATED

15. REGULATORY INFORMATION

U.S. REGULATIONS:

EPA SARA 311/312 (TITLE III HAZARD CATEGORIES):
ACUTE HEALTH: NO
CHRONIC HEALTH: NO
FIRE HAZARD: NO
PRESSURE HAZARD: NO
REACTIVE HAZARD: NO

SARA - SECTION 313 AND 40 CFR 372:
THIS MATERIAL CONTAINS THE FOLLOWING CHEMICALS SUBJECT TO THE REPORTING REQUIREMENTS OF SARA 313 AND 40 CFR 372: NONE KNOWN

EPA (CERCLA) REPORTABLE QUANTITY (IN POUNDS): NONE KNOWN

CERCLA/SARA - SECTION 302 EXTREMELY HAZARDOUS SUBSTANCES AND TPQS (IN POUNDS):
THIS MATERIAL CONTAINS THE FOLLOWING CHEMICALS SUBJECT TO THE REPORTING REQUIREMENTS OF SARA 302 AND 40 CFR 372: NONE KNOWN

CALIFORNIA PROPOSITION 65:
WARNING:
THIS MATERIAL CONTAINS THE FOLLOWING CHEMICALS WHICH ARE KNOWN TO THE STATE OF CALIFORNIA TO CAUSE CANCER, BIRTH DEFECTS OR OTHER REPRODUCTIVE HARM, AND ARE SUBJECT TO THE REQUIREMENTS OF CALIFORNIA PROPOSITION 65 (CA HEALTH & SAFETY CODE SECTION 25249.5): NONE KNOWN

CARCINOGEN IDENTIFICATION:
THIS MATERIAL HAS NOT BEEN IDENTIFIED AS A CARCINOGEN BY NTP, IARC, OR OSHA. SEE SECTION 11 FOR CARCINOGENICITY INFORMATION OF INDIVIDUAL COMPONENTS, IF ANY.

TSCA: ALL COMPONENTS ARE LISTED ON THE TSCA INVENTORY.

INTERNATIONAL REGULATIONS:

CANADIAN REGULATIONS:
THIS PRODUCT HAS BEEN CLASSIFIED IN ACCORDANCE WITH THE HAZARD CRITERIA OF THE CONTROLLED PRODUCTS REGULATIONS (CPR) AND THE MSDS CONTAINS ALL THE INFORMATION REQUIRED BY THE CPR.

DOMESTIC SUBSTANCES LIST: LISTED

WHMIS CLASSIFICATION: NOT REGULATED

16. OTHER INFORMATION

ISSUE DATE: 22-FEB-2005

PREVIOUS ISSUE DATE: 01/01/2002

PRODUCT CODE: 47601, 47602, 47603, 47604, 47605, 47606, 47607, 47609

REASON FOR REVISION:
COMBINED ALL GRADES INTO SINGLE MSDS.
CHANGED RESPONSIBLE PARTY FROM PHILLIPS TO CONOCO PHILLIPS. OTHER FORMATTING CHANGES

PREVIOUS PRODUCT CODE:
5246020000, 5233030000, 5247040000, 5248050000, 5249060000, 5250070000, 5251080000, 5252090000

MSDS CODE: 720080

DISCLAIMER OF EXPRESSED AND IMPLIED WARRANTIES:

THE INFORMATION PRESENTED IN THIS MATERIAL SAFETY DATA SHEET IS BASED ON DATA BELIEVED TO BE ACCURATE AS OF THE DATE THIS MATERIAL SAFETY DATA SHEET WAS PREPARED. HOWEVER, NO WARRANTY OF MERCHANTABILITY, FITNESS FOR ANY PARTICULAR PURPOSE, OR ANY OTHER WARRANTY IS EXPRESSED OR IS TO BE IMPLIED REGARDING THE ACCURACY OR COMPLETENESS OF THE INFORMATION PROVIDED ABOVE, THE RESULTS TO BE OBTAINED FROM THE USE OF THIS INFORMATION OR THE PRODUCT, THE SAFETY OF THIS PRODUCT, OR THE HAZARDS RELATED TO ITS USE. NO RESPONSIBILITY IS ASSUMED FOR ANY DAMAGE OR INJURY RESULTING FROM ABNORMAL USE OR FROM ANY FAILURE TO ADHERE TO RECOMMENDED PRACTICES. THE INFORMATION PROVIDED ABOVE, AND THE PRODUCT, ARE FURNISHED ON THE CONDITION THAT THE PERSON RECEIVING THEM SHALL MAKE THEIR OWN DETERMINATION AS TO THE SUITABILITY OF THE PRODUCT FOR THEIR PARTICULAR PURPOSE AND ON THE CONDITION THAT THEY ASSUME THE RISK OF THEIR USE. IN ADDITION, NO AUTHORIZATION IS GIVEN NOR IMPLIED TO PRACTICE ANY PATENTED INVENTION WITHOUT A LICENSE.

ACME REFINING
PREMIUM AW HYDRAULIC OIL LIGHT **Revised: 03/01/2009**

MSDS Contents

MATERIAL SAFETY DATA SHEET

SECTION I PRODUCT IDENTIFICATION

MANUFACTURER'S NAME: ACME REFINING

TELEPHONE NO: (216) 961-6900

ADDRESS:
3591 WEST 56TH STREET
CLEVELAND, OHIO 44102

TRADE NAME: ACME PREMIUM AW HYDRAULIC OIL LIGHT

DATE: MARCH 1, 2009

SECTION II HAZARDOUS INGREDIENTS

COMPONENT NAME PERCENT (OPTIONAL) TLV (UNITS) C.A.S REG. NO.

SARA TITLE III SECTION 313

NO ITEM LISTED IN SECTION 313 IS PRESENT IN THIS PRODUCT IN A REPORTABLE QUANTITY.

IN EVENT OF OIL MISTING - 5 MG./CUBIC METER

SECTION III PHYSICAL DATA

PROX. BOILING POINT C: N/A

FREEZING POINT: N/A

VOLATILITY/VOL (%): N/A

VAPOR PRESSURE (MMHg) @ 20 C: N/A

VAPOR DENSITY (AIR = 1): N/A

SOLUBILITY IN H2O: INSOLUBLE

APPEARANCE: CLEAR AMBER LIQUID

SPECIFIC GRAVITY: 0.87

EVAPORATION RATE: N/A

NFPA HAZARD IDENTIFICATION:

DEGREE OF HAZARD:
HEALTH 1
FIRE 1
REACTIVITY 0

HAZARD RATING:
0-LEAST
1-SLIGHT
2-MODERATE
3-HIGH
4-EXTREME

SECTION IV FIRE AND EXPLOSION HAZARD DATA

FLASH POINT F: 400 F. COC

LOWER EXPLOSIVE LIMIT: N/A
UPPER EXPLOSIVE LIMIT: N/A

EXTINGUISH MEDIA: USE CARBON DIOXIDE, FOAM, FOG, OR DRY CHEMICAL

FIRE & EXPLOSION HAZARDS: NONE

FIRE FIGHTING PROCEDURES:
HANDLE AS A PETROLEUM FIRE, AVOID SMOKE INHALATION, WEAR SELF-CONTAINED BREATHING APPARATUS.

SECTION V HEALTH INFORMATION

CARCINOGENICITY:
NTP?: NO
IARC MONOGRAPHS?: NO
OSHA REGULATED?: NO

EFFECTS OF OVEREXPOSURE: MILD IRRITATION OF EYES AND SKIN.

INGESTION: MAY CAUSE NAUSEA AND VOMITING

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: ALLERGY, ECZEMA OR SKIN CONDITIONS

FIRST AID:
EYE CONTACT: FLUSH WITH WATER UNTIL IRRITATION SUBSIDES
SKIN CONTACT: WIPE OFF WITH DRY CLOTH, WASH THOROUGHLY WITH SOAP.
INHALATION: REMOVE INDIVIDUAL TO FRESH AIR.
INGESTION: DO NOT INDUCE VOMITING, DRINK WATER OR MILK.

SECTION VI REACTIVITY DATA

CHEMICAL STABILITY: STABLE

CONDITIONS TO AVOID: NONE

INCOMPATIBLE MATERIALS: STRONG OXIDANTS

DECOMPOSITION PRODUCTS: CO., AND OTHER ASPHYXIATES

HAZARDOUS POLYMERIZATION: WILL NOT OCCUR

SECTION VII SPILL, LEAK & DISPOSAL PROCEDURES

ACTION TO TAKE FOR SPILL:
SOAK UP WITH CHEMICAL ABSORBENT. SHOVEL INTO A CONTAINER FOR DISPOSAL.

DISPOSAL METHOD:
DISPOSE OF IN ACCORDANCE WITH ALL LOCAL, STATE, AND FEDERAL REGULATIONS.

SECTION VIII SPECIAL HANDLING INFORMATION

VENTILATION:
LOCAL EXHAUST: RECOMMENDED
RESPIRATORY PROTECTION: NONE REQUIRED FOR NORMAL CONDITIONS.

PROTECTIVE CLOTHING: CHEMICAL RESISTANT GLOVES, SAFETY GOGGLES

HANDLING AND STORAGE: KEEP CONTAINER CLOSED WHEN NOT IN USE.

OTHER PRECAUTIONS:
DO NOT REUSE EMPTY CONTAINERS. DO NOT PRESSURIZE OR EXPOSE CONTAINERS TO HEAT OR FLAME. KEEP CLOSED WHEN NOT IN USE.

THE INFORMATION SUPPLIED ABOVE IS PRESENTED IN GOOD FAITH AND HAS BEEN DERIVED FROM SOURCES BELIEVED TO BE RELIABLE. HOWEVER, NO WARRANTY, EXPRESSED OR IMPLIED IS EXTENDED REGARDING ITS ACCURACY OR THE RESULTS TO BE OBTAINED FROM ITS USE, SINCE CONDITIONS OF USE ARE BEYOND OUR CONTROL. ALL RISKS ARE ASSUMED BY THE USER.

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Material Safety Data Sheet Collection
Genium group inc.
1171 RiverFront Center, Amsterdam, NY 12010
(518) 842-4111

Issue Date: 2006-06

Hydrochloric Acid
HYD2200

Section 1 - Chemical Product and Company Identification 61

Material Name: Hydrochloric Acid
CAS Number: 7647-01-0
Chemical Formula: ClH
Structural Chemical Formula: HCl
EINECS Number: 231-595-7
ACX Number: X1002202-3
Synonyms: 4-D BOWL SANITIZER; ACIDE CHLORHYDRIQUE; ACIDO CLORHIDRICO; ACIDO CLORIDRICO; ANHYDROUS HYDROCHLORIC ACID; ANHYDROUS HYDROGEN CHLORIDE; AQUEOUS HYDROGEN CHLORIDE; BOWL CLEANER; CHLOORWATERSTOF; CHLOROHYDRIC ACID; CHLOROWODOR; CHLORURE D'HYDROGENE; CHLORURE D'HYDROGENE ANHYDRE; CHLORURO DE HIDROGENO; CHLORWASSERSTOFF; CLORURO DE HIDROGENO ANHIDRO; EMULSION BOWL CLEANER; EPA PESTICIDE CHEMICAL CODE 045901; HYDROCHLORIC ACID; HYDROCHLORIC ACID GAS; HYDROCHLORIDE; HYDROGEN CHLORIDE; HYDROGEN CHLORIDE (HCL); HYGEIA CREME MAGIC BOWL CLEANER; MURIATIC ACID; MURIATIC ACID); NOW SOUTH SAFTI-SOL BRAND CONCENTRATED BOWL CLEANSE WITHMAGIC ACTIO; PERCLEEN BOWL AND URINAL CLEANER; SPIRITS OF SALT; VARLEY'S OCEAN BLUE SCENTED TOILET BOWL CLEANER; VARLEY POLY-PAK BOWL CREME; WHITE EMULSION BOWL CLEANER; WUEST BOWL CLEANER SUPER CONCENTRATED
General Use: Hydrogen chloride is used to produce pharmaceutical hydrochlorides; vinyl chloride from acetylene; alkyl chlorides from olefins and arsenious chloride from arsenious oxide; electronic grade for etching semiconductor crystals. Used in the chlorination of rubber; in organic reactions involving isomerization, polymerization and alkylation; as a catalyst and condensing agent; for making chlorine where economical; in the separation of cotton from wool and cotton de-linting; as flux in the babbitt type of metal alloy; etching semi-conductor crystals.
Hydrochloric acid is used for pickling and heavy duty cleaning of metal parts; rust and scale removal. The production of chlorides; neutralizing bases; a laboratory reagent. For hydrolyzing starch and proteins in preparations for food. As a catalyst and solvent in organic synthesis. As "spirits of salts" for cleaning of lime and masonry from new brickwork. As flux or flux component for soldering; manufacture of "killed spirits".

Section 2 - Composition / Information on Ingredients

Name	CAS	%
hydrogen chloride	7647-01-0	> 99.0

OSHA PEL
Ceiling: 5 ppm, 7 mg/m^3.

NIOSH REL
Ceiling: 5 ppm (7 mg/m^3).

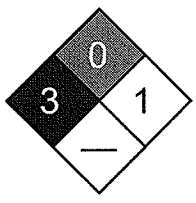
DFG (Germany) MAK
TWA: 5 ppm; PEAK: 5 ppm.

ACGIH TLV
Ceiling: 2 ppm.

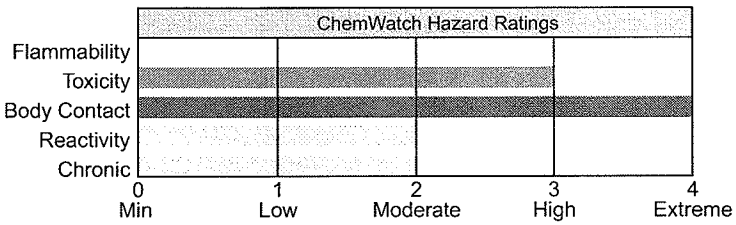
IDLH Level
50 ppm.

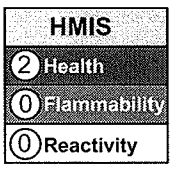
EU OEL
TWA: 5 ppm; STEL: 10 ppm.

Section 3 - Hazards Identification

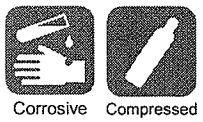


Fire Diamond





ANSI Signal Word
Danger!


Corrosive Compressed Gas

☆☆☆☆☆ Emergency Overview ☆☆☆☆☆

Colorless gas; characteristic suffocating, pungent odor. Corrosive. Stored as compressed gas which may cause frostbite. Chronic Effects: erosion of teeth.

Potential Health Effects

Target Organs: eyes, skin, respiratory system, liver (in animals)
Primary Entry Routes: inhalation, skin contact, eye contact
Acute Effects

Inhalation: The vapor is extremely discomforting to the upper respiratory tract, may cause severe mucous membrane damage and may be harmful if inhaled.
Inhalation of quantities of liquid mist may be extremely hazardous, even lethal due to spasm, extreme irritation of larynx and bronchi, chemical pneumonitis and pulmonary edema.
A single severe exposure may cause coughing and choking; bleeding of nose, inflammation and occasionally ulceration of the nose, throat and larynx. Fluid on the lungs followed by generalized lung damage may follow.
Breathing of vapor may aggravate asthma and inflammatory or fibrotic pulmonary disease.
High concentrations cause necrosis of the tracheal and bronchial epithelium, pulmonary edema, atelectasis and emphysema and damage to the pulmonary blood vessels and liver.
Inhalation hazard is increased at higher temperatures.
The vapor from heated material is extremely discomforting to the upper respiratory tract and lungs if inhaled.
Continued severe exposure can result in pulmonary edema and corrosion of tissues in the nose and throat.

Eye: Hydrogen Chloride: The vapor is extremely discomforting to the eyes and is capable of causing pain and severe conjunctivitis. Corneal injury may develop, with possible permanent impairment of vision, if not promptly and adequately treated.
The material may be irritating to the eye, with prolonged contact causing inflammation. Repeated or prolonged exposure to irritants may produce conjunctivitis.
Hydrochloric Acid: Eye contact is extremely painful and may cause rapid corneal damage. The liquid is extremely corrosive to the eyes and is capable of causing severe damage with loss of sight.
The vapor is highly discomforting and may be corrosive to the eyes. The vapor from heated material is extremely discomforting to the eyes.

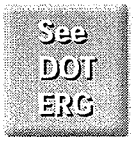
Skin: The material is corrosive to the skin and may cause chemical burns.
Toxic effects may result from skin absorption. Bare unprotected skin should not be exposed to this material. The material may accentuate any pre-existing skin condition.
The vapor is discomforting to the skin.

Ingestion: Considered an unlikely route of entry in commercial/industrial environments.
The liquid is extremely corrosive if swallowed and is capable of causing burns to mouth, throat, esophagus, with extreme discomfort, pain and may be fatal if swallowed in quantity. Ingestion may result in nausea, abdominal irritation, pain and vomiting.

Carcinogenicity: NTP - Not listed; IARC - Group 3, Not classifiable as to carcinogenicity to humans; OSHA - Not listed; NIOSH - Not listed; ACGIH - Not listed; EPA - Not listed; MAK - Not listed.

Chronic Effects: Chronic exposure may cause discoloration or erosion of the teeth, bleeding of the nose and gums; and ulceration of the nasal mucous membranes.
Repeated exposures of animals to concentrations of about 34 ppm produced no immediate toxic effects.
Workers exposed to hydrochloric acid suffered from gastritis and a number of cases of chronic bronchitis have also been reported.
Repeated or prolonged exposure to dilute solutions may cause dermatitis. Repeated exposure to low vapor concentrations can cause skin tenderness, bleeding of the nose and gums, chronic bronchitis, gastritis.

Section 4 - First Aid Measures



Inhalation: Remove to fresh air.
Lay patient down. Keep warm and rested.
If breathing is shallow or has stopped, ensure clear airway and apply resuscitation. Transport to hospital or doctor.

Eye Contact: Immediately hold the eyes open and flush continuously for at least 15 minutes with fresh running water. Ensure irrigation under eyelids by occasionally lifting the upper and lower lids.
Transport to hospital or doctor without delay. Removal of contact lenses after an eye injury should only be undertaken by skilled personnel.

Skin Contact: Immediately flush body and clothes with large amounts of water, using safety shower if available.
Quickly remove all contaminated clothing, including footwear.
Wash affected areas with water (and soap if available) for at least 15 minutes. Transport to hospital or doctor.

Ingestion: Contact a Poison Control Center. Rinse mouth out with plenty of water. Do NOT induce vomiting. Give a glass of water.

After first aid, get appropriate in-plant, paramedic, or community medical support.

Note to Physicians: For acute or short-term repeated exposures to strong acids:
1.Airway problems may arise from laryngeal edema and inhalation exposure.
Treat with 100% oxygen initially.
2.Respiratory distress may require cricothyroidotomy if endotracheal intubation is contraindicated by excessive swelling.

3. Intravenous lines should be established immediately in all cases where there is evidence of circulatory compromise.
4.Strong acids produce a coagulation necrosis characterized by formation of a coagulum (eschar) as a result of the desiccating action of the acid on proteins in specific tissues.

INGESTION:

1.Immediate dilution (milk or water) within 30 minutes post-ingestion is recommended.
2.Do not attempt to neutralize the acid since exothermic reaction may extend the corrosive injury.
3.Be careful to avoid further vomiting since re-exposure of the mucosa to the acid is harmful. Limit fluids to one or two glasses in an adult.
4.Charcoal has no place in acid management.
5.Some authors suggest the use of lavage within 1 hour of ingestion.

SKIN:

1.Skin lesions require copious saline irrigation. Treat chemical burns as thermal burns with non-adherent gauze and wrapping.
2.Deep second-degree burns may benefit from topical silver sulfadiazine.

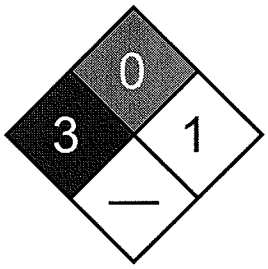
EYE:

1.Eye injuries require retraction of the eyelids to ensure thorough irrigation of the conjunctival cul-de-sacs. Irrigation should last at least 20-30 minutes. Do not use neutralizing agents or any other additives. Several liters of saline are required.
2.Cycloplegic drops (1% cyclopentolate for short-term use or 5% homatropine for longer term use), antibiotic drops, vasoconstrictive agents, or artificial tears may be indicated dependent on the severity of the injury.
3.Steroid eye drops should only be administered with the approval of a consulting ophthalmologist.

Section 5 - Fire-Fighting Measures

See DOT ERG

Flash Point: Nonflammable
Autoignition Temperature: Not applicable
LEL: Not applicable
UEL: Not applicable
Extinguishing Media: Water spray or fog; foam; Bromochlorodifluoromethane (BCF) (where regulations permit); Dry agent; Carbon dioxide.



Fire Diamond

General Fire Hazards/Hazardous Combustion Products: Noncombustible liquid. Will not burn, but heat produces highly toxic fumes/vapors.
Heating may cause expansion or decomposition leading to violent rupture of containers. Decomposes on heating and produces toxic fumes of hydrogen chloride. Decomposition may produce toxic fumes of chlorine.
Reacts with metals producing flammable/explosive hydrogen gas. Contact with moisture or water may generate heat causing ignition. Reacts vigorously with alkalis. Moderate fire hazard when in contact with reducing agents.

Fire Incompatibility: Reacts with metals producing flammable/explosive hydrogen gas.
Avoid reactions with metals, metal oxides, hydroxides, amines, carbonates, alkaline materials, acetic anhydride, cyanides, sulphides, sulphites, phosphides, acetylides, borides, carbides, silicides, vinyl acetate, formaldehyde and potassium permanganate, unsaturated organics, metal acetylides, sulphuric acid.
Note: Compatibility with plastics should be confirmed prior to use.

Fire-Fighting Instructions: Contact fire department and tell them location and nature of hazard.
Wear full body protective clothing with breathing apparatus. Prevent, by any means available, spillage from entering drains or waterways. Consider evacuation. Cool fire-exposed containers with water spray from a protected location. If safe to do so, remove containers from path of fire. Equipment should be thoroughly decontaminated after use. Water spray or fog may be used to disperse vapor. Do not approach cylinders suspected to be hot. If safe to do so, stop flow of gas.

Section 6 - Accidental Release Measures

See DOT ERG

Small Spills: DO NOT touch the spill material. Clean up all spills immediately. Wear fully protective PVC clothing and breathing apparatus. Contain and absorb spill with sand, earth, inert material or vermiculite. Use soda ash or slaked lime to neutralize. Collect residues and place in labeled plastic containers with vented lids. Clear area of personnel and move upwind. Avoid breathing vapors and contact with skin and eyes. Do not exert excessive pressure on valve; do not attempt to operate damaged valve. Water spray or fog may be used to disperse vapor.

Large Spills: Contact fire department and tell them location and nature of hazard. Clear area of personnel and move upwind. Wear full body protective clothing with breathing apparatus. Prevent, by any means available, spillage from entering drains or waterways. Consider evacuation. Stop leak if safe to do so. Remove leaking cylinders to a safe place if possible. Release pressure under safe, controlled conditions by opening the valve. Do not exert excessive pressure on valve; do not attempt to operate damaged valve. Shut off all possible sources of ignition and increase ventilation. Water spray or fog may be used to disperse vapor. Use soda ash or slaked lime to neutralize. Collect and seal in labeled drums for disposal. Wash spill area with large quantities of water. If contamination of

drains or waterways occurs, advise emergency services. After clean-up operations, decontaminate and launder all protective clothing and equipment before storing and reusing. DO NOT touch the spill material. Contain and absorb spill with sand, earth, inert material or vermiculite.
DO NOT USE WATER OR NEUTRALIZING AGENTS INDISCRIMINATELY ON LARGE SPILLS.
Regulatory Requirements: Follow applicable OSHA regulations (29 CFR 1910.120).

Section 7 - Handling and Storage

Handling Precautions: Avoid generating and breathing mist and vapor, breathing vapors and contact with skin and eyes.
Avoid physical damage to containers. Use in a well-ventilated area. Wear protective clothing and gloves when handling containers. Handle and open container with care.
WARNING: To avoid violent reaction, ALWAYS add material to water and NEVER water to material. When handling, DO NOT eat, drink or smoke. Always wash hands with soap and water after handling. Work clothes should be laundered separately. Use good occupational work practices. Observe manufacturer's storing and handling recommendations.
Atmosphere should be regularly checked against established exposure standards to ensure safe working conditions are maintained.
Local exhaust ventilation may be required for safe working, i.e. to keep exposures below required standards; otherwise, PPE is required.
Keep dry. Reacts violently with water.
Transport containers on a trolley. Avoid sources of heat. DO NOT transfer gas from one cylinder to another.
Recommended Storage Methods: Packaging as recommended by manufacturer. Check that containers are clearly labeled.
Cylinder. Ensure the use of equipment rated for cylinder pressure. Ensure the use of compatible materials of construction. Valve protection cap to be in place until cylinder is secured, connected. Cylinder must be properly secured either in use or in storage. Cylinder valve must be closed when not in use or when empty. Segregate full from empty cylinders. WARNING: Suckback into cylinder may result in rupture. Use back-flow preventive device in piping.
Hydrochloric acid: Packs of 2.5 litres or less require a child-resistant closure. Glass container or Plastic carboy or Polylined drum.
Regulatory Requirements: Follow applicable OSHA regulations.

Section 8 - Exposure Controls / Personal Protection

Engineering Controls: If risk of overexposure exists, wear air supplied breathing apparatus. Provide adequate ventilation in warehouse or closed storage areas. Use in a well-ventilated area. Local exhaust ventilation may be required for safe working, i. e. , to keep exposures below required standards; otherwise, PPE is required.
If risk of inhalation or overexposure exists, wear NIOSH-approved respirator or work in fume hood. Hydrogen chloride vapors will not be adequately absorbed by organic vapor respirators.
Personal Protective Clothing/Equipment:
Eyes: Chemical goggles. Full face shield.
DO NOT wear contact lenses. Contact lenses pose a special hazard; soft contact lenses may absorb irritants and all lenses concentrate them.
Hands/Feet: Neoprene gloves; rubber gloves. Nitrile gloves.
Safety footwear. Rubber boots.
Hydrochloric acid: Barrier cream and Neoprene gloves or Elbow length PVC gloves. Nitrile gloves.
PVC boots or PVC safety gumboots.
Respiratory Protection:
Exposure Range >5 to <50 ppm: Air Purifying, Negative Pressure, Half Mask
Exposure Range 50 to unlimited ppm: Self-contained Breathing Apparatus, Pressure Demand, Full Face
Cartridge Color: white
Other: Ensure there is ready access to a safety shower; Eyewash unit.
Acid-resistant overalls. Full protective suit. Operators should be trained in procedures for safe use of this material.
Glove Selection Index:

BUTYL	Best selection
BUTYL/NEOPRENE	Best selection
HYPALON	Best selection
NEOPRENE	Best selection
NEOPRENE/NATURAL	Best selection
NITRILE+PVC	Best selection
PE/EVAL/PE	Best selection
SARANEX-23	Best selection
VITON/NEOPRENE	Best selection
PVC	Best selection

NITRILE ..... Best selection
NATURAL RUBBER..... Satisfactory; may degrade after 4 hours continuous immersion
NATURAL+NEOPRENE..... Satisfactory; may degrade after 4 hours continuous immersion
NAT+NEOPR+NITRILE ..... Poor to dangerous choice for other than short-term immersion

Section 9 - Physical and Chemical Properties

Appearance/General Info: Hydrogen chloride: Colorless, corrosive gas. Pungent suffocating odor. White fumes in moist air. Soluble in methanol, ethanol, ether and benzene.
Hydrochloric acid: Clear to light yellow (orange tint for inhibited grades) fuming corrosive liquid with sharp, suffocating odor.

Physical State: Hydrogen chloride: Compressed gas; Hydrochloric acid: Liquid
Odor Threshold: 0.26 to 0.3 ppm
Vapor Pressure (kPa): < 24.8 at 25 °C
Vapor Density (Air=1): 1.268 at 20 °C
Formula Weight: 36.461
Specific Gravity (H_2O=1, at 4 °C): < 1.19 at 20 °C
Evaporation Rate: Slow

pH: Hydrochloric acid: < 1
Boiling Point: -85 °C (-121 °F)
Freezing/Melting Point: -114.44 °C (-173.992 °F)
Volatile Component (% Vol): 100
Decomposition Temperature (°C): Not applicable
Water Solubility: 56.1 g/100 cc hot water at 60 °C

Section 10 - Stability and Reactivity

Stability/Polymerization/Conditions to Avoid: Decomposes in the presence of moisture to produce corrosive acid. May generate sufficient heat to ignite combustible materials. Presence of heat source and direct sunlight (ultra-violet radiation). Product is considered stable under normal handling conditions. Hazardous polymerization will not occur.
Storage Incompatibilities: Hydrogen chloride: Segregate from most common metals and their alloys, alkalis, unsaturated organics, fluorine, metal carbides, metal acetylides, potassium permanganate and sulfuric acid. Compatibility with plastics should be confirmed prior to use.
Hydrochloric acid: Segregate from alkalies, oxidizing agents and chemicals readily decomposed by acids, i.e. cyanides, sulfides, carbonates. Avoid storage with metals, metal oxides, hydroxides, amines, carbonates, alkaline materials, acetic anhydride, cyanides, sulphides, sulphites, phosphides, acetylides, borides, carbides, silicides, vinyl acetate, formaldehyde and potassium permanganate. Reacts with zinc, brass, galvanized iron, aluminum, copper and copper alloys.

Section 11 - Toxicological Information

Toxicity
Inhalation (human) LC_{Lo}: 1300 ppm/30 m
Inhalation (human) LC_{Lo}: 3000 ppm/5 m
Inhalation (rat) LC_{50}: 3124 ppm/60 m
Inhalation (rat) LC_{50}: 4701 ppm/30 m
Oral (rat) LD_{50}: 900 mg/kg

Irritation
Eye (rabbit): 5 mg/30 s - mild

See *RTECS* MW 4025000, for additional data.

Section 12 - Ecological Information

Environmental Fate: No data found.
Ecotoxicity: TL_m Gambusia affinis (mosquito fish) 282 ppm/96 hr (fresh water) /Conditions of bioassay not specified; Lethal Lepomis macrochirus (bluegill sunfish) 3.6 mg/l/48 hr /Conditions of bioassay not specified; LC_{50} Cockle 330 to 1,000 mg/l/48 hr /Conditions of bioassay not specified; LC_{50} Carassius auratus (goldfish) 178 mg/l (1 to 2 hr survival time) /Conditions of bioassay not specified; LC_{50} Shore crab 240 mg/l/48 hr /Conditions of bioassay not specified; LC_{50} Shrimp 100 to 330 ppm/48 hr (salt water) /Conditions of bioassay not specified; LC_{100} Trout 10 mg/l 24 hr /Conditions of bioassay not specified
Biochemical Oxygen Demand (BOD): none

Section 13 - Disposal Considerations

Disposal: Recycle wherever possible. Consult manufacturer for recycling options. Treat and neutralize at an effluent treatment plant. Bury residue in an authorized landfill. Decontaminate empty containers with a lime slurry. Return empty containers to supplier or bury empty containers at an authorized landfill.
Return empty cylinders to supplier.

Section 14 - Transport Information

DOT Hazardous Materials Table Data (49 CFR 172.101):

Note: This material has multiple possible HMT entries. Choose the appropriate one based on state and condition of specific material when shipped.

Shipping Name and Description: Hydrogen chloride, anhydrous
ID: UN1050
Hazard Class: 2.3 - Poisonous gas
Packing Group:
Symbols:
Label Codes: 2.3 - Poison Gas, 8 - Corrosive
Special Provisions: 3
Packaging: **Exceptions:** None **Non-bulk:** 304 **Bulk:** None
Quantity Limitations: **Passenger aircraft/rail:** Forbidden **Cargo aircraft only:** Forbidden
Vessel Stowage: **Location:** D **Other:** 40

Shipping Name and Description: Hydrochloric acid
ID: UN1789
Hazard Class: 8 - Corrosive material
Packing Group: II - Medium Danger
Symbols:
Label Codes: 8 - Corrosive
Special Provisions: A3, A6, B3, B15, IB2, N41, T8, TP2, TP12
Packaging: **Exceptions:** 154 **Non-bulk:** 202 **Bulk:** 242
Quantity Limitations: **Passenger aircraft/rail:** 1 L **Cargo aircraft only:** 30 L
Vessel Stowage: **Location:** C **Other:**

Shipping Name and Description: Hydrochloric acid
ID: UN1789
Hazard Class: 8 - Corrosive material
Packing Group: III - Minor Danger
Symbols:
Label Codes: 8 - Corrosive
Special Provisions: IB3, T4, TP1, TP12
Packaging: **Exceptions:** 154 **Non-bulk:** 203 **Bulk:** 241
Quantity Limitations: **Passenger aircraft/rail:** 5 L **Cargo aircraft only:** 60 L
Vessel Stowage: **Location:** C **Other:**

Section 15 - Regulatory Information

EPA Regulations:
RCRA 40 CFR: Not listed
CERCLA 40 CFR 302.4: Listed per CWA Section 311(b)(4) 5000 lb (2268 kg)
SARA 40 CFR 372.65: Listed
SARA EHS 40 CFR 355: Listed
RQ: 5000 lb
TPQ: 500 lb
TSCA: Listed

Section 16 - Other Information

Disclaimer: Judgments as to the suitability of information herein for the purchaser's purposes are necessarily the purchaser's responsibility. Although reasonable care has been taken in the preparation of such information, Genium Group, Inc. extends no warranties, makes no representations, and assumes no responsibility as to the accuracy or suitability of such information for application to the purchaser's intended purpose or for consequences of its use.

Material Safety Data Sheet Collection
Genium group inc.
1171 RiverFront Center, Amsterdam, NY 12010
(518) 842-4111

Hydrogen Peroxide Solution 20-60%
HYD2600

Issue Date: 2006-06

Section 1 - Chemical Product and Company Identification 61

Material Name: Hydrogen Peroxide Solution 20-60% **CAS Number:** 7722-84-1
Chemical Formula: H_2O_2
Structural Chemical Formula: H_2O_2
EINECS Number: 231-765-0
ACX Number: X1002204-7
Synonyms: ALBONE; ALBONE 35; ALBONE 50; ALBONE 70; ALBONE 35CG; ALBONE 50CG; ALBONE 70CG; ALBONE DS; DIHYDROGEN DIOXIDE; HIGH-STRENGTH HYDROGEN PEROXIDE; HIOXYL; HYDROGEN DIOXIDE; HYDROGEN DIOXIDE SOLUTION; HYDROGEN PEROXIDE; HYDROGEN PEROXIDE (AQUEOUS); HYDROGEN PEROXIDE SOLUTION; HYDROGEN PEROXIDE SOLUTION (30%); HYDROGEN PEROXIDE SOLUTION 20-60%; HYDROPEROXIDE; INHIBINE; INTEROX; KASTONE; PERHYDROL; PERONE 30; PERONE 35; PERONE 50; PEROSSIDO DI IDROGENO; PEROXAAN; PEROXAN; PEROXIDE; PEROXYDE D'HYDROGENE; T-STUFF; SUPEROXOL; WASSERSTOFFPEROXID; WATERSTOFPEROXYDE
General Use: At varying concentrations used for bleaching and deodorizing of textiles, wood pulp, hair, fur etc.; source of organic and inorganic peroxides; pulp and paper industry; plasticizers; rocket fuel; foam rubber; manufacture of glycerol; antichlor; dyeing; electroplating; antiseptic, laboratory reagent, epoxidation, hydroxylation, oxidation and reduction; viscosity control for starch and cellulose derivatives; refining and cleaning metals; bleaching and oxidizing agent in food; neutralizing agent in wine distillation; seed disinfectant; substitute for chlorine water and sewage treatment.
Pharmaceutical grades : 200 Volume (50% H_2O_2) and 100 Volume (30% H_2O_2).

Section 2 - Composition / Information on Ingredients

Name	CAS	%
hydrogen peroxide	7722-84-1	20 - 60
water	7732-18-5	40 - 80

OSHA PEL
TWA: 1 ppm, 1.4 mg/m^3.

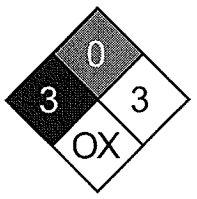
NIOSH REL
TWA: 1 ppm (1.4 mg/m^3).

DFG (Germany) MAK
TWA: 1 ppm; PEAK: 1 ppm.

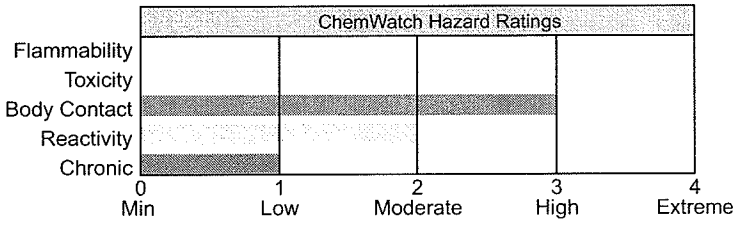
ACGIH TLV
TWA: 1 ppm.

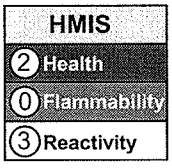
IDLH Level
75 ppm.

Section 3 - Hazards Identification



Fire Diamond





ANSI Signal Word
Danger!


Corrosive

☆☆☆☆☆ Emergency Overview ☆☆☆☆☆

Colorless liquid; slight acrid odor (high concentrations). Corrosive. Other Acute Effects: difficulty breathing, salivation, giddiness, muscle weakness, tremors/numbness of extremities, pulmonary edema, possible sight loss. Strong oxidizer.

Potential Health Effects

Target Organs: eyes, skin, respiratory system, central nervous system (CNS)
Primary Entry Routes: inhalation, skin contact, eye contact

Acute Effects

Inhalation: The vapor/mist is highly discomforting and corrosive to the upper respiratory tract.
Inhalation of excessive levels of mist may result in headache, dizziness, vomiting, diarrhea, irritability, insomnia and, in extreme cases, pulmonary edema.

Eye: The liquid is discomforting and is highly corrosive to the eyes and is capable of causing severe damage with loss of sight.
Reactions may not occur on exposure but response may be delayed with symptoms only appearing many hours later and may cause severe ulceration.

Skin: Skin contact will result in rapid drying and bleaching, leading to chemical burns on prolonged contact. Bare unprotected skin should not be exposed to this material. The material may accentuate any pre-existing skin condition.

Ingestion: The liquid is highly corrosive if swallowed and is capable of causing burns to mouth, throat, esophagus, with extreme discomfort, pain. Ingestion may result in nausea, abdominal irritation, pain, vomiting, and possible internal bleeding. Released oxygen gas may cause distension, pain, even severe organ damage.

Carcinogenicity: NTP - Not listed; IARC - Group 3, Not classifiable as to carcinogenicity to humans; OSHA - Not listed; NIOSH - Not listed; ACGIH - Class A3, Animal carcinogen; EPA - Not listed; MAK - Not listed.

Chronic Effects: Severe systemic poisoning can cause tremors and numbness of the extremities, shock, convulsions, and unconsciousness.

Section 4 - First Aid Measures

See DOT ERG

Inhalation: Remove to fresh air. Lay patient down. Keep warm and rested. If breathing is shallow or has stopped, ensure clear airway and apply resuscitation. Transport to hospital or doctor.

Eye Contact: Immediately hold the eyes open and wash continuously for at least 15 minutes with fresh running water. Ensure irrigation under eyelids by occasionally lifting the upper and lower lids. Transport to hospital or doctor without delay.
Removal of contact lenses after an eye injury should only be undertaken by skilled personnel.

Skin Contact: Immediately flush body and clothes with large amounts of water, using safety shower if available. Quickly remove all contaminated clothing, including footwear. Wash affected areas with water (and soap if available) for at least 15 minutes. Transport to hospital or doctor.

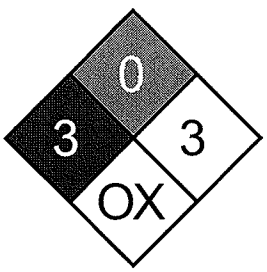
Ingestion: Rinse mouth out with plenty of water. Contact a Poison Control Center.
If swallowed, do NOT induce vomiting. Give a glass of water.

After first aid, get appropriate in-plant, paramedic, or community medical support.

Note to Physicians: Treat symptomatically.

Section 5 - Fire-Fighting Measures

See DOT ERG



Fire Diamond

Flash Point: Nonflammable

LEL: 40% v/v

UEL: 100% v/v

Extinguishing Media: Flooding quantities of water only in the early stages of a fire.
Water spray or fog. DO NOT use halogenated fire extinguishing agents.

General Fire Hazards/Hazardous Combustion Products: Non combustible liquid. Will not burn but increases intensity of fire. Contact with readily oxidizable organic material may cause ignition/fire. Heating may cause expansion or decomposition, leading to violent rupture of containers.

Fire Incompatibility: Avoid contact with organic materials/compounds, particularly finely divided combustible materials, as ignition may result. Violent catalytic decomposition will occur in contact with certain metals such as iron, copper, chromium, brass, bronze, lead, silver, manganese or their salts.

Fire-Fighting Instructions: Alert fire department and tell them location and nature of hazard..
May be violently or explosively reactive. Wear full body protective clothing with breathing apparatus. Prevent, by any means available, spillage from entering drains or water ways. Use fire fighting procedures suitable for surrounding area. Cool fire exposed containers with water spray from a protected location. Do not approach containers suspected to be hot. If safe to do so, remove containers from path of fire.

Section 6 - Accidental Release Measures

See DOT ERG

Small Spills: Clean up all spills immediately. Avoid contact with skin and eyes. Wear impervious gloves and safety glasses. Remove all ignition sources. Small quantities may be discharged to sewer with a large excess of water. Wipe up.

Large Spills: Clear area of personnel and move upwind. Alert fire department and tell them location and nature of hazard.
May be violently or explosively reactive. Wear full body protective clothing with breathing apparatus. Prevent, by any means available, spillage from entering drains or water ways. No smoking, bare lights or ignition sources.

Increase ventilation. Stop leak if safe to do so. Contain spill with sand, earth or vermiculite. Collect recoverable product into labeled containers for recycling. DO NOT return unused product to containers. Absorb remaining product with sand, earth or vermiculite. Collect residues and place in labeled plastic containers with vented lids. Wash spill area with large quantities of water.

After clean up operations, decontaminate and launder all protective clothing and equipment before storing and re-using. If contamination of drains or waterways occurs, advise emergency services.

Regulatory Requirements: Follow applicable OSHA regulations (29 CFR 1910.120).

Section 7 - Handling and Storage

Handling Precautions: Avoid generating and breathing mist. Handle and open container with care. Atmosphere should be regularly checked against established exposure standards to ensure safe working conditions are maintained. Use good occupational work practice. Observe manufacturer's storing and handling recommendations. Avoid all personal contact, including inhalation. Wear protective clothing when risk of exposure occurs. Avoid smoking, bare lights, heat or ignition sources. Use in a well-ventilated area. Avoid contact with incompatible materials. DO NOT return unused product to containers. Avoid sources of heat. Mild steel, brass, bronze and copper equipment should not be used. When handling, DO NOT eat, drink or smoke. Always wash hands with soap and water after handling. Work clothes should be laundered separately. Launder contaminated clothing before re-use.

Recommended Storage Methods: Packaging as recommended by manufacturer. Check that containers are clearly labelled. Glass container. Container to have vented cap. Properly passivated aluminium or stainless steel containers. Polyethylene containers or porcelain, vitreous stoneware.

Regulatory Requirements: Follow applicable OSHA regulations.

Section 8 - Exposure Controls / Personal Protection

Engineering Controls: Use in a well-ventilated area.

Personal Protective Clothing/Equipment:

Eyes: Chemical goggles. Full face shield.

Contact lenses pose a special hazard; soft lenses may absorb irritants and all lenses concentrate them.

Hands/Feet: Barrier cream and PVC gloves. Rubber boots.

Respiratory Protection:

Exposure Range >1 to 50 ppm: Supplied Air, Constant Flow/Pressure Demand, Half Mask

Exposure Range >50 to <75 ppm: Supplied Air, Constant Flow/Pressure Demand, Full Face

Exposure Range 75 to unlimited ppm: Self-contained Breathing Apparatus, Pressure Demand, Full Face

Note: odor threshold unknown

Other: Do not allow clothing wet with material to stay in contact with skin. Overalls, PVC apron and impervious apron. Eyewash unit. Ensure there is ready access to a safety shower.

Glove Selection Index:

NEOPRENE..... Best selection

NATURAL RUBBER..... Satisfactory; may degrade after 4 hours continuous immersion

Section 9 - Physical and Chemical Properties

Appearance/General Info: Clear, colorless, water-like liquid with a slightly sharp odor. Hydrogen peroxide readily decomposes and requires stabilization. Soluble in ether, insoluble in hydrocarbons and decomposed by many organic solvents.

Material hazard increases as concentration of peroxide increases.

Concentration (%w/w)	27.5	35	50	59.5
Boiling Pt.	106	107	114	119
Melting Pt.	-23	-33	-52	-56
Vap. Press. (mmHg)	15	13	10	8
Spec. grav.	1.10	1.13	1.20	1.24

Self accelerating decomposition temperature SADT (°C) >50 for all concentrations.

Physical State: Liquid

Vapor Density (Air=1): Not applicable.

Formula Weight: Not applicable.

Evaporation Rate: Not available

pH: Not available

pH (1% Solution): Not available.

Volatile Component (% Vol): Not available.

Decomposition Temperature (°C): Not applicable

Water Solubility: Miscible with water

Section 10 - Stability and Reactivity

Stability/Polymerization/Conditions to Avoid: Avoid any contamination of this material as it is very reactive and any contamination is potentially hazardous. Presence of heat source and direct sunlight. Solutions of hydrogen peroxide decompose slowly releasing oxygen. Heat or contaminants will accelerate decomposition. Containers may be pressurized. Hydrogen peroxide is decomposed by alkalis and even ordinary dust or rust.

Storage Incompatibilities: Rotate all stock to prevent aging. Use on FIFO (First In-First Out) basis. Segregate from combustible materials, particularly finely divided combustible materials and reducing agents.

Section 11 - Toxicological Information

Not available. Refer to individual constituents.

See *RTECS* MX 0899500, for additional data.

Section 12 - Ecological Information

Environmental Fate: No data found.
Ecotoxicity: Aquatic toxicity: more than 40 ppm/time period not specified/fingerling trout/toxic/salt water
Biochemical Oxygen Demand (BOD): none

Section 13 - Disposal Considerations

Disposal: Recycle wherever possible. Consult manufacturer for recycling options. Consult State Land Waste Management Authority for disposal. Decompose small amounts by slowly adding to warm caustic solution. Puncture containers to prevent re-use.

Section 14 - Transport Information

DOT Hazardous Materials Table Data (49 CFR 172.101):

Note: This material has multiple possible HMT entries. Choose the appropriate one based on state and condition of specific material when shipped.

Shipping Name and Description: Hydrogen peroxide, aqueous solutions *with more than 40 percent but not more than 60 percent hydrogen peroxide (stabilized as necessary)*
ID: UN2014
Hazard Class: 5.1 - Oxidizer
Packing Group: II - Medium Danger
Symbols:

Label Codes: 5.1 - Oxidizer, 8 - Corrosive
Special Provisions: 12, A3, A6, B53, B80, B81, B85, IB2, IP5, T7, TP2, TP6, TP24, TP37
Packaging: **Exceptions:** None **Non-bulk:** 202 **Bulk:** 243
Quantity Limitations: **Passenger aircraft/rail:** Forbidden **Cargo aircraft only:** Forbidden
Vessel Stowage: **Location:** D **Other:** 25, 66, 75, 106

Shipping Name and Description: Hydrogen peroxide, aqueous solutions *with not less than 20 percent but not more than 40 percent hydrogen peroxide (stabilized as necessary)*
ID: UN2014
Hazard Class: 5.1 - Oxidizer
Packing Group: II - Medium Danger
Symbols:

Label Codes: 5.1 - Oxidizer, 8 - Corrosive
Special Provisions: A2, A3, A6, B53, IB2, IP5, T7, TP2, TP6, TP24, TP37
Packaging: **Exceptions:** None **Non-bulk:** 202 **Bulk:** 243
Quantity Limitations: **Passenger aircraft/rail:** 1 L **Cargo aircraft only:** 5 L
Vessel Stowage: **Location:** D **Other:**

Section 15 - Regulatory Information

EPA Regulations:
RCRA 40 CFR: Not listed
CERCLA 40 CFR 302.4: Not listed
SARA 40 CFR 372.65: Not listed
SARA EHS 40 CFR 355: Listed
RQ: 1000 lb
TPQ: 1000 lb
TSCA: Listed

Section 16 - Other Information

Disclaimer: Judgments as to the suitability of information herein for the purchaser's purposes are necessarily the purchaser's responsibility. Although reasonable care has been taken in the preparation of such information, Genium Group, Inc. extends no warranties, makes no representations, and assumes no responsibility as to the accuracy or suitability of such information for application to the purchaser's intended purpose or for consequences of its use.

76 LUBRICANTS
SUPER MOTOR OIL **Revised: 10/15/2004**

MSDS Contents

76 LUBRICANTS

MSDS CODE: 721780

STATUS: FINAL

DATE OF ISSUE: 15-OCT-2004

MATERIAL SAFETY DATA SHEET

76 SUPER MOTOR OIL

1. PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME: 76 SUPER MOTOR OIL

PRODUCT CODE: 1043226, 1043286, 1043331, 1043376, 1043401

INTENDED USE: CRANKCASE OIL

SYNONYMS:
76 SUPER MOTOR OIL, SAE 10W-30
76 SUPER MOTOR OIL, SAE 10W-40
76 SUPER MOTOR OIL, SAE 20W-50
76 SUPER MOTOR OIL, SAE 30
76 SUPER MOTOR OIL, SAE 40

RESPONSIBLE PARTY:
76 LUBRICANTS
A DIVISION OF CONOCOPHILLIPS
600 N. DAIRY ASHFORD
HOUSTON, TEXAS 77079-1175

CUSTOMER SERVICE: 888-766-7676

TECHNICAL INFORMATION: 800-435-7761

THE INTENDED USE OF THIS PRODUCT IS INDICATED ABOVE. IF ANY ADDITIONAL USE IS KNOWN, PLEASE CONTACT US AT THE TECHNICAL INFORMATION NUMBER LISTED.

EMERGENCY OVERVIEW:

24 HOUR EMERGENCY TELEPHONE NUMBERS:
SPILL, LEAK, FIRE OR ACCIDENT CALL CHEMTREC:
NORTH AMERICA: (800) 424-9300
OTHERS: (703) 527-3887 (COLLECT)

CALIFORNIA POISON CONTROL SYSTEM: (800) 356-3219

HEALTH HAZARDS/PRECAUTIONARY MEASURES:
AVOID CONTACT WITH EYES, SKIN AND CLOTHING. WASH THOROUGHLY AFTER HANDLING.

PHYSICAL HAZARDS/PRECAUTIONARY MEASURES:
KEEP AWAY FROM ALL SOURCES OF IGNITION.

APPEARANCE: CLEAR, AMBER

PHYSICAL FORM: LIQUID

ODOR: CHARACTERISTIC PETROLEUM

NFPA 704 HAZARD CLASS:
HEALTH: 1 (SLIGHT)
FLAMMABILITY: 1 (SLIGHT)
INSTABILITY: 0 (LEAST)

HMIS HAZARD CLASS:
HEALTH: 1 (SLIGHT)
FLAMMABILITY: 1 (SLIGHT)
PHYSICAL HAZARDS: 0 (LEAST)

2. COMPOSITION/INFORMATION ON INGREDIENTS

HAZARDOUS COMPONENTS:

COMPONENT/CAS NO	PERCENT (%)	ACGIH	OSHA	NIOSH	OTHER
ZINC COMPOUND(S) PROPRIETARY	0.5-1.5	NE	NE	NE	NE

NON-HAZARDOUS COMPONENTS:

COMPONENT/CAS NO	PERCENT (%)	ACGIH	OSHA	NIOSH	OTHER
LUBRICANT BASE OIL (PETROLEUM) VARIOUS STEL 5 MG/M3 NOHSC TWA	77-91	5 MG/M3 TWA 10 MG/M3	5 MG/M3 TWA	2500 MG/M3 IDLH	AS OIL MIST, IF GENERATED
ADDITIVES PROPRIETARY	9-23	NE	NE	NE	NE

ALL COMPONENTS ARE LISTED ON THE TSCA INVENTORY.

THE BASE OIL FOR THIS PRODUCT CAN BE A MIXTURE OF ANY OF THE FOLLOWING HIGHLY REFINED PETROLEUM STREAMS:
CAS 64741-88-4; CAS 64741-89-5; CAS 64741-96-4; CAS 64741-97-5;
CAS 64742-01-4; CAS 64742-52-5; CAS 64742-53-6; CAS 64742-54-7;
CAS 64742-55-8; CAS 64742-56-9; CAS 64742-57-0; CAS 64742-62-7;
CAS 64742-63-8; CAS 64742-65-0; CAS 72623-83-7; CAS 72623-85-9;
CAS 72623-86-0; CAS 72623-87-1

NOTE:
STATE, LOCAL OR OTHER AGENCIES OR ADVISORY GROUPS MAY HAVE ESTABLISHED MORE STRINGENT LIMITS. CONSULT AN INDUSTRIAL HYGIENIST OR SIMILAR PROFESSIONAL, OR YOUR LOCAL AGENCIES, FOR FURTHER INFORMATION.

1%=10,000 PPM.
NE=NOT ESTABLISHED

3. HAZARDS IDENTIFICATION

POTENTIAL HEALTH EFFECTS:

EYE:
CONTACT MAY CAUSE MILD EYE IRRITATION INCLUDING STINGING, WATERING, AND REDNESS.

SKIN:
CONTACT MAY CAUSE MILD SKIN IRRITATION INCLUDING REDNESS, AND A BURNING SENSATION. PROLONGED OR REPEATED CONTACT CAN WORSEN IRRITATION BY CAUSING DRYING AND CRACKING OF THE SKIN LEADING TO DERMATITIS (INFLAMMATION). NO HARMFUL EFFECTS FROM SKIN ABSORPTION ARE EXPECTED.

INHALATION (BREATHING):
NO INFORMATION AVAILABLE. STUDIES BY OTHER EXPOSURE ROUTES SUGGEST A LOW DEGREE OF TOXICITY BY INHALATION.

INGESTION (SWALLOWING): NO HARMFUL EFFECTS EXPECTED FROM INGESTION.

SIGNS AND SYMPTOMS:
EFFECTS OF OVEREXPOSURE MAY INCLUDE IRRITATION OF THE NOSE AND THROAT, IRRITATION OF THE RESPIRATORY TRACT, NAUSEA, DIARRHEA.

CANCER:
INADEQUATE EVIDENCE AVAILABLE TO EVALUATE THE CANCER HAZARD OF THIS MATERIAL. SEE SECTION 11 FOR CARCINOGENICITY INFORMATION OF INDIVIDUAL COMPONENTS, IF ANY.

TARGET ORGANS: NO DATA AVAILABLE FOR THIS MATERIAL.

DEVELOPMENTAL: NO DATA AVAILABLE FOR THIS MATERIAL.

PRE-EXISTING MEDICAL CONDITIONS:
CONDITIONS AGGRAVATED BY EXPOSURE MAY INCLUDE SKIN DISORDERS.

4. FIRST AID MEASURES

EYE:
IF IRRITATION OR REDNESS DEVELOPS, MOVE VICTIM AWAY FROM EXPOSURE AND INTO FRESH AIR. FLUSH EYES WITH CLEAN WATER. IF SYMPTOMS PERSIST, SEEK MEDICAL ATTENTION.

SKIN:
WIPE MATERIAL FROM SKIN AND REMOVE CONTAMINATED SHOES AND CLOTHING. CLEANSE AFFECTED AREA(S) THOROUGHLY BY WASHING WITH MILD SOAP AND WATER AND, IF NECESSARY, A WATERLESS SKIN CLEANSER. IF IRRITATION OR REDNESS DEVELOPS AND PERSISTS, SEEK MEDICAL ATTENTION.

INHALATION (BREATHING):

IF RESPIRATORY SYMPTOMS DEVELOP, MOVE VICTIM AWAY FROM SOURCE OF EXPOSURE AND INTO FRESH AIR. IF SYMPTOMS PERSIST, SEEK MEDICAL ATTENTION. IF VICTIM IS NOT BREATHING, CLEAR AIRWAY AND IMMEDIATELY BEGIN ARTIFICIAL RESPIRATION. IF BREATHING DIFFICULTIES DEVELOP, OXYGEN SHOULD BE ADMINISTERED BY QUALIFIED PERSONNEL. SEEK IMMEDIATE MEDICAL ATTENTION.

INGESTION (SWALLOWING):
FIRST AID IS NOT NORMALLY REQUIRED; HOWEVER, IF SWALLOWED AND SYMPTOMS DEVELOP, SEEK MEDICAL ATTENTION.

NOTES TO PHYSICIAN:
HIGH-PRESSURE HYDROCARBON INJECTION INJURIES MAY PRODUCE SUBSTANTIAL NECROSIS OF UNDERLYING TISSUE DESPITE AN INNOCUOUS APPEARING EXTERNAL WOUND. OFTEN THESE INJURIES REQUIRE EXTENSIVE EMERGENCY SURGICAL DEBRIDEMENT AND ALL INJURIES SHOULD BE EVALUATED BY A SPECIALIST IN ORDER TO ASSESS THE EXTENT OF INJURY.

ACUTE ASPIRATIONS OF LARGE AMOUNTS OF OIL-LADEN MATERIAL MAY PRODUCE A SERIOUS ASPIRATION PNEUMONIA. PATIENTS WHO ASPIRATE THESE OILS SHOULD BE FOLLOWED FOR THE DEVELOPMENT OF LONG-TERM SEQUELAE. INHALATION EXPOSURE TO OIL MISTS BELOW CURRENT WORKPLACE EXPOSURE LIMITS IS UNLIKELY TO CAUSE PULMONARY ABNORMALITIES.

5. FIRE-FIGHTING MEASURES

FLAMMABLE PROPERTIES:

FLASH POINT: 365 DEG. F/185 DEG. C (PMCC) APPROXIMATELY

OSHA FLAMMABILITY CLASS: NOT REGULATED

NFPA FLAMMABILITY CLASS: NO DATA

LEL%: NO DATA
UEL%: NO DATA

AUTOIGNITION TEMPERATURE: NO DATA

UNUSUAL FIRE & EXPLOSION HAZARDS:
THIS MATERIAL MAY BURN, BUT WILL NOT IGNITE READILY. VAPORS ARE HEAVIER THAN AIR AND CAN ACCUMULATE IN LOW AREAS. IF CONTAINER IS NOT PROPERLY COOLED, IT CAN RUPTURE IN THE HEAT OF A FIRE.

EXTINGUISHING MEDIA:
DRY CHEMICAL, CARBON DIOXIDE, FOAM, OR WATER SPRAY IS RECOMMENDED. WATER OR FOAM MAY CAUSE FROTHING OF MATERIALS HEATED ABOVE 212 DEG. F. CARBON DIOXIDE CAN DISPLACE OXYGEN. USE CAUTION WHEN APPLYING CARBON DIOXIDE IN CONFINED SPACES.

FIRE FIGHTING INSTRUCTIONS:
FOR FIRES BEYOND THE INCIPIENT STAGE, EMERGENCY RESPONDERS IN THE IMMEDIATE HAZARD AREA SHOULD WEAR BUNKER GEAR. WHEN THE POTENTIAL CHEMICAL HAZARD IS UNKNOWN, IN ENCLOSED OR CONFINED SPACES, OR WHEN EXPLICITLY REQUIRED BY DOT, A SELF CONTAINED BREATHING APPARATUS SHOULD BE WORN. IN ADDITION, WEAR OTHER APPROPRIATE PROTECTIVE EQUIPMENT AS CONDITIONS WARRANT (SEE SECTION 8).

ISOLATE IMMEDIATE HAZARD AREA, KEEP UNAUTHORIZED PERSONNEL OUT. STOP SPILL/RELEASE IF IT CAN BE DONE WITH MINIMAL RISK. MOVE UNDAMAGED CONTAINERS FROM IMMEDIATE HAZARD AREA IF IT CAN BE DONE WITH MINIMAL RISK.

WATER SPRAY MAY BE USEFUL IN MINIMIZING OR DISPERSING VAPORS AND TO PROTECT PERSONNEL. COOL EQUIPMENT EXPOSED TO FIRE WITH WATER, IF IT CAN BE DONE WITH

MINIMAL RISK. AVOID SPREADING BURNING LIQUID WITH WATER USED FOR COOLING PURPOSES.

6. ACCIDENTAL RELEASE MEASURES

THIS MATERIAL MAY BURN, BUT WILL NOT IGNITE READILY. KEEP ALL SOURCES OF IGNITION AWAY FROM SPILL/RELEASE.

STAY UPWIND AND AWAY FROM SPILL/RELEASE. NOTIFY PERSONS DOWN WIND OF THE SPILL/RELEASE, ISOLATE IMMEDIATE HAZARD AREA AND KEEP UNAUTHORIZED PERSONNEL OUT. STOP SPILL/RELEASE IF IT CAN BE DONE WITH MINIMAL RISK. WEAR APPROPRIATE PROTECTIVE EQUIPMENT INCLUDING RESPIRATORY PROTECTION AS CONDITIONS WARRANT (SEE SECTION 8).

PREVENT SPILLED MATERIAL FROM ENTERING SEWERS, STORM DRAINS, OTHER UNAUTHORIZED DRAINAGE SYSTEMS, AND NATURAL WATERWAYS. DIKE FAR AHEAD OF SPILL FOR LATER RECOVERY OR DISPOSAL. SPILLED MATERIAL MAY BE ABSORBED INTO AN APPROPRIATE ABSORBENT MATERIAL.

NOTIFY FIRE AUTHORITIES AND APPROPRIATE FEDERAL, STATE, AND LOCAL AGENCIES. IMMEDIATE CLEANUP OF ANY SPILL IS RECOMMENDED. IF SPILL OF ANY AMOUNT IS MADE INTO OR UPON NAVIGABLE WATERS, THE CONTIGUOUS ZONE, OR ADJOINING SHORELINES, NOTIFY THE NATIONAL RESPONSE CENTER (PHONE NUMBER 800-424-8802).

7. HANDLING AND STORAGE

HANDLING:
DO NOT ENTER CONFINED SPACES SUCH AS TANKS OR PITS WITHOUT FOLLOWING PROPER ENTRY PROCEDURES SUCH AS ASTM D-4276 AND 29CFR 1910.146. THE USE OF APPROPRIATE RESPIRATORY PROTECTION IS ADVISED WHEN CONCENTRATIONS EXCEED ANY ESTABLISHED EXPOSURE LIMITS (SEE SECTIONS 2 AND 8).

DO NOT WEAR CONTAMINATED CLOTHING OR SHOES. WASH THOROUGHLY AFTER HANDLING. USE GOOD PERSONAL HYGIENE PRACTICES.

HIGH PRESSURE INJECTION OF HYDROCARBON FUELS, HYDRAULIC OILS OR GREASES UNDER THE SKIN MAY HAVE SERIOUS CONSEQUENCES EVEN THOUGH NO SYMPTOMS OR INJURY MAY BE APPARENT. THIS CAN HAPPEN ACCIDENTALLY WHEN USING HIGH PRESSURE EQUIPMENT SUCH AS HIGH PRESSURE GREASE GUNS, FUEL INJECTION APPARATUS OR FROM PINHOLE LEAKS IN TUBING OF HIGH PRESSURE HYDRAULIC OIL EQUIPMENT.

"EMPTY" CONTAINERS RETAIN RESIDUE AND MAY BE DANGEROUS. DO NOT PRESSURIZE, CUT, WELD, BRAZE, SOLDER, DRILL, GRIND, OR EXPOSE SUCH CONTAINERS TO HEAT, FLAME, SPARKS, OR OTHER SOURCES OF IGNITION. THEY MAY EXPLODE AND CAUSE INJURY OR DEATH. CONTAINERS SHOULD BE DISPOSED OF IN AN ENVIRONMENTALLY SAFE MANNER AND IN ACCORDANCE WITH GOVERNMENTAL REGULATIONS.

BEFORE WORKING ON OR IN TANKS WHICH CONTAIN OR HAVE CONTAINED THIS MATERIAL, REFER TO OSHA REGULATIONS, ANSI Z49.1 AND OTHER REFERENCES PERTAINING TO CLEANING, REPAIRING, WELDING, OR OTHER CONTEMPLATED OPERATIONS.

STORAGE:
KEEP CONTAINER(S) TIGHTLY CLOSED. USE AND STORE THIS MATERIAL IN COOL, DRY, WELL-VENTILATED AREAS AWAY FROM HEAT AND ALL SOURCES OF IGNITION. STORAGE TEMPERATURES ABOVE 113 DEG. F MAY LEAD TO THERMAL DECOMPOSITION, RESULTING IN THE GENERATION OF HYDROGEN SULFIDE AND OTHER SULFUR CONTAINING GASES. STORE ONLY IN APPROVED CONTAINERS. KEEP AWAY FROM ANY INCOMPATIBLE MATERIAL (SEE SECTION 10). PROTECT CONTAINER(S) AGAINST PHYSICAL DAMAGE.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

ENGINEERING CONTROLS:
IF CURRENT VENTILATION PRACTICES ARE NOT ADEQUATE TO MAINTAIN AIRBORNE CONCENTRATIONS BELOW THE ESTABLISHED EXPOSURE LIMITS (SEE SECTION 2), ADDITIONAL ENGINEERING CONTROLS MAY BE REQUIRED.

PERSONAL PROTECTIVE EQUIPMENT (PPE):

RESPIRATORY:
A NIOSH CERTIFIED AIR PURIFYING RESPIRATOR WITH A TYPE 95 (R OR P) PARTICULATE FILTER MAY BE USED UNDER CONDITIONS WHERE AIRBORNE CONCENTRATIONS ARE EXPECTED TO EXCEED EXPOSURE LIMITS (SEE SECTION 2).

PROTECTION PROVIDED BY AIR PURIFYING RESPIRATORS IS LIMITED (SEE MANUFACTURER'S RESPIRATOR SELECTION GUIDE). USE A NIOSH APPROVED SELF-CONTAINED BREATHING APPARATUS (SCBA) OR EQUIVALENT OPERATED IN A PRESSURE DEMAND OR OTHER POSITIVE PRESSURE MODE IF THERE IS POTENTIAL FOR AN UNCONTROLLED RELEASE, EXPOSURE LEVELS ARE NOT KNOWN, OR ANY OTHER CIRCUMSTANCES WHERE AIR PURIFYING RESPIRATORS MAY NOT PROVIDE ADEQUATE PROTECTION. A RESPIRATORY PROTECTION PROGRAM THAT MEETS OSHA'S 29 CFR 1910.134 AND ANSI Z88.2 REQUIREMENTS MUST BE FOLLOWED WHENEVER WORKPLACE CONDITIONS WARRANT A RESPIRATOR'S USE.

SKIN:
THE USE OF GLOVES IMPERVIOUS TO THE SPECIFIC MATERIAL HANDLED IS ADVISED TO PREVENT SKIN CONTACT AND POSSIBLE IRRITATION (SEE MANUFACTURERS LITERATURE FOR INFORMATION ON PERMEABILITY).

EYE/FACE:
APPROVED EYE PROTECTION TO SAFEGUARD AGAINST POTENTIAL EYE CONTACT, IRRITATION, OR INJURY IS RECOMMENDED. DEPENDING ON CONDITIONS OF USE, A FACE SHIELD MAY BE NECESSARY.

OTHER PROTECTIVE EQUIPMENT:
A SOURCE OF CLEAN WATER SHOULD BE AVAILABLE IN THE WORK AREA FOR FLUSHING EYES AND SKIN. IMPERVIOUS CLOTHING SHOULD BE WORN AS NEEDED.

SUGGESTIONS FOR THE USE OF SPECIFIC PROTECTIVE MATERIALS ARE BASED ON READILY AVAILABLE PUBLISHED DATA. USERS SHOULD CHECK WITH SPECIFIC MANUFACTURERS TO CONFIRM THE PERFORMANCE OF THEIR PRODUCTS.

9. PHYSICAL AND CHEMICAL PROPERTIES

NOTE:
UNLESS OTHERWISE STATED, VALUES ARE DETERMINED AT 20 DEG. C (68 DEG. F) AND 760 MM HG (1 ATM).

APPEARANCE: CLEAR AMBER

PHYSICAL FORM: LIQUID

ODOR: CHARACTERISTIC PETROLEUM

ODOR THRESHOLD: NO DATA

pH: NOT APPLICABLE

VAPOR PRESSURE (MM HG): <1

VAPOR DENSITY (AIR=1): >1

BOILING POINT: NO DATA

SOLUBILITY IN WATER: NEGLIGIBLE

PARTITION COEFFICIENT (N-OCTANOL/WATER): NO DATA

SPECIFIC GRAVITY: 0.86-0.89

BULK DENSITY: 7.16-7.41

BULK DENSITY UNITS: LBS/GAL

VISCOSITY CST @ 100 DEG. C: 10.0 - 21.0

VISCOSITY CST @ 40 DEG. C: 67 - 193

PERCENT VOLATILE: NEGLIGIBLE

EVAPORATION RATE (NBUAC=1): <1

FLASH POINT: 365 DEG. F/185 DEG. C
TEST METHOD: (PMCC) APPROXIMATELY

LEL%: NO DATA
UEL%: NO DATA

AUTOIGNITION TEMPERATURE: NO DATA

10. STABILITY AND REACTIVITY

STABILITY:
STABLE UNDER NORMAL AMBIENT AND ANTICIPATED STORAGE AND HANDLING CONDITIONS OF TEMPERATURE AND PRESSURE.

CONDITIONS TO AVOID:
EXTENDED EXPOSURE TO HIGH TEMPERATURES CAN CAUSE DECOMPOSITION.

MATERIALS TO AVOID (INCOMPATIBLE MATERIALS):
AVOID CONTACT WITH STRONG OXIDIZING AGENTS, REDUCING AGENTS.

HAZARDOUS DECOMPOSITION PRODUCTS:
COMBUSTION CAN YIELD CARBON, NITROGEN, SULFUR, PHOSPHORUS, AND ZINC OXIDES. HYDROGEN SULFIDE AND ALKYL MERCAPTANS MAY ALSO BE RELEASED. THERMAL DECOMPOSITION MAY PRODUCE HYDROGEN SULFIDE AND OTHER SULFUR-CONTAINING GASES AT TEMPERATURES GREATER THAN 113 DEG. F. METHACRYLATE MONOMERS MAY ALSO BE FORMED.

HAZARDOUS POLYMERIZATION: WILL NOT OCCUR.

11. TOXICOLOGICAL INFORMATION

CHRONIC DATA:

LUBRICANT BASE OIL (PETROLEUM) - CAS: VARIOUS
CARCINOGENICITY:
THE PETROLEUM BASE OILS CONTAINED IN THIS PRODUCT HAVE BEEN HIGHLY REFINED BY

A VARIETY OF PROCESSES INCLUDING SOLVENT EXTRACTION, HYDROTREATING, AND DEWAXING TO REMOVE AROMATICS AND IMPROVE PERFORMANCE CHARACTERISTICS. ALL OF THE OILS MEET THE IP-346 CRITERIA OF LESS THAN 3 PERCENT PAH'S AND THEREFORE NONE ARE LISTED AS A CARCINOGEN BY NTP, IARC, OR OSHA.

ACUTE DATA:

LUBRICANT BASE OIL (PETROLEUM) - CAS: VARIOUS
DERMAL:
LD50 = >2 G/KG
LC50 = NO INFORMATION AVAILABLE
ORAL:
LD50 = >5 G/KG

ADDITIVES - CAS: PROPRIETARY
DERMAL:
LD50 = NO INFORMATION AVAILABLE
LC50 = NO INFORMATION AVAILABLE
ORAL:
LD50 = NO INFORMATION AVAILABLE

ZINC COMPOUND(S) - CAS: PROPRIETARY
DERMAL:
LD50 = NO INFORMATION AVAILABLE
LC50 = NO INFORMATION AVAILABLE
ORAL:
LD50 = NO INFORMATION AVAILABLE

12. ECOLOGICAL INFORMATION

NOT EVALUATED AT THIS TIME.

13. DISPOSAL CONSIDERATIONS

THIS MATERIAL UNDER MOST INTENDED USES WOULD BECOME USED OIL DUE TO CONTAMINATION BY PHYSICAL OR CHEMICAL IMPURITIES. RECYCLE ALL USED OIL. WHILE BEING RECYCLED, USED OIL IS REGULATED BY 40 CFR 279. USE RESULTING IN CHEMICAL OR PHYSICAL CHANGE OR CONTAMINATION MAY ALSO SUBJECT IT TO REGULATION AS HAZARDOUS WASTE. UNDER FEDERAL REGULATIONS, USED OIL IS A SOLID WASTE MANAGED UNDER 40 CFR 279. HOWEVER, IN CALIFORNIA, USED OIL IS MANAGED AS HAZARDOUS WASTE UNTIL TESTED TO SHOW IT IS NOT HAZARDOUS. CONSULT STATE AND LOCAL REGULATIONS REGARDING THE PROPER HANDLING OF USED OIL. IN THE CASE OF USED OIL, THE INTENT TO DISCARD IT MAY CAUSE THE USED OIL TO BE REGULATED AS HAZARDOUS WASTE.

CONTENTS SHOULD BE COMPLETELY USED AND CONTAINERS EMPTIED PRIOR TO DISCARD. RINSATE MAY BE CONSIDERED A RCRA HAZARDOUS WASTE AND MUST BE DISPOSED OF WITH CARE AND IN COMPLIANCE WITH FEDERAL, STATE AND LOCAL REGULATIONS. LARGE EMPTY CONTAINERS, SUCH AS DRUMS, SHOULD BE RETURNED TO THE DISTRIBUTOR OR A DRUM RECONDITIONER. TO ASSURE PROPER DISPOSAL OF SMALL EMPTY CONTAINERS, CONSULT WITH STATE AND LOCAL REGULATIONS AND DISPOSAL AUTHORITIES.

14. TRANSPORTATION INFORMATION

DOT PROPER SHIPPING NAME: NOT REGULATED
NOTE:

MATERIAL IS UNREGULATED UNLESS IN CONTAINER OF 3500 GALLONS OR MORE, THEN PROVISIONS OF 49 CFR PART 130 APPLY FOR LAND SHIPMENT.

IMDG SHIPPING DESCRIPTION: NOT REGULATED

ICAO/IATA SHIPPING DESCRIPTION: NOT REGULATED

15. REGULATORY INFORMATION

U.S. REGULATIONS:

EPA SARA 311/312 (TITLE III HAZARD CATEGORIES):
ACUTE HEALTH: NO
CHRONIC HEALTH: NO
FIRE HAZARD: NO
PRESSURE HAZARD: NO
REACTIVE HAZARD: NO

SARA - SECTION 313 AND 40 CFR 372:
THIS MATERIAL CONTAINS THE FOLLOWING CHEMICALS SUBJECT TO THE REPORTING REQUIREMENTS OF SARA 313 AND 40 CFR 372:

ZINC COMPOUND(S) PROPRIETARY 0.5-1.5%

EPA (CERCLA) REPORTABLE QUANTITY (IN POUNDS): NONE KNOWN

CERCLA/SARA - SECTION 302 EXTREMELY HAZARDOUS SUBSTANCES AND TPQS (IN POUNDS):
THIS MATERIAL CONTAINS THE FOLLOWING CHEMICALS SUBJECT TO THE REPORTING REQUIREMENTS OF SARA 302 AND 40 CFR 372: NONE KNOWN

CALIFORNIA PROPOSITION 65:
WARNING:
THIS MATERIAL CONTAINS THE FOLLOWING CHEMICALS WHICH ARE KNOWN TO THE STATE OF CALIFORNIA TO CAUSE CANCER, BIRTH DEFECTS OR OTHER REPRODUCTIVE HARM, AND ARE SUBJECT TO THE REQUIREMENTS OF CALIFORNIA PROPOSITION 65 (CA HEALTH & SAFETY CODE SECTION 25249.5): NONE KNOWN

USED ENGINE OILS, WHILE NOT A COMPONENT OF THIS MATERIAL, IS ON THE PROPOSITION 65 LIST OF CHEMICALS KNOWN TO THE STATE OF CALIFORNIA TO CAUSE CANCER.

CARCINOGEN IDENTIFICATION:
THIS MATERIAL HAS NOT BEEN IDENTIFIED AS A CARCINOGEN BY NTP, IARC, OR OSHA. SEE SECTION 11 FOR CARCINOGENICITY INFORMATION OF INDIVIDUAL COMPONENTS, IF ANY.

USED MOTOR OIL HAS BEEN IDENTIFIED AS A POSSIBLE SKIN CARCINOGEN BY IARC.

TSCA: ALL COMPONENTS ARE LISTED ON THE TSCA INVENTORY.

INTERNATIONAL REGULATIONS:

CANADIAN REGULATIONS:
THIS PRODUCT HAS BEEN CLASSIFIED IN ACCORDANCE WITH THE HAZARD CRITERIA OF THE CONTROLLED PRODUCTS REGULATIONS (CPR) AND THE MSDS CONTAINS ALL THE INFORMATION REQUIRED BY THE CPR.

DOMESTIC SUBSTANCES LIST: LISTED

WHMIS CLASSIFICATION: NOT REGULATED

16. OTHER INFORMATION

ISSUE DATE: 15-OCT-2004

PREVIOUS ISSUE DATE: 3/27/2002

PRODUCT CODE: 1043226, 1043286, 1043331, 1043376, 1043401

REASON FOR REVISION:
COMPOSITION INFORMATION MODIFIED - SEE SECTION 2
COMBINED ALL GRADES INTO SINGLE MSDS.

PREVIOUS PRODUCT CODE: 3310052000

MSDS CODE: 721780

DISCLAIMER OF EXPRESSED AND IMPLIED WARRANTIES:
THE INFORMATION PRESENTED IN THIS MATERIAL SAFETY DATA SHEET IS BASED ON DATA BELIEVED TO BE ACCURATE AS OF THE DATE THIS MATERIAL SAFETY DATA SHEET WAS PREPARED. HOWEVER, NO WARRANTY OF MERCHANTABILITY, FITNESS FOR ANY PARTICULAR PURPOSE, OR ANY OTHER WARRANTY IS EXPRESSED OR IS TO BE IMPLIED REGARDING THE ACCURACY OR COMPLETENESS OF THE INFORMATION PROVIDED ABOVE, THE RESULTS TO BE OBTAINED FROM THE USE OF THIS INFORMATION OR THE PRODUCT, THE SAFETY OF THIS PRODUCT, OR THE HAZARDS RELATED TO ITS USE. NO RESPONSIBILITY IS ASSUMED FOR ANY DAMAGE OR INJURY RESULTING FROM ABNORMAL USE OR FROM ANY FAILURE TO ADHERE TO RECOMMENDED PRACTICES. THE INFORMATION PROVIDED ABOVE, AND THE PRODUCT, ARE FURNISHED ON THE CONDITION THAT THE PERSON RECEIVING THEM SHALL MAKE THEIR OWN DETERMINATION AS TO THE SUITABILITY OF THE PRODUCT FOR THEIR PARTICULAR PURPOSE AND ON THE CONDITION THAT THEY ASSUME THE RISK OF THEIR USE. IN ADDITION, NO AUTHORIZATION IS GIVEN NOR IMPLIED TO PRACTICE ANY PATENTED INVENTION WITHOUT A LICENSE.

ALCONOX
LIQUINOX **Revised: 07/14/2006**

MSDS Contents

MSDS_LIQUINOX_ENGLISH_ANSI

LIQUINOX

MSDS

SECTION 1: PRODUCT AND COMPANY IDENTIFICATION

CHEMICAL FAMILY: DETERGENT.

MANUFACTURER:
ALCONOX, INC.
30 GLENN ST.
SUITE 309
WHITE PLAINS, NY 10603.

MANUFACTURER EMERGENCY: 800-255-3924.

PHONE NUMBER: 813-248-0585 (OUTSIDE OF THE UNITED STATES).

SUPPLIER: SAME AS MANUFACTURER.

PRODUCT NAME: LIQUINOX

SECTION 2: INGREDIENT INFORMATION

C.A.S.	CONCENTRATION %	INGREDIENT NAME	T.L.V.	LD/50	LC/50
25155-30-0	10-30	SODIUM DODECYLBENZENE-SULFONATE	NOT AVAILABLE	438 MG/KG RAT ORAL 1330 MG/KG MOUSE ORAL	NOT AVAILABLE

SECTION 3: HAZARD IDENTIFICATION

ROUTE OF ENTRY: SKIN CONTACT, EYE CONTACT, INHALATION AND INGESTION.

EFFECTS OF ACUTE EXPOSURE:

EYE CONTACT: MAY CAUSE IRRITATION.

SKIN CONTACT: PROLONGED AND REPEATED CONTACT MAY CAUSE IRRITATION.

INHALATION: MAY CAUSE HEADACHE AND NAUSEA.

INGESTION:
MAY CAUSE VOMITING AND DIARRHEA.
MAY CAUSE GASTRIC DISTRESS.

EFFECTS OF CHRONIC EXPOSURE: SEE EFFECTS OF ACUTE EXPOSURE

SECTION 4: FIRST AID MEASURES

SKIN CONTACT:
REMOVE CONTAMINATED CLOTHING.
WASH THOROUGHLY WITH SOAP AND WATER.
SEEK MEDICAL ATTENTION IF IRRITATION PERSISTS.

EYE CONTACT:
CHECK FOR AND REMOVE CONTACT LENSES.

FLUSH EYES WITH CLEAR, RUNNING WATER FOR 15 MINUTES WHILE HOLDING EYELIDS
OPEN: IF IRRITATION PERSISTS, CONSULT A PHYSICIAN.

INHALATION:
REMOVE VICTIM TO FRESH AIR.
IF IRRITATION PERSISTS, SEEK MEDICAL ATTENTION.

INGESTION:
DO NOT INDUCE VOMITING, SEEK MEDICAL ATTENTION.
DILUTE WITH TWO GLASSES OF WATER.
NEVER GIVE ANYTHING BY MOUTH TO AN UNCONSCIOUS PERSON.

SECTION 5: FIRE FIGHTING MEASURES

FLAMMABILITY: NOT FLAMMABLE.

CONDITIONS OF FLAMMABILITY: SURROUNDING FIRE.

EXTINGUISHING MEDIA:
CARBON DIOXIDE, DRY CHEMICAL, FOAM.
WATER
WATER FOG.

SPECIAL PROCEDURES:
SELF-CONTAINED BREATHING APPARATUS REQUIRED.
FIREFIGHTERS SHOULD WEAR THE USUAL PROTECTIVE GEAR.
USE WATER SPRAY TO COOL FIRE EXPOSED CONTAINERS.

AUTO-IGNITION TEMPERATURE: NOT AVAILABLE.

FLASH POINT (DEG. C), METHOD: NONE

LOWER FLAMMABILITY LIMIT (% VOL): NOT APPLICABLE.
UPPER FLAMMABILITY LIMIT (% VOL): NOT APPLICABLE.

EXPLOSION DATA:
SENSITIVITY TO STATIC DISCHARGE: NOT AVAILABLE.
SENSITIVITY TO MECHANICAL IMPACT: NOT AVAILABLE.

HAZARDOUS COMBUSTION PRODUCTS:
OXIDES OF CARBON (COx).
HYDROCARBONS.

RATE OF BURNING: NOT AVAILABLE.

EXPLOSIVE POWER: CONTAINERS MAY RUPTURE IF EXPOSED TO HEAT OR FIRE.

SECTION 6: ACCIDENTAL RELEASE MEASURES

LEAK/SPILL:
CONTAIN THE SPILL.
PREVENT ENTRY INTO DRAINS, SEWERS, AND OTHER WATERWAYS.
WEAR APPROPRIATE PROTECTIVE EQUIPMENT.
SMALL AMOUNTS MAY BE FLUSHED TO SEWER WITH WATER.
SOAK UP WITH AN ABSORBENT MATERIAL.
PLACE IN APPROPRIATE CONTAINER FOR DISPOSAL.
NOTIFY THE APPROPRIATE AUTHORITIES AS REQUIRED.

SECTION 7: HANDLING AND STORAGE

HANDLING PROCEDURES AND EQUIPMENT:
PROTECT AGAINST PHYSICAL DAMAGE.
AVOID BREATHING VAPORS/MISTS.
WEAR PERSONAL PROTECTIVE EQUIPMENT APPROPRIATE TO TASK.
WASH THOROUGHLY AFTER HANDLING.
KEEP OUT OF REACH OF CHILDREN.
AVOID CONTACT WITH SKIN, EYES AND CLOTHING.
AVOID EXTREME TEMPERATURES.
LAUNDER CONTAMINATED CLOTHING PRIOR TO REUSE.

STORAGE REQUIREMENTS:
STORE AWAY FROM INCOMPATIBLE MATERIALS.
KEEP CONTAINERS CLOSED WHEN NOT IN USE.

SECTION 8: EXPOSURE CONTROLS / PERSONAL PROTECTION

PRECAUTIONARY MEASURES:

GLOVES/TYPE: WEAR APPROPRIATE GLOVES.

RESPIRATORY/TYPE: NONE REQUIRED UNDER NORMAL USE.

EYE/TYPE: SAFETY GLASSES RECOMMENDED.

FOOTWEAR/TYPE: SAFETY SHOES PER LOCAL REGULATIONS.

CLOTHING/TYPE: AS REQUIRED TO PREVENT SKIN CONTACT.

OTHER/TYPE:
EYE WASH FACILITY SHOULD BE IN CLOSE PROXIMITY.
EMERGENCY SHOWER SHOULD BE IN CLOSE PROXIMITY.

VENTILATION REQUIREMENTS: LOCAL EXHAUST AT POINTS OF EMISSION.

EXPOSURE LIMIT OF MATERIAL: NOT AVAILABLE.

SECTION 9: PHYSICAL AND CHEMICAL PROPERTIES

PHYSICAL STATE: LIQUID.

APPEARANCE & ODOR:
ODORLESS.
PALE YELLOW.

ODOR THRESHOLD (PPM): NOT AVAILABLE.

VAPOR PRESSURE (MMHg): @ 20 DEG. C (68 DEG. F). 17

VAPOR DENSITY (AIR=1): >1

VOLATILES (%) BY VOLUME: NOT AVAILABLE.

EVAPORATION RATE (BUTYL ACETATE = 1): <1.

BOILING POINT (DEG. C): 100 (212F)

FREEZING POINT (DEG. C): NOT AVAILABLE.

pH: 8.5

SPECIFIC GRAVITY @ 20 DEG. C (WATER = 1).: 1.083

SOLUBILITY IN WATER (%): COMPLETE.

COEFFICIENT OF WATER\OIL DIST.: NOT AVAILABLE

VOC: NONE

CHEMICAL FAMILY: DETERGENT.

SECTION 10: STABILITY AND REACTIVITY

CHEMICAL STABILITY:
PRODUCT IS STABLE UNDER NORMAL HANDLING AND STORAGE CONDITIONS.

CONDITIONS OF INSTABILITY: EXTREME TEMPERATURES.

HAZARDOUS POLYMERIZATION: WILL NOT OCCUR.

INCOMPATIBLE SUBSTANCES:
STRONG ACIDS.
STRONG OXIDIZING AGENTS.

HAZARDOUS DECOMPOSITION PRODUCTS: SEE HAZARDOUS COMBUSTION PRODUCTS.

SECTION 11: TOXICOLOGICAL INFORMATION

LD50 OF PRODUCT, SPECIES & ROUTE: >5000 MG/KG RAT ORAL.

LC50 OF PRODUCT, SPECIES & ROUTE: NOT AVAILABLE.

SENSITIZATION TO PRODUCT: NOT AVAILABLE.

CARCINOGENIC EFFECTS: NOT LISTED AS A CARCINOGEN.

REPRODUCTIVE EFFECTS: NOT AVAILABLE.

TERATOGENICITY: NOT AVAILABLE.

MUTAGENICITY: NOT AVAILABLE.

SYNERGISTIC MATERIALS: NOT AVAILABLE.

SECTION 12: ECOLOGICAL INFORMATION

ENVIRONMENTAL TOXICITY: NO DATA AT THIS TIME.

ENVIRONMENTAL FATE: NO DATA AT THIS TIME.

SECTION 13: DISPOSAL CONSIDERATIONS

WASTE DISPOSAL: IN ACCORDANCE WITH LOCAL AND FEDERAL REGULATIONS.

SECTION 14: TRANSPORT INFORMATION

D.O.T. CLASSIFICATION: NOT REGULATED.

SPECIAL SHIPPING INFORMATION: NOT REGULATED.

SECTION 15: REGULATORY INFORMATION

CANADIAN REGULATORY INFORMATION:

WHMIS CLASSIFICATION: NOT CONTROLLED.

DSL STATUS: NOT AVAILABLE.

USA REGULATORY INFORMATION:

SARA HAZARD CATEGORIES SECTIONS 311/312:
IMMEDIATE (ACUTE) HEALTH HAZARD: NO.
DELAYED (CHRONIC) HEALTH HAZARD: NO.
FIRE HAZARD: NO.

SUDDEN RELEASE OF PRESSURE: NO.
REACTIVE: NO.

SARA SECTION 313: NONE

TSCA INVENTORY:
ALL COMPONENTS OF THIS PRODUCT ARE LISTED ON THE TSCA INVENTORY.

NFPA:
HEALTH HAZARD 1
FLAMMABILITY 0
REACTIVITY 0

HMIS:
HEALTH HAZARD 1
FLAMMABILITY 0
PHYSICAL HAZARD 0
PPE A

SECTION 16: OTHER INFORMATION

SUPPLIER MSDS DATE: 2006/07/14

DATA PREPARED BY:
GLOBAL SAFETY MANAGEMENT
3340 PEACHTREE ROAD, #1800
ATLANTA, GA 30326

PHONE: 877-683-7460

FAX: (877) 683-7462

WEB: WWW.GLOBALSAFETYNET.COM

EMAIL: INFO@GLOBALSAFETYNET.COM.

GENERAL NOTE:
THIS MATERIAL SAFETY DATA SHEET WAS PREPARED FROM INFORMATION OBTAINED FROM VARIOUS SOURCES, INCLUDING PRODUCT SUPPLIERS AND THE CANADIAN CENTER FOR OCCUPATIONAL HEALTH AND SAFETY.

MS 01.40.01.01.06.1

AIR PRODUCTS AND CHEMICALS
ISOBUTYLENE Revised: 07/01/1999

MSDS Contents

MATERIAL SAFETY DATA SHEET

SECTION 1. PRODUCT IDENTIFICATION

PRODUCT NAME: ISOBUTYLENE

CHEMICAL NAME:
ISOBUTYLENE, UNSATURATED ALIPHATIC HYDROCARBON, ALKENE, LIQUEFIED PETROLEUM GAS (LPG), LP-GAS

FORMULA: (CH3)2C:CH3 OR C4H8

SYNONYMS: ISOBUTENE, 1,1-DIMETHYL ETHYLENE, 2-METHYL PROPYLENE

MANUFACTURER: AIR PRODUCTS AND CHEMICALS, INC.
7201 HAMILTON BOULEVARD
ALLENTOWN, PA 18195 - 1501

PRODUCT INFORMATION: (800) 752-1597

MSDS NUMBER: 1068

REVISION: 5

REVIEW DATE: JULY 1999

REVISION DATE: JULY 1999

SECTION 2. COMPOSITION / INFORMATION ON INGREDIENTS

ISOBUTYLENE IS PACKAGED AS PURE PRODUCT (>99%).

CAS NUMBER: 115-11-7

EXPOSURE LIMITS:
OSHA: NONE ESTABLISHED
ACGIH: SIMPLE ASPHYXIANT

NIOSH: NONE ESTABLISHED

ACGIH RECOMMENDS 1000 PPM TWA FOR LPG (LIQUEFIED PETROLEUM GAS).

SECTION 3. HAZARD IDENTIFICATION

EMERGENCY OVERVIEW:
ISOBUTYLENE IS A FLAMMABLE, COLORLESS LIQUEFIED COMPRESSED GAS PACKAGED IN CYLINDERS UNDER ITS OWN VAPOR PRESSURE OF 39.4 PSIA AT 70 DEG. F. IT POSES AN IMMEDIATE FIRE AND EXPLOSION HAZARD WHEN MIXED WITH AIR AT CONCENTRATIONS EXCEEDING 1.8%. HIGH CONCENTRATIONS THAT CAN CAUSE RAPID SUFFOCATION ARE ABOVE THE LOWER FLAMMABLE LIMIT AND MUST NOT BE ENTERED. ISOBUTYLENE IS HEAVIER THAN AIR AND MAY COLLECT IN LOW AREAS OR TRAVEL ALONG THE GROUND WHERE THERE MAY BE AN IGNITION SOURCE PRESENT. DIRECT CONTACT WITH LIQUID CAN CAUSE FROSTBITE.

EMERGENCY TELEPHONE NUMBERS:
(800) 523-9374 CONTINENTAL U.S., CANADA AND PUERTO RICO
(610) 481-7711 OTHER LOCATIONS

ACUTE POTENTIAL HEALTH EFFECTS:

ROUTES OF EXPOSURE:

EYE CONTACT:
CONTACT WITH LIQUID (OR RAPIDLY EXPANDING GAS) MAY CAUSE IRRITATION AND FROSTBITE.

INGESTION:
INGESTION IS NOT A LIKELY ROUTE OF EXPOSURE FOR ISOBUTYLENE. LIQUEFIED GAS MAY CAUSE FREEZE BURNS TO THE MUCOUS MEMBRANES AND POSSIBLE CENTRAL NERVOUS SYSTEM DEPRESSION.

INHALATION:
ISOBUTYLENE IS A CENTRAL NERVOUS SYSTEM (CNS) DEPRESSANT AND A MILD ANESTHETIC. IT CAN ALSO REDUCE THE AMOUNT OF OXYGEN IN THE AIR NECESSARY TO SUPPORT LIFE. EXPOSURE TO OXYGEN-DEFICIENT ATMOSPHERES (LESS THAN 19.5%) MAY PRODUCE DIZZINESS, NAUSEA, VOMITING, LOSS OF CONSCIOUSNESS, AND DEATH. AT VERY LOW OXYGEN CONCENTRATIONS (LESS THAN 12%) UNCONSCIOUSNESS AND DEATH MAY OCCUR WITHOUT WARNING. IT SHOULD BE NOTED THAT BEFORE SUFFOCATION COULD OCCUR, THE LOWER FLAMMABLE LIMIT FOR ISOBUTYLENE IN AIR WILL BE EXCEEDED; CAUSING BOTH AN OXYGEN DEFICIENT AND AN EXPLOSIVE ATMOSPHERE.

SKIN CONTACT:
CONTACT WITH LIQUID (OR RAPIDLY EXPANDING GAS) CAN CAUSE IRRITATION AND FROSTBITE.

POTENTIAL HEALTH EFFECTS OF REPEATED EXPOSURE:

ROUTE OF ENTRY: SKIN CONTACT

SYMPTOMS: REPEATED OR PROLONGED CONTACT MAY CAUSE DERMATITIS.

TARGET ORGANS: SKIN

MEDICAL CONDITIONS AGGRAVATED BY OVEREXPOSURE: MAY AGGRAVATE DERMATITIS.

CARCINOGENICITY:
ISOBUTYLENE IS NOT LISTED AS A CARCINOGEN OR POTENTIAL CARCINOGEN BY NTP, IARC, OR OSHA SUBPART Z.

SECTION 4. FIRST AID MEASURES

EYE CONTACT:
FLUSH EYES WITH PLENTY OF LUKEWARM WATER FOR SEVERAL MINUTES. SEEK MEDICAL ATTENTION IMMEDIATELY.

INGESTION:
WASH OUT MOUTH WITH LUKEWARM WATER PROVIDED PERSON IS CONSCIOUS. OBTAIN PROMPT MEDICAL ATTENTION.

INHALATION:
REMOVE PERSON TO FRESH AIR. IF NOT BREATHING, ADMINISTER ARTIFICIAL RESPIRATION. IF BREATHING IS DIFFICULT, ADMINISTER OXYGEN. OBTAIN PROMPT MEDICAL ATTENTION.

SKIN CONTACT:
IF LIQUID ISOBUTYLENE COMES IN CONTACT WITH SKIN, REMOVE CONTAMINATED CLOTHING AND FLUSH WITH PLENTY OF LUKEWARM WATER FOR SEVERAL MINUTES. SEEK MEDICAL ATTENTION IMMEDIATELY.

NOTES TO PHYSICIAN:
TREATMENT OF OVEREXPOSURE SHOULD BE DIRECTED AT THE CONTROL OF SYMPTOMS AND THE CLINICAL CONDITION.

SECTION 5. FIRE FIGHTING MEASURES

FLASH POINT: NOT APPLICABLE

AUTOIGNITION: 869 DEG. F (465 DEG. C)

FLAMMABLE RANGE: 1.8% - 9.6%

EXTINGUISHING MEDIA: CARBON DIOXIDE, DRY CHEMICAL, WATER.

SPECIAL FIRE FIGHTING INSTRUCTIONS:
EVACUATE ALL PERSONNEL FROM AREA. IF POSSIBLE, WITHOUT RISK, SHUT OFF SOURCE OF ISOBUTYLENE, THEN FIGHT FIRE ACCORDING TO TYPES OF MATERIALS BURNING. EXTINGUISH FIRE ONLY IF GAS FLOW CAN BE STOPPED. THIS WILL AVOID POSSIBLE ACCUMULATION AND RE-IGNITION OF A FLAMMABLE GAS MIXTURE. KEEP ADJACENT CYLINDERS COOL BY SPRAYING WITH LARGE AMOUNTS OF WATER UNTIL THE FIRE BURNS ITSELF OUT. SELF-CONTAINED BREATHING APPARATUS (SCBA) MAY BE REQUIRED.

UNUSUAL FIRE AND EXPLOSION HAZARDS:
MOST CYLINDERS ARE DESIGNED TO VENT CONTENTS WHEN EXPOSED TO ELEVATED TEMPERATURES. PRESSURE IN A CYLINDER CAN BUILD UP DUE TO HEAT AND IT MAY RUPTURE IF PRESSURE RELIEF DEVICES SHOULD FAIL TO FUNCTION. ISOBUTYLENE VAPORS ARE HEAVIER THAN AIR AND MAY TRAVEL TO A SOURCE OF IGNITION AND FLASH BACK.

HAZARDOUS COMBUSTION PRODUCTS: CARBON MONOXIDE

SECTION 6. ACCIDENTAL RELEASE MEASURES

STEPS TO BE TAKEN IF MATERIAL IS RELEASED OR SPILLED:
EVACUATE IMMEDIATE AREA. ELIMINATE ANY POSSIBLE SOURCES OF IGNITION, AND PROVIDE MAXIMUM EXPLOSION-PROOF VENTILATION. USE A FLAMMABLE GAS METER (EXPLOSIMETER) CALIBRATED FOR ISOBUTYLENE TO MONITOR CONCENTRATION. NEVER ENTER AN AREA WHERE THE ISOBUTYLENE CONCENTRATION IS GREATER THAN 0.36% (WHICH IS 20% OF THE LOWER

FLAMMABLE LIMIT). AN IMMEDIATE FIRE AND EXPLOSION HAZARD EXISTS WHEN ATMOSPHERIC ISOBUTYLENE CONCENTRATIONS EXCEED 1.8%. USE APPROPRIATE PROTECTIVE EQUIPMENT (SCBA AND FIRE RESISTANT SUIT). SHUT OFF SOURCE OF LEAK IF POSSIBLE. ISOLATE ANY LEAKING CYLINDER. IF LEAK IS FROM CONTAINER, PRESSURE RELIEF DEVICE OR ITS VALVE, CONTACT YOUR SUPPLIER. IF THE LEAK IS IN THE USER'S SYSTEM, CLOSE THE CYLINDER VALVE, SAFELY VENT THE PRESSURE, AND PURGE WITH AN INERT GAS BEFORE ATTEMPTING REPAIRS.

SECTION 7. STORAGE AND HANDLING

STORAGE:
STORE CYLINDERS IN A WELL-VENTILATED, SECURE AREA, PROTECTED FROM THE WEATHER. CYLINDERS SHOULD BE STORED UPRIGHT WITH VALVE OUTLET SEALS AND VALVE PROTECTION CAPS IN PLACE. THERE SHOULD BE NO SOURCES OF IGNITION. ALL ELECTRICAL EQUIPMENT SHOULD BE EXPLOSION-PROOF IN THE STORAGE AREAS. STORAGE AREAS MUST MEET NATIONAL ELECTRICAL CODES FOR CLASS 1 HAZARDOUS AREAS. FLAMMABLE STORAGE AREAS MUST BE SEPARATED FROM OXYGEN AND OTHER OXIDIZERS BY A MINIMUM DISTANCE OF 20 FT. OR BY A BARRIER OF NON-COMBUSTIBLE MATERIAL AT LEAST 5 FT. HIGH HAVING A FIRE RESISTANCE RATING OF AT LEAST 1/2 HOUR. POST "NO SMOKING OR OPEN FLAMES" SIGNS IN THE STORAGE OR USE AREAS. DO NOT ALLOW STORAGE TEMPERATURE TO EXCEED 125 DEG. F (52 DEG. C). STORAGE SHOULD BE AWAY FROM HEAVILY TRAVELED AREAS AND EMERGENCY EXITS. FULL AND EMPTY CYLINDERS SHOULD BE SEGREGATED. USE A FIRST-IN FIRST-OUT INVENTORY SYSTEM TO PREVENT FULL CONTAINERS FROM BEING STORED FOR LONG PERIODS OF TIME.

HANDLING:
DO NOT DRAG, ROLL, SLIDE OR DROP CYLINDER. USE A SUITABLE HAND TRUCK DESIGNED FOR CYLINDER MOVEMENT. NEVER ATTEMPT TO LIFT A CYLINDER BY ITS CAP. SECURE CYLINDERS AT ALL TIMES WHILE IN USE. USE A SEPARATE CONTROL VALVE TO SAFELY DISCHARGE GAS FROM CYLINDER. USE A CHECK VALVE TO PREVENT REVERSE FLOW INTO CYLINDER. NEVER APPLY FLAME OR LOCALIZED HEAT DIRECTLY TO ANY PART OF THE CYLINDER. DO NOT ALLOW ANY PART OF THE CYLINDER TO EXCEED 125 DEG. F (52 DEG. C). ONCE CYLINDER HAS BEEN CONNECTED TO PROPERLY PURGED AND INERTED PROCESS, OPEN CYLINDER VALVE SLOWLY AND CAREFULLY. IF USER EXPERIENCES ANY DIFFICULTY OPERATING CYLINDER VALVE, DISCONTINUE USE AND CONTACT SUPPLIER. NEVER INSERT AN OBJECT (E.G., WRENCH, SCREWDRIVER, ETC.) INTO VALVE CAP OPENINGS. DOING SO MAY DAMAGE VALVE CAUSING A LEAK TO OCCUR. USE AN ADJUSTABLE STRAP-WRENCH TO REMOVE OVER-TIGHT OR RUSTED CAPS. ALL PIPED SYSTEMS AND ASSOCIATED EQUIPMENT MUST BE GROUNDED. ELECTRICAL EQUIPMENT SHOULD BE NON-SPARKING OR EXPLOSION-PROOF.

SPECIAL PRECAUTIONS:
ALWAYS STORE AND HANDLE COMPRESSED GAS CYLINDERS IN ACCORDANCE WITH COMPRESSED GAS ASSOCIATION, INC. (TELEPHONE 703-412-0900) PAMPHLET CGA P-1, SAFE HANDLING OF COMPRESSED GASES IN CONTAINERS. LOCAL REGULATIONS MAY REQUIRE SPECIFIC EQUIPMENT FOR STORAGE OR USE.

SECTION 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

ENGINEERING CONTROLS:

VENTILATION:
PROVIDE ADEQUATE NATURAL OR EXPLOSION-PROOF VENTILATION TO PREVENT ACCUMULATION OF GAS CONCENTRATIONS ABOVE 0.36% (20% OF LEL).

RESPIRATORY PROTECTION:
EMERGENCY USE: DO NOT ENTER AREAS WHERE ISOBUTYLENE CONCENTRATION IS GREATER THAN 0.36% (20% OF LEL). EXPOSURE TO CONCENTRATIONS BELOW THIS CONCENTRATION DO NOT REQUIRE RESPIRATORY PROTECTION.

EYE PROTECTION:
SAFETY GLASSES FOR HANDLING CYLINDERS. CHEMICAL GOGGLES WITH FULL FACESHIELD FOR CONNECTING OR DISCONNECTING CYLINDERS.

SKIN PROTECTION:
LEATHER GLOVES FOR HANDLING CYLINDERS. NEOPRENE GLOVES DURING USE OF PRODUCT. FIRE RESISTANT SUIT AND GLOVES IN EMERGENCY SITUATIONS.

OTHER PROTECTIVE EQUIPMENT:
SAFETY SHOES ARE RECOMMENDED WHEN HANDLING CYLINDERS.

SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

APPEARANCE, ODOR AND STATE:
AT ROOM TEMPERATURE AND ATMOSPHERIC PRESSURE, ISOBUTYLENE IS A COLORLESS, FLAMMABLE GAS WITH A MILD ODOR. IT IS SHIPPED AS A LIQUEFIED GAS UNDER ITS OWN VAPOR PRESSURE.

MOLECULAR WEIGHT: 56.1

BOILING POINT (1 ATM): 20.1 DEG. F (-6.6 DEG. C)

SPECIFIC GRAVITY (AIR = 1): 2.0

FREEZING POINT / MELTING POINT: -220.1 DEG. F (-140.1 DEG. C)

VAPOR PRESSURE (AT 70 DEG. F (21.1 DEG. C)): 39.4 PSIA

GAS DENSITY (AT 70 DEG. F (21.1 DEG. C) AND 1 ATM): 0.15 LB/FT3

SOLUBILITY IN WATER: NEGLIGIBLE

LIQUID DENSITY (AT 70 DEG. F (21.1 DEG. C), SAT.): 37.56 LB/FT3

SECTION 10. STABILITY AND REACTIVITY

CHEMICAL STABILITY: STABLE

CONDITIONS TO AVOID:
CYLINDERS SHOULD NOT BE EXPOSED TO TEMPERATURES IN EXCESS OF 125 DEG. F (52 DEG, C).

INCOMPATIBILITY (MATERIALS TO AVOID): OXYGEN, HALOGENS AND OXIDIZERS

REACTIVITY:
A) HAZARDOUS DECOMPOSITION PRODUCTS: NONE
B) HAZARDOUS POLYMERIZATION: MAY OCCUR AT HIGH TEMPERATURES OR PRESSURES OR IN THE PRESENCE OF A CATALYST.

SECTION 11. TOXICOLOGICAL INFORMATION

LC50 (INHALATION): NOT APPLICABLE. SIMPLE ASPHYXIANT.

LD50 (ORAL): NOT APPLICABLE

LD50 (DERMAL): NOT APPLICABLE

SKIN CORROSIVITY: ISOBUTYLENE IS NOT CORROSIVE TO THE SKIN.

ADDITIONAL NOTES:
ISOBUTYLENE IS A CNS DEPRESSANT AND ACTS AS A SIMPLE ASPHYXIANT AND MILD ANESTHETIC.

SECTION 12. ECOLOGICAL INFORMATION

AQUATIC TOXICITY: NOT DETERMINED

MOBILITY: NOT DETERMINED

PERSISTENCE AND BIODEGRADABILITY: NOT DETERMINED

POTENTIAL TO BIOACCUMULATE: NOT DETERMINED

REMARKS:
THIS PRODUCT DOES NOT CONTAIN ANY CLASS I OR CLASS II OZONE DEPLETING CHEMICALS.

SECTION 13. DISPOSAL CONSIDERATIONS

UNUSED PRODUCT / EMPTY CYLINDER:
RETURN CYLINDER AND UNUSED PRODUCT TO SUPPLIER. DO NOT ATTEMPT TO DISPOSE OF UNUSED PRODUCT.

DISPOSAL:
RESIDUAL PRODUCT IN THE SYSTEM MAY BE BURNED IF A SUITABLE BURNING UNIT (FLAIR INCINERATOR) IS AVAILABLE ON SITE. THIS SHALL BE DONE IN ACCORDANCE WITH FEDERAL, STATE, AND LOCAL REGULATIONS. WASTES CONTAINING THIS MATERIAL MAY BE CLASSIFIED BY EPA AS HAZARDOUS WASTE BY CHARACTERISTIC (I.E., IGNITABILITY, CORROSIVITY, TOXICITY, REACTIVITY). WASTE STREAMS MUST BE CHARACTERIZED BY THE USER TO MEET FEDERAL, STATE, AND LOCAL REQUIREMENTS.

SECTION 14. TRANSPORT INFORMATION

DOT SHIPPING NAME: ISOBUTYLENE

HAZARD CLASS: 2.1

IDENTIFICATION NUMBER: UN1055

SHIPPING LABEL(S): FLAMMABLE GAS

PLACARD (WHEN REQUIRED): FLAMMABLE GAS

SPECIAL SHIPPING INFORMATION:
CYLINDERS SHOULD BE TRANSPORTED IN A SECURE UPRIGHT POSITION IN A WELL-VENTILATED TRUCK. NEVER TRANSPORT IN PASSENGER COMPARTMENT OF A VEHICLE. ENSURE CYLINDER VALVE IS PROPERLY CLOSED, VALVE OUTLET CAP HAS BEEN REINSTALLED, AND VALVE PROTECTION CAP IS SECURED BEFORE SHIPPING CYLINDER.

CAUTION:
COMPRESSED GAS CYLINDERS SHALL NOT BE REFILLED EXCEPT BY QUALIFIED PRODUCERS OF COMPRESSED GASES. SHIPMENT OF A COMPRESSED GAS CYLINDER WHICH HAS NOT BEEN FILLED BY THE OWNER OR WITH THE OWNER'S WRITTEN CONSENT IS A VIOLATION OF

FEDERAL LAW (49 CFR 173.301).

NORTH AMERICAN EMERGENCY RESPONSE GUIDEBOOK NUMBER (NAERG #): 115

SECTION 15. REGULATORY INFORMATION

U.S. FEDERAL REGULATIONS:

EPA - ENVIRONMENTAL PROTECTION AGENCY
CERCLA: COMPREHENSIVE ENVIRONMENTAL RESPONSE, COMPENSATION, AND LIABILITY ACT OF 1980 (40 CFR PARTS 117 AND 302)
 REPORTABLE QUANTITY (RQ): NONE

SARA TITLE III: SUPERFUND AMENDMENT AND REAUTHORIZATION ACT

SECTIONS 302/304: EMERGENCY PLANNING AND NOTIFICATION (40 CFR PART 355)
 EXTREMELY HAZARDOUS SUBSTANCES: ISOBUTYLENE IS NOT LISTED.
 THRESHOLD PLANNING QUANTITY (TPQ): NONE
 REPORTABLE QUANTITY (RQ): NONE

SECTIONS 311/312: HAZARDOUS CHEMICAL REPORTING (40 CFR PART 370)
 IMMEDIATE HEALTH: YES PRESSURE: YES
 DELAYED HEALTH: NO REACTIVITY: NO
 FIRE: YES

SECTION 313: TOXIC CHEMICAL RELEASE REPORTING (40 CFR PART 372)
ISOBUTYLENE DOES NOT REQUIRE REPORTING UNDER SECTION 313.

CLEAN AIR ACT:
SECTION 112 (R): RISK MANAGEMENT PROGRAMS FOR CHEMICAL ACCIDENTAL RELEASE (40 CFR PART 68)
 ISOBUTYLENE IS LISTED AS A REGULATED SUBSTANCE.
 THRESHOLD PLANNING QUANTITY (TPQ): 10,000 LBS

TSCA: TOXIC SUBSTANCE CONTROL ACT
ISOBUTYLENE IS LISTED ON THE TSCA INVENTORY.

OSHA - OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION:
29 CFR PART 1910.119: PROCESS SAFETY MANAGEMENT OF HIGHLY HAZARDOUS CHEMICALS
ISOBUTYLENE IS NOT LISTED IN APPENDIX A AS A HIGHLY HAZARDOUS CHEMICAL. HOWEVER, ANY PROCESS THAT INVOLVES A FLAMMABLE GAS ON SITE IN ONE LOCATION, IN QUANTITIES OF 10,000 POUNDS (4,553 KG) OR GREATER IS COVERED UNDER THIS REGULATION UNLESS IT IS USED AS FUEL.

STATE REGULATIONS:

CALIFORNIA:
PROPOSITION 65: THIS PRODUCT IS NOT A LISTED SUBSTANCE WHICH THE STATE OF CALIFORNIA REQUIRES WARNING UNDER THIS STATUTE.

SECTION 16. OTHER INFORMATION

NFPA RATINGS:
HEALTH: = 1
FLAMMABILITY: = 4
REACTIVITY: = 0
SPECIAL:

HMIS RATINGS:
HEALTH: = 0
FLAMMABILITY: = 4
REACTIVITY: = 0

ALAMO CEMENT
CEMENT, PORTLAND **Revised: 03/04/1991**

MSDS Contents

U.S. DEPARTMENT OF LABOR
OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION

OMB NO 1218-0074
EXPIRATION DATE 05/31/86

MATERIAL SAFETY DATA SHEET

REQUIRED UNDER USDL SAFETY AND HEALTH REGULATIONS FOR SHIPYARD EMPLOYMENT
(29 CFR 1915)

3/4/91

SECTION I

MANUFACTURER'S NAME: ALAMO CEMENT

ADDRESS (NUMBER, STREET, CITY, STATE AND ZIP CODE):
P.O. BOX 34807
SAN ANTONIO, TX 78233

EMERGENCY TELEPHONE NO.

CHEMICAL NAME AND SYNONYMS: CEMENT

TRADE NAME AND SYNONYMS: CEMENT, PORTLAND

CHEMICAL FAMILY: CEMENT, CALCIUM

FORMULA: SILICATES & ALUMINATES

SECTION II - HAZARDOUS INGREDIENTS

PAINTS, PRESERVATIVES AND SOLVENTS	%	TLV (UNITS)
PIGMENTS	N/A	
CATALYST	N/A	
VEHICLE	N/A	
SOLVENTS	N/A	
ADDITIVES	N/A	
OTHERS	N/A	

ALLOYS AND METALLIC COATINGS	%	TLV (UNITS)
BASE METAL	N/A	

ALLOYS	N/A
METALLIC COATINGS	N/A
FILLER METAL PLUS COATING OR CORE FLUX	N/A
OTHERS	N/A

HAZARDOUS MIXTURES OF OTHER LIQUIDS, SOLIDS, OR GASES

	%	TLV (UNITS)
N/A		

SECTION III - PHYSICAL DATA

BOILING POINT (DEG. F):	N/A
SPECIFIC GRAVITY (H2O = 1):	3.17
VAPOR PRESSURE (MM HG.):	N/A
PERCENT VOLATILE BY VOLUME (%):	0.0
VAPOR DENSITY (AIR = 1):	N/A
EVAPORATION RATE (= 1):	0.0
SOLUBILITY IN WATER:	50% - 80%
APPEARANCE AND ODOR:	GREY, NO ODOR

SECTION IV - FIRE AND EXPLOSION HAZARD DATA

FLASHPOINT (METHOD USED): N/A

FLAMMABLE LIMITS: LEL: UEL:

EXTINGUISHING MEDIA: N/A

SPECIAL FIRE FIGHTING PROCEDURES: N/A

UNUSUAL FIRE AND EXPLOSION HAZARDS: NONE

SECTION V - HEALTH HAZARD DATA

THRESHOLD LIMIT VALUE:

EFFECTS OF OVEREXPOSURE: MAY CAUSE SLIGHT SKIN IRRITATION OR DRYING OUT AS A RESULT OF PROLONGED OVEREXPOSURE.

EMERGENCY FIRST AID PROCEDURES: WASH WITH EYE WASH IF DUST GETS IN EYE, SEE PHYSICIAN. WASH HANDS AND SKIN WITH SOAP AND WATER, USE NORMAL HAND MOISTURIZING CREAM IF SKIN IS DRY OR CHAPPED.

SECTION VI - REACTIVITY DATA

STABILITY:
- UNSTABLE ( )
- STABLE (X)

CONDITIONS TO AVOID:

INCOMPATIBILITY (MATERIALS TO AVOID):

HAZARDOUS DECOMPOSITION PRODUCTS: NONE

HAZARDOUS POLYMERIZATION:
MAY OCCUR ( )
WILL NOT OCCUR (X)

CONDITIONS TO AVOID:

SECTION VII - SPILL OR LEAK PROCEDURES

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED: SHOVEL OR SWEEP UP AND RE-USE, IF POSSIBLE; OTHERWISE, DISPOSE OF AS AN AGGREGATE AND AVOID WATER DUE TO CEMENT'S NATURE OF HARDENING IN CONTACT WITH WATER.

WASTE DISPOSAL METHOD: SEE ABOVE

SECTION VIII - SPECIAL PROTECTION INFORMATION

RESPIRATORY PROTECTION (SPECIFY TYPE): OSHA-MSHA APPROVED SILICA DUST RESPIRATOR

VENTILATION: SUBJECT TO LOCAL CODES
LOCAL EXHAUST:
MECHANICAL (GENERAL):
SPECIAL:
OTHER:

PROTECTIVE GLOVES: COTTON OR NORMAL RUBBER GLOVES

EYE PROTECTION: STANDARD SAFETY GLASSES

OTHER PROTECTIVE EQUIPMENT: USE CLOTHING AS NECESSARY TO AVOID SKIN CONTACT

SECTION IX - SPECIAL PRECAUTIONS

PRECAUTIONS TO BE TAKEN IN HANDLING AND STORING: PROTECT FROM MOISTURE

OTHER PRECAUTIONS:

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Material Safety Data Sheet Collection
Genium group inc.
1171 RiverFront Center, Amsterdam, NY 12010
(518) 842-4111

Potassium Permanganate
POT7020

Issue Date: 2006-06

Section 1 - Chemical Product and Company Identification 61

Material Name: Potassium Permanganate **CAS Number:** 7722-64-7
Chemical Formula: $KMnO_4$
Structural Chemical Formula: $KMnO_4$
EINECS Number: 231-760-3
ACX Number: X1000083-0
Synonyms: Potassium Permanganate; POTASSIUM PERMANGANATE; ALGAE-K; ARGUCIDE; C.I. 77755; CAIROX; CHAMELEON MINERAL; CHLORISOL; CONDY'S CRYSTALS; DIVERSEY DIVERSOL CX WITH ARODYNE; DIVERSEY DIVERSOL CXU; EPA PESTICIDE CHEMICAL CODE 068501; HILCO #88; ICC 237 DISINFECTANT,SANITIZER,DESTAINER,AND DEODORIZER; KALIUMPERMANGANAAT; KALIUMPERMANGANAT; PERMANGANATE DE POTASSIUM; PERMANGANATE OF POTASH; PERMANGANATO POTASICO; PERMANGANIC ACID (HMNO4),POTASSIUM SALT; PERMANGANIC ACID POTASSIUM SALT; POTASSIO (PERMANGANATO DI); POTASSIUM (PERMANGANATE DE); PURPLE SALT; SOLO SAN SOO; WALKO TABLETS
General Use: Bleaching resins, waxes, fats, oils, straw, cotton, silk and other fibers and chamois skins; dyeing wood brown; printing fabrics; washing carbon dioxide in manufacture of mineral waters; photography; tanning leathers; purifying water; with formaldehyde solution to expel formaldehyde gas for disinfecting; as an important reagent in analytical and synthetic organic chemistry.

Section 2 - Composition / Information on Ingredients

Name	CAS	%
potassium permanganate	7722-64-7	>99

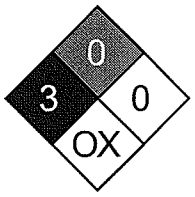
OSHA PEL
Ceiling: 5 mg/m^3; as Mn.

ACGIH TLV
TWA: 0.2 mg/m^3. *Manganese - Elemental & inorganic cmpds (as Mn)*

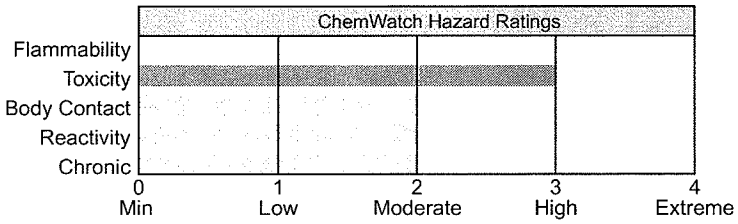
NIOSH REL
TWA: 1 mg/m^3; STEL: 3 mg/m^3; as Mn inorganic.

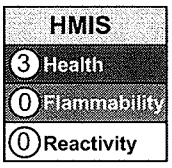
DFG (Germany) MAK
TWA: 0.5 mg/m^3; PEAK: 5 mg/m^3; as Mn inorganic, ceiling, measured as inhalable fraction of the aerosol, substances with systemic effects, onset of effect greater than 2 hours, half-life greater than shift length, strongly cumulative.

Section 3 - Hazards Identification



Fire Diamond





ANSI Signal Word
Danger!


Corrosive

☆☆☆☆☆ Emergency Overview ☆☆☆☆☆
Odorless, dark purple crystals. Corrosive. Other Acute Effects: respiratory tract irritation, blood/kidney damage. Strong oxidizer.

Potential Health Effects

Target Organs: respiratory system, eyes, skin, gastrointestinal (GI) tract
Primary Entry Routes: ingestion, inhalation

Acute Effects

Inhalation: The material is moderately discomforting to the upper respiratory tract and may be harmful if inhaled.
Manganese fume is toxic and produces nervous system effects characterized by tiredness. Acute poisoning is rare although acute inflammation of the lungs may occur. A chemical pneumonia may also result from frequent exposure.
Inhalation of freshly formed metal oxide particles sized below 1.5 microns and generally between 0.02 to 0.05 microns may result in "metal fume fever". Symptoms may be delayed for up to 12 hours and begin with the sudden onset of thirst, and a sweet, metallic or foul taste in the mouth.
Other symptoms include upper respiratory tract irritation accompanied by coughing and a dryness of the mucous membranes, lassitude and a generalized feeling of malaise. Mild to severe headache, nausea, occasional vomiting, fever or chills, exaggerated mental activity, profuse sweating, diarrhea, excessive urination and prostration may also occur. Tolerance to the fumes develops rapidly, but is quickly lost. All symptoms usually subside within 24-36 hours following removal from exposure.
Persons with impaired respiratory function, airway diseases, and conditions such as emphysema or chronic bronchitis, may incur further disability if excessive concentrations of particulate are inhaled.

Eye: The material is corrosive to the eyes and is capable of causing pain and severe conjunctivitis.
Corneal injury may develop, with possible permanent impairment of vision, if not promptly and adequately treated.

Skin: The material is highly discomforting to the skin and is capable of causing skin reactions which may lead to dermatitis.
Open cuts, abraded or irritated skin should not be exposed to this material.
The material may accentuate any pre-existing skin condition.

Ingestion: The material is corrosive to the gastrointestinal tract, may cause severe mucous membrane damage and may be harmful if swallowed.
Poisonings rarely occur after oral administration of manganese salts as they are generally poorly absorbed from the gut (generally less than 4%) and seems to be dependent, in part, on levels of dietary iron and may increase following the consumption of alcohol. A side-effect of oral manganese administration is an increase in losses of calcium in the feces and a subsequent lowering of calcium blood levels. Absorbed manganese tends to be slowly excreted in the bile.
Divalent manganese appears to be 2.5-3 times more toxic than the trivalent form.
Ingestion may cause brown discoloration and burns to the mouth with edema of the glottis, nausea, vomiting and diarrhea.
Over-exposure may result in anemia, swelling of the throat with possibility of suffocation and kidney damage.

Carcinogenicity: NTP - Not listed; IARC - Not listed; OSHA - Not listed; NIOSH - Not listed; ACGIH - Not listed; EPA - Class D, Not classifiable as to human carcinogenicity; MAK - Not listed.

Chronic Effects: Manganese is an essential trace element in all living organisms with the level of tissue manganese remaining remarkably constant throughout life.
Systemic poisoning may result from inhalation or chronic ingestion of manganese containing substances. Chronic exposure has been associated with two major effects; bronchitis/pneumonitis following inhalation of manganese dusts and "manganism", a neuropsychiatric disorder that may also arise from inhalation exposures.
Chronic exposure to low levels may result in the accumulation of toxic concentrations in critical organs. The brain in particular appears to sustain cellular damage to the ganglion. Symptoms appear before any pathology is evident and may include a mask-like facial expression, spastic gait, tremors, slurred speech, sometimes dystonia (disordered muscle tone), fatigue, anorexia, asthenia (loss of strength and energy), apathy and the inability to concentrate. Insomnia may be an early finding.
Rat studies indicate the gradual accumulation of brain manganese to produce lesions mimicking those found in Parkinsonism.
Long term exposures to manganese compounds may effect the central nervous system. Symptoms include muscular weakness and tremors similar to Parkinson's disease. Behavioral changes and handwriting differences may also appear. Other symptoms include sleepiness, weakness in the legs, muscle twitchings and tremors, nocturnal leg cramps, and a typical Parkinsonian slapping gait may appear. These systems may stimulate progressive bulbar paralysis, multiple sclerosis, amyotrophic lateral sclerosis and progressive lenticular degeneration. The blood may show increased erythrocyte formation and increased osmotic fragility.
No known cases of chronic manganese poisoning by potassium permanganate have been reported.

Section 4 - First Aid Measures

Inhalation: Remove to fresh air.
Lay patient down. Keep warm and rested.
If breathing is shallow or has stopped, ensure clear airway and apply resuscitation. Transport to hospital or doctor.

Eye Contact: Immediately hold the eyes open and flush continuously for at least 15 minutes with fresh running water. Ensure irrigation under eyelids by occasionally lifting the upper and lower lids.
Transport to hospital or doctor without delay. Removal of contact lenses after an eye injury should only be undertaken by skilled personnel.

Skin Contact: Immediately remove all contaminated clothing, including footwear (after rinsing with water).
Wash affected areas thoroughly with water (and soap if available).

Seek medical attention in event of irritation.

Ingestion: Contact a Poison Control Center.

Do NOT induce vomiting. Give a glass of water.

After first aid, get appropriate in-plant, paramedic, or community medical support.

Note to Physicians: Both dermal and oral toxicity of manganese salts is low because of limited solubility of manganese. No known permanent pulmonary sequelae develop after acute manganese exposure.

Treatment is supportive.

In clinical trials with miners exposed to manganese-containing dusts, L-dopa relieved extrapyramidal symptoms of both hypokinetic and dystonic patients.

For short periods of time symptoms could also be controlled with scopolamine and amphetamine. BAL and calcium EDTA prove ineffective.

For potassium intoxications:

1.Hyperkalemia, in patients with abnormal renal function, results from reduced renal excretion following intoxication.

2.The presence of electrocardiographic evidence of hyperkalemia or serum potassium levels exceeding 7.5 mE/L indicates a medical emergency requiring an intravenous line and constant cardiac monitoring.

3.The intravenous ingestion of 5-10 mL of 10% calcium gluconate in adults, over a 2 minute period, antagonizes the cardiac and neuromuscular effects.

The duration of action is approximately 1 hour.

Section 5 - Fire-Fighting Measures

Flash Point: Nonflammable

Autoignition Temperature: Not applicable

LEL: Not applicable

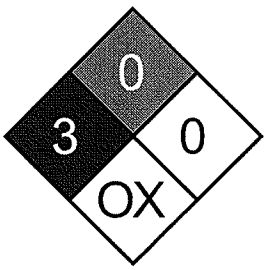
UEL: Not applicable

Extinguishing Media: Jets of water; water spray or fog; foam; dry chemical powder.

BCF (where regulations permit).

Carbon dioxide.

See DOT ERG



Fire Diamond

General Fire Hazards/Hazardous Combustion Products: Will not burn but increases intensity of fire.

Heating may cause expansion or decomposition leading to violent rupture of containers.

Heat affected containers remain hazardous.

Contact with combustibles such as wood, paper, oil or finely divided metal may cause ignition, combustion or violent decomposition.

May emit irritating, poisonous or corrosive fumes.

May cause spontaneous ignition if mixed with glycol, or anti-freeze compounds.

Reacts violently when exposed to sulfuric acid or hydrogens peroxide.

May form explosive compounds with ammonium compounds.

Decomposes on heating and produces oxygen, oxides of manganese and potassium. Reacts with concentrated acids to produce oxygen.

Reacts with hydrochloric acid to produce chlorine.

Fire Incompatibility: Oxidizing agents as a class are not necessarily combustible themselves, but can increase the risk and intensity of fire in many other substances.

Reacts vigorously with metallic powders, ammonium compounds, phosphorous, carbon, arsenates, ethylene glycol, sulfur, hydrazine, metal hydrides, peroxides, alcohol and other combustible materials.

Avoid reaction with acids.

Potassium permanganate is readily decomposed by many reducing substances such as ferrous or mercury salts, iodides, bromides, oxalates, etc., especially in the presence of an acid.

Fire-Fighting Instructions: Contact fire department and tell them location and nature of hazard.

Wear full body protective clothing with breathing apparatus. Prevent, by any means available, spillage from entering drains or waterways.

Fight fire from a safe distance, with adequate cover.

Extinguishers should be used only by trained personnel.

Use water delivered as a fine spray to control fire and cool adjacent area.

Avoid spraying water onto liquid pools.

Do not approach containers suspected to be hot.

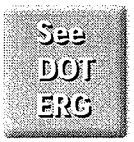
Cool fire-exposed containers with water spray from a protected location.

If safe to do so, remove containers from path of fire.

If fire gets out of control withdraw personnel and warn against entry.

Equipment should be thoroughly decontaminated after used.

Section 6 - Accidental Release Measures



Small Spills: Clean up all spills immediately. No smoking, bare lights, ignition sources.
Avoid all contact with any organic matter including fuel, solvents, sawdust, paper or cloth and other incompatible materials, as ignition may result.
Avoid breathing dust or vapors and all contact with skin and eyes.
Control personal contact by using protective equipment.
Contain and absorb spill with dry sand, earth, inert material or vermiculite. DO NOT use sawdust as fire may result.
Scoop up solid residues and seal in labeled drums for disposal.
Neutralize/decontaminate area.

Large Spills: Pollutant - Clear area of personnel and move upwind. Contact fire department and tell them location and nature of hazard.
May be violently or explosively reactive. Wear full body protective clothing with breathing apparatus. Prevent, by any means available, spillage from entering drains or waterways. Consider evacuation.
No smoking, flames or ignition sources. Increase ventilation.
Contain spill with sand, earth or other clean, inert materials. NEVER use organic absorbents such as sawdust, paper or cloth.
Use spark-free and explosion-proof equipment.
Collect residues and seal in labeled drums for disposal.
Wash area and prevent runoff into drains. Decontaminate equipment and launder all protective clothing before storage and reuse.
If contamination of drains or waterways occurs advise emergency services.
Cover residue with a reducer (hypo, a bisulfate or a ferrous salt, but not carbon, sulfur or a strong reducing agent) mix and spray with water.
To promote rapid reduction, add sulfuric acid with reducer above. Scoop into a metal container of water and neutralize with soda ash. Wash residue with soap solution containing some reducer.

Regulatory Requirements: Follow applicable OSHA regulations (29 CFR 1910.120).

Section 7 - Handling and Storage

Handling Precautions: Avoid personal contact and inhalation of dust, mist or vapors.
Provide adequate ventilation.
Always wear protective equipment and wash off any spillage from clothing.
Keep material away from light, heat, flammables or combustibles. Keep cool, dry and away from incompatible materials.
Avoid physical damage to containers.
Do not repack or return unused portions to original containers. Withdraw only sufficient amounts for immediate use.
Contamination can lead to decomposition leading to possible intense heat and fire. When handling NEVER smoke, eat or drink.
Always wash hands with soap and water after handling.
Use only good occupational work practices. Observe manufacturer's storing and handling directions.

Recommended Storage Methods: Check that containers are clearly labeled.
Packaging as recommended by manufacturer.
Glass container.
Plastic drum.
Polyethylene or polypropylene container.
Polylined drum.

Regulatory Requirements: Follow applicable OSHA regulations.

Section 8 - Exposure Controls / Personal Protection

Engineering Controls: General exhaust is adequate under normal operating conditions.
If risk of overexposure exists, wear NIOSH-approved respirator.
Correct fit is essential to obtain adequate protection.
Provide adequate ventilation in warehouse or closed storage areas.

Personal Protective Clothing/Equipment:

Eyes: Safety glasses with side shields; chemical goggles. Full face shield.
Contact lenses pose a special hazard; soft lenses may absorb irritants and all lenses concentrate them.

Hands/Feet: Impervious gloves; PVC gloves.
Rubber gloves.
Safety footwear.
Rubber boots.

Other: Overalls. Impervious protective clothing.
Eyewash unit.
Ensure there is ready access to a safety shower.

Equipment should be kept clean and in working-order.

Section 9 - Physical and Chemical Properties

Appearance/General Info: Purple-bronze (almost black) odorless, crystals or powder with a metallic luster. Sweet with an astringent after-taste. Decomposed by alcohol and many other organic solvents. Concentrated solutions are alkaline.

Physical State: Divided solid
Formula Weight: 158.04
Specific Gravity (H_2O=1, at 4 °C): 2.7
Evaporation Rate: Not applicable
pH: Not applicable
pH (1% Solution): >7

Boiling Point: Decomposes at 1 atm
Freezing/Melting Point: 240 °C (464 °F)
Volatile Component (% Vol): Not applicable
Decomposition Temperature (°C): <240
Water Solubility: 6.38 g/100 cc at 20 °C water

Section 10 - Stability and Reactivity

Stability/Polymerization/Conditions to Avoid: Presence of heat source and ignition source. Presence of elevated temperatures. Product is considered stable under normal handling conditions. Hazardous polymerization will not occur.

Storage Incompatibilities: Contact with acids produces toxic fumes.
Oxidizing agents as a class are not necessarily combustible themselves but can increase the risk and intensity of fire in many other substances.
Segregate from reducing agents, concentrated acids, tin, sulfur, alcohol, peroxides, bromides, iodides, arsenates, ethylene glycol, ammonium compounds, metallic powders, phosphorous, hydrazine, ferrous or mercury salts, oxalates and combustible materials and organic substances generally.

Section 11 - Toxicological Information

Toxicity
Oral (human) LD_{Lo}: 143 mg/kg
Oral (woman) TD_{Lo}: 2.4 mg/kg/d
Oral (rat) LD_{50}: 1090 mg/kg
Dyspnea, nausea, effects on spermatogenesis and the male fertility index recorded.

Irritation
Nil reported

See *RTECS* SD 6475000, for additional data.

Section 12 - Ecological Information

Environmental Fate: No data found.
Ecotoxicity: LC_{50} Ictalurus punctatus (channel catfish) 0.75 mg/l/96 hr /conditions of bioassay not specified
BCF: no food chain concentration potential
Biochemical Oxygen Demand (BOD): none

Section 13 - Disposal Considerations

Disposal: Recycle wherever possible. Special hazards may exist - specialist advice may be required.
Consult manufacturer for recycling options.
Follow applicable federal, state, and local regulations.
Treat and neutralize at an approved treatment plant.
Decontaminate empty containers. Observe all label safeguards until containers are cleaned and destroyed.
Puncture containers to prevent reuse and bury at an authorized landfill.
For small quantities: Dissolve solid residue in water. Add a reducer (hypo, a bisulfate, or a ferrous salt but not carbon, sulfur or strong reducing agent), and sulphuric acid to promote reduction.
Neutralize with soda ash.
Bury precipitate in an authorized landfill.
Decontaminate empty containers with reducer, acid and soda ash, as above.
Recycle containers wherever possible, otherwise dispose of in an authorized landfill.

Section 14 - Transport Information

DOT Hazardous Materials Table Data (49 CFR 172.101):

Shipping Name and Description: Potassium permanganate
ID: UN1490
Hazard Class: 5.1 - Oxidizer
Packing Group: II - Medium Danger
Symbols:
Label Codes: 5.1 - Oxidizer
Special Provisions: IB8, IP4
Packaging: **Exceptions:** 152 **Non-bulk:** 212 **Bulk:** 240
Quantity Limitations: **Passenger aircraft/rail:** 5 kg **Cargo aircraft only:** 25 kg
Vessel Stowage: **Location:** D **Other:** 56, 58, 69, 106, 107

Section 15 - Regulatory Information

EPA Regulations:
RCRA 40 CFR: Not listed
CERCLA 40 CFR 302.4: Listed per CWA Section 311(b)(4) 100 lb (45.35 kg)
SARA 40 CFR 372.65: Listed as Compound
SARA EHS 40 CFR 355: Not listed
TSCA: Listed

Section 16 - Other Information

Disclaimer: Judgments as to the suitability of information herein for the purchaser's purposes are necessarily the purchaser's responsibility. Although reasonable care has been taken in the preparation of such information, Genium Group, Inc. extends no warranties, makes no representations, and assumes no responsibility as to the accuracy or suitability of such information for application to the purchaser's intended purpose or for consequences of its use.

ANTHRATECH WESTERN CANADA
SILICA SAND Revised: 09/30/2001

MSDS Contents

MATERIAL SAFETY DATA SHEET

SECTION 1 - PRODUCT IDENTIFICATION AND USE

PRODUCT IDENTIFIER: SILICA SAND

VARIOUS SIZES, INCLUDING SILICA FLOUR, PLAY SAND, TRACTION SAND

DESCRIPTION: ODORLESS, GRANULAR SAND

PRODUCT USE: WATER TREATMENT FILTRATION, SAND BLASTING ABRASIVE

MANUFACTURER'S NAME:
AWI(ANTHRATECH WESTERN INC.)
4450-46 AVENUE, SE
CALGARY, ALBERTA T2B 3N7

EMERGENCY PHONE: (403) 255-7377

SUPPLIER'S NAME:
AWI (ANTHRATECH WESTERN INC.)
4450-46 AVENUE, SE
CALGARY, ALBERTA T2B 3N7

EMERGENCY PHONE: (403) 620-4505

SECTION 2 - HAZARDOUS INGREDIENTS

SILICA, CRYSTALLINE QUARTZ
C.A.S. NUMBER: 14808-60-7
LD50: N/A
LC50: N/A

SECTION 3 - PHYSICAL DATA

PHYSICAL STATE: SOLID

ODOR & APPEARANCE: ODORLESS, GRANULAR SAND

ODOR THRESHOLD: N/A

SPECIFIC GRAVITY: 2.6 (APPROXIMATE)

VAPOR PRESSURE: N/A

VAPOR DENSITY: N/A

EVAPORATION RATE: N/A

BOILING POINT: 4000 DEG. F

FREEZING POINT: N/A

pH: 7.3

COEFFICIENT OF WATER/OIL DISTRIBUTION: N/A

SECTION 4 - FIRE AND EXPLOSION DATA

CONDITIONS OF FLAMMABILITY: N/A

MEANS OF EXTINCTION: N/A

FLASH POINT: N/A

UPPER FLAMMABLE LIMIT: N/A
LOWER FLAMMABLE LIMIT: N/A

AUTO-IGNITION TEMPERATURE: N/A

EXPLOSION DATA (MECHANICAL IMPACT): N/A

EXPLOSION DATA (STATIC IMPACT): N/A

SECTION 5 - REACTIVITY DATA

CONDITIONS UNDER WHICH THE PRODUCT IS CHEMICALLY UNSTABLE: N/A

SUBSTANCE OR CLASS OF SUBSTANCE WITH WHICH THE PRODUCT IS INCOMPATIBLE: N/A

CONDITIONS OF REACTIVITY: N/A

HAZARDOUS DECOMPOSITION PRODUCTS: N/A

SECTION 6 - TOXICOLOGICAL PROPERTIES

SKIN CONTACT: NO EFFECT

SKIN ABSORPTION: NO EFFECT

EYE CONTACT: NO LONG-TERM EFFECT OTHER THAN DUST DISCOMFORT

INGESTION: NO EFFECT

INHALATION ACUTE EXPOSURE: NO IMMEDIATE EFFECT

CHRONIC EXPOSURE:
RESPIRATORY DISEASES MAY DEVELOP SUCH AS SILICOSIS, PNEUMOCONIOSIS AND PULMONARY FIBROSIS

EXPOSURE LIMITS:

ACGIH TLV:
CRYSTALLINE QUARTZ
TLV-TWA: 0.1 MG/CUBIC M (RESPIRABLE DUST)

SEE THRESHOLD LIMIT VALUE AND BIOLOGICAL EXPOSURE INDICES FOR 1987-1988 AMERICAN CONFERENCE OF GOVERNMENTAL INDUSTRIAL HYGIENISTS, BE CHANGED TO 50 MICROGRAMS RESPIRABLE FREE SILICA PER CUBIC METER OF AIR (50 (MICRO)G/CUBIC M) AVERAGED OVER A WORK SHIFT OF UP TO 10 HOURS PER DAY, 40 HOURS PER WEEK. THE NIOSH CRITERIA DOCUMENT OF CRYSTALLINE SILICA SHOULD BE CONSULTED FOR MORE DETAILED INFORMATION.

SECTION 7 - PREVENTIVE MEASURES

USE LOCAL EXHAUST TO CONTROL DUST DISPERSION. FOR RESPIRATORY PROTECTION, USE AN AIR-SUPPLIED RESPIRATOR OR OTHER CONVENTIONAL PARTICULATE RESPIRATORY PROTECTION BASED ON CONSIDERATIONS OF AIRBORNE CONCENTRATIONS AND DURATION OF EXPOSURE. FOR MORE INFORMATION CONTACT THE FOLLOWING STANDARDS:

1) AMERICAN NATIONAL STANDARD INSTITUTE (ANSI 2.88.2)
2) OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION (OSHA -29CFR PART 1910.134)
3) MINE SAFETY AND HEALTH ADMINISTRATION (MSHA - CFR PART 56)

SAFETY GLASSES SHOULD BE WORN TO PREVENT DUST IN EYES, IN CASE OF SPILL, VACUUM SPILLAGE AND DISPOSE OF WASTE IN CONTAINERS OF SLURRY TO AVOID REDISPERSION.

STORE IN SILOS OR BAGS.

SECTION 8 - FIRST AID MEASURES

EYE CONTACT:
A WATER WASH WILL REMOVE PARTICLES

INHALATION:
REMOVE FROM CONTAMINATED AREA. IF SHORTNESS OF BREATH OR OTHER BREATHING PROBLEMS PERSIST, CONSULT A PHYSICIAN.

SECTION 9 - PREPARATION OF DATE OF MSDS

PREPARED BY: PRODUCTION & QUALITY CONTROL

TELEPHONE NUMBER: (403) 255-7377

DATE PREPARED: SEPTEMBER 30, 2001

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Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-6

Appendix F
NFPA 70 E—Electrical Safety Tables

NFPA 70 (E) Table 130.7 (C) (9) (a) Hazard/Risk Category Classifications

Task (Assumes Equipment Is Energized, and Work Is Done Within the Flash Protection boundary	Hazard/Risk Category	V-rated Gloves	V-rated Tools
Panel boards Rated 240 V and Below --- Notes 1 and 3			
Circuit breaker (CB) or fused switch operation with covers on	0	N	N
CB or fused switch operation with covers off	0	N	N
Work on energized parts, including voltage testing	1	Y	Y
Remove/install CBs or fused switches	1	Y	Y
Removal of bolted covers (to expose bare, energized parts)	1	N	N
Opening hinged covers (to expose bare, energized parts)	0	N	N
Panel boards or Switchboards Rated >240 V and up to 600 V (with molded case or insulated case circuit breakers) --- Notes 1 and 3			
CB or fused switch operation with covers on	0	N	N
CB or fused switch operation with covers off	1	N	N
Work on energized parts, including voltage testing	2*	Y	Y
600 V Class Motor control Centers (MCCs) --- Notes 2 (except as indicated) and 3			
CB or fused switch or starter operation with enclosure doors closed	0	N	N
Reading a panel meter while operating a meter switch	0	N	N
CB or fused switch or starter operation with enclosure doors open	1	N	N
Work on energized parts, including voltage testing	2*	Y	Y
Work on control circuits with energized parts 120 V or below, exposed	0	Y	Y
Work on control circuits with energized parts > 120 V exposed	2*	Y	Y
Insertion or removal of individual starter "buckets" from MCC - Note 4	3	Y	N
Application of safety grounds, after voltage test	2*	Y	N
Removal of bolted covers (to expose bare, energized parts)	2*	N	N
Opening hinged covers (to expose bare, energized parts)	1	N	N
600 V Class Switchgear (with power circuit breakers or fused switches)-- Notes 5 and 6			
CB or fused switch operation with enclosure door closed	0	N	N
Reading a panel meter while operating a meter switch	0	N	N
CB or fused switch operation with enclosure door open	1	N	N
Work on energized parts, including voltage testing	2*	Y	Y
Work on control circuits with energized parts 120 V or below, exposed	0	Y	Y
Work on control circuits with energized parts > 120 V, exposed	2*	Y	Y
Insertion or removal (racking) of CBs from cubicles, doors open	3	N	N
Insertion or removal (racking) of CBs from cubicles, doors closed	2	N	N
Application of safety grounds, after voltage test	2*	Y	N
Removal of bolted covers (to expose bare, energized parts)	3	N	N
Opening hinged covers (to expose bare, energized parts)	2	N	N

NFPA 70 (E) Table 130.7 (C) (9) (a) Hazard/Risk Category Classifications (Continued)

Task (Assumes Equipment Is Energized, and Work Is Done Within the Flash Protection Boundary)	Hazard/Risk Category	V-rated Gloves	V-rated Tools
Other 600 V Class (277 V through 600 V, nominal) Equipment -- Note 3			
Lighting or small power transformers (600 V, maximum)	--	--	--
Removal of bolted covers (to expose bare, energized parts)	2*	N	N
Opening hinged covers (to expose bare energized parts)	1	N	N
Work on energized parts, including voltage testing	2*	Y	Y
Application of safety grounds, after voltage test	2*	Y	N
Revenue meters (kW-hour, at primary voltage and current)	--	--	--
Insertion or removal	2*	Y	N
Cable trough or tray cover removal or installation	1	N	N
Miscellaneous equipment cover removal or installation	1	N	N
Work on energized parts, including voltage testing	2*	Y	Y
Application of safety grounds, after voltage test	2*	Y	N
NEMA E2 (fused contactor) Motor Starters, 2.3 kV Through 7.2 kV			
Contactor operation with enclosure doors closed	0	N	N
Reading a panel meter while operating a meter switch	0	N	N
Contactor operation with enclosure doors open	2*	N	N
Work on energized parts, including voltage testing	3	Y	Y
Work on control circuits with energized parts 120 V or below, exposed	0	Y	Y
Work on control circuits with energized parts > 120 V, exposed	3	Y	Y
Insertion or removal (racking) of starters from cubicles, doors open	3	N	N
Insertion or removal (racking) of starters from cubicles, doors closed	2	N	N
Application of safety grounds, after voltage test	3	Y	N
Removal of bolted covers (to expose bare, energized parts)	4	N	N
Opening hinged covers (to exposed bare, energized parts)	3	N	N
Metal Clad Switchgear, 1 kV and Above			
CB or fused switch operation with enclosure doors closed	2	N	N
Reading a panel meter while operating a meter switch	0	N	N
CB or fused switch operation with enclosure doors open	4	N	N
Work on energized parts, including voltage testing	4	Y	Y
Work on control circuits with energized parts 120 V or below, exposed	2	Y	Y
Work on control circuits with energized parts > 120 V, exposed	4	Y	Y
Insertion or removal (racking) of CBs from cubicles, doors open	4	N	N
Insertion or removal (racking) of CBs from cubicles, doors closed	2	N	N
Application of safety grounds, after voltage test	4	Y	N
Removal of bolted covers (to expose bare, energized parts)	4	N	N
Opening hinged covers (to expose bare, energized parts)	3	N	N
Opening voltage transformer or control power transformer compartments	4	N	N

NFPA 70 (E) Table 130.7 (C) (9) (a) Hazard/Risk Category Classifications (Continued)

Task (Assumes Equipment Is Energized, and Work Is Done Within the Flash Protection Boundary)	Hazard/Risk Category	V-rated Gloves	V-rated Tools
Other Equipment 1 kV and Above			
Metal clad load interrupter switches, fused or unfused	--	--	--
Switch operation, doors closed	2	N	N
Work on energized parts, including voltage testing	4	Y	Y
Removal of bolted covers (to expose bare, energized parts)	4	N	N
Opening hinged covers (to expose bare, energized parts)	3	N	N
Outdoor disconnect switch operation (hook stick operated)	3	Y	Y
Outdoor disconnect switch operation (gang-operated, from grade)	2	N	N
Insulated cable examination, in manhole or other confined space	4	Y	N
Insulated cable examination, in open area	2	Y	N

Note:
V-rated Gloves are gloves rated and tested for the maximum line-to-line voltage upon which work will be done.
V-rated Tools are tools rated and tested for the maximum line-to-line voltage upon which work will be done.
2* means that a double-layer switching hood and hearing protection are required for this task in addition to the other Hazard/Risk Category 2 requirements of Table 130.7 (C) (10).

Y = yes (required)

N = no (not required)

Notes:
1. 25 kA short circuit current available, 0.03 second (2 cycle) fault clearing time.
2. 65 kA short circuit current available, 0.03 second (2 cycle) fault clearing time.
3. For < 10 kA short circuit current available, the hazard/risk category required may be reduced by one number
4. 65 kA short circuit current available, 0.33 second (20 cycle) fault clearing time.
5. 65k A short circuit current available, up to 1.0 second (60 cycle) fault clearing time.
6. for < 25 kA short circuit current available, the hazard/risk category required may be reduced by one number

NFPA 70 (E) Table 130.7 (C) (10) Protective Clothing and Personal Protective Equipment (PPE) Matrix

Protective Clothing and Equipment	Protective Systems for Hazard/Risk Category					
Hazard/Risk Category Number	**-1** (Note 3)	**0**	**1**	**2**	**3**	**4**
Non-melting (according to ASTM F 1506-00) or Untreated Natural Fiber						
a. T-shirt (short-sleeve)	X			X	X	X
b. Shirt (long-sleeve)		X				
c. Pants (long)	X	X	X (Note 4)	X (Note 6)	X	X
FR Clothing (Note 1)						
a. Long-sleeve shirt			X	X	X (Note 9)	X
b. Pants			X (Note 4)	X (Note 6)	X (Note 9)	X
c. overall			(Note 5)	(Note 7)	X (Note 9)	(Note 5)
d. Jacket, parka, or rainwear			AN	AN	AN	AN
FR Protective Equipment						
a. Flash suit jacket (multilayer)						X
b. Flash suit pants (multilayer)						X
c. Head protection						
1. Hard hat			X	X	X	X
2. FR hard hat liner					AR	AR
d. Eye protection		--	--	--	--	--
1. Safety glasses	X	X	X	AL	AL	AL
2. Safety goggles				AL	AL	AL
e. Face and head area protection		--	--	--	--	--
1. Arc-rated face shield, or flash suit hood				X (Note 8)		
2. Flash suit hood					X	X
3. Hearing protection (car canal inserts)				X (Note 8)	X	X
f. Hand protection			--	--	--	--
Leather gloves (Note 2)			AN	X	X	X
g. Foot protection						
Leather work shoes			AN	X	X	X

AN = As needed
AL = Select one in group
AR = As required
FR = Flame Resistant
X = Minimum required

Notes:
1. See Table 130.7(C) (11). Arc rating for a garment is expressed in cal/cm^2.
2. If voltage-rated gloves are required, the leather protectors worn external to the rubber gloves satisfy this requirement.
3. Hazard/Risk Category Number "-1" is only defined if determined by Notes 3 or 6 of Table 130.7(C) (9) (a).
4. Regular weight (minimum 12 oz/yd^2 fabric weight), untreated, denim cotton blue jeans are acceptable in lieu of FR pants. The FR pants used for Hazard/Risk Category 1 shall have a minimum arc rating of 4.
5. Alternate is to use FR coveralls (minimum arc rating of 4) instead of FR shirt and FR pants.
6. If the FR pants have a minimum arc rating of 8, long pants of non-melting or untreated natural fiber pants and t-shirt.
7. Alternate is to use FR coveralls (minimum arc rating of 4) over non-melting or untreated natural fiber pants and T-shirt.
8. A face shield with a minimum arc rating of 8, with wrap-around guarding to protect not only the face, but also the forehead, ears, and neck (or, alternatively, a flash suit hood), is required.
9. Alternate is to use two sets of FR coveralls (the inner with a minimum arc rating of 4 and outer coverall with a minimum arc rating of 5) over non-melting or untreated natural fiber clothing, instead of FR coveralls over FR shirt and FR pants over non-melting or untreated natural fiber clothing.

NFPA 70 (E) Table 130.7 (C) (11) Protective Clothing Characteristics

Hazard/Risk Category	Clothing Description (Typical number of clothing layers is given in parentheses)	Required Minimum Arc Rating of PPE [J/cm^2(cal/cm^2)]
0	Non-melting, flammable materials (i.e., untreated cotton, wool rayon, or silk, or blends of these materials) with a fabric weight at least 4.5 oz/yd^2 (1)	N/A
1	Flame Resistant (FR) shirt and FR pants or FR coverall (1)	16.74 (4)
2	Cotton underwear -- conventional short sleeve and brief/shorts plus FR shirt and FR pants (1 and 2)	33.47 (8)
3	Cotton underwear plus FR shirt and FR pants plus FR coverall, or cotton underwear plus two FR coveralls (2 or 3)	104.6 (25)
4	Cotton underwear plus FR shirt and FR pants plus multilayer flash suit (3 or more)	167.36 (40)

Note: Arc rating is defined in Article 100 and can be either ATPV or E_{BT}. ATPV is defined in ASTM F 1959-99 as the incident energy on a fabric or material that results in sufficient heat transfer through the fabric or material to cause the onset of a second-degree burn based on the Stoll curve. E_{BT} is defined in ASTM F 1959-99 as the average of the five highest incident energy exposure values below the Stoll curve where the specimens do not exhibit break-open. E_{BT} is reported when ATPV cannot be measured due to FR fabric break-open.

NFPA 70E Table 130.2(C)

Approach Boundaries to Live Parts for Shock Protection

(All dimensions are distance from live part to employee.)

(1)	(2)	(3)	(4)	(5)
	Limited Approach Boundary [1]		Restricted Approach Boundary [1], Includes Inadvertent Movement Adder	Prohibited Approach Boundary [1]
Nominal System Voltage Range, Phase to Phase	Exposed Moveable Conductor	Exposed Fixed Circuit Part		
Less than 50	Not specific	Not specific	Not specific	Not specific
50 to 300	3.05 m (10 ft 0 in.)	1.07 m (3 ft 6 in.)	Avoid contact	Avoid contact
301 to 750	3.05 m (10 ft 0 in.)	1.07 m 3 ft 6 in.)	304.8 mm (1 ft 0 in.)	25.4 mm (0 ft 1 in.)
751 to 15 kV	3.05 m (10 ft 0 in.)	1.53 m (5 ft 0 in.)	660.4 mm (2 ft 2 in.)	177.8 mm (0 ft 7 in.)
15.1 kV to 36 kV	3.05 m (10 ft 0 in.)	1.83 m (6 ft 0 in.)	787.4 mm (2 ft 7 in.)	254 mm (0 ft 10 in.)
36.1 kV to 46 kV	3.05 m (10 ft 0 in.)	2.44 m (8 ft 0 in.)	838.2 mm (2 ft 9 in.)	431.8 mm (1 ft 5 in.)
46.1 kV to 72.5 kV	3.05 m (10 ft 0 in.)	2.44 m (8 ft 0 in.)	965.2 mm (3 ft 2 in.)	635 mm (2 ft 1 in.)
72.6 kV to 121 kV	3.25 m (10 ft 8 in.)	2.44 m (8 ft 0 in.)	991 mm (3 ft 3 in.)	812.8 mm (2 ft 8 in.)
138 kV to 145 kV	3.36 m (11 ft 0 in.)	3.05 m (10 ft 0 in.)	1.093 m (3 ft 7 in.)	939.8 mm (3 ft 1 in.)
161 kV to 169 kV	3.56 m (11 ft 8 in.)	3.56 m (11 ft 8 in.)	1.22 m (4 ft 0 in.)	1.07 m (3 ft 6 in.)
230 kV to 242 kV	3.97 m (13 ft 0 in.)	3.97 m (13 ft 0 in.)	1.6 m (5 ft 3 in.)	1.45 m (4 ft 9 in.)
345 kV to 362 kV	4.68 m (15 ft 4 in.)	4.68 m (15 ft 4 in.)	2.59 m (8 ft 6 in.)	2.44 m (8 ft 0 in.)
500 kV to 550 kV	5.8 m (19 ft 0 in.)	5.8 m (19 ft 0 in.)	3.43 m (11 ft 3 in.)	3.28 m (10 ft 9 in.)
765 kV to 800 kV	7.24 m (23 ft 9 in.)	7.24 m (23 ft 9 in.)	4.55 m (14 ft 11 in.)	4.4 m (14 ft 5 in.)

Note: For Flash Protection Boundary, see NFPA 70E 130.3(A)

1: See definitions in Article 100 and text in NFPA 70E 130.2(D)(2) and Annex C for elaboration

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-6

Appendix G
Guidelines for Standard Safety Disciplinary Actions

Guidelines for Standard Safety Disciplinary Actions Acknowledgment Form

I have read and understand the Shaw Environmental and Infrastructure, Inc. *Guidelines for Standard Safety Disciplinary Actions*.

Printed Name	Signature	Representing	Date

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-6

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-6

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Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-6

Appendix H
Incident Notification, Reporting, and Management Procedure

Incident Notification, Reporting, and Management Procedure

Directions, Notes, and Reminders

- **Follow this procedure step-by-step for all incidents.**
- **This procedure has limited application to subcontractors. Assist subcontractors with medical emergencies (as applicable) and then immediately notify the Program H&S Manager for guidance.**
- **Periodically review this procedure in order to be familiar with the steps - prior to an incident occurring.**
- **For injuries and vehicle accidents, secure the scene to prevent additional injury/incident, administer on-site first aid, and arrange for emergency assistance prior to making any other notifications.**
- **The Site Supervisor is responsible for making all other notifications to:**
  - **CORE Health Networks (must be notified while employee is en route to medical care facility): 877-EHS-Shaw (or 877-347-7429)**
  - **Shaw Help Desk / Hot Line: 866-299-3445**
  - **Project Manager: Kathleen Romalia - (720) 554-8207 Cell**
  - **Marcia Musgrave: 419-425-6160.**
- **A Supervisor (or SSHO) is responsible for notifying the Program H&S Manager or Alternate H&S Manager by telephone prior to making any other notifications (other than calling 911 and CORE).**
- **A Supervisor or the SSHO shall accompany all injured personnel to the CORE clinic or to the hospital emergency room.**
- **The Project Manager shall notify the Program Manager in person or by telephone no later than two hours after the incident.**
- **All incident reports shall be completed by typing (when feasible and applicable).**
- **All incident reports shall be submitted (email or fax) to the Program H&S Manager or Alternate H&S Manager for review and distribution.**
- **Complete all the blanks on the INCIDENT NOTIFICATION AND COMMUNICATION CONTACT LIST (page 6) and post near all site telephones.**

Incident Notification, Reporting, and Management Procedure

Action	Who / When	Under what circumstances	How	Notes
1. Notify Site Superintendent for all incidents (no matter how minor)	Injured person, first person recognizing incident, driver/passenger, or employee causing damage *Immediately*	All incidents no matter how minor (including minor cuts, scratches, minor strains/sprains, and insect bites)	In person or by telephone	Site Superintendent to make note of very minor incidents (such as band-aid over scratch) in field logbook
2. For ***life-threatening injuries / illnesses*** - make scene safe, contact local emergency personnel For ***non life-threatening injuries / illnesses*** - make scene safe, transport injured person to doctor at an occupational medical facility For ***vehicle accidents*** – make scene safe, notify police, aid injured parties For ***equipment / property damage*** - make scene safe, prevent further damage or injuries	Site Superitendent *Immediately (concurrently with next step if injury or illness)* Site Superitendent *Immediately (concurrently with next step if injury or illness)* Driver/passenger *Immediately* Employee causing damage *Immediately*	In case of serious injury or illness requiring off-site medical care	Via ambulance Via vehicle	Site Superitendent or Site Safety Officer must immediately go to emergency care facility. Follow HS101 post accident alcohol and drug testing procedure. Site Superitendent or Site Safety and Health Officer must transport and stay with injured person until released from care. Make medical personnel aware of Shaw's "restricted work will be provided" and "no prescriptions if possible" policies. CORE clinics are the preferred urgent care facilities when possible, unless injury is severe and victim is transported by ambulance.
3. Notify CORE Health Networks (for injuries / illnesses to Shaw employees only)	Site Superitendent *Immediately, prior to transporting the injured employee, unless injuries are life threatening*	• Serious injury requiring off-site medical care • If employee states that he/she has been exposed to any chemical or biological substance • If illness is work related	CORE Medical 877-347-7429 Note: Outside Continental US call: **225-614-9561**	Not required for temporary agency and subcontractor labor Provide name of injured employee, name and phone # of treating medical facility, description of the incident CORE will help with medical facility coordination and follow-up care
4. Notify Program H&S Manager (if unsure, see contact list) Notify Alternate H&S Manager if Program H&S Manager cannot be contacted. (if unsure, see contact list)	Site Superitendent *Immediately (concurrently with providing transportation to occupational medical facility or EMS transport to hospital)*	All incidents except on-site first aid cases	See Incident Notification and Communication Contact List (attached)	Program H&S Manager will notify H&S Director

Incident Notification, Reporting, and Management Procedure

Action	Who / *When*	Under what circumstances	How	Notes
5. Notify Shaw Notification Hotline / Help Desk	Site Superintendent *As soon as possible. Prior to sending an individual for medical treatment*	• Illness and/or injury (doctors cases and above) • Any utility damage • Property damage (damage > $2,500.00) • Vehicle accidents (All) • Criminal activity (i.e. bomb threat, theft) • Natural disaster (all) • Explosion and/or fires (damage > $2,500.00 or result in injury) • Environmental spills/releases (incidents that requires regulatory notification or have an offsite impact) • Regulatory agency visit • Fatalities	Shaw Notification Hotline / Help Desk Phone Number: 866-299-3445 Note - Outside the Continental US call: 225-215-5056	Request name of Hotline / Help Desk operator for future reference and note date/time of notification
6. Complete forms: I*njuries and illnesses*: • Authorization for Release of Protected Medical Information • Authorization for Treatment of Occupational Injury/Illness • Return-To-Work Examination Form ***and*** fax to CORE ***and*** email or fax to Program H&S Manager	Injured employee and medical facility personnel (Site Superintendent or Site Safety and Health Officer is responsible for verifying forms are completed) *Prior to leaving medical facility*	• Serious injury requiring off-site medical care • If employee states that he/she has been exposed to any chemical or biological substance	Fax to CORE: 225.292.8986 Email or fax to Program H&S Manager	Site Superintendent or Site Safety and Health Officer must take these forms with him/her to occupational medical facility or hospital (Contained in HS 020) Contact Program H&S Manager for blank electronic forms or obtain forms from: http://shawnet3.shawgrp.com/sites/eihs/federal/Lists/Announcements/DispForm.aspx?ID=8
7. Call Project Manager and notify of incident (Remind Project Manager of notification responsibilities to Program Manager)	Site Superintendent *As soon as reasonably possible*	If Hot Line / Help Desk notification is required (see # 5 above)	See Incident Notification and Communication Contact List	Project Manager will verbally report incident to upper level of Operations/Business Line Management *As soon as reasonably possible*
8. Notify Marcia Musgrave	Site Superintendent	All incidents involving personnel (injuries, illnesses, vehicle accidents)	419-425-6160	

Incident Notification, Reporting, and Management Procedure

Action	Who / When	Under what circumstances	How	Notes
9. Call back Program H&S Manager to report on status of *injured / ill employee*	Site Superintendent *Prior to employee leaving medical facility*	All injuries and illnesses requiring off-site medical care	See Incident Notification and Communication Contact List (attached)	
10. Complete forms (typed electronically): *OSHA Recordable Cases* • Superintendent's Employee Injury/Illness Report Form • Injured Employee Statement • Witness Statement Form(s) *First Aid Cases (Doctor's)* • Superintendent's Employee Injury/Illness Report • Injured Employee Statement • Witness Statement Form(s) Email or Fax completed forms to Program H&S Manager and CORE	• Site Superintendent • Witnesses *As soon as possible – no later than 24 hours*	All injuries, illnesses, and first aide cases	Email or fax to Program H&S Manager See Incident Notification and Communication Contact List (attached) Fax to CORE 225.292.8986	Site Superintendent should have these forms with him/her at all times (Contained in HS 020) Contact Program H&S Manager for blank electronic forms or obtain forms from: http://shawnet3.shawgrp.com/sites/eihs/federal/Lists/Announcements/DispForm.aspx?ID=8
11. Complete forms (typed electronically): *Chargeable Vehicle Accidents* • Vehicle Accident Report • Witness Statement Form(s) • Driving Record Certification (Procedure HS800) *Non-Chargeable Vehicle Accidents* • Vehicle Accident Report • Witness Statement Form(s) *Equipment, Property Damage and General Liability Incidents* • Equipment, Property Damage and General Liability Loss Report • Witness Statement Form(s) Email or Fax completed forms to Program H&S Manager	• Site Superintendent • Witnesses *As soon as possible – no later than 24 hours*	All vehicle accidents and /or all property damage	Email or fax to Program H&S Manager Health See Incident Notification and Communication Contact List (attached)	Superintendent should have these forms with him/her at all times (Contained in HS 020) Contact Program H&S Manager for blank electronic forms or obtain forms from: http://shawnet3.shawgrp.com/sites/eihs/federal/Lists/Announcements/DispForm.aspx?ID=8

Incident Notification, Reporting, and Management Procedure

Action	Who / When	Under what circumstances	How	Notes
12. Complete these additional forms (typed electronically): *OSHA Recordable Cases* • Incident Investigation Report *First Aid Cases (Doctor's)* • Incident Investigation Report *Chargeable Vehicle Accidents* • Incident Investigation Report *Non-Chargeable Vehicle Accidents* • Incident Investigation Report *Equipment, Property Damage and General Liability Incidents* • Incident Investigation Report *Near Miss* • Incident Investigation Report	Site Superitendent *As soon as possible – no later than 72 hours of incident*	Near Misses as defined by HS020	Email or fax to Program H&S Manager See Incident Notification and Communication Contact List (attached)	Superitendent should have these forms with him/her at all times (Contained in HS 020) Contact Program H&S Manager for blank electronic forms or obtain forms from: http://shawnet3.shawgrp.com/sites/eihs/federal/Lists/Announcements/DispForm.aspx?ID=8
• SharePoint electronic Near Miss Report	*As soon as possible – no later than 96 hours of incident*	All other Near Misses	Contact Program H&S Manager	
Email or Fax completed forms to Program H&S Manager				Do not include any employee or project identification information – *these reports are anonymous*
13. Perform "Accident Review Board" (ARB) as required by HS020 - Coordinate through Program H&S Manager	Program H&S Manager *Within 10 days of incident*	OSHA Recordable Cases Chargeable Vehicle Accidents		
Perform "Incident Review Board" (IRB) to extract lessons learned - Coordinate through Program H&S Manager		Doctor's First Aid Cases Utility damage or significant property damage		An IRB is outside of the HS020 requirements for an ARB.

INCIDENT NOTIFICATION AND COMMUNICATION CONTACT LIST

Project Number: 143253 **Project/Office Name / Location: Kirtland AFB, Albuquerque, NM**

Name	Phone Number(s)	Fax Number	E-mail
Shaw Notification Hotline/Helpdesk	866-299-3445 225-215-5056	N/A	N/A
CORE (Must be notified prior to or during transport to medical treatment center)	877-EHS-Shaw-(877-347-7429)	225.292.8986	
Program H&S Manager: Dave Mummert	Office 419.425.6129 Cell 419.348.1544		david.mummert@shawgrp.com
Site Safety and Health Officer (SSHO) - James Vigerust	505-262-8736 Office 505-410-4995 (cell)		james.vigerust@shawgrp.com
Project Manager: Kathleen Romalia	Office (720)554-8207 Cell (720) 989-1154		kathleen.romalia@shawgrp.com
E&I H&S Director – Andrew Johnson	513-782-4972 (office) 859-393-4346 (cell)		andrew.johnson@shawgrp.ocm

Final
Sampling and Analysis Plan/Quality Assurance Project Plan
Midwestern Region Performance Based Remediation

Prepared for U.S. Air Force Center for Engineering and the Environment
2261 Hughes Ave., Suite 155
Lackland Air Force Base, Texas 78236-9861

Prepared by Shaw Environmental & Infrastructure, Inc.
1401 Enclave Parkway, Suite 250
Houston, Texas 77077

Contract No. FA8903-09-D-8580, Task Order No. 0013
Project No. 144106
Revision 0
January 2012

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SAP/QAPP WORKSHEET #1 – TITLE PAGE

SAMPLING AND ANALYSIS PLAN/ QUALITY ASSURANCE PROJECT PLAN

PERFORMANCE-BASED REMEDIATION TASK ORDER FOR MIDWEST REGION: SCOTT AFB, CANNON AFB, HOLLOMAN AFB, AND KIRTLAND AFB

January 2012

Prepared for

U.S. Air Force Center for Engineering and the Environment
2261 Hughes Ave., Suite 155
Lackland Air Force Base, Texas 78236-9861

Prepared by

Shaw Environmental & Infrastructure, Inc.
1401 Enclave Parkway, Suite 250
Houston, Texas 77077

CONTENTS

Section **Page**

SAP/QAPP Worksheet **Page**

CONTENTS (Continued)

SAP/QAPP Worksheet **Page**

CONTENTS (Concluded)

SAP/QAPP Worksheet **Page**

ACRONYMS AND ABBREVIATIONS

Due to the complexity of this document, acronym and abbreviation definitions will only appear in this list and not in the text and tables.

AFB	Air Force Base
AFCEE	U.S. Air Force Center for Engineering and the Environment
BFB	4-bromofluorobenzene
BS	Bachelor of Science
BS/LCS	blank sample/laboratory control sample
°C	Degrees Celsius
CA	Corrective Action
CAS	Chemical Abstract Service
CCC	Calibration Check Compounds
CCV	continuing calibration verification
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CIH	Certified Industrial Hygienist
COC	chain-of-custody
COR	Contracting Officer's Representative
CQM	Construction Quality Management
CSM	Conceptual Site Model
%D	Percent Difference
DAD	Dual Diode Array Detector
DFTPP	Decafluorotriphenylphosphine
DOD	U.S. Department of Defense
DOT	U.S. Department of Transportation
DQA	Data Quality Assessment
DQI	Data Quality Indicator
DQO	Data Quality Objective
DRO	Diesel Range Organics
DUP	matrix duplicate
ECD	Electron Capture Detector
EDD	electronic data deliverable
EPA	U.S. Environmental Protection Agency
ERPIMS	Environmental Restoration Program Information Management System
Deg. F	Degrees Fahrenheit
FedEx	Federal Express
FID	flame ionization detector
g	gram
GC/MS	gas chromatograph(y)/mass spectrometer (spectroscopy)
GRO	Gasoline Range Organics

ACRONYMS AND ABBREVIATIONS (Continued)

HAZWOPER	Hazardous Waste Operations and Emergency Response
HPLC	High Performance Liquid Chromatography
HWB	Hazardous Waste Bureau
ICAL	initial calibration
ICP	inductively coupled plasma
ICS	interference check
ICV	initial calibration verification
ID	identification
IDW	investigation-derived waste
IEPA	Illinois Environmental Protection Agency
IL	Illinois
IS	Internal Standards
LCD	laboratory control duplicate
LCDS	laboratory control duplicate sample
LCS	laboratory control sample
LCSD	laboratory control sample duplicate
LOD	Limit of Detection
LOQ	Limit of Quantitation
MB	method blank
MCL	maximum contaminant level
MDL	method detection limit
µg/kg	microgram per kilogram
µg/L	microgram per liter
mg/kg	milligram per kilogram
mg/L	milligram per liter
mL	milliliter(s)
MQO	Measurement Quality Objective
MS	Master of Science
MS/MSD	matrix spike/matrix spike duplicate
MSA	method of standard addition
NA	not applicable or not available
NE	not established
NM	New Mexico
NMED	New Mexico Environment Department
NMWQCC	New Mexico Water Quality Control Commission
ORO	Oil Range Organics
ORP	Oxidation Reduction Potential
OSHA	Occupational Safety and Health Administration
PAH	polynuclear aromatic hydrocarbons
PARCC	Precision, Accuracy, Representativeness, Completeness, and Comparability
PBR	performance-based remediation
PCB	polychlorinated biphenyl

ACRONYMS AND ABBREVIATIONS (Continued)

pCi/g	picocuries per gram
pCi/L	Picocuries per liter
PDS	post-digestion spike
PE	Professional Engineer
PG	Professional Geologist
pg/g	picogram per gram
pg/L	picogram per liter
PID	photoionization detector
PM	Project Manager
PMP	Project Management Plan
POC	Point of Contact
PPE	Personal protective equipment
PQO	Project Quality Objective
QA	quality assurance
QAPP	Quality Assurance Project Plan
QASP	Quality Assurance Sampling Plan
QC	quality control
QL	quantitation limit
QSM	Quality Systems Manual
%R	Percent recovery
RF	Response Factor
RSD	Relative Standard Deviation
RCRA	Resource Conservation and Recovery Act
RPD	relative percent difference
SAP	Sampling and Analysis Plan
Shaw	Shaw Environmental & Infrastructure, Inc.
SOP	Standard Operating Procedure
SOO	Statement of Objectives
SPCC	System Performance Check Compounds
SSL	Soil Screening Level
SVOC	semivolatile organic compounds
TACO	Tiered Approach to Corrective Action Objectives
TBD	to be determined
TCLP	Toxicity Characteristic Leaching Procedure
TIC	tentatively identified compound
TO	Task Order
tox	Toxic pollutant
TPH	total petroleum hydrocarbons
TSA	Technical Systems Audit
UFP	Uniform Federal Policy
UPS	United Parcel Service
USAF	U.S. Air Force
UXO	unexploded ordnance

ACRONYMS AND ABBREVIATIONS (Concluded)

VOA	volatile organic analysis
VOC	volatile organic compound
XA	Concentration in the matrix spike sample
XB	Concentration in the matrix spike duplicate sample
XM	Average value of the concentrations of matrix spike and matrix spike duplicate

Executive Summary

This SAP/QAPP describes the sampling and analysis, QA, and QC activities that Shaw Environmental & Infrastructure, Inc. will implement during field sampling activities on remediation projects for AFCEE under contract FA8903-09-D-8580-0013, Task Order 0013 PBR for the Midwest Region. Data generated from environmental samples will serve as a basis for decisions related to environmental conditions at the sites.

This SAP/QAPP is based on the requirements of the following documents:

- *Uniform Federal Policy (UFP) for Quality Assurance Project Plans (QAPPs): Evaluating, Assessing, and Documenting Environmental Collection and Use Programs Part 2A: UFP-QAPP Workbook* (Intergovernmental Data Quality Task Force, 2005)
- *Guidance on Systematic Planning Using the Data Quality Objectives Process, U.S. Environmental Protection Agency (USEPA) QA/G-4* (USEPA, 2006)
- *EPA Requirements for Quality Assurance Project Plans, U.S. Environmental Protection Agency (USEPA) QA/R-5* (USEPA, 2001)
- *EPA Guidance for Quality Assurance Project Plans, U.S. Environmental Protection Agency (USEPA) QA/G-5* (USEPA, 2002)
- *U.S. Department of Defense Quality Systems Manual for Environmental Laboratories, Version 4.2*, (DOD, 2010)

This SAP/QAPP has the following objectives:

- Provide an outline for each site-specific SAP/QAPP.
- Describe and establish consistent field sampling procedures.
- Establish data gathering, sample handling, and documentation methods that will be employed during field activities.
- Ensure that the data collected over the course of the project are of known quality to meet their intended use.
- Ensure that all components of data acquisition are thoroughly documented, are verifiable, and are defensible.
- Describe the project data quality objectives.
- Derive appropriate QA objectives and QC checks based on these data quality objectives.
- Outline the criteria for data quality in terms of precision, accuracy, representativeness, comparability, and completeness, often referred to as the "PARCC" parameters.

SAP/QAPP WORKSHEET #2 –
SAP/QAPP IDENTIFYING INFORMATION

Site Name/Number:	See Site-Specific Work Plans
Site Location:	See Site-Specific Work Plans
Contractor Name:	Shaw Environmental & Infrastructure, Inc.
Contract Number:	FA8903-09-D-8580-0013, Task Order 0013 PBR for Midwest Region
Contract Title:	Performance-Based Remediation Task Order for Midwest Region: Scott AFB, Cannon AFB, Holloman AFB, and Kirtland AFB
Work Assignment Number:	Shaw Project Number 144106

1. This program SAP/QAPP was prepared in accordance with the requirements of the following documents:

   - *Uniform Federal Policy (UFP) for Quality Assurance Project Plans (QAPPs): Evaluating, Assessing, and Documenting Environmental Collection and Use Programs Part 2A: UFP-QAPP Workbook* (Intergovernmental Data Quality Task Force, 2005)
   - *Guidance on Systematic Planning Using the Data Quality Objectives Process, U.S. Environmental Protection Agency (USEPA) QA/G-4* (USEPA, 2006)
   - *U.S. Department of Defense (DOD) Quality Systems Manual (QSM) for Environmental Laboratories, Version 4.2* (DOD, 2010)
   - *EPA Guidance for Quality Assurance Project Plans, USEPA QA/G-5,* (USEPA, 2002)
   - *EPA Requirements for Quality Assurance Project Plans,* USEPA QA/R-5, (USEPA, 2001a)

2. Identify regulatory program: Following the RCRA process as administered by the NMED and the CERCLA process as administered by IEPA.

3. This SAP/QAPP is a generic program SAP/QAPP. Site-specific SAP/QAPPs will be generated for each site, as necessary.

4. List dates of scoping sessions that were held:

Scoping Session	Date
Scoping sessions have not yet been held.	Not Applicable
A project kick-off meeting took place in San Antonio, Texas	October 11, 2011
Site-specific scoping sessions, if held, will be documented in the Site-Specific SAP/QAPPs	Not Applicable

5. List dates and titles of any SAP/QAPP documents written for previous site work that are relevant to the current investigations.

Title	Date
Hazardous Waste Facility Permit for Holloman Air Force Base, RCRA Permit NM6572124422-2, prepared by the New Mexico Environment Department, Hazardous Waste Bureau (HWB), Santa Fe, New Mexico.	NMED, February 2004
Hazardous Waste Facility Permit for Cannon Air Force Base, RCRA Permit NM7572124454-1, prepared by the New Mexico Environment Department, Hazardous Waste Bureau (HWB), Santa Fe, New Mexico.	NMED, February 2003
Hazardous Waste Facility Permit for Kirtland Air Force Base, RCRA Permit NM9570024423, prepared by the New Mexico Environment Department, Hazardous Waste Bureau (HWB), Santa Fe, New Mexico.	NMED, August 2010
See site-specific SAP/QAPPs for relevant previous site-specific documents.	Not Applicable

6. List organizational partners (stakeholders) and connection with lead organization:

Oversight by the NMED HWB at sites in New Mexico
Oversight by IEPA at sites in Illinois
Oversight by the U.S. AFCEE
Oversight by the USEPA, Region 6 (New Mexico) and Region 5 (Illinois)

7. Lead organization

AFCEE

8. If any required SAP/QAPP elements or required information are not applicable to the project or are provided elsewhere, then note the omitted SAP/QAPP elements and provide an explanation for their exclusion below:

Additional site-specific information is provided in site-specific SAP/QAPP documents that will be submitted with each site-specific work plan.

UFP-QAPP Worksheet #	Required Information	Crosswalk to Related Information
A. Project Management		
Documentation		
1	Title Page	
2	Table of Contents; SAP/QAPP Identifying Information	
3	Distribution List	
4	Project Personnel Sign-Off Sheet	
Project Organization		
5	Project Organizational Chart	PMP Figure 2-1
6	Communication Pathways	PMP Chapter 2.0
7	Personnel Responsibilities and Qualifications Table	PMP Table 2-2
8	Special Personnel Training Requirements Table	Site-specific SAP/QAPPs
Project Planning/Problem Definition		
9	Project Planning Session Documentation (including Data Needs tables); Project Scoping Session Participants Sheet	Site-specific SAP/QAPPs
10	Problem Definition, Site History, and Background. Site Maps (historical and present)	PMP Chapter 1.0 and Table 1-1.
11	Site-Specific Project Quality Objectives	Site-specific SAP/QAPPs
12	Measurement Performance Criteria Table	Site-specific SAP/QAPPs
13	Sources of Secondary Data and Information Secondary Data Criteria and Limitations Table	PMP Chapter 1.0, Section 1.3; Site-specific SAP/QAPPs
14	Summary of Project Tasks	PMP Chapter 1
15	Reference Limits and Evaluation Table	
16	Project Schedule/Timeline Table	PMP Appendix A(Project Schedule)
B. Measurement Data Acquisition		
Sampling Tasks		
17	Sampling Design and Rationale	
18	Sampling Locations and Methods/SOP Requirements Table Sample Location Map(s)	
19	Analytical Methods/SOP Requirements Table	
20	Field QC Sample Summary Table	
21	Project Sampling SOP References Table Sampling SOPs	
22	Field Equipment Calibration, Maintenance, Testing, and Inspection Table	
Analytical Tasks		
23	Analytical SOPs Analytical SOP References Table	
24	Analytical Instrument Calibration Table	
25	Analytical Instrument and Equipment Maintenance, Testing, and Inspection Table	
Sample Collection		
26	Sample Handling System, Documentation Collection, Tracking, Archiving and Disposal Sample Handling Flow Diagram	
27	Sample Custody Requirements, Procedures/SOPs, Sample Container Identification Example Chain-of-Custody Form and Seal	
Quality Control Samples		
28	QC Samples Table Screening/Confirmatory Analysis Decision Tree	
Data Management Tasks		
29	Project Documents and Records Table	PMP Chapter 6
30	Analytical Services Table Analytical and Data Management SOPs	

UFP-QAPP Worksheet #	Required Information	Crosswalk to Related Information
C. Assessment Oversight		
31	Planned Project Assessments Table Audit Checklists	PMP Appendix B (QASP)
32	Assessment Findings and Corrective Action Responses Table	
33	QA Management Reports Table	
D. Data Review		
34	Verification (Step I) Process Table	
35	Validation (Steps IIa and IIb) Process Table	
36	Validation (Steps IIa and IIb) Summary Table	
37	Usability Assessment	

SAP/QAPP WORKSHEET #3 – DISTRIBUTION LIST

Name of SAP/ QAPP Recipients	Title/Role	Organization	Telephone Number	E-Mail Address
Daniel Cevallos Jr.	USAF Contracting Officer	USAF	210-395-8753	Daniel.Cevallos@us.af.mil
Stephanie Ramon	COR	USAF AFCEE	210-395-8628	Stephanie.Ramon.1@us.af.mil
David Strasser	NMED Oversight Holloman, AFB	NMED HWB	505-222-9526	David.Strasser@state.nm.us
Lane Andress	NMED Oversight Cannon, AFB	NMED HWB	505-476-6059	Lane.Andress@state.nm.us
William McDonald	NMED Oversight Kirtland, AFB	NMED HWB	505-222-9582	William.Mcdonald@state.nm.us
Paul Lake	IEPA Oversight Scott AFB	IEPA	217-785-7728	Paul.Lake@illinois.gov
David Scruggs	Base POC, Holloman AFB	Holloman AFB		Clarence.Scruggs@holloman.af.mil
Ronald Lancaster	Base POC, Cannon AFB	Cannon AFB	575-784-1146	Ronald.Lancaster@cannon.af.mil
Ludie (Wayne) Bitner	Base POC, Kirtland AFB	Kirtland AFB		Ludie.Bitner@us.af.mil
Scott Clark	Base POC, Kirtland AFB	Kirtland AFB	505-846-9017	Scott.Clark@kirtland.af.mil
Richelle Collingham	Base POC, Scott AFB	Scott AFB	618-256-2125	richelle.collingham.1@us.af.mil
Kathleen Romalia	Shaw PM	Shaw	720-554-8207	Kathleen.Romalia@shawgrp.com
Lisa Stahl	Shaw Public Affairs Officer	Shaw	720-554-8213	Lisa.Stahl@shawgrp.com
Dale Flores	Shaw Senior Scientist	Shaw	505-262-8948	Dale.Flores@shawgrp.com
Christopher Long	Shaw Senior Scientist	Shaw	281-531-3179	Christopher.Long@shawgrp.com
Joe Colella	Shaw Senior Engineer	Shaw	770-663-1469	Joe.Colella@shawgrp.com
Subramanyam "Van" Vangala	Shaw Senior Engineer	Shaw	713-996-4459	Van.Vangala@shawgrp.com
William Foss	Shaw Senior Scientist	Shaw	281-531-3180	William.Foss@shawgrp.com
Maqsud Rahman	Shaw Project Chemist	Shaw	513-782-4859	Maqsud.Rahman@shawgrp.com
Dezbah Tso-Jesus	Shaw Regulatory Specialist	Shaw	505-262-8718	Dezbah.Tso@shawgrp.com
Tommy Sammons	Shaw Regulatory Specialist	Shaw	864-289-8550	Tommy.Sammons@shawgrp.com
Craig Givens	Shaw QC Specialist	Shaw	505-262-8742	Craig.Givens@shawgrp.com
Mark Weisberg	Shaw Risk Assessor	Shaw	412-858-3996	Mark.Weisberg@shawgrp.com
David Mummert	Health and Safety Manager	Shaw	419-425-6129	David.Mummert@shawgrp.com
James Vigerust	Health and Safety Lead	Shaw	505-262-8936	James.Vigerust@shawgrp.com
Sue Bell	Laboratory Project Manager	Accutest Laboratories Southeast	813-741-3338	sueb@accutest.com
Svetlana Izosimova	Laboratory QA Manager	Accutest Laboratories Southeast	407-425-6700	svetlani@accutest.com
TBD in Site-Specific SAP/QAPP	Site-Specific Scientist/Engineer as Field Team Lead	Shaw	TBD in Site-Specific SAP/QAPP	TBD in Site-Specific SAP/QAPP

SAP/QAPP WORKSHEET #4 – PROJECT PERSONNEL SIGN-OFF SHEET

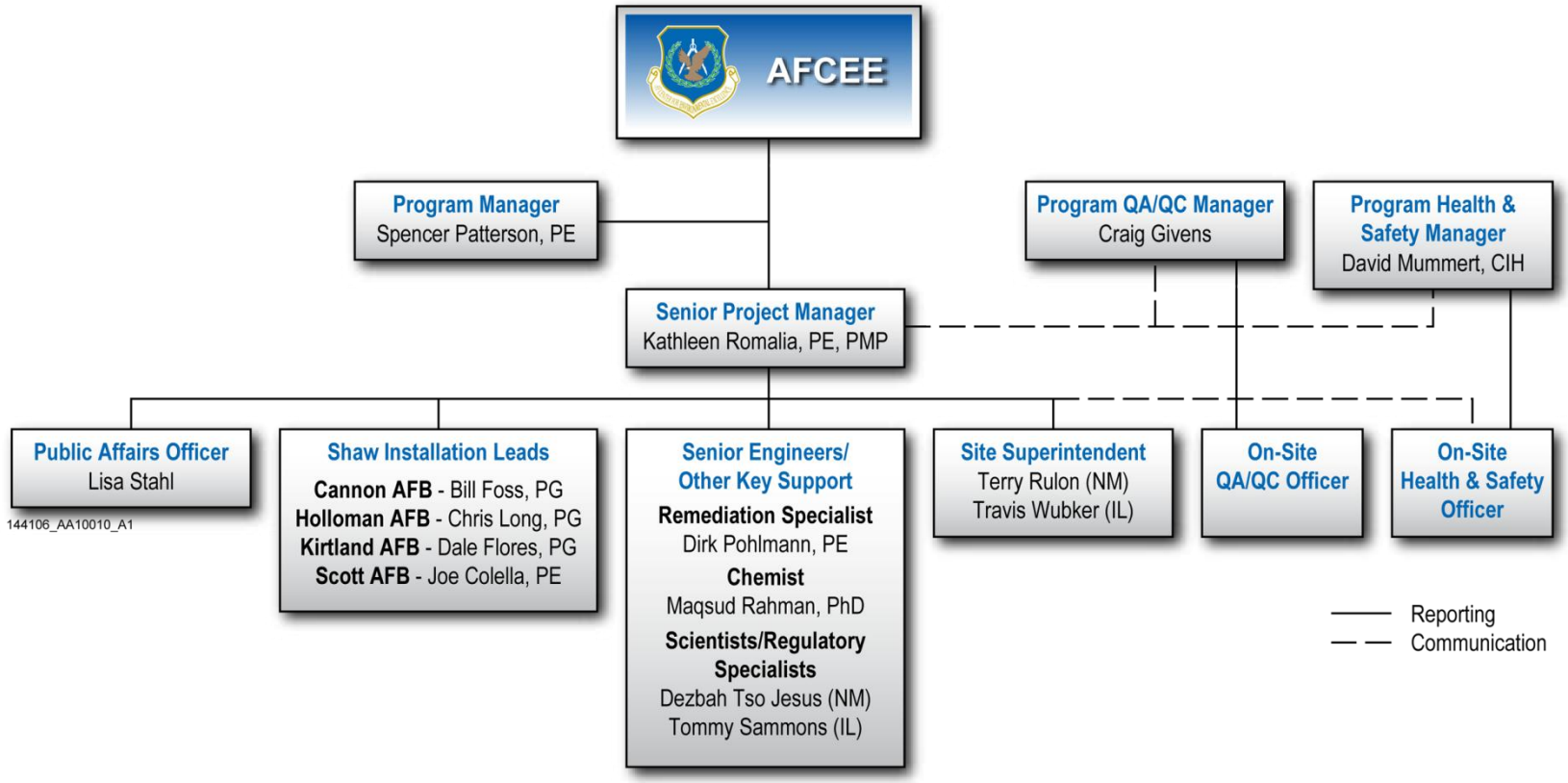
The Project Personnel Sign-Off Sheet will be used to document that key project personnel overseeing and/or performing site work have read the applicable sections of the SAP/QAPP and will perform the sampling and analysis tasks as described.

Project Personnel	Organization/Title/Role	Telephone Number	Signature*	Date SAP/QAPP Read
Kathleen Romalia	Shaw Project Manager	720-554-8207		
Dale Flores	Shaw Senior Scientist	505-262-8948		
Christopher Long	Shaw Senior Scientist	281-531-3179		
Joe Colella	Shaw Senior Engineer	770-663-1469		
Subramanyam "Van" Vangala	Shaw Senior Engineer	713-996-4459		
William Foss	Shaw Senior Scientist	281-531-3180		
Maqsud Rahman	Shaw Project Chemist	513-782-4859		
Dezbah Tso-Jesus	Shaw Regulatory Specialist	505-262-8718		
Tommy Sammons	Shaw Regulatory Specialist	864-289-8550		
Mark Weisberg	Shaw Risk Assessor	412-858-3996		
Craig Givens	Shaw Quality Control Specialist	505-262-8742		
David Mummert	Health and Safety Manager	419-425-6129		
Sue Bell	Laboratory Project Manager	813-741-3338		
Svetlana Izosimova	Laboratory Quality Assurance Manager	407-425-6700		

*I have read and I understand this SAP/QAPP and will perform the tasks as described.

Please forward the original signed form with all columns completed to Shaw Environmental & Infrastructure, Inc., c/o Craig Givens – 2440 Louisiana Blvd NE, Suite 300, Albuquerque, NM 87110 or forward an electronic version via e-mail to Craig.Givens@shawgrp.com for the project files upon completion.

SAP/QAPP WORKSHEET #5 – PROJECT ORGANIZATION CHART



SAP/QAPP WORKSHEET #6 – COMMUNICATION PATHWAYS

Communication Drivers	Responsible Affiliation	Name	Telephone Number and/or E-Mail	Procedure
SAP/QAPP Approval/Major Changes to SAP/QAPP	USAF AFCEE COR	Stephanie Ramon	210-395-8628	COR will review and approve SAP/QAPP and associated site-specific SAP/QAPPs. Field activities will not begin until the SAP/QAPP and applicable site-specific SAP/QAPP has been approved. All major changes to the Final SAP/QAPP must be in compliance with USEPA-505-B-04-900A and be approved by USAF AFCEE COR.
Point of Contact with USAF AFCEE COR	Shaw Project Manager	Kathleen Romalia	720-554-8207	All materials and information about the project will be forwarded to Stephanie Ramon by Kathleen Romalia (PM). If changes are necessary, the PM will communicate changes via phone and/or e-mail to the project personnel and is authorized to stop work if necessary.
Remediation or Sampling Quality Issues	Shaw Quality Control Specialist	Craig Givens	505-262-8742	In general, the Quality Control Specialist is the point of contact for remediation and sampling QC issues. Upon resolution, the Quality Control Specialist oversees the documentation, notification, and corrective actions associated with the QC issue in writing. The Quality Control Specialist is also responsible for generating SAP/QAPP amendments as necessary for approval by the AFCEE COR. Due to the potential impact field changes and SAP/QAPP amendments may have on the project, the Quality Control Specialist is to be notified of such issues within 24 hours.
SAP/QAPP Changes (including changes in the field)	Shaw Project Chemist	Maqsud Rahman	513-782-4859	The Project Chemist is responsible for documenting field changes related to sampling and informing or seeking approval from the AFCEE COR. The Project Chemist oversees the documentation, notification and corrective actions associated with project management issues in writing. Due to the potential impact field changes and SAP/QAPP amendments may have on the project, the Project Chemist is to be notified of such issues within 24 hours.

SAP/QAPP WORKSHEET #6 – COMMUNICATION PATHWAYS (Continued)

Communication Drivers	Responsible Affiliation	Name	Telephone Number and/or E-Mail	Procedure
Sample Collection Issues	Shaw Project Chemist	Maqsud Rahman	513-782-4859	The Project Chemist is the point of contact for sampling and chemistry issues. If sampling issues are not resolved at the project level (in consultation with the PM, Site Supervisor, Technical Lead, Geologist, etc.), then the issue will be elevated to the Quality Control Specialist and/or PM. Due to the potential impact sampling issues may have on the project the Project Chemist is to be notified of sampling issues within 24 hours.
Reporting Laboratory Data Quality Issues and Corrective Actions	Shaw Project Chemist	Maqsud Rahman	513-782-4859	The Project Chemist is the point of contact for laboratory issues and for EDDs.
Field Corrective Actions	Shaw Quality Control Specialist	Craig Givens	505-262-8742	Based on QC oversight of field work the need for corrective actions will be determined by the Quality Control Specialist.
Health and Safety Issues	Shaw Health and Safety Manager	David Mummert	419-425-6129	The Project Health and Safety Manager is the point of contact for health and safety issues. Due to the potential seriousness of health and safety issues, the Project Health and Safety Manager is to be notified of health and safety issues immediately if possible and in any event, within 24 hours.

SAP/QAPP WORKSHEET #7 – PERSONNEL RESPONSIBILITIES AND QUALIFICATIONS TABLE

Name(s)	Title	Organizational Affiliation	Responsibility	Education and Experience Qualification
Stephanie Ramon	COR	U.S Air Force Center for Engineering and the Environment	• Manages governmental oversight of the project • Manages project funding and scope • Coordinates project documents review • Serves as primary contact and liaison with regulatory agencies • Provides technical oversight of the project • Oversees daily activities	Not Applicable
Spencer Patterson	Program Manager	Shaw	• Signs the contract • Provides senior corporate representation directly to the Air Force, as needed • Ensures sufficient quality and quantities of all required physical resources • Ensures staffing continuity	PE 10+ years experience
Kathleen Romalia	Project Manager	Shaw	• Manages oversight of the project for Shaw Environmental & Infrastructure, Inc. • Reviews and approves the SAP/QAPP • Ensures that all requirements of project contract are attained in a manner consistent with project plans • Manages project budgets and schedules	PE, PMP 10+ years experience
Tommy Sammons - IL	Regulatory Specialist	Shaw	• Serves as lead point of contact for regulatory matters • Is responsible for the hazardous materials and their proper storage, transportation, and disposal • Coordinates review and approval procedures for manifests • Develops compliance strategies for site activities • Ensures compliance with CERCLA, as well as other pertinent regulatory requirements (SARA, OSHA, DOT) • Reviews deliverables for regulatory compliance	20+ years experience
Dezbah Tso–Jesus - NM	Regulatory Specialist	Shaw	• Serves as lead point of contact for regulatory matters • Is responsible for the hazardous materials and their proper storage, transportation, and disposal • Coordinates review and approval procedures for manifests • Develops compliance strategies for site activities • Ensures compliance with RCRA and NM Administrative Code, as well as other pertinent regulatory requirements (SARA, OSHA, DOT) • Reviews deliverables for regulatory compliance	10+ years experience

SAP/QAPP WORKSHEET #7 – PERSONNEL RESPONSIBILITIES AND QUALIFICATIONS TABLE (Continued)

Name(s)	Title	Organizational Affiliation	Responsibility	Education and Experience Qualification
Dirk Pohlmann	Remediation Specialist	Shaw	• Manages labor, materials, plant and equipment to complete remediation activities on time, within budget, and as specified in the work plans • Analyzes and evaluates performance data and provides recommendations for optimizing treatment approaches throughout remedial activities • Ensures performance of all remedial approaches, designs, operations, and maintenance activities	
Maqsud Rahman	Project Chemist	Shaw	• Assists in developing the project DQOs and preparing the SAP/QAPP • Selects qualified subcontract laboratories • Implements chemical data QC procedures and audits field performance • Reviews laboratory data prior to use • Coordinates or performs validation of laboratory data • Reviews data validation report • Prepares the appropriate sections of the report summarizing the project activities • Serves as a technical advisor to the project • Serves as point of contact for chemistry issues to the WSMR AEC COR	Ph.D. Chemistry, 20+ years experience in applied environmental sciences
Dale Flores – Kirtland AFB	Senior Scientist	Shaw	• Develops work plans to address project scope of work • Prepares work plan variances, if necessary • Manages technical project elements • Reports to Project Manager	PG BS – Geology 15+ years experience
Christopher Long – Holloman AFB	Senior Scientist	Shaw	• Develops work plans to address project scope of work • Prepares work plan variances, if necessary • Manages technical project elements • Reports to Project Manager	PG MS – Geology 15+ years experience
William Foss – Cannon AFB	Senior Scientist	Shaw	• Develops work plans to address project scope of work • Prepares work plan variances, if necessary • Manages technical project elements • Reports to Project Manager	

SAP/QAPP WORKSHEET #7 – PERSONNEL RESPONSIBILITIES AND QUALIFICATIONS TABLE (Continued)

Name(s)	Title	Organizational Affiliation	Responsibility	Education and Experience Qualification
Joe Colella – Scott AFB	Senior Engineer	Shaw	• Develops work plans to address project scope of work • Prepares work plan variances, if necessary • Manages technical project elements • Reports to Project Manager	PE MS – Engineering 20+ years experience
Subramanyam "Van" Vangala	Senior Engineer	Shaw	• Develops work plans to address project scope of work • Prepares work plan variances, if necessary • Manages technical project elements • Reports to Project Manager	PE
Craig Givens	Quality Assurance/ Quality Control Manager Specialist	Shaw	• Approves UFP-QAPP • Conducts QA/QC training for project personnel • Provides QC oversight to ensure performance requirements of all work activities are met • Develops the project QC objectives and prepares the QC Plan • Administers the QC Plan • Manages QC documentation and QC deliverables • Lists definable features of work • Conducts inspections (preparatory, initial, follow-up, completions)	BS Geologic Engineering 25+ years experience USACE CQM
David Mummert	Health and Safety Manager	Shaw	• Develops and administers the Site Health and Safety Plan • Coordinates preparation of Job Safety Analyses • Selects appropriate PPE • Reviews essential health and safety requirements with on-site personnel	CIH
TBD in Site-Specific SAP/QAPP	Site-Specific Field Health and Safety Officer	Shaw	• Develops and administers the Site Health and Safety Plan • Manages personnel and environmental monitoring • Coordinates preparation of Job Safety Analyses • Selects appropriate site-specific PPE • Reviews essential health and safety requirements with on-site personnel • Facilitates daily safety meetings	50 Hour Site Safety Officer training

SAP/QAPP WORKSHEET #7 – PERSONNEL
RESPONSIBILITIES AND QUALIFICATIONS TABLE (Concluded)

Name(s)	Title	Organizational Affiliation	Responsibility	Education and Experience Qualification
Terry Rulon - NM	Site Superintendent/ Construction Manager	Shaw	• Coordinates day-to-day operations with installation personnel • Manages onsite operations, labor, material, subcontractor plan, and equipment to complete remediation on time, within budget, and as specified in the SOO. • Initiates scheduling and work sequencing • Interfaces with vendors and subcontractors to ensure timely and appropriate resources are procured	
Travis Wubker – IL	Site Superintendent/ Construction Manager	Shaw	• Coordinates day-to-day operations with installation personnel • Manages onsite operations, labor, material, subcontractor plan, and equipment to complete remediation on time, within budget, and as specified in the SOO. • Initiates scheduling and work sequencing • Interfaces with vendors and subcontractors to ensure timely and appropriate resources are procured	
TBD in Site-Specific SAP/QAPP	Site-Specific Field Sampling Technicians	Shaw or Subcontractor	• Performs all sampling in accordance with approved SAP/QAPP • Ensures that field QC samples are collected as specified in the SAP/QAPP • Completes field documentation • Coordinates laboratory and field sampling activities • Implements field corrective actions as required • Must have OSHA Certification 40 hour and 8 Hour	High School Diploma or Equivalent 1 year relevant experience

SAP/QAPP WORKSHEET #8 – SPECIAL PERSONNEL TRAINING REQUIREMENTS TABLE

All field personnel will be required to have completed the OSHA 40-hour HAZWOPER Standard Protection training, continued 8-hour HAZWOPER and submit to annual medical surveillance, as required by OSHA. The Shaw Site Health and Safety Manager will be responsible for ensuring that training and/or certification is met and that qualified personnel are performing the work.

Sample collection activities will be performed by field technicians, chemists, geologists, or qualified subcontractors. The field technicians will be trained and monitored by the Project Chemist or Installation Leads while performing any sampling tasks.

The laboratory will have an established policy and procedure on training and documenting of the analyst's competency. Each staff member who performs sample preparation and analysis will demonstrate his or her proficiency through preparation and analysis of four LCSs as described in USEPA SW-846 (USEPA, 1986). Analysts will be considered proficient if the acceptance criteria for method accuracy and precision are met. The laboratory will maintain all training records on file.

SAP/QAPP Worksheet #8 is used to identify and describe any specialized/nonroutine site-specific training requirements or certifications needed by personnel in order to successfully complete the project or task. Routine OSHA or sampling training requirements are not required elements of this worksheet. Examples of special training may include specialized radiological screening or sampling training. Site-specific specialized training requirements, if applicable, will be identified and documented in the site-specific SAP/QAPPs.

SAP/QAPP WORKSHEET #9 – PROJECT SCOPING SESSION PARTICIPANTS SHEET

Worksheet #9 will be used to document (to the extent practicable) information about project scoping sessions. This worksheet will be used to identify team members that are responsible for planning the project. If this worksheet is not used for site-specific SAP/QAPPs then the crosswalk table (Worksheet #2) should be used to identify where information about scoping can be found. The information for this worksheet will be provided, as applicable, in each site-specific SAP/QAPP.

Project Name: Midwestern Region Performance Based Remediation		Site Name:			
Projected Date(s) of Sampling:					
		Site Location:			
Project Manager: Kathleen Romalia					
Date of Session: Project Scoping Session To Be Determined					
Scoping Session Purpose:					
Name	**Title**	**Affiliation**	**Phone #**	**E-mail Address**	**Project Role**
Comments/Decisions:					
Action Items:					
Consensus Decisions:					

SAP/QAPP WORKSHEET #10 – PROBLEM DEFINITION

Table 1-1 in the PMP lists the programmed Midwest PBR sites at each of the four bases, the proposed performance objective, and the planned technical approaches. SAP/QAPP Worksheet #10 addresses elements of SAP/QAPP Worksheets #10 and #11, the project problem definitions and quality objectives/systematic planning process. The QA objectives are expressed in terms of project DQOs. DQOs are qualitative and quantitative statements that clarify the project objectives; specify the most appropriate type of data for the project decisions; determine the most appropriate conditions from which to collect data; and specify tolerable limits on decision errors. DQOs are based on the end uses of the data and are determined through a seven-step process as described in USEPA QA/G-4 (USEPA, 2006).

10.1 DQO Process

The following discussion of the DQO processes will serve as guidance for developing site-specific plans to ensure that the goals for investigation or other program activities are met. The process involves one or more planning sessions that are documented on Worksheet #9. An updated Worksheet #10 will be provided in each site-specific work plan or site-specific sampling and analysis plan.

The DQO development process consists of seven steps:

- State the problem.
- Identify the goal of the study.
- Identify information inputs.
- Define the boundaries of the study.
- Develop the analytic approach.
- Specify performance or acceptance criteria.
- Develop the detailed plan for obtaining data.

Several of the steps in the DQO process can occur simultaneously, and in some situations, the process does not have to include all steps. For example, when enforcement or compliance monitoring programs are being developed to comply with existing regulations, many of the steps may have already been completed. Outputs from the DQO process are summarized in Worksheets #10 and #11 and will be updated in each site-specific plan.

Step 1 – State the Problem

This step requires that the problem that will require new environmental data be summarized. The resources available to resolve the contamination problem must be specified. Key activities associated with this step include:

- Identifying members of the scoping team
- Developing or refining the CSM
- Defining the exposure pathways and exposure scenarios
- Specifying available resources
- Writing a brief summary of the problem.

The main output of this step is a complete description of the contamination problem that includes the regulatory and programmatic context of the problem. This description typically consists of the following:

- A list of the known and suspected contaminants in each environmental medium and estimates of their concentration, variability, distribution, and location
- The CSM and exposure pathways
- A summary of the outcome and status of any previous response(s) at the site, such as early actions or previous data collection activities
- The site's physical and chemical characteristics that influence migration and associated human, environmental, and physical target(s)
- An estimate of the budget, schedule, and available personnel necessary to implement the appropriate response for the site.

Data and information from previous remedial investigations and feasibility studies will be used as references. Specific parameters will be discussed in the site-specific plans.

Step 2 – Identify the Goal of the Study

This step requires identification of the decision/objective that requires new environmental data. For example, an early assessment decision is to determine whether a chemical release poses a potential threat to human health or the environment. Key activities associated with this step include:

- Identifying the key objective for the current phase or stage of the project
- Identifying alternative actions that may be taken based on the findings of the field investigation
- Identifying relationships between this objective and any other current or subsequent objectives.

The output from this step should include the following:

- A statement of the objectives that will use environmental data
- A list of the actions that will be taken toward remediation or removal of the potential contamination problem based on the outcome of the field investigation.
- Identification of the end users of the data.
- Identification of the intended end use of the data.

Step 3 – Identify Informational Inputs

The purpose of this step is to identify the information needed to support the objective and specify which inputs require new environmental measurements. Key activities associated with this step include:

- Identifying the informational inputs needed to resolve the objective
- Identifying sources for each informational input and listing those inputs that are obtained through environmental measurements

- Defining the basis for establishing contaminant-specific action levels
- Identifying potential sampling approaches and appropriate analytical methods.

The outputs that will result from this step include a list of informational inputs needed to make the decision and a list of environmental variables or characteristics that will be measured. The outputs from this step are actually the inputs that will be used to support the objective, sometimes referred to as the "decision."

Step 4 – Define the Boundaries of the Study

This step requires definition of the spatial and temporal aspects of the environmental media that the data must represent to support the objective. Key activities associated with this step include:

- Defining the geographic areas of the field investigation
- Defining each environmental medium of concern
- Dividing each medium into strata having relatively homogeneous characteristics
- Defining the scale of decision making (this is the smallest area, volume, or time frame of the medium) in which the scoping team wishes to control decision errors
- Determining the time frame to which the objective applies
- Determining when to take samples
- Identifying practical constraints that may hinder sample collection (reconsider previous steps as necessary)

Outputs from this step may include:

- A detailed description and physical representation (map) of the geographic limits (boundaries) of each environmental medium (soil, water, air, etc.) within which the decision(s) will be made
- A detailed description of the characteristics that define the population of interest
- Definition of the time period in which samples will be taken and to which objectives will apply
- The most appropriate scale of decision making for each medium of concern
- A description of practical constraints that may impede sampling.

Step 5 – Develop the Analytic Approach

The purpose of this step is to integrate the output from the previous steps of the DQO process into a statement that defines the conditions that would cause the decision maker to choose among alternative actions. Key activities associated with this step include:

- Specifying the parameter of interest (i.e., mean, medium, maximum, or proportion)
- Specifying the action level for the decision.

The output from this step is an "if...then..." statement that defines the conditions that would cause the decision maker to choose among alternative courses of action. It should include the decision, the actions, the parameter of interest, the action level, and the scale (magnitude of impact) of decision making.

Step 6 – Specify Performance or Acceptance Criteria

The purpose of this step is to specify the acceptable decision error rates based on a consideration of the consequences of making an incorrect decision. These limits will be used in the last step of the process.

Key activities associated with this step include the following:

- Determining the possible range of the parameter of interest
- Defining both types of decision errors and identifying the potential consequences of each
- Specifying a range of possible parameter values where the consequences of decision errors are relatively minor (gray region), whenever possible
- Assigning probability values to points above and below the action level that reflect the acceptable probability for the occurrence of decision errors, when necessary
- Checking the limits on decision errors to ensure that they accurately reflect the decision maker's concern about the relative consequences for each type of decision error.

The outputs from this step are the acceptable decision error rates based on a consideration of the consequences of making an incorrect decision. These limits on decision errors can be expressed in a decision error limits table, or in a design goal diagram.

Decision rules will preferentially be expressed in the form of *hypothesis tests* when this approach is viable from a technical and practical perspective (e.g., to determine whether study area concentrations statistically exceed background concentrations*).*

Quantitative tolerances for Type I and Type II errors (for hypothesis tests) will be specified when statistical designs are viable to achieve project objectives.

Step 7 – Develop the Plan for Obtaining Data

The purpose of this step is to identify the most resource-effective sampling design that generates data that satisfy the DQOs specified in the preceding steps. To develop the optimal design for this study, it may be necessary to work through this step more than once after revisiting previous steps of the DQO process. Remediation activities and supporting investigations at Midwest PBR sites will require the collection of different kinds of data for each site including both qualitative and quantitative data. From a systematic planning perspective, quantitative data will be categorized as screening data (data of sufficient quality to support an intermediate or preliminary decision but must eventually be supported by definitive data) or definitive data (analytical data that are suitable for final decision making). The need for chemical or nonchemical analyses will be determined on a site-by-site basis based on the remedial objectives and remedial technologies applicable at each location. An updated Worksheet #17 in each site-specific plan will provide the sampling design and rationale.

10.2 Conceptual Site Model

If appropriate for the project, Worksheet #10 should also be used to create a CSM. Worksheet #10 should include the general site description, history and background, existing site data (if any), site geology, hydrogeology and other key components necessary for the CSM. The CSM can then be used to develop site investigation scope or help determine cleanup action levels that take into account the future land use. It can also be used to develop site-specific sampling designs and procedures for sample collection and analysis. Worksheet #10 should include relevant maps, pictures, figures, and tables related to the problem definition.

SAP/QAPP WORKSHEET #11 – PROJECT QUALITY OBJECTIVES/SYSTEMATIC PLANNING PROCESS STATEMENTS

The PQOs may be presented in text or table format. Site-specific PQOs will be established and documented in site-specific plans.

Who will use the data?

Data will be used by the project team and will be reviewed, as applicable, by: the USAF at the one of the four bases included in the Midwest PBR; AFCEE; USEPA Regions 5 and 6; and the regulatory bodies IEPA and NMED.

What will the data be used for?

The purpose of this step is to identify the information needed to support the objective and specify which inputs require new environmental measurements. Key activities associated with this step include:

- Identifying the informational inputs needed to resolve the objective
- Identifying sources for each informational input and listing those inputs that are obtained through environmental measurements
- Defining the basis for establishing contaminant-specific action levels
- Identifying potential sampling approaches and appropriate analytical methods.

The outputs that will result from this step include a list of informational inputs needed to make the decision and a list of environmental variables or characteristics that will be measured. The outputs from this step are actually the inputs that will be used to support the objective, sometimes referred to as the "decision."

Data will be collected to fill data gaps related to previous investigations, evaluate remedial action alternatives for each applicable site, monitor the effectiveness of applied technologies (as applicable), and determine achievement of Remedial Goals.

What types of data are needed? *(Define parameters/matrices.)*

The DQO process helps define the types of environmental data that will be used and sets guidelines for designing a data collection program that will meet PQOs. The process also provides a logical, objective, and quantitative framework for determining the time and resources that will be used to generate data of the desired level of quality. The DQO process will be applied to each site and presented in site-specific plans.

The purpose of this step is to identify the most resource-effective sampling design that generates data that satisfy the DQOs specified in the preceding steps. To develop the optimal design for this study, it may be necessary to work through this step more than once after revisiting previous steps of the DQO process.

How "good" do the data need to be in order to support the environmental decision? *(Screening or Definitive?)*

As defined in the USEPA guidance document entitled *Guidance on Systematic Planning Using the Data Quality Objectives Process* (USEPA, 2006), DQOs are qualitative and quantitative statements that specify the quality of data required to support decisions during investigation and remedial response activities. This guidance and the DQO process were developed specifically for CERCLA but may be also applied to RCRA sites. DQOs are applicable to all data collection activities, and the level of detail and data quality needed will vary based on the intended uses of the data.

Remediation activities and supporting investigations at the Midwest PBR sites will require the collection of different kinds of data for each site, including both qualitative and quantitative data. From the DQO perspective, quantitative data will be categorized as screening data (data of sufficient quality to support an intermediate or preliminary decision but must eventually be supported by definitive data) or definitive data (analytical data that are suitable for final decision making).

Definitive site-specific data may be required to support engineering decisions, document confirmatory sampling, and make a determination for site closure. Screening data may be collected to support health and safety operations and make qualitative assessments in the field. Determination of data needs for each site will be provided in site-specific plans.

How much data are needed? *(Number of samples for each analytical group, matrix, and concentration)*

This step requires definition of the spatial and temporal aspects of the environmental media that the data must represent to support the objective. Key activities associated with this step include:

- Defining the geographic areas of the field investigation
- Defining each environmental medium of concern
- Dividing each medium into strata having relatively homogeneous characteristics
- Defining the scale of decision making (this is the smallest area, volume, or time frame of the medium) in which the scoping team wishes to control decision errors
- Determining the time frame to which the objective applies
- Determining when to take samples
- Identifying practical constraints that may hinder sample collection (reconsider previous steps as necessary).

Outputs from this step may include:

- A detailed description and physical representation (map) of the geographic limits (boundaries) of each environmental medium (soil, water, air, etc.) within which the decision(s) will be made
- A detailed description of the characteristics that define the population of interest
- Definition of the time period in which samples will be taken and to which objectives will apply

- The most appropriate scale of decision making for each medium of concern
- A description of practical constraints that may impede sampling.

MQOs for data completeness will be established based on the number of samples required to meet statistical tolerances and the number of samples that are planned for analysis.

Where, when, and how should the data be collected/generated?

Sampling requirements will be defined in site-specific work plans and SAP/QAPP.

Who will collect and generate the data?

Project team personnel will collect all field samples, and samples will be sent to an approved off-site laboratory for analysis.

How will the data be reported?

Field data will be recorded in field logbooks/log sheets. Copies of laboratory analytical reports will be sent to the Project Chemist, including an electronic copy of the EDD that can be uploaded into an analytical database.

Laboratory data will be reviewed on an ongoing basis. All data reported by the laboratory will undergo a three-tiered internal review process by the analyst, a peer or supervisor review, and a project management review before being sent to the Task Manager and Data Coordinator for additional project review. In the data review process, the data are compared to information such as the sample history, sample preparation, and QC sample data to evaluate the validity of the results.

How will the data be archived?

All data will be stored in the project central files records management system (as either hard copies or electronic copies).

SAP/QAPP WORKSHEET #12 – MEASUREMENT PERFORMANCE CRITERIA TABLE – FIELD QC SAMPLES

This section addresses the following elements of SAP/QAPP Worksheet #12. The site-specific SAP/QAPP should provide separate Worksheets for each sample matrix. Worksheet Tables 12.1 (soil matrix) and 12.2 (water matrix) lists the minimum field QC samples for consideration in the site-specific SAP/QAPP.

SAP/QAPP Worksheet #12.1 – Measurement Performance Criteria Table (Soil Matrix)

QC Sample	Analytical Group	Frequency	DQIs	Measurement Performance Criteria	QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S&A)
Field Duplicates	Site-specific	1 per 10 field samples collected	Precision	50% - RPD	S&A
MS/MSD	Site-specific	5% (field samples); 1 per 20 field samples collected	Precision and Accuracy	DOD QSM LCS limits or laboratory statistically derived control limits in accordance with DOD QSM requirements	S&A
Equipment Rinse Blanks	Site-specific	None – if disposable sampling equipment is used, 1 per day, or event, or as appropriate for reusable sampling equipment	Sensitivity/ Contamination (Accuracy/Bias)	Detections < QLs (Worksheet #15), or as specified	S
Temperature Blanks	Site-specific	Every cooler shipped to the laboratory when temperature preservation is recommended	Representativeness	≤ 6°C	S

SAP/QAPP Worksheet #12.2 – Measurement Performance Criteria Table (Water Matrix)

QC Sample	Analytical Group	Frequency	Data Quality Indicators (DQIs)	Measurement Performance Criteria	QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S&A)
Field Duplicates	Site-specific	1 per 10 field samples collected	Precision	30% - RPD	S&A
(MS/MSD	Site-specific	5% (field samples); 1 per 20 field samples collected	Precision and Accuracy	DOD QSM LCS limits or laboratory statistically derived control limits in accordance with DOD QSM requirements	S&A
Equipment Rinse Blanks	Site-specific	None – if disposable sampling equipment is used, 1 per day, or event, or as appropriate for reusable sampling equipment	Sensitivity/ Contamination (Accuracy/Bias)	Detections < QLs (Worksheet #15)), or as specified	S
Trip Blanks	Site-specific	One per cooler with volatile samples	Sensitivity/ Contamination (Accuracy/Bias)	Detections < QLs (Worksheet #15)	S
Temperature Blanks	Site-specific	Every cooler shipped to the laboratory when temperature preservation is recommended	Representativeness	≤ 6°C	S

12.1 Field Quality Control

To verify the reliability of field sampling procedures and materials, field QC samples will be collected for each sampled media. Field QC samples are necessary for establishing data comparability, determining the total measurement error (the overall precision of the measurement system from sample collection to analysis) and for quality assurance during sample handling and shipment. Field QC samples may include field duplicates, equipment rinse blanks, source blanks, trip blanks, and temperature blanks. The type and quantity of field QC samples required will depend on the project DQOs.

12.1.1 Field Duplicates

Field duplicates are secondary samples collected at the same time and from the same source as their corresponding primary samples. The identity of the duplicate is concealed or "blinded" from the laboratory. The purpose of duplicate samples is to evaluate the variability of the contaminant distribution in the sampled matrix. In general, field duplicates will represent at least 10% of all field samples. Site-specific DQOs may allow for changes to this frequency. Any changes will be documented in the site-specific SAP/QAPP (Worksheets #12 and #20).

Soil sample field duplicates will be collected as homogenized split samples for semivolatile organic compounds and nonvolatile inorganic analyses. Some soil types are not suitable for homogenization

(i.e., high clay content). In these cases field duplicates may be collected as collocated duplicates. For VOA, soil sample field duplicates will be collected as collocated samples that are not homogenized.

12.1.2 Matrix Spike/Matrix Spike Duplicate

MS/MSD are laboratory QC samples that may require additional field sample volume/mass collections. MS/MSD samples will be field collected and/or designated on the COC form, spiked at the laboratory with the contaminants of concern, and analyzed together with the field (parent) samples. MS/MSD samples measure the laboratory's overall accuracy and precision in the site-specific sample matrix. Additional sample mass may need to be collected for MS/MSD analyses.

Water samples designated for MS/MSD analyses should be collected in triplicate volumes. Samples for MS/MSD analysis will be clearly identified on the COC record. MS/MSD pairs should be analyzed at the minimum frequency of 5% of all field samples, or one MS/MSD request for a parent sample for every 20 field samples collected.

12.1.3 Equipment Rinse Blank

Rinse Blank. An equipment rinse blank is a sample of analyte-free water collected from a final rinse of sampling equipment after the decontamination procedure has been performed. The purpose of rinse blanks is to determine whether the sampling equipment is adequately cleaned prior to sampling or, may be causing cross contamination between samples. Equipment rinse blank samples are collected from re-usable, non-disposable sampling equipment only. During equipment decontamination, analyte-free water used as a final rinse will be collected in appropriate sample containers. The scope and frequency of equipment blank collection will be consistent with the project DQOs. As appropriate, rinse blank samples should be collected at a minimum frequency of one per day, or one per site, or per sampling event.

Source Blank. If justified by the project DQOs, decontamination source water samples will be collected at a frequency of one per source and submitted to the laboratory for all required analyses. Additional source blanks will be collected upon change of source and when decontamination events are interrupted for periods greater than 1 week.

12.1.4 Trip Blank

Trip blanks are samples of analyte-free water in 40-mL vials, which are prepared in the laboratory, shipped to the field together with sample containers, and returned to the laboratory for storage and analysis along with the field samples. The trip blank data demonstrate whether the samples were exposed to ambient contamination or cross-contamination during storage and transport to the laboratory. Trip blanks will be analyzed for VOCs only; therefore, the 40-mL vials must not contain any headspace. The applicability of trip blanks is defined by the project DQOs.

When necessary, one trip blank is required for each day of sampling, and one trip blank must accompany each shipping cooler containing surface water or groundwater samples for VOC analysis. Trip blanks may not be necessary for analysis with wastewater or soil samples.

12.1.5 Temperature Blank

Temperature blanks are small volumes (typically 40-mL vials or 125 mL bottles) of tap water placed in each shipping cooler containing field samples. Laboratory personnel may use the temperature blanks to measure the temperature of the samples in the cooler upon arrival at the laboratory.

SAP/QAPP WORKSHEET #13 – SECONDARY DATA CRITERIA AND LIMITATIONS TABLE

Worksheet #13 is used to document any previously collected data that will be used to develop the sampling objectives for the current project. This Worksheet will identifies the source of existing (secondary) data that may used and discusses the limitations (if any) of the existing data. If no secondary data are used, then this is documented in Worksheets #2 and #13.

Section 1.3 in the PMP, "Technical Approach and Site Descriptions," gives indications of data existing and possibly available for the sites at each of the four bases. These data will be reviewed, used, and documented as secondary data toward development of the sampling objectives.

SAP/QAPP Worksheet #13 – Secondary Data Criteria and Limitations Table

Secondary Data	Data Source (originating organization, report title and date)	Data Generator(s) (originating organization, data types, data generation/collection dates)	How Data Will Be Used	Limitations on Data Use
TBD on site-specific basis				

SAP/QAPP WORKSHEET #14 – SUMMARY OF PROJECT TASKS

14.1 Scope of Work

Worksheet #14 within each site-specific SAP/QAPP will be used to summarize all major tasks associated with the site-specific sampling effort. The scope of work for activities may include some of the following examples:

- Obtaining well permits
- Utility locating
- Concrete coring
- Structure demolition
- Soil sampling
- Installing monitoring wells
- Well abandonment
- Groundwater sampling
- Performing laboratory analyses
- Vapor Sampling
- Surveying
- Restoring site conditions
- Characterizing waste for disposal (including all investigation-derived waste [IDW])
- Collecting QC samples
- Reviewing and validating analytical data, and uploading to the AFCEE ERPIMS database.

14.2 Sample Collection Procedures

This section within each site-specific SAP/QAPP will describe the sampling techniques that will be used to collect soil, surface water, groundwater, and IDW samples, etc. for chemical analysis.

14.3 Analytical Requirements

This section within each site-specific SAP/QAPP will specify the chemical analysis methods that will be used for the project.

14.4 Data Recording and Transfer

This section within each site-specific SAP/QAPP details the requirements for data reporting and data package formats that will be provided by the laboratory.

14.4.1 Hard Copy Deliverables

All relevant raw data and documentation, including (but not limited to) logbooks, field and laboratory data sheets, electronic files, and final reports, will be maintained by the subcontractor laboratory, or laboratories, for at least 10 years. The laboratory will notify Shaw 30 days before disposal of any relevant laboratory records.

Shaw will maintain copies of all COC forms until receipt of the laboratory report. Laboratory reports will be logged in upon receipt and filed in chronological order. If necessary, based on project DQOs, a second copy of the laboratory report will be available for in-house or third-party data validation.

The data deliverable requirements for projects will be compliant with DOD and AFCEE requirements. The project DQOs will establish the need for in-house or third-party data review and validation, and appropriate USEPA data package levels (II, III or IV).

Data Deliverables Package Requirements

Deliverable Requirement	Level IV	Level III	Level II
Case Narrative	X	X	X
Corrective Action Report(s)	X	X	X
Cross-reference of field sample numbers, laboratory identification numbers, and analytical QC batches	X	X	X
COC Form, Cooler Receipt Form	X	X	X
Sample log-in sheet	X		
Data summary for each blank and sample	X	X	X
TICs for each sample (10 peaks) (GC/MS only)	X	(Only if requested by project)	
LCS/LCD report (including concentration spiked, percent recovered, percent recovery acceptance limits, RPD, and RPD acceptance limits)	X	X	X
Surrogate recovery report (including concentration spiked, percent recovered, and percent recovery acceptance limits) – organic methods only	X	X	X
MS/MSD report (including concentration spiked, percent recovered, percent recovery acceptance limits, RPD, and RPD acceptance limits)	X	X	X
Instrument performance check (tuning) report (GC/MS)	X	X	
Initial calibration data (including acceptance limits)	X	X (summary only)	
Calibration verification data (including acceptance limits) For GC indicate which column was used for quantitation)	X	X (summary only)	
Chromatograms for each sample (and reruns), confirmation runs, blank, spike, duplicate, and standards	X	X[b]	
Instrument quantitation report	X		
Internal standard areas and retention time reports (including acceptance limits and out-of-control flags)	X	X	
Reconstructed ion chromatogram for each sample and rerun, blank, spike, duplicate, and standard	X		
Raw and background subtracted mass spectra for each target analyte found (GC/MS only)	X		
Post-digestion spike recovery (metals)	X	X	X
Duplicate sample report (inorganic methods)	X	X	X
Instrument Blank results	X	X	X
ICP interference check sample report (metals)	X	X	X
Standard addition results (metals)	X	X	
ICP serial dilution results (metals)	X	X	X
Sample preparation bench sheets	X	X	
Gel permeation chromatograph cleanup logs (if performed)	X		
Method blank summary	X		
Standard preparation logs	X		
Analysis run logs	X	X	
Percent solids/moisture	X	X	X
pH	X[c]		

[a]Must include: field sample ID, laboratory ID, date/time sampled, date received, extracted/analyzed, QL, MDL, dilution factor(s), results, comments, approval signature/date.
[b]For petroleum fuels or PCB [polychlorinated biphenyl] analyses chromatograms for samples with compound detection only.
[c]For water sample volatile analysis only.

14.4.2 Electronic Deliverables

The laboratory's EDD will be in Enviro Data® or equivalent format (Shaw's current database format). The analytical laboratory will follow the requirements stated in the Laboratory Interface Document (Data Transfer Standard) for the Analytical Laboratory EDD and as specified by Shaw. Sampling and analytical data generated during execution of the projects will be uploaded to the AFCEE ERPIMS database as specified in the contract documents.

Field information (e.g., date and time collected, sample identification, field parameter measurements, etc.) will be entered into the database from the field logs, notebooks, COC forms or uploaded from electronic files generated in the field.

14.5 Data Management

This section describes the data management procedures for data review, verification, reporting, and validation.

14.5.1 Data Reduction, Verification, and Reporting

All analytical data generated by the laboratory will be reviewed prior to reporting to ensure the validity of reported data. This internal laboratory data review process will consist of data reduction, three levels of documented review, and reporting. Review processes will be documented using appropriate checklist forms, or logbooks, that will be signed and dated by the reviewer.

14.5.2 Data Reduction

Data reduction involves the mathematical or statistical calculations used by the laboratory to convert raw data to the reported data. The laboratory will perform reduction of analytical data as specified in each of the appropriate analytical methods and laboratory SOPs. For each method, all raw data results will be recorded using method-specific forms or a standardized output from each of the various instruments.

All data calculations will be verified and initialed by personnel both generating and approving them. All raw and electronic data, notebook references, supporting documentation, and correspondence will be assembled, packaged, and stored for a minimum of 10 years for future use. All reports will be held client confidential. If the laboratory is unable to store project-related data for 10 years, then it is the responsibility of the laboratory to contact Shaw to make alternative arrangements.

14.5.3 Laboratory Data Verification and Review

The laboratory analyst who generates the analytical data will have the primary responsibility for the correctness and completeness of data. Each step of this verification and review process will involve the evaluation of data quality based on both the results of the QC data and the professional judgment of those conducting the review. This application of technical knowledge and experience to the evaluation of data is essential in ensuring that data of known quality are generated consistently. All data generated and reduced will follow well-documented, in-house protocols.

Level 1. Technical (Peer) Data Review

Analysts will review the quality of their work based on an established set of guidelines, including the QC criteria established in each method, in this SAP/QAPP, and as stated within the laboratory QA Manual. This review will, at a minimum, ensure that the following conditions have been met:

- Sample preparation information is correct and complete.
- Analysis information is correct and complete.
- Appropriate SOPs have been followed.
- Calculations are verified.
- There are no data transposition errors.
- Analytical results are correct and complete.
- QC samples are within established control limits.
- Blanks and LCSs are within appropriate QC limits.
- Special sample preparation and analytical requirements have been met.

Documentation is complete, for example, any anomalies and holding times have been documented and forms have been completed.

Level 2. Technical Data Review

A supervisor or data review specialist whose function is to provide an independent review of data packages will perform this review. This review will also be conducted according to an established set of guidelines and will be structured to verify the following finding of Level 1 data review:

- All appropriate laboratory SOPs have been followed.
- Calibration data are scientifically sound, appropriate to the method, and completely documented.
- QC samples are within established guidelines.
- Qualitative identification of contaminants is correct.
- Manual integrations are justified and properly documented.
- Quantitative results and calculations are correct.
- Data are qualified correctly.
- Documentation is complete, for example, any anomalies and holding times have been documented and appropriate forms have been completed.
- Data are ready for incorporation into the final report.
- The data package is complete and complies with contract requirements.

The Level 2 review will be structured so that all calibration data and QC sample results are reviewed and all of the analytical results from at least 10% of the samples are checked back to the sample preparation and analytical bench sheets. If no problems are found with the data package, the review will be considered complete.

If any problems are found with the data package, an additional 10% of the sample results will be checked against the sample preparatory and analytical bench sheets. This cycle will then be repeated until either no errors are found in the checked data set or all data has been checked. All errors and corrections noted will be documented.

Level 3. Administrative Quality Assurance Data Review

The Laboratory QA Manager will review 10% of all data packages. This review should be similar to the review as provided in Level 2, except that it will provide a total overview of the data package to ensure its consistency and compliance with project requirements. All errors noted will be corrected and documented.

14.6 Data Validation

The need for data validation by Shaw or a third-party, independent validation company will be determined based on the requirements of the AFCEE and the site-specific DQOs. Data validation will be in accordance with the *USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review* (USEPA 2004), *USEPA Contract Laboratory Program National Functional Guidelines for Organic Data Review* (USEPA 2008), the DOD QSM (DOD, 2010), and the QC criteria specified in the site-specific SAP/QAPP document. Data will be validated and qualified with the following data qualifiers:

- *J qualifier* denotes the analyte was positively identified, but the associated numerical value is estimated.
- *U qualifier* denotes the analyte was analyzed for, but not detected. The associated numerical value is at or below the reporting limit.
- *R qualifier* denotes the data are unusable due to deficiencies in the ability to analyze the sample and meet QC criteria.
- *B qualifier* denotes blank contamination.

14.6.1 Data Review

The Shaw Project Chemist will review the laboratory data packages for samples that are not submitted for third-party data validation to establish that holding times for extraction and analysis and internal QC check requirements have been met and to determine data usability.

SAP/QAPP WORKSHEET #15 –
REFERENCE LIMITS AND EVALUATION TABLE

Worksheet #15 is completed for each planned analysis method and matrix sampled (e.g., soil, water, or air). Worksheet #15 identifies target analytes, sample analysis detection and quantification limits, project quantification limit goals, and project comparison criteria or action limits. The project comparison criteria columns indicate human-health risk-based soil screening levels, preliminary remediation goals, codified regulatory limits, or applicable background concentration values that the projects may use as site-specific decision criteria at project sites in New Mexico and Illinois. Regulatory standards will typically be the NMED Risk-Based SSLs for residential land use (NMED, 2009), USEPA's Regional Screening Levels for residential land use (USEPA 2011), Illinois Environmental Protection Agency's Tiered Approach to Corrective Action Objectives (IEPA 2007), USEPA Drinking Water Program, MCLs (USEPA, 2001b), or NMWQCC Standards for Protection of Groundwater (NMWQCC, 2002). Other reference limits may be appropriate on a site-specific basis. All comparison criteria sources are noted in Worksheet #15.

Worksheet 15.1
Matrix: Soil
Analytical Group: VOCs - SW846 - 8260B - Target Compound List
Concentration Level: Low

Analyte	CAS Number	NM Sites Project Comparison Criteria (mg/kg)	NM Sites Comparison Criteria Reference	IL Sites Project Comparison Criteria (mg/kg)	IL Sites Comparison Criteria Reference	Project Quantitation Limit Goal (µg/kg)[a]	Achievable Laboratory Limits, Accutest Laboratories			Method Performance Criteria	
							LOQ (µg/kg)	LOD (µg/kg)	MDL (µg/kg)	Bias Control Limits (%R) (LCS, MS)	Precision Limits (RPD) (LCSD, MSD)
VOCs 8260B											
1,1,1-Trichloroethane	71-55-6	2.18E+04	NMED 2009	2.0E+00	IEPA 2007[b]	600000	5	2	1.1	80-133	27
1,1,2,2-Tetrachloroethane	79-34-5	7.98E+00	NMED 2009	8.7E+03	USEPA 2011	1000000	5	2	1.2	70-128	30
1,1,2-Trichloroethane	79-00-5	1.72E+01	NMED 2009	2.0E-02	IEPA 2007[c]	155000	5	2	1.1	76-118	28
1,1-Dichloroethane	75-34-3	6.29E+01	NMED 2009	2.3E+01	IEPA 2007[b]	650000	5	2	1.1	77-132	26
1,1-Dichloroethylene	75-35-4	6.18E+02	NMED 2009	6.0E-02	IEPA 2007[c]	350000	5	2	1.4	66-132	27
1,2,4-Trichlorobenzene	120-82-1	1.43E+02	NMED 2009	5.0E+00	IEPA 2007[c]	390000	5	2	1.2	82-137	32
1,2-Dibromo-3-chloropropane	96-12-8	1.94E-01	NMED 2009	2.0E-03	IEPA 2007[c]	230	5	2.5	2.3	67-129	29
1,2-Dibromoethane	106-93-4	5.74E-01	NMED 2009	4.0E-04	IEPA 2007[c]	160	5	2	1	77-126	24
1,2-Dichloroethane	107-06-2	7.74E+00	NMED 2009	2.0E-02	IEPA 2007[b]	200	5	2	1	78-129	24
1,2-Dichloropropane	78-87-5	1.47E+01	NMED 2009	3.0E-02	IEPA 2007[c]	4500	5	2	1.2	74-127	27
2-Hexanone	591-78-6	2.1E+02	USEPA 2011	2.1E+02	USEPA 2011	105000	25	10	5.4	67-130	29
4-Methyl-2-pentanone	108-10-1	5.95E+03	NMED 2009	5.3E+03	USEPA 2011	440000	25	10	5.5	69-125	24
Acetone	67-64-1	6.75E+04	NMED 2009	2.5E+01	IEPA 2007[c]	35000000	50	25	20	61-144	29
Benzene	71-43-2	1.55E+01	NMED 2009	3.0E-02	IEPA 2007[b]	400	5	2	1.5	78-130	25
Bromodichloromethane	75-27-4	5.25E+00	NMED 2009	6.0E-01	IEPA 2007[c]	5000	5	2	1.1	73-122	25
Bromoform	75-25-2	6.16E+02	NMED 2009	8.0E-1	IEPA 2007[b]	26500	5	2	1.5	70-139	26
Carbon disulfide	75-15-0	1.94E+03	NMED 2009	3.2E+01	IEPA 2007[b]	410000	5	4	2	61-142	27
Carbon tetrachloride	56-23-5	4.38E+00	NMED 2009	7.0E-02	IEPA 2007[b]	150	5	2	1.8	79-135	29
Chlorobenzene	108-90-7	5.08E+02	NMED 2009	1.0E+00	IEPA 2007[b]	65000	5	2	1	83-122	23
Chloroethane	75-00-3	4.36E+04	NMED 2009	1.5E+04	USEPA 2011	750000	5	4	2	61-153	31
Chloroform	67-66-3	5.72E+00	NMED 2009	6.0E-01	IEPA 2007[b]	150	5	2	1.2	79-129	27
cis-1,2-Dichloroethylene	156-59-2	7.82E+02	NMED 2009	4.0E-01	IEPA 2007[c]	390000	5	2	1.5	74-123	26
cis-1,3-Dichloropropene	10061-01-5	NA	NA	NA	NA	5	5	2	1	79-130	23
Cyclohexane	110-82-7	7.0E+03	USEPA 2011	7.0E+03	USEPA 2011	3500000	5	2	1.4	76-135	25
Dibromochloromethane	124-48-1	1.19E+01	NMED 2009	6.8E-01	USEPA 2011	650000	5	2	1	78-117	27
Dichlorodifluoromethane	75-71-8	4.81E+02	NMED 2009	9.4E+01	USEPA 2011	125000	5	2	1.5	35-162	30
Ethylbenzene	100-41-4	6.97E+01	NMED 2009	1.3E+01	IEPA 2007[b]	200000	5	2	1	82-124	25
Freon 113	76-13-1	1.04E+05	NMED 2009	4.3E+04	USEPA 2011	21500000	5	2	1.7	62-147	29

Worksheet 15.1 (Continued)
Matrix: Soil
Analytical Group: VOCs - SW846 - 8260B - Target Compound List
Concentration Level: Low

Analyte	CAS Number	NM Sites Project Comparison Criteria (mg/kg)	NM Sites Comparison Criteria Reference	IL Sites Project Comparison Criteria (mg/kg)	IL Sites Comparison Criteria Reference	Project Quantitation Limit Goal (µg/kg)[a]	Achievable Laboratory Limits, Accutest Laboratories			Method Performance Criteria	
							LOQ (µg/kg)	LOD (µg/kg)	MDL (µg/kg)	Bias Control Limits (%R) (LCS, MS)	Precision Limits (RPD) (LCSD, MSD)
VOCs 8260B (Continued)											
Isopropylbenzene	98-82-8	3.21E+03	NMED 2009	2.1E+03	USEPA 2011	240000	5	2	1.1	82-133	27
m-Dichlorobenzene	541-73-1	NE	NA	NE	NA	5	5	2	1.2	82-126	29
Methyl acetate	79-20-9	7.82E+04	NMED 2009	7.8E+04	USEPA 2011	39000000	25	20	13	67-130	26
Methyl bromide	74-83-9	2.23E+01	NMED 2009	7.3E+00	USEPA 2011	3650	5	4	2	60-146	31
Methyl chloride	74-87-3	3.56E+01	NMED 2009	1.2E+02	USEPA 2011	60000	5	4	2	58-163	26
Methyl ethyl ketone	78-93-3	3.56E+01	NMED 2009	2.8E+04	USEPA 2011	14000000	25	10	6.1	66-134	23
Methyl Tert Butyl Ether	1634-04-4	8.62E+02	NMED 2009	3.2E-01	IEPA 2007[c]	390000	5	4	2	70-131	25
Methylcyclohexane	108-87-2	1.20E+04	NMED 2009	NE	NA	5	5	2	1.3	81-145	27
Methylene chloride	75-09-2	1.99E+02	NMED 2009	2.0E-02	IEPA 2007[b]	6500	10	5	4.6	62-140	25
o-Dichlorobenzene	95-50-1	3.01E+03	NMED 2009	NA	USEPA 2011	950000	5	2	1.1	83-123	28
p-Dichlorobenzene	106-46-7	3.22E+01	NMED 2009	NA	USEPA 2011	1200	5	2	1.1	84-124	28
Styrene	100-42-5	8.97E+03	NMED 2009	4.0	IEPA 2007[b]	750000	5	4	2.6	79-123	28
Tetrachloroethylene	127-18-4	6.99E+00	NMED 2009	6.0E-02	IEPA 2007[b]	5500	5	2	1	79-132	27
Toluene	108-88-3	5.57E+03	NMED 2009	1.2E+01	IEPA 2007[b]	325000	5	2	1.2	80-123	26
trans-1,2-Dichloroethylene	156-60-5	2.73E+02	NMED 2009	7.0E-01	IEPA 2007[c]	800000	5	2	1.5	77-129	27
trans-1,3-Dichloropropene	10061-02-6	NE	NA	NE	NA	5	5	2	1.1	87-131	27
Trichloroethylene	79-01-6	4.57E+01	NMED 2009	6.0E-02	IEPA 2007[b]	2500	5	2	1.2	78-132	28
Trichlorofluoromethane	75-69-4	2.01E+03	NMED 2009	7.9E+02	USEPA 2011	415000	5	4	2	67-149	29
Vinyl chloride	75-01-4	8.65E-01	NMED 2009	1.0E-02	IEPA 2007[b]	140	5	2	1.5	60-145	29
Xylene (total)	1330-20-7	1.09E+03	NMED 2009	1.5E+02	IEPA 2007[b]	160000	15	6	3.2	83-127	24

Worksheet 15.1 (Concluded)
Matrix: Soil
Analytical Group: VOCs - SW846 - 8260B - Target Compound List
Concentration Level: Low

Analyte	CAS Number	NM Sites Project Comparison Criteria (mg/kg)	NM Sites Comparison Criteria Reference	IL Sites Project Comparison Criteria (mg/kg)	IL Sites Comparison Criteria Reference	Project Quantitation Limit Goal (µg/kg)[a]	Achievable Laboratory Limits, Accutest Laboratories			Method Performance Criteria	
							LOQ (µg/kg)	LOD (µg/kg)	MDL (µg/kg)	Bias Control Limits (%R) (LCS, MS)	Precision Limits (RPD) (LCSD, MSD)
Surrogate Spike Compounds											
Dibromofluoromethane	1868-53-7	NE	NA	NE	NA	NA	NA	NA	NA	80-121	NA
Toluene-D8	2037-26-5	NE	NA	NE	NA	NA	NA	NA	NA	71-130	NA
4-Bromofluorobenzene	460-00-4	NE	NA	NE	NA	NA	NA	NA	NA	59-148	NA
1,2-Dichloroethane-D4	17060-07-0	NE	NA	NE	NA	NA	NA	NA	NA	77-123	NA

[a]The Project Quantification Limit was calculated as half of the Project Comparison Criteria.
[b]Inhalation Standard.
[c]Ingestion Standard.

(NMED 2009) New Mexico Environment Department, Hazardous Waste Bureau and Ground Water Quality Bureau Voluntary Remediation Program Technical Background Document for Development of Soil Screening Levels, Revision 5.0, August 2009, Table A-1 NMED Soil Screening Levels December 2009 for Residential Soil

(USEPA 2011) U.S. Environmental Protection Agency, Mid-Atlantic Risk Assessment, Regional Screening Levels, on-line risk-based concentrations table for Residential Soil http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/index.htm

(IEPA 2007) Illinois Environmental Protection Agency, Illinois Administrative Code (IAC) Part 742 Appendix B, Table B-1 Soil Preliminary Remediation Goals (PRGs) (Including Migration to Class I Groundwater), February 23, 2007

Worksheet 15.2
Matrix: Water
Analytical Group: VOCs - SW846 - 8260B - Target Compound List
Concentration Level: Low

Analyte	CAS Number	NM Sites Project Comparison Criteria (mg/L)	NM Sites Comparison Criteria Reference	IL Sites Project Comparison Criteria (mg/L)	IL Sites Comparison Criteria Reference	Project Quantitation Limit Goal (µg/L)[a]	Achievable Laboratory Limits, Accutest Laboratories			Method Performance Criteria	
							LOQ (µg/L)	LOD (µg/L)	MDL (µg/L)	Bias Control Limits (%R) (LCS, MS)	Precision Limits (RPD) (LCSD, MSD)
VOCs 8260B											
1,1,1-Trichloroethane	71-55-6	6.0E-02	NMWQCC 2002	2.0E-01	IEPA 2007	30	1	0.5	0.2	79-133	11
1,1,2,2-Tetrachloroethane	79-34-5	1.0E-02	NMWQCC 2002	4.2E-01	IEPA 2007	5	1	0.5	0.23	71-120	11
1,1,2-Trichloroethane	79-00-5	1.0E-02	NMWQCC 2002	5.0E-03	IEPA 2007	2.5	1	0.5	0.22	80-114	11
1,1-Dichloroethane	75-34-3	2.5E-02	NMWQCC 2002	7.0E-01	IEPA 2007	12.5	1	0.5	0.25	82-127	10
1,1-Dichloroethylene	75-35-4	5.0E-03	NMWQCC 2002	7.0E-03	IEPA 2007	2.5	1	0.5	0.23	75-133	13
1,2,4-Trichlorobenzene	120-82-1	7.0E-02	USEPA 2009	7.0E-02	IEPA 2007	35	1	0.75	0.5	68-123	11
1,2-Dibromo-3-chloropropane	96-12-8	2.0E-04	USEPA 2009	2.0E-04	IEPA 2007	0.1	2	1	0.5	61-118	15
1,2-Dibromoethane	106-93-4	1.0E-04	NMWQCC 2002	5.0E-05	IEPA 2007	0.025	1	0.5	0.37	80-115	10
1,2-Dichloroethane	107-06-2	1.0E-02	NMWQCC 2002	5.0E-03	IEPA 2007	2.5	1	0.5	0.2	76-122	11
1,2-Dichloropropane	78-87-5	5.0E-03	USEPA 2009	5.0E-03	IEPA 2007	2.5	1	0.5	0.25	81-120	11
2-Hexanone	591-78-6	NE	NA	NE	NA	10	10	5	4	58-125	14
4-Methyl-2-pentanone	108-10-1	NE	NA	5.6E-01	IEPA 2007	280	5	4	2	62-125	13
Acetone	67-64-1	NE	NA	6.3E+00	IEPA 2007	3150	25	20	10	59-134	14
Benzene	71-43-2	1.0E-02	NMWQCC 2002	5.0E-03	IEPA 2007	2.5	1	0.5	0.2	83-124	11
Bromodichloromethane	75-27-4	Tox	NMWQCC 2002	2.0E-04	IEPA 2007	0.1	1	0.5	0.2	76-116	10
Bromoform	75-25-2	NE	NA	1.0E-03	IEPA 2007	1	1	0.5	0.2	68-128	11
Carbon disulfide	75-15-0	NE	NA	NE	NA	2	2	1	0.5	67-147	12
Carbon tetrachloride	56-23-5	1.0E-02	NMWQCC 2002	5.0E-03	IEPA 2007	2.5	1	0.5	0.25	74-139	13
Chlorobenzene	108-90-7	1.0E-01	USEPA 2009	1.0E-01	IEPA 2007	50	1	0.5	0.2	87-115	9
Chloroethane	75-00-3	NE	NA	2.8E+00	IEPA 2007	1400	2	1	0.5	54-166	20
Chloroform	67-66-3	1.0E-01	NMWQCC 2002	2.0E-04	IEPA 2007	0.1	1	0.5	0.22	85-123	10
cis-1,2-Dichloroethylene	156-59-2	7.0E-02	USEPA 2009	7.0E-02	IEPA 2007	35	1	0.5	0.26	81-114	10
cis-1,3-Dichloropropene	10061-01-5	NE	NA	1.0E-03	IEPA 2007	1	1	0.5	0.2	83-119	10
Cyclohexane	110-82-7	NE	NA	NE	NA	1	1	0.5	0.31	79-131	11
Dibromochloromethane	124-48-1	NE	NA	1.4E-01	IEPA 2007	70	1	0.5	0.2	74-116	11
Dichlorodifluoromethane	75-71-8	Tox	NMWQCC 2002	1.4E+00	IEPA 2007	700	2	1	0.5	34-158	22
Ethylbenzene	100-41-4	7.5E-01	NMWQCC 2002	7.0E-01	IEPA 2007	350	1	0.5	0.2	87-118	10

Worksheet 15.2 (Continued)
Matrix: Water
Analytical Group: VOCs - SW846 - 8260B - Target Compound List
Concentration Level: Low

Analyte	CAS Number	NM Sites Project Comparison Criteria (mg/L)	NM Sites Comparison Criteria Reference	IL Sites Project Comparison Criteria (mg/L)	IL Sites Comparison Criteria Reference	Project Quantitation Limit Goal (µg/L)[a]	Achievable Laboratory Limits, Accutest Laboratories			Method Performance Criteria	
							LOQ (µg/L)	LOD (µg/L)	MDL (µg/L)	Bias Control Limits (%R) (LCS, MS)	Precision Limits (RPD) (LCSD, MSD)
VOCs 8260B (Continued)											
Freon 113	76-13-1	NE	NA	NE	NA	1	1	0.5	0.47	74-139	13
Isopropylbenzene	98-82-8	NE	NA	7.0E-01	IEPA 2007	350	1	0.5	0.2	87-131	10
m-Dichlorobenzene	541-73-1	NE	NA	NE	NA	1	1	0.5	0.2	86-115	9
Methyl Acetate	79-20-9	NE	NA	NE	NA	20	20	10	5	65-122	13
Methyl bromide	74-83-9	Tox	NMWQCC 2002	NE	NA	2	2	1	0.5	55-151	21
Methyl chloride	74-87-3	Tox	NMWQCC 2002	NE	NA	2	2	1	0.5	55-173	22
Methyl ethyl ketone	78-93-3	NE	NA	NE	NA	5	5	4	2	61-127	13
Methyl Tert Butyl Ether	1634-04-4	NE	NA	7.0E-02	IEPA 2007	35	1	0.5	0.34	75-116	10
Methylcyclohexane	108-87-2	NE	NA	NE	NA	1	1	0.5	0.38	86-132	11
Methylene chloride	75-09-2	1.0E-01	NMWQCC 2002	5.0E-03	IEPA 2007	2.5	5	4	2	69-125	11
o-Dichlorobenzene	95-50-1	6.0E-01	USEPA 2009	6.0E-01	USEPA 2009	300	1	0.5	0.25	85-115	9
p-Dichlorobenzene	106-46-7	7.5E-02	USEPA 2009	7.5E-02	USEPA 2009	37.5	1	0.5	0.23	87-113	10
Styrene	100-42-5	1.0E-01	USEPA 2009	1.0E-01	IEPA 2007	50	1	0.5	0.2	78-118	11
Tetrachloroethylene	127-18-4	5.0E-03	USEPA 2009	5.0E-03	IEPA 2007	2.5	1	0.5	0.25	80-131	12
Toluene	108-88-3	7.5E-01	NMWQCC 2002	1.0E+00	IEPA 2007	375	1	0.5	0.2	86-116	10
trans-1,2-Dichloroethylene	156-60-5	NE	NA	1.0E-01	IEPA 2007	50	1	0.5	0.35	82-126	10
trans-1,3-Dichloropropene	10061-02-6	NE	NA	7.5E-02	USEPA 2009	37.5	1	0.5	0.2	87-123	10
Trichloroethylene	79-01-6	NE	NA	5.0E-03	IEPA 2007	2.5	1	0.5	0.26	85-124	10
Trichlorofluoromethane	75-69-4	NE	NA	2.1E+00	IEPA 2007	1050	2	1	0.5	66-156	15
Vinyl chloride	75-01-4	1.0E-03	NMWQCC 2002	2.0E-03	IEPA 2007	1	1	0.5	0.22	57-153	22
Xylene (total)	1330-20-7	6.2E-01	NMWQCC 2002	1.0E+01	IEPA 2007	310	3	1	0.52	86-120	10

Worksheet 15.2 (Concluded)
Matrix: Water
Analytical Group: VOCs - SW846 - 8260B - Target Compound List
Concentration Level: Low

Analyte	CAS Number	NM Sites Project Comparison Criteria (mg/L)	NM Sites Comparison Criteria Reference	IL Sites Project Comparison Criteria (mg/L)	IL Sites Comparison Criteria Reference	Project Quantitation Limit Goal (µg/L)[a]	Achievable Laboratory Limits, Accutest Laboratories			Method Performance Criteria	
							LOQ (µg/L)	LOD (µg/L)	MDL (µg/L)	Bias Control Limits (%R) (LCS, MS)	Precision Limits (RPD) (LCSD, MSD)
Surrogate Spike Compounds											
Dibromofluoromethane	1868-53-7	NE	NA	NE	NA	NA	NA	NA	NA	87-116	
1,2-Dichloroethane-D4	17060-07-0	NE	NA	NE	NA	NA	NA	NA	NA	76-127	
Toluene-D8	2037-26-5	NE	NA	NE	NA	NA	NA	NA	NA	86-112	
4-Bromofluorobenzene	460-00-4	NE	NA	NE	NA	NA	NA	NA	NA	84-120	

[a]The Project Quantification Limit was calculated as half of the Project Comparison Criteria.

Comparison Criteria is less than LOQ

(USEPA 2009) Maximum contaminant level, USEPA National Drinking Water Regulations, Code of Federal Regulations, Title 40, Part 141, Subpart G

(IEPA 2007) Table A-1. Groundwater (Class I) Preliminary Remediation Goals (PRGs) February 23, 2007

(NMWQCC 2002) New Mexico Water Quality Control Commission Regulations, Section 20.6.2 of the New Mexico Administrative Code, New Mexico Water Quality Control Commission, Santa Fe, NM

Worksheet 15.3
Matrix: Soil
Analytical Group: SVOCs - SW846 - 8270C - Target Compound List
Concentration Level: Low

Analyte	CAS Number	NM Sites Project Comparison Criteria (mg/kg)	NM Sites Comparison Criteria Reference	IL Sites Project Comparison Criteria (mg/kg)	IL Sites Comparison Criteria Reference	Project Quantitation Limit Goal (µg/kg)[a]	Achievable Laboratory Limits, Accutest Laboratories			Method Performance Criteria	
							LOQ (µg/kg)	LOD (µg/kg)	MDL (µg/kg)	Bias Control Limits (%R) (LCS, MS)	Precision Limits (RPD) (LCSD, MSD)
VOCs 8270C											
1,1'-Biphenyl	92-52-4	3.91E+03	NMED 2009	5.1E+01	USEPA 2011	25500	170	33	17	57-92	29
2,4,5-Trichlorophenol	95-95-4	6.11E+03	NMED 2009	2.7E+02	IEPA 2007[b]	3055246	170	33	17	60-101	28
2,4,6-Trichlorophenol	88-06-2	6.11E+01	NMED 2009	2.0E-01	IEPA 2007[b]	29000	170	33	17	60-100	27
2,4-Dichlorophenol	120-83-2	1.83E+02	NMED 2009	1.0E+00	IEPA 2007[b]	91657	170	33	17	60-101	30
2,4-Dimethylphenol	105-67-9	1.22E+03	NMED 2009	9.0E+00	IEPA 2007[b]	611049	170	67	21	49-89	31
2,4-Dinitrophenol	51-28-5	1.22E+02	NMED 2009	2.0E-01	IEPA 2007[b]	61105	830	670	330	39-107	40
2,4-Dinitrotoluene	121-14-2	1.57E+01	NMED 2009	8.0E-04	IEPA 2007[b]	450	170	33	17	59-103	30
2,6-Dinitrotoluene	606-20-2	6.12E+01	NMED 2009	7.0E-04	IEPA 2007[b]	450	170	33	20	57-99	30
2-Chloronaphthalene	91-58-7	6.26E+03	NMED 2009	6.3E+03	USEPA 2011	3150000	170	33	33	57-95	28
2-Chlorophenol	95-57-8	3.91E+02	NMED 2009	4.0E+00	IEPA 2007[b]	195000	170	33	17	54-97	31
2-Methylnaphthalene	91-57-6	3.1E+02	USEPA 2011	3.1E+02	USEPA 2011	1150000	170	33	17	57-103	32
2-Methylphenol	95-48-7	3.1E+03	USEPA 2011	1.5E+01	IEPA 2007[b]	1550000	170	33	17	53-94	29
2-Nitroaniline	88-74-4	6.1E+02	USEPA 2011	6.1E+02	USEPA 2011	36500	170	67	33	53-106	29
2-Nitrophenol	88-75-5	NE	NA	NE	NA	170	170	33	17	55-96	30
3&4-Methylphenol		NE	NA	NE	NA	170	170	67	24	54-95	31
3,3'-Dichlorobenzidine	91-94-1	1.08E+01	NMED 2009	7.0E-03	IEPA 2007[b]	500	330	67	33	34-88	31
3-Nitroaniline	99-09-2	NE	NA	NE	NA	170	170	67	33	29-85	31
4,6-Dinitro-o-cresol	534-52-1	6.11E+00	NMED 2009	4.9E+00	USEPA 2011	3055	330	130	67	58-109	37
4-Bromophenyl phenyl ether	101-55-3	NE	NA	NE	NA	170	170	33	17	60-104	26
4-Chloro-3-methyl phenol	59-50-7	6.1E+03	USEPA 2011	6.1E+03	USEPA 2011	2750000	170	33	17	59-102	27
4-Chloroaniline	106-47-8	2.4E+00	USEPA 2011	7.0E-01	IEPA 2007[b]	1200	170	33	17	19-85	34
4-Chlorophenyl phenyl ether	7005-72-3	NE	NA	NE	NA	170	170	33	17	60-101	26
4-Nitroaniline	100-01-6	2.4E+01	USEPA 2011	2.4E+01	USEPA 2011	12000	170	67	33	49-104	31
4-Nitrophenol	100-02-7	NE	NA	NE	NA	830	830	330	130	56-106	29
Acenaphthene	83-32-9	3.44E+03	NMED 2009	5.7E+02	IEPA 2007[b]	2350000	170	33	17	59-97	29
Acenaphthylene	208-96-8	NE	NA	NE	NA	1150000	170	33	17	58-98	30
Acetophenone	98-86-2	7.82E+03	NMED 2009	7.8E+03	USEPA 2011	3900000	170	33	17	47-95	30
Anthracene	120-12-7	1.72E+04	NMED 2009	1.2E+04	IEPA 2007[b]	11500000	170	33	17	61-104	29
Atrazine	1912-24-9	2.1E+00	USEPA 2011	2.1E+00	USEPA 2011	1050	170	33	17	61-105	31
Benzaldehyde	100-52-7	7.8E+03	USEPA 2011	7.8E+03	USEPA 2011	3900000	830	330	170	37-113	31
Benzo(a)anthracene	56-55-3	6.21E+00	NMED 2009	1.5E-01	USEPA 2011	900	170	33	17	60-106	31

Worksheet 15.3 (Continued)
Matrix: Soil
Analytical Group: SVOCs - SW846 - 8270C - Target Compound List
Concentration Level: Low

Analyte	CAS Number	NM Sites Project Comparison Criteria (mg/kg)	NM Sites Comparison Criteria Reference	IL Sites Project Comparison Criteria (mg/kg)	IL Sites Comparison Criteria Reference	Project Quantitation Limit Goal (µg/kg)[a]	Achievable Laboratory Limits, Accutest Laboratories			Method Performance Criteria	
							LOQ (µg/kg)	LOD (µg/kg)	MDL (µg/kg)	Bias Control Limits (%R) (LCS, MS)	Precision Limits (RPD) (LCSD, MSD)
VOCs 8270C (Continued)											
Benzo(a)pyrene	50-32-8	6.21E-01	NMED 2009	1.5E-02	USEPA 2011	311	170	33	17	59-102	32
Benzo(b)fluoranthene	205-99-2	6.21E+00	NMED 2009	1.5E-01	USEPA 2011	1050	170	33	17	60-107	31
Benzo(g,h,i)perylene	191-24-2	NE	NA	NE	NA	1150000	170	33	17	56-103	32
Benzo(k)fluoranthene	207-08-9	6.21E+01	NMED 2009	1.5E+00	USEPA 2011	4500	170	33	17	61-107	30
bis(2-Chloroethoxy)methane	111-91-1	1.8E+02	USEPA 2011	1.8E+02	USEPA 2011	90000	170	33	17	51-89	30
bis(2-Chloroethyl)ether	111-44-4	2.56E+00	NMED 2009	4.0E-04	IEPA 2007[c]	170	170	33	17	50-96	33
bis(2-Chloroisopropyl)ether	108-60-1	4.6E+00	USEPA 2011	4.6E+00	USEPA 2011	2300	170	33	17	44-94	32
bis(2-Ethylhexyl)phthalate	117-81-7	3.47E+02	NMED 2009	3.6E+00	IEPA 2007[b]	23000	330	130	67	57-111	29
Butyl benzyl phthalate	85-68-7	2.6E+02	USEPA 2011	2.6E+03	USEPA 2011	130000	170	67	33	57-110	28
Caprolactam	105-60-2	3.1E+04	USEPA 2011	3.1E+04	USEPA 2011	15500000	170	67	53	53-107	33
Carbazole	86-74-8	NE	NA	NE	NA	170	170	33	17	60-106	30
Chrysene	218-01-9	6.21E+02	NMED 2009	1.6E+02	IEPA 2007[b]	44000	170	33	17	60-107	31
Dibenzo(a,h)anthracene	53-70-3	6.21E-01	NMED 2009	9.0E-02	MSA 2007	210	170	33	17	57-105	29
Dibenzofuran	132-64-9	7.8E+01	USEPA 2011	7.8E+01	USEPA 2011	39000	170	33	17	58-103	27
Diethyl phthalate	84-66-2	4.89E+04	NMED 2009	4.7E+02	IEPA 2007[c]	1000000	330	130	67	59-106	27
Dimethyl phthalate	131-11-3	6.11E+05	NMED 2009	3.8E+02	IEPA 2007[c]	650000	170	67	33	60-100	26
Di-n-butyl phthalate	84-74-2	6.11E+03	NMED 2009	2.3E+03	IEPA 2007[c]	1150000	330	130	67	59-105	27
Di-n-octyl phthalate	117-84-0	NE	NA	1.0E+04	IEPA 2007[b]	800000	170	67	33	59-117	28
Fluoranthene	206-44-0	2.29E+03	NMED 2009	4.3E+03	IEPA 2007[b]	1550000	170	33	17	60-110	32
Fluorene	86-73-7	2.29E+03	NMED 2009	5.6E+02	IEPA 2007[b]	170	170	33	17	60-99	30
Hexachlorobenzene	118-74-1	3.04E+00	NMED 2009	2.0E+00	IEPA 2007[b]	200	170	33	17	58-103	27
Hexachlorobutadiene	87-68-3	6.11E+01	NMED 2009	6.2E+00	USEPA 2011	3100	170	67	33	49-95	33
Hexachlorocyclopentadiene	77-47-4	3.67E+02	NMED 2009	4.0E+02	IEPA 2007[c]	5000	170	83	73	36-94	41
Hexachloroethane	67-72-1	6.11E+01	NMED 2009	5.0E-01	IEPA 2007[b]	30552	170	67	33	44-89	38
Indeno(1,2,3-cd)pyrene	193-39-5	6.21E+00	NMED 2009	4.0E-01	MSA 2007	800	170	33	17	57-104	33
Isophorone	78-59-1	5.12E+03	NMED 2009	8.0E+00	IEPA 2007[c]	2300000	170	33	17	58-97	30
Naphthalene	91-20-3	4.50E+01	NMED 2009	1.2E+01	IEPA 2007[c]	85000	170	33	27	54-93	32
Nitrobenzene	98-95-3	4.94E+01	NMED 2009	1.0E-01	IEPA 2007[b]	19500	170	33	17	53-92	32
N-Nitroso-di-n-propylamine	621-64-7	6.9E-02	USEPA 2011	5.0E-05	IEPA 2007[b]	34.5	170	33	17	49-94	28
N-Nitrosodiphenylamine	86-30-6	9.93E+02	NMED 2009	1.0E+00	IEPA 2007[b]	65000	170	33	17	53-107	28
Pentachlorophenol	87-86-5	2.98E+01	NMED 2009	8.9E-01	USEPA 2011	445	830	330	200	50-115	33
Phenanthrene	85-01-8	1.83E+03	NMED 2009	2.2E+02	IEPA 2007[b]	1150000	170	33	17	61-103	32

Worksheet 15.3 (Concluded)
Matrix: Soil
Analytical Group: SVOCs - SW846 - 8270C - Target Compound List
Concentration Level: Low

Analyte	CAS Number	NM Sites Project Comparison Criteria (mg/kg)	NM Sites Comparison Criteria Reference	IL Sites Project Comparison Criteria (mg/kg)	IL Sites Comparison Criteria Reference	Project Quantitation Limit Goal (µg/kg)[a]	Achievable Laboratory Limits, Accutest Laboratories			Method Performance Criteria	
							LOQ (µg/kg)	LOD (µg/kg)	MDL (µg/kg)	Bias Control Limits (%R) (LCS, MS)	Precision Limits (RPD) (LCSD, MSD)
VOCs 8270C (Continued)											
Phenol	108-95-2	1.83E+04	NMED 2009	1.0E+02	IEPA 2007[b]	1150000	170	33	17	55-99	28
Pyrene	129-00-0	1.72E+03	NMED 2009	4.2E+03	IEPA 2007[b]	1150000	170	33	17	58-109	33
Surrogate Spike Compounds											
2-Fluorophenol	367-12-4	NE	NA	NE	NA	NA	NA	NA	NA	40-102	
Phenol-d5	4165-62-2	NE	NA	NE	NA	NA	NA	NA	NA	41-100	
2,4,6-Tribromophenol	118-79-6	NE	NA	NE	NA	NA	NA	NA	NA	42-108	
Nitrobenzene-d5	4165-60-0	NE	NA	NE	NA	NA	NA	NA	NA	40-105	
2-Fluorobiphenyl	321-60-8	NE	NA	NE	NA	NA	NA	NA	NA	43-107	
Terphenyl-d14	1718-51-0	NE	NA	NE	NA	NA	NA	NA	NA	45-119	

[a]The Project Quantification Limit was calculated as half of the Project Comparison Criteria.
[b]Ingestion Standard.
[c]Inhalation Standard.

Comparison Criteria is less than LOQ

(NMED 2009) New Mexico Environment Department, Hazardous Waste Bureau and Ground Water Quality Bureau Voluntary Remediation Program Technical Background Document for Development of Soil Screening Levels, Revision 5.0, August 2009, Table A-1 NMED Soil Screening Levels December 2009 for Residential Soil

(USEPA 2011) U.S. Environmental Protection Agency, Mid-Atlantic Risk Assessment, Regional Screening Levels, on-line risk-based concentrations table for Residential Soil http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/index.htm

(IEPA 2007) Illinois Environmental Protection Agency (IEPA), Illinois Administrative Code (IAC) Part 742 Appendix B, Table B-1 Soil Preliminary Remediation Goals (PRGs) (Including Migration to Class I Groundwater), February 23, 2007

Worksheet 15.4
Matrix: Water
Analytical Group: SVOCs - SW846 - 8270C - Target Compound List
Concentration Level: Low

Analyte	CAS Number	NM Sites Project Comparison Criteria (mg/L)	NM Sites Comparison Criteria Reference	IL Sites Project Comparison Criteria (mg/L)	IL Sites Comparison Criteria Reference	Project Quantitation Limit Goal (µg/L)[a]	Achievable Laboratory Limits, Accutest Laboratories			Method Performance Criteria	
							LOQ (µg/L)	LOD (µg/L)	MDL (µg/L)	Bias Control Limits (%R) (LCS, MS)	Precision Limits (RPD) (LCSD, MSD)
SVOCs 8270C											
2-Chlorophenol	95-57-8	NA	NA	3.50E-02	IEPA 2007	17.5	5	1	0.5	44-103	29
4-Chloro-3-methyl phenol	59-50-7	NA	NA	NA	NA	5	5	1	0.5	53-105	24
2,4-Dichlorophenol	120-83-2	tox	NMWQCC 2002	2.10E-02	IEPA 2007	10.5	5	1	0.5	53-108	26
2,4-Dimethylphenol	105-67-9	NA	NA	1.40E-01	IEPA 2007	70	5	2	1.1	37-91	28
2,4-Dinitrophenol	51-28-5	NA	NA	1.40E-02	IEPA 2007	7	25	20	10	37-111	30
4,6-Dinitro-o-cresol	534-52-1	NA	NA	9.80E-03	IEPA 2007	4.9	10	4	2	62-115	26
2-Methylphenol	95-48-7	NA	NA	3.50E-01	IEPA 2007	175	5	1	0.54	35-91	30
3&4-Methylphenol		NA	NA	NA	NA	5	5	2	1.1	32-85	29
2-Nitrophenol	88-75-5	NA	NA	NA	NA	5	5	1	0.54	49-111	30
4-Nitrophenol	100-02-7	NA	NA	NA	NA	25	25	10	5	13-55	31
Pentachlorophenol	87-86-5	1.00E-03	USEPA 2009	1.00E-03	IEPA 2007	0.5	25	10	5.4	57-118	26
Phenol	108-95-2	tox	NMWQCC 2002	1.00E-01	IEPA 2007	50	5	2	0.5	13-54	34
2,4,5-Trichlorophenol	95-95-4	tox	NMWQCC 2002	7.00E-01	IEPA 2007	350	5	1	0.5	59-106	23
2,4,6-Trichlorophenol	88-06-2	tox	NMWQCC 2002	1.00E-02	IEPA 2007	5	5	1	0.5	58-107	24
Acenaphthene	83-32-9	NA	NA	4.20E-01	IEPA 2007	210	5	1	0.5	58-106	21
Acenaphthylene	208-96-8	NA	NA	2.10E-01	IEPA 2007	105	5	1	0.5	58-105	21
Acetophenone	98-86-2	NA	NA	NA	NA	5	5	1	0.51	54-102	27
Anthracene	120-12-7	tox	NMWQCC 2002	2.10E+00	IEPA 2007	1050	5	1	0.5	65-108	19
Atrazine	1912-24-9	3.00E-03	USEPA 2009	3.00E-03	USEPA 2009	1.5	5	1	0.68	65-109	20
Benzaldehyde	100-52-7	NA	NA	NA	NA	25	25	10	5	42-130	27
Benzo(a)anthracene	56-55-3	NA	NA	1.30E-04	IEPA 2007	0.065	5	1	0.5	63-111	19
Benzo(a)pyrene	50-32-8	2.00E-04	USEPA 2009	2.00E-04	IEPA 2007	0.1	5	1	0.5	62-106	20
Benzo(b)fluoranthene	205-99-2	NA	NA	1.80E-04	IEPA 2007	0.09	5	1	0.5	63-109	20
Benzo(g,h,i)perylene	191-24-2	NA	NA	2.10E-01	IEPA 2007	105	5	1	0.5	61-111	21
Benzo(k)fluoranthene	207-08-9	tox	NMWQCC 2002	1.70E-04	IEPA 2007	0.085	5	1	0.5	64-111	20
4-Bromophenyl phenyl ether	101-55-3	NA	NA	NA	NA	5	5	1	0.5	64-107	20
Butyl benzyl phthalate	85-68-7	NA	NA	1.40E+00	IEPA 2007	700	5	2	1.1	59-114	20
1,1'-Biphenyl	92-52-4	NA	NA	NA	NA	5	5	1	0.5	55-101	24
2-Chloronaphthalene	91-58-7	NA	NA	5.60E-01	IEPA 2007	280	5	1	0.5	54-105	24
4-Chloroaniline	106-47-8	NA	NA	2.80E-02	IEPA 2007	14	5	1	0.5	53-103	22
Caprolactam	105-60-2	NA	NA	NA	NA	10	10	5	4	10-35	32
Carbazole	86-74-8	NA	NA	NA	NA	5	5	1	0.5	66-109	20

Worksheet 15.4 (Continued)
Matrix: Water
Analytical Group: SVOCs - SW846 - 8270C - Target Compound List
Concentration Level: Low

Analyte	CAS Number	NM Sites Project Comparison Criteria (mg/L)	NM Sites Comparison Criteria Reference	IL Sites Project Comparison Criteria (mg/L)	IL Sites Comparison Criteria Reference	Project Quantitation Limit Goal (µg/L)[a]	Achievable Laboratory Limits, Accutest Laboratories			Method Performance Criteria	
							LOQ (µg/L)	LOD (µg/L)	MDL (µg/L)	Bias Control Limits (%R) (LCS, MS)	Precision Limits (RPD) (LCSD, MSD)
SVOCs 8270C (Continued)											
Chrysene	218-01-9	NA	NA	1.50E-03	IEPA 2007	0.75	5	1	0.5	64-111	19
bis(2-Chloroethoxy)methane	111-91-1	NA	NA	NA	NA	5	5	1	0.5	48-101	28
bis(2-Chloroethyl)ether	111-44-4	NA	NA	1.00E-02	IEPA 2007	5	5	1	0.54	51-108	27
bis(2-Chloroisopropyl)ether	108-60-1	NA	NA	2.80E-01	IEPA 2007	140	5	1	0.54	43-106	27
4-Chlorophenyl phenyl ether	7005-72-3	NA	NA	NA	NA	5	5	1	0.5	61-107	20
2,4-Dinitrotoluene	121-14-2	tox	NMWQCC 2002	2.00E-05	IEPA 2007	0.01	5	1	0.5	60-109	20
2,6-Dinitrotoluene	606-20-2	tox	NMWQCC 2002	3.10E-04	IEPA 2007	0.155	5	1	0.5	58-104	21
3,3'-Dichlorobenzidine	91-94-1	NA	NA	2.00E-02	IEPA 2007	10	10	2	1	57-105	25
Dibenzo(a,h)anthracene	53-70-3	NA	NA	3.00E-04	IEPA 2007	0.15	5	1	0.52	62-112	20
Dibenzofuran	132-64-9	NA	NA	2.80E-02	IEPA 2007	14	5	1	0.5	61-108	20
Di-n-butyl phthalate	84-74-2	tox	NMWQCC 2002	7.00E-01	IEPA 2007	350	5	1	0.87	62-109	20
Di-n-octyl phthalate	117-84-0	NA	NA	1.40E-01	IEPA 2007	70	5	2	1.1	60-120	24
Diethyl phthalate	84-66-2	tox	NMWQCC 2002	5.60E+00	IEPA 2007	2800	5	2	1.1	62-109	19
Dimethyl phthalate	131-11-3	tox	NMWQCC 2002	7.00E+01	IEPA 2007	35000	5	1	0.99	63-106	19
bis(2-Ethylhexyl)phthalate	117-81-7	tox	NMWQCC 2002	6.00E-03	IEPA 2007	3	5	2	1.1	59-116	21
Fluoranthene	206-44-0	tox	NMWQCC 2002	2.80E-01	IEPA 2007	140	5	1	0.5	65-114	21
Fluorene	86-73-7	tox	NMWQCC 2002	2.80E-01	IEPA 2007	140	5	1	0.5	61-106	19
Hexachlorobenzene	118-74-1	1.00E-03	USEPA 2009	6.00E-05	IEPA 2007	0.03	5	1	0.56	62-107	20
Hexachlorobutadiene	87-68-3	tox	NMWQCC 2002	NA	NA	5	5	2	1	38-107	30
Hexachlorocyclopentadiene	77-47-4	5.00E-02	USEPA 2009	5.00E-02	IEPA 2007	25	10	2	1.9	19-84	35
Hexachloroethane	67-72-1	tox	NMWQCC 2002	7.00E-03	IEPA 2007	5	5	2	1	35-101	29
Indeno(1,2,3-cd)pyrene	193-39-5	NA	NA	4.30E-04	IEPA 2007	0.215	5	1	0.5	61-113	20
Isophorone	78-59-1	NA	NA	1.40E+00	IEPA 2007	700	5	1	0.5	56-111	26
2-Methylnaphthalene	91-57-6	NA	NA	2.10E-01	IEPA 2007	105	5	1	0.57	56-112	26
2-Nitroaniline	88-74-4	NA	NA	NA	NA	5	5	1	0.5	60-109	20
3-Nitroaniline	99-09-2	NA	NA	NA	NA	5	5	1	0.5	52-107	21
4-Nitroaniline	100-01-6	NA	NA	NA	NA	5	5	1	0.5	59-111	21
Naphthalene	91-20-3	NA	NA	1.40E-01	IEPA 2007	70	5	1	0.8	50-104	28
Nitrobenzene	98-95-3	tox	NMWQCC 2002	3.50E-03	IEPA 2007	1.75	5	1	0.59	52-105	28
N-Nitroso-di-n-propylamine	621-64-7	NA	NA	1.80E-03	IEPA 2007	0.9	5	1	0.5	51-104	28

Worksheet 15.4 (Concluded)
Matrix: Water
Analytical Group: SVOCs - SW846 - 8270C - Target Compound List
Concentration Level: Low

Analyte	CAS Number	NM Sites Project Comparison Criteria (mg/L)	NM Sites Comparison Criteria Reference	IL Sites Project Comparison Criteria (mg/L)	IL Sites Comparison Criteria Reference	Project Quantitation Limit Goal (µg/L)[a]	Achievable Laboratory Limits, Accutest Laboratories			Method Performance Criteria	
							LOQ (µg/L)	LOD (µg/L)	MDL (µg/L)	Bias Control Limits (%R) (LCS, MS)	Precision Limits (RPD) (LCSD, MSD)
SVOCs 8270C (Continued)											
N-Nitrosodiphenylamine	86-30-6	tox	NMWQCC 2002	3.20E-03	IEPA 2007	1.6	5	2	1	57-110	19
Phenanthrene	85-01-8	tox	NMWQCC 2002	2.10E-01	IEPA 2007	105	5	1	0.5	65-108	20
Pyrene	129-00-0	tox	NMWQCC 2002	2.10E-01	IEPA 2007	105	5	1	0.5	60-113	20
Surrogate Spike Compounds											
2-Fluorophenol	367-12-4	NA	NA	NA	NA	NA	NA	NA	NA	14-62	
Phenol-d5	4165-62-2	NA	NA	NA	NA	NA	NA	NA	NA	10-40	
2,4,6-Tribromophenol	118-79-6	NA	NA	NA	NA	NA	NA	NA	NA	33-118	
Nitrobenzene-d5	4165-60-0	NA	NA	NA	NA	NA	NA	NA	NA	42-108	
2-Fluorobiphenyl	321-60-8	NA	NA	NA	NA	NA	NA	NA	NA	40-106	
Terphenyl-d14	1718-51-0	NA	NA	NA	NA	NA	NA	NA	NA	39-121	

[a]The Project Quantification Limit was calculated as half of the Project Comparison Criteria.

Comparison Criteria is less than LOQ

(NMWQCC 2002) New Mexico Water Quality Control Commission Regulations, Section 20.6.2 of the New Mexico Administrative Code, New Mexico Water Quality Control Commission, Santa Fe, NM

(USEPA 2009) Maximum contaminant level, USEPA National Drinking Water Regulations, Code of Federal Regulations, Title 40, Part 141, Subpart G.

(IEPA 2007) Table A-1. Groundwater (Class I) Preliminary Remediation Goals (PRGs) February 23, 2007

Worksheet 15.5
Matrix: Soil
Analytical Group: Total Petroleum Hydrocarbons (TPH), Gasoline Range Organics (GRO) - SW846 - 8015C
Concentration Level: Low

Analyte	CAS Number	NM Sites Project Comparison Criteria (mg/kg)	NM Sites Comparison Criteria Reference	IL Sites Project Comparison Criteria (mg/kg)	IL Sites Comparison Criteria Reference	Project Quantitation Limit Goal (mg/kg)	Achievable Laboratory Limits, Accutest Laboratories			Method Performance Criteria	
							LOQ (mg/kg)	LOD (mg/kg)	MDL (mg/kg)	Bias Control Limits (%R) (LCS, MS)	Precision Limits (RPD) (LCSD, MSD)
TPH-GRO (C6-C10)	NA					5	5	2.5	2.5	74-121	17
Surrogate Spike Compounds											
4-Bromofluorobenzene	460-00-4									56-136	
aaa-Trifluorotoluene	98-08-8									61-121	

(NMED 2009) New Mexico Environment Department, Hazardous Waste Bureau and Ground Water Quality Bureau Voluntary Remediation Program Technical Background Document for Development of Soil Screening Levels, Revision 5.0, August 2009, Table A-1 NMED Soil Screening Levels December 2009 for Residential Soil

(USEPA 2011) U.S. Environmental Protection Agency, Mid-Atlantic Risk Assessment, Regional Screening Levels, on-line risk-based concentrations table for Residential Soil http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/index.htm

(IEPA 2007) Illinois Environmental Protection Agency (IEPA), Illinois Administrative Code (IAC) Part 742 Appendix B, Table B-1 Soil Preliminary Remediation Goals (PRGs) (Including Migration to Class I Groundwater), February 23, 2007

(IEPA 2007) Illinois Environmental Protection Agency (IEPA), Illinois Administrative Code (IAC) Part 742, Subpart K, Appendix A Tables G & H

Worksheet 15.6
Matrix: Water
Analytical Group: Total Petroleum Hydrocarbons (TPH), Gasoline Range Organics (GRO) - SW846 - 8015C
Concentration Level: Low

Analyte	CAS Number	NM Sites Project Comparison Criteria (mg/L)	NM Sites Comparison Criteria Reference	IL Sites Project Comparison Criteria (mg/L)	IL Sites Comparison Criteria Reference	Project Quantitation Limit Goal (mg/L)[a]	Achievable Laboratory Limits, Accutest Laboratories			Method Performance Criteria	
							LOQ (mg/L)	LOD (mg/L)	MDL (mg/L)	Bias Control Limits (%R) (LCS, MS)	Precision Limits (RPD) (LCSD, MSD)
TPH-GRO (C6-C10)						0.1	0.1	0.05	0.05	75-129	13
Surrogate Spike Compounds											
4-Bromofluorobenzene	460-00-4	NA	NA	NA	NA	NA	NA	NA	NA	57-129	
aaa-Trifluorotoluene	98-08-8	NA	NA	NA	NA	NA	NA	NA	NA	58-120	

[a]The Project Quantification Limit was calculated as half of the Project Comparison Criteria.

(USEPA 2009) Maximum contaminant level, USEPA National Drinking Water Regulations, Code of Federal Regulations, Title 40, Part 141, Subpart G.

(IEPA 2007) Table A-1. Groundwater (Class I) Preliminary Remediation Goals (PRGs) February 23, 2007

Worksheet 15.7
Matrix: Soil
Analytical Group: Total Petroleum Hydrocarbons (TPH), Diesel and Oil Range Organics (DRO and ORO) - SW846 - 8015C
Concentration Level: Low

Analyte	CAS Number	NM Sites Project Comparison Criteria (mg/kg)	NM Sites Comparison Criteria Reference	IL Sites Project Comparison Criteria (mg/kg)	IL Sites Comparison Criteria Reference	Project Quantitation Limit Goal (mg/kg)	Achievable Laboratory Limits, Accutest Laboratories			Method Performance Criteria	
							LOQ (mg/kg)	LOD (mg/kg)	MDL (mg/kg)	Bias Control Limits (%R) (LCS, MS)	Precision Limits (RPD) (LCSD, MSD)
TPH-DRO (C10-C28)	NA					8.3	8.3	4.2	3.3	60-107	36
TPH-ORO (>C28-C40)	NA					8.3	8.3	4.2	3.3	47-124	33
Surrogate Spike Compounds											
o-Terphenyl	84-15-1									49-108	

(NMED 2006) New Mexico Environment Department TPH Screening Guidelines October, 2006

Worksheet 15.8
Matrix: Water
Analytical Group: Total Petroleum Hydrocarbons (TPH), Diesel and Oil Range Organics (DRO and ORO) - SW846 - 8015C
Concentration Level: Low

Analyte	CAS Number	NM Sites Project Comparison Criteria (mg/L)	NM Sites Comparison Criteria Reference	IL Sites Project Comparison Criteria (mg/L)	IL Sites Comparison Criteria Reference	Project Quantitation Limit Goal (mg/L)	Achievable Laboratory Limits, Accutest Laboratories			Method Performance Criteria	
							LOQ (mg/L)	LOD (mg/L)	MDL (mg/L)	Bias Control Limits (%R) (LCS, MS)	Precision Limits (RPD) (LCSD, MSD)
TPH-DRO (C10-C28)		520	NMED 2006			0.25	0.25	0.13	0.1	59-114	34
TPH-ORO (>C28-C40)		200	NMED 2006			0.25	0.25	0.13	0.1	60-140	30
Surrogate Spike Compounds											
o-Terphenyl	84-15-1									42-114	

(NMED 2006) New Mexico Environment Department TPH Screening Guidelines October, 2006

Worksheet 15.9
Matrix: Soil
Analytical Group: Organochlorine Pesticides - SW846 - 8081B
Concentration Level: Low

Analyte	CAS Number	NM Sites Project Comparison Criteria (mg/kg)	NM Sites Comparison Criteria Reference	IL Sites Project Comparison Criteria (mg/kg)	IL Sites Comparison Criteria Reference	Project Quantitation Limit Goal (µg/kg)[a]	Achievable Laboratory Limits, Accutest Laboratories			Method Performance Criteria	
							LOQ (µg/kg)	LOD (µg/kg)	MDL (µg/kg)	Bias Control Limits (%R) (LCS, MS)	Precision Limits (RPD) (LCSD, MSD)
Organochlorine Pesticides 8081B											
Aldrin	309-00-2	2.84E-01	NMED 2009	5.0E-01	IEPA 2007	20	1.7	0.66	0.43	57-118	27
alpha-BHC	319-84-6	7.72E-01	NMED 2009	5.0E-04	IEPA 2007	50	1.7	0.66	0.36	65-116	23
beta-BHC	319-85-7	2.70E+00	NMED 2009	NE	NA	1.7	1.7	0.66	0.36	63-124	20
delta-BHC	319-86-8	NE	NA	NE	NA	1.7	1.7	0.66	0.33	41-127	25
gamma-BHC (Lindane)	58-98-9	5.17E+00	NMED 2009	9.0E-03	IEPA 2007	250	1.7	0.66	0.4	68-121	22
alpha-Chlordane	5103-71-9	NE	NA	NE	NA	900	1.7	0.66	0.36	69-120	28
gamma-Chlordane	5103-74-2	NE	NA	NE	NA	900	1.7	0.66	0.36	70-123	34
Dieldrin	60-57-1	3.04E-01	NMED 2009	4.0E-03	IEPA 2007	20	1.7	0.66	0.36	69-122	25
4,4'-DDD	72-54-8	2.03E+01	NMED 2009	1.6E+01	IEPA 2007	1500	3.3	0.66	0.43	63-135	28
4,4'-DDE	72-55-9	1.43E+01	NMED 2009	5.4E+01	IEPA 2007	1000	3.3	0.66	0.4	66-127	28
4,4'-DDT	50-29-3	1.72E+01	NMED 2009	3.2E+01	IEPA 2007	1000	3.3	0.66	0.43	66-142	28
Endrin	72-20-8	1.83E+01	NMED 2009	1.0	IEPA 2007	9166	3.3	0.66	0.4	69-135	24
Endosulfan sulfate	1031-07-8	NE	NA	1.8E+01	IEPA 2007	235000	3.3	0.66	0.36	61-126	25
Endrin aldehyde	7421-93-4	NE	NA	1.0E+00	IEPA 2007	11500	3.3	0.66	0.43	5-113	30
Endrin ketone	53494-70-5	NE	NA	NE	NA	3.3	3.3	0.66	0.36	64-135	23
Endosulfan-I	959-98-8	NE	NA	1.8E+01	IEPA 2007	235000	1.7	0.33	0.33	68-119	20
Endosulfan-II	33213-65-9	NE	NA	1.8E+01	IEPA 2007	235000	1.7	0.33	0.33	65-124	19
Heptachlor	76-44-8	1.08E+00	NMED 2009	2.3E+01	IEPA 2007	50	1.7	0.66	0.4	65-123	26
Heptachlor epoxide	1024-57-3	5.3E-02	USEPA 2011	7.0E-01	IEPA 2007	26.5	1.7	0.33	0.33	69-117	26
Methoxychlor	72-43-5	3.1E+02	USEPA 2011	1.6E+02	IEPA 2007	155000	3.3	1.3	0.66	66-139	23
Toxaphene	8001-35-2	4.42E+00	NMED 2009	3.1E+01	IEPA 2007	300	83	41	33	50-150	30

Worksheet 15.9 (Concluded)
Matrix: Soil
Analytical Group: Organochlorine Pesticides - SW846 - 8081B
Concentration Level: Low

Analyte	CAS Number	NM Sites Project Comparison Criteria (mg/kg)	NM Sites Comparison Criteria Reference	IL Sites Project Comparison Criteria (mg/kg)	IL Sites Comparison Criteria Reference	Project Quantitation Limit Goal (µg/kg)[a]	Achievable Laboratory Limits, Accutest Laboratories			Method Performance Criteria	
							LOQ (µg/kg)	LOD (µg/kg)	MDL (µg/kg)	Bias Control Limits (%R) (LCS, MS)	Precision Limits (RPD) (LCSD, MSD)
Surrogate Spike Compounds											
Tetrachloro-m-xylene	877-09-8	NE	NA	NE	NA	NA	NA	NA	NA	46-122	
Decachlorobiphenyl	2051-24-3	NE	NA	NE	NA	NA	NA	NA	NA	50-133	

[a]The Project Quantification Limit was calculated as half of the Project Comparison Criteria.

(NMED 2009) New Mexico Environment Department, Hazardous Waste Bureau and Ground Water Quality Bureau Voluntary Remediation Program Technical Background Document for Development of Soil Screening Levels, Revision 5.0, August 2009, Table A-1 NMED Soil Screening Levels December 2009 for Residential Soil

(USEPA 2011) U.S. Environmental Protection Agency, Mid-Atlantic Risk Assessment, Regional Screening Levels, on-line risk-based concentrations table for Residential Soil http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/index.htm

(IEPA 2007) Illinois Environmental Protection Agency, Illinois Administrative Code (IAC) Part 742 Appendix B, Table B-1 Soil Preliminary Remediation Goals (PRGs) (Including Migration to Class I Groundwater), February 23, 2007

Worksheet 15.10
Matrix: Water
Analytical Group: Organochlorine Pesticides - SW846 - 8081B
Concentration Level: Low

Analyte	CAS Number	NM Sites Project Comparison Criteria (mg/L)	NM Sites Comparison Criteria Reference	IL Sites Project Comparison Criteria (mg/L)	IL Sites Comparison Criteria Reference	Project Quantitation Limit Goal (µg/L)[a]	Achievable Laboratory Limits, Accutest Laboratories			Method Performance Criteria	
							LOQ (µg/L)	LOD (µg/L)	MDL (µg/L)	Bias Control Limits (%R) (LCS, MS)	Precision Limits (RPD) (LCSD, MSD)
Organochlorine Pesticides 8081B											
Aldrin	309-00-2	tox	NMWQCC 2002	1.4E-02	IEPA 2007	7	0.05	0.01	0.005	72-122	16
alpha-BHC	319-84-6	NA	NA	1.1E-04	IEPA 2007	0.055	0.05	0.01	0.005	77-132	16
beta-BHC	319-85-7	NA	NA	NA	NA	0.05	0.05	0.01	0.005	73-132	17
delta-BHC	319-86-8	NA	NA	NA	NA	0.05	0.05	0.01	0.005	43-127	30
gamma-BHC (Lindane)	58-89-9	NA	NA	2.0E-04	IEPA 2007	0.1	0.05	0.01	0.005	80-136	17
alpha-Chlordane	5103-71-9	tox	NMWQCC 2002	2.0E-03	IEPA 2007	1	0.05	0.01	0.005	75-131	16
gamma-Chlordane	5103-74-2	tox	NMWQCC 2002	2.0E-03	IEPA 2007	1	0.05	0.01	0.005	79-136	17
Dieldrin	60-57-1	tox	NMWQCC 2002	9.0E-03	IEPA 2007	4.5	0.05	0.01	0.005	80-136	16
4,4'-DDD	72-54-8	NA	NA	1.4E-02	IEPA 2007	7	0.1	0.02	0.01	64-154	25
4,4'-DDE	72-55-9	NA	NA	1.0E-02	IEPA 2007	5	0.1	0.02	0.01	65-146	21
4,4'-DDT	50-29-3	tox	NMWQCC 2002	6.0E-03	IEPA 2007	3	0.1	0.02	0.01	62-143	28
Endrin	72-20-8	tox	NMWQCC 2002	2.0E-03	IEPA 2007	1	0.1	0.02	0.01	75-139	15
Endosulfan sulfate	1031-07-8	NA	NA	4.2E-02	IEPA 2007	21	0.1	0.02	0.01	62-138	24
Endrin aldehyde	7421-93-4	NA	NA	2.0E-03	IEPA 2007	1	0.1	0.02	0.01	5-139	44
Endrin ketone	53494-70-5	NA	NA	NA	NA	0.1	0.1	0.02	0.01	76-132	17
Endosulfan-I	959-98-8	tox	NMWQCC 2002	4.2E-02	IEPA 2007	21	0.05	0.01	0.005	72-140	19
Endosulfan-II	33213-65-9	tox	NMWQCC 2002	4.2E-02	IEPA 2007	21	0.05	0.01	0.005	75-139	16
Heptachlor	76-44-8	tox	NMWQCC 2002	4.0E-04	IEPA 2007	0.2	0.05	0.01	0.005	71-143	15
Heptachlor epoxide	1024-57-3	NA	NA	2.0E-04	IEPA 2007	0.1	0.05	0.01	0.005	78-129	17
Methoxychlor	72-43-5	NA	NA	4.0E-02	IEPA 2007	20	0.1	0.05	0.02	63-140	20
Toxaphene	8001-35-2	tox	NMWQCC 2002	3.0E-03	IEPA 2007	1.5	2.5	1.3	1.0	50-150	20

Worksheet 15.10 (Concluded)
Matrix: Water
Analytical Group: Organochlorine Pesticides - SW846 - 8081B
Concentration Level: Low

Analyte	CAS Number	NM Sites Project Comparison Criteria (mg/L)	NM Sites Comparison Criteria Reference	IL Sites Project Comparison Criteria (mg/L)	IL Sites Comparison Criteria Reference	Project Quantitation Limit Goal (µg/L)[a]	Achievable Laboratory Limits, Accutest Laboratories			Method Performance Criteria	
							LOQ (µg/L)	LOD (µg/L)	MDL (µg/L)	Bias Control Limits (%R) (LCS, MS)	Precision Limits (RPD) (LCSD, MSD)
Surrogate Spike Compounds											
Tetrachloro-m-xylene	877-09-8	NA	NA	NA	NA	NA	NA	NA	NA	42-127	
Decachlorobiphenyl	2051-24-3	NA	NA	NA	NA	NA	NA	NA	NA	27-127	

[a]The Project Quantification Limit was calculated as half of the Project Comparison Criteria.

(NMWQCC 2002) New Mexico Water Quality Control Commission Regulations, Section 20.6.2 of the New Mexico Administrative Code, New Mexico Water Quality Control Commission, Santa Fe, NM

(IEPA 2007) Table A-1. Groundwater (Class I) Preliminary Remediation Goals (PRGs) February 23, 2007

Worksheet 15.11
Matrix: Soil
Analytical Group: Chlorinated Herbicides - SW846 - 8151A
Concentration Level: Low

Analyte	CAS Number	NM Sites Project Comparison Criteria (mg/kg)	NM Sites Comparison Criteria Reference	IL Sites Project Comparison Criteria (mg/kg)	IL Sites Comparison Criteria Reference	Project Quantitation Limit Goal (µg/kg)[a]	Achievable Laboratory Limits, Accutest Laboratories			Method Performance Criteria	
							LOQ (µg/kg)	LOD (µg/kg)	MDL (µg/kg)	Bias Control Limits (%R) (LCS, MS)	Precision Limits (RPD) (LCSD, MSD)
Chlorinated Herbicides 8151A											
2,4-D	94-75-7	6.9E+02	USEPA 2011	1.5E+00	IEPA 2007	345000	33	17	10	40-140	30
2,4,5-TP (Silvex)	93-72-1	4.9E+02	USEPA 2011	1.1E+01	IEPA 2007	245000	3.3	1.7	1.1	40-140	30
2,4,5-T	93-76-5	6.1E+02	USEPA 2011	6.1E+02	USEPA 2011	305000	3.3	1.7	1.1	40-140	30
Dicamba	1918-00-9	1.8E+03	USEPA 2011	1.8E+03	USEPA 2011	900000	3.3	1.7	1.4	40-140	30
Dinoseb	88-85-7	6.1E+01	USEPA 2011	3.4E-01	IEPA 2007	30500	83	33	17	10-140	30
Dalapon	75-99-0	1.8E+03	USEPA 2011	8.5E-01	IEPA 2007	900000	170	66	33	20-140	30
Dichloroprop	120-36-5	NA	NA	NA	NA	33	33	17	12	40-140	30
2,4-DB	94-82-6	4.9E+02	USEPA 2011	4.9E+02	USEPA 2011	245000	33	17	10	40-140	30
MCPP	93-65-2	6.1E+01	USEPA 2011	6.1E+01	USEPA 2011	30500	3300	1700	720	40-140	30
MCPA	94-74-6	3.1E+01	USEPA 2011	3.1E+01	USEPA 2011	19500	3300	1700	1000	40-140	30
Pentachlorophenol	87-86-5	2.98E+01	NMED 2009	8.9E-01	USEPA 2011	445	3.3	1.7	0.78	40-140	30
Surrogate Spike Compounds											
2,4-DCAA	19719-28-9	NE	NA	NE	NA	NA	NA	NA	NA	40-140	

[a]The Project Quantification Limit was calculated as half of the Project Comparison Criteria.

(NMED 2009) New Mexico Environment Department, Hazardous Waste Bureau and Ground Water Quality Bureau Voluntary Remediation Program Technical Background Document for Development of Soil Screening Levels, Revision 5.0, August 2009, Table A-1 NMED Soil Screening Levels December 2009 for Residential Soil

(USEPA 2011) U.S. Environmental Protection Agency, Mid-Atlantic Risk Assessment, Regional Screening Levels, on-line risk-based concentrations table for Residential Soil http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/index.htm

(IEPA 2007) Illinois Environmental Protection Agency, Illinois Administrative Code (IAC) Part 742 Appendix B, Table B-1 Soil Preliminary Remediation Goals (PRGs) (Including Migration to Class I Groundwater), February 23, 2007

Worksheet 15.12
Matrix: Water
Analytical Group: Chlorinated Herbicides - SW846 - 8151A
Concentration Level: Low

Analyte	CAS Number	NM Sites Project Comparison Criteria (mg/L)	NM Sites Comparison Criteria Reference	IL Sites Project Comparison Criteria (mg/L)	IL Sites Comparison Criteria Reference	Project Quantitation Limit Goal (mg/L)[a]	Achievable Laboratory Limits, Accutest Laboratories			Method Performance Criteria	
							LOQ (µg/L)	LOD (µg/L)	MDL (µg/L)	Bias Control Limits (%R) (LCS, MS)	Precision Limits (RPD) (LCSD, MSD)
Chlorinated Herbicides 8151A											
2,4-D	94-75-7	7.0E-02	USEPA 2009	7.0E-02	IEPA 2007	35	1.0	0.5	0.25	40-140	30
2,4,5-TP (Silvex)	93-72-1	5.0E-02	USEPA 2009	5.0E-02	IEPA 2007	25	0.1	0.05	0.036	40-140	30
2,4,5-T	93-76-5	NA	NA	2.8E-01	IEPA 2007	140	0.1	0.05	0.019	40-140	30
Dicamba	1918-00-9	NA	NA	2.1E-01	IEPA 2007	105	0.1	0.05	0.025	40-140	30
Dinoseb	88-85-7	7.0E-03	USEPA 2009	7.0E-03	IEPA 2007	3.5	2.0	1.0	0.5	10-140	30
Dalapon	75-99-0	2.0E-01	USEPA 2009	2.0E-01	IEPA 2007	100	2.5	1.3	1.0	20-140	30
Dichloroprop	120-36-5	NA	NA	NA	NA	1	1.0	0.5	0.21	40-140	30
2,4-DB	94-82-6	NA	NA	5.6E-02	IEPA 2007	28	1.0	0.5	0.44	40-140	30
MCPP	93-65-2	NA	NA	7.0E-03	IEPA 2007	3.5	100	50	13	40-140	30
MCPA	94-74-6	NA	NA	3.5E-03	IEPA 2007	1.75	100	50	19	40-140	30
Pentachlorophenol	87-86-5	tox	NMWQCC 2002	1.0E-03	IEPA 2007	0.5	0.1	0.05	0.021	40-140	30
Surrogate Spike Compounds											
2,4-DCAA	19719-28-9	NA	NA	NA	NA	NA	NA	NA	NA	40-140	

[a]The Project Quantification Limit was calculated as half of the Project Comparison Criteria.

Comparison criteria is less than LOQ

(NMWQCC 2002) New Mexico Water Quality Control Commission Regulations, Section 20.6.2 of the New Mexico Administrative Code, New Mexico Water Quality Control Commission, Santa Fe, NM

(USEPA 2009) Maximum contaminant level, USEPA National Drinking Water Regulations, Code of Federal Regulations, Title 40, Part 141, Subpart G.

(IEPA 2007) Table A-1. Groundwater (Class I) Preliminary Remediation Goals (PRGs) February 23, 2007

Worksheet 15.13
Matrix: Soil
Analytical Group: Polychlorinated Biphenyls (PCB) - SW846 - 8082A – Aroclors
Concentration Level: Low

Analyte	CAS Number	NM Sites Project Comparison Criteria (mg/kg)	NM Sites Comparison Criteria Reference	IL Sites Project Comparison Criteria (mg/kg)	IL Sites Comparison Criteria Reference	Project Quantitation Limit Goal (µg/kg)[a]	Achievable Laboratory Limits, Accutest Laboratories			Method Performance Criteria	
							LOQ (µg/kg)	LOD (µg/kg)	MDL (µg/kg)	Bias Control Limits (%R) (LCS, MS)	Precision Limits (RPD) (LCSD, MSD)
PCB Aroclors 8082A											
Aroclor 1016	12674-11-2	3.93E+00	NMED 2009	1.0E+00	IEPA 2007	500	17	8.3	6.6	69-117	26
Aroclor 1221	11104-28-2	1.76E+00	NMED 2009	1.0E+00	IEPA 2007	500	17	13	8.3	60-140	30
Aroclor 1232	11141-16-5	1.76E+00	NMED 2009	1.0E+00	IEPA 2007	500	17	13	8.3	70-130	30
Aroclor 1242	53469-21-9	2.22E+00	NMED 2009	1.0E+00	IEPA 2007	500	17	8.3	6.6	70-130	30
Aroclor 1248	12672-29-6	2.22E+00	NMED 2009	1.0E+00	IEPA 2007	500	17	8.3	6.6	70-130	30
Aroclor 1254	11097-69-1	1.12E+00	NMED 2009	1.0E+00	IEPA 2007	500	17	8.3	6.6	70-130	30
Aroclor 1260	11096-82-5	2.22E+00	NMED 2009	1.0E+00	IEPA 2007	500	17	8.3	6.6	71-121	30
Surrogate Spike Compounds											
Tetrachloro-m-xylene	877-09-8	NA	NA	NA	NA	NA	NA	NA	NA	44-126	
Decachlorobiphenyl	2051-24-3	NA	NA	NA	NA	NA	NA	NA	NA	39-157	

[a]The Project Quantification Limit was calculated as half of the Project Comparison Criteria.

(NMED 2009) New Mexico Environment Department, Hazardous Waste Bureau and Ground Water Quality Bureau Voluntary Remediation Program Technical Background Document for Development of Soil Screening Levels, Revision 5.0, August 2009, Table A-1 NMED Soil Screening Levels December 2009 for Residential Soil

(IEPA 2007) Illinois Environmental Protection Agency, Illinois Administrative Code (IAC) Part 742 Appendix B, Table B-1 Soil Preliminary Remediation Goals (PRGs) (Including Migration to Class I Groundwater), February 23, 2007

Worksheet 15.14
Matrix: Water
Analytical Group: Polychlorinated Biphenyls (PCB) - SW846 - 8082A – Aroclors
Concentration Level: Low

Analyte	CAS Number	NM Sites Project Comparison Criteria (mg/L)	NM Sites Comparison Criteria Reference	IL Sites Project Comparison Criteria (mg/L)	IL Sites Comparison Criteria Reference	Project Quantitation Limit Goal (µg/L)[a]	Achievable Laboratory Limits, Accutest Laboratories			Method Performance Criteria	
							LOQ (µg/L)	LOD (µg/L)	MDL (µg/L)	Bias Control Limits (%R) (LCS, MS)	Precision Limits (RPD) (LCSD, MSD)
PCB Aroclors 8082A											
Aroclor 1016	12674-11-2	5.0E-04	USEPA 2009	5.0E-04	IEPA 2007	0.5	0.5	0.25	0.2	76-117	16
Aroclor 1221	11104-28-2	5.0E-04	USEPA 2009	5.0E-04	IEPA 2007	0.5	0.5	0.4	0.25	60-140	30
Aroclor 1232	11141-16-5	5.0E-04	USEPA 2009	5.0E-04	IEPA 2007	0.5	0.5	0.4	0.25	70-130	30
Aroclor 1242	53469-21-9	5.0E-04	USEPA 2009	5.0E-04	IEPA 2007	0.5	0.5	0.25	0.2	70-130	30
Aroclor 1248	12672-29-6	5.0E-04	USEPA 2009	5.0E-04	IEPA 2007	0.5	0.5	0.25	0.2	70-130	30
Aroclor 1254	11097-69-1	5.0E-04	USEPA 2009	5.0E-04	IEPA 2007	0.5	0.5	0.25	0.2	70-130	30
Aroclor 1260	11096-82-5	5.0E-04	USEPA 2009	5.0E-04	IEPA 2007	0.5	0.5	0.25	0.2	65-117	23
Surrogate Spike Compounds											
Tetrachloro-m-xylene	877-09-8	NA	NA	NA	NA	NA	NA	NA	NA	38-127	
Decachlorobiphenyl	2051-24-3	NA	NA	NA	NA	NA	NA	NA	NA	25-137	

[a]The Project Quantification Limit was calculated as half of the Project Comparison Criteria.

(USEPA 2009) Maximum contaminant level, USEPA National Drinking Water Regulations, Code of Federal Regulations, Title 40, Part 141, Subpart G.

(IEPA 2007) Table A-1. Groundwater (Class I) Preliminary Remediation Goals (PRGs) February 23, 2007

Worksheet 15.15
Matrix: Soil
Analytical Group: Dioxin/Furan - SW846 - 8290A
Concentration Level: Low

Analyte	CAS Number	NM Sites Project Action Limit (mg/kg)	NM Sites Action Limit Reference	IL Sites Project Action Limit (mg/kg)	IL Sites Action Limit Reference	Project Quantitation Limit Goal (pg/g)[a]	Achievable Laboratory Limits, Accutest Laboratories			Method Performance Criteria	
							LOQ (pg/g)	LOD (pg/g)	MDL (pg/g)	Bias Control Limits (%R) (LCS, MS)	Precision Limits (RPD) (LCSD, MSD)
Dioxin/Furan 8290A											
2,3,7,8-Tetrachlorodibenzo-p-dioxin	1746-01-6	4.50E-05	NMED 2009	4.5E-06	USEPA 2011	2.3E+03	2.0	0.2	0.074	40-135	20
1,2,3,7,8-Pentachlorodibenzo-p-dioxin	40321-76-4	NA	NA	NA	NA	5.0	5.0	0.2	0.100	40-135	20
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin	39227-28-6	NA	NA	NA	NA	5.0	5.0	0.2	0.094	40-135	20
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin	57653-85-7	9.40E-05	USEPA 2011[b]	NA	NA	4.7E+04	5.0	0.2	0.087	40-135	20
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin	19408-74-3	9.40E-05	USEPA 2011[b]	NA	NA	4.7E+04	5.0	0.2	0.131	40-135	20
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin	35822-46-9	NA	NA	NA	NA	5.0	5.0	0.2	0.126	40-135	20
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin	3268-87-9	NA	NA	NA	NA	10.0	10.0	0.4	0.190	40-135	20
Total Tetrachlorodibenzo-p-dioxin	41903-57-5	NA	NA	NA	NA	2.0	2.0	0.2	0.074	40-135	20
Total Pentachlorodibenzo-p-dioxin	36088-22-9	NA	NA	NA	NA	5.0	5.0	0.2	0.100	40-135	20
Total Hexachlorodibenzo-p-dioxin	34465-46-8	NA	NA	NA	NA	5.0	5.0	0.2	0.131	40-135	20
Total Heptachlorodibenzo-p-dioxin	37871-00-4	NA	NA	NA	NA	5.0	5.0	0.2	0.126	40-135	20
2,3,7,8-Tetrachlorodibenzofuran	51207-31-9	3.74E-04	NMED 2009	NA	NA	1.9E+05	2.0	0.2	0.049	40-135	20
1,2,3,7,8-Pentachlorodibenzofuran	57117-41-6	NA	NA	NA	NA	5.0	5.0	0.2	0.091	40-135	20
2,3,4,7,8-Pentachlorodibenzofuran	57117-31-4	NA	NA	NA	NA	5.0	5.0	0.2	0.074	40-135	20
1,2,3,4,7,8-Hexachlorodibenzofuran	70648-26-9	NA	NA	NA	NA	5.0	5.0	0.2	0.080	40-135	20
1,2,3,6,7,8-Hexachlorodibenzofuran	57117-44-9	NA	NA	NA	NA	5.0	5.0	0.2	0.088	40-135	20
1,2,3,7,8,9-Hexachlorodibenzofuran	72918-21-9	NA	NA	NA	NA	5.0	5.0	0.2	0.096	40-135	20
2,3,4,6,7,8-Hexachlorodibenzofuran	60851-34-5	NA	NA	NA	NA	5.0	5.0	0.2	0.136	40-135	20
1,2,3,4,6,7,8-Heptachlorodibenzofuran	67562-39-4	NA	NA	NA	NA	5.0	5.0	0.2	0.187	40-135	20
1,2,3,4,7,8,9-Heptachlorodibenzofuran	55673-89-7	NA	NA	NA	NA	5.0	5.0	0.2	0.142	40-135	20
1,2,3,4,6,7,8,9-Octachlorodibenzofuran	39001-02-0	NA	NA	NA	NA	10.0	10.0	0.4	0.265	40-135	20
Total Tetrachlorodibenzofuran	55722-27-5	NA	NA	NA	NA	2.0	2.0	0.2	0.049	40-135	20

Worksheet 15.15 (Concluded)
Matrix: Soil
Analytical Group: Dioxin/Furan - SW846 - 8290A
Concentration Level: Low

Analyte	CAS Number	NM Sites Project Action Limit (mg/kg)	NM Sites Action Limit Reference	IL Sites Project Action Limit (mg/kg)	IL Sites Action Limit Reference	Project Quantitation Limit Goal (pg/g)[a]	Achievable Laboratory Limits, Accutest Laboratories			Method Performance Criteria	
							LOQ (pg/g)	LOD (pg/g)	MDL (pg/g)	Bias Control Limits (%R) (LCS, MS)	Precision Limits (RPD) (LCSD, MSD)
Total Pentachlorodibenzofuran	30402-15-4	NA	NA	NA	NA	5.0	5.0	0.2	0.091	40-135	20
Total Hexachlorodibenzofuran	55684-94-1	NA	NA	NA	NA	5.0	5.0	0.2	0.136	40-135	20
Total Heptachlorodibenzofuran	38998-75-3	NA	NA	NA	NA	5.0	5.0	0.2	0.187	40-135	20

[a]The Project Quantification Limit was calculated as half of the Project Action Limit.
[b]Project Action Limit obtained from USEPA RSL for Hexachlorodibenzo-p-dioxin (HxCDD) mixture of 1,2,3,6,7,8 and 1,2,3,7,8,9.

(NMED 2009) New Mexico Environment Department, Hazardous Waste Bureau and Ground Water Quality Bureau Voluntary Remediation Program Technical Background Document for Development of Soil Screening Levels, Revision 5.0, August 2009, Table A-1 NMED Soil Screening Levels December 2009 for Residential Soil

(USEPA 2011) U.S. Environmental Protection Agency, Mid-Atlantic Risk Assessment, Regional Screening Levels, on-line risk-based concentrations table for Residential Soil http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/index.htm

Worksheet 15.16
Matrix: Water
Analytical Group: Dioxin/Furan - SW846 - 8290A
Concentration Level: Low

Analyte	CAS Number	NM Sites Project Action Limit (mg/L)	NM Sites Action Limit Reference	IL Sites Project Action Limit (mg/L)	IL Sites Action Limit Reference	Project Quantitation Limit Goal (pg/L)	Achievable Laboratory Limits, Accutest Laboratories			Method Performance Criteria	
							LOQ (pg/L)	LOD (pg/L)	MDL (pg/L)	Bias Control Limits (%R) (LCS, MS)	Precision Limits (RPD) (LCSD, MSD)
Dioxin/Furan 8290A											
2,3,7,8-Tetrachlorodibenzo-p-dioxin	1746-01-6	3.00E-08	USEPA 2009	3.00E-08	USEPA 2009	20	20	4	1.457	40-135	20
1,2,3,7,8-Pentachlorodibenzo-p-dioxin	40321-76-4	NA	NA	NA	NA	50	50	4	1.381	40-135	20
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin	39227-28-6	NA	NA	NA	NA	50	50	4	2.116	40-135	20
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin	57653-85-7	NA	NA	NA	NA	50	50	4	1.775	40-135	20
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin	19408-74-3	NA	NA	NA	NA	50	50	4	1.944	40-135	20
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin	35822-46-9	NA	NA	NA	NA	50	50	4	1.954	40-135	20
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin	3268-87-9	NA	NA	NA	NA	100	100	8	2.626	40-135	20
Total Tetrachlorodibenzo-p-dioxin	41903-57-5	NA	NA	NA	NA	20	20	4	1.457	40-135	20
Total Pentachlorodibenzo-p-dioxin	36088-22-9	NA	NA	NA	NA	50	50	4	1.381	40-135	20
Total Hexachlorodibenzo-p-dioxin	34465-46-8	NA	NA	NA	NA	50	50	4	2.116	40-135	20
Total Heptachlorodibenzo-p-dioxin	37871-00-4	NA	NA	NA	NA	50	50	4	1.954	40-135	20
2,3,7,8-Tetrachlorodibenzofuran	51207-31-9	NA	NA	NA	NA	20	20	4	1.085	40-135	20
1,2,3,7,8-Pentachlorodibenzofuran	57117-41-6	NA	NA	NA	NA	50	50	4	1.754	40-135	20
2,3,4,7,8-Pentachlorodibenzofuran	57117-31-4	NA	NA	NA	NA	50	50	4	1.151	40-135	20
1,2,3,4,7,8-Hexachlorodibenzofuran	70648-26-9	NA	NA	NA	NA	50	50	4	1.310	40-135	20
1,2,3,6,7,8-Hexachlorodibenzofuran	57117-44-9	NA	NA	NA	NA	50	50	4	1.272	40-135	20
1,2,3,7,8,9-Hexachlorodibenzofuran	72918-21-9	NA	NA	NA	NA	50	50	4	1.277	40-135	20
2,3,4,6,7,8-Hexachlorodibenzofuran	60851-34-5	NA	NA	NA	NA	50	50	4	0.997	40-135	20
1,2,3,4,6,7,8-Heptachlorodibenzofuran	67562-39-4	NA	NA	NA	NA	50	50	4	2.222	40-135	20
1,2,3,4,7,8,9-Heptachlorodibenzofuran	55673-89-7	NA	NA	NA	NA	50	50	4	1.308	40-135	20
1,2,3,4,6,7,8,9-Octachlorodibenzofuran	39001-02-0	NA	NA	NA	NA	100	100	8	2.497	40-135	20
Total Tetrachlorodibenzofuran	55722-27-5	NA	NA	NA	NA	20	20	4	1.085	40-135	20

Worksheet 15.16 (Concluded)
Matrix: Water
Analytical Group: Dioxin/Furan - SW846 - 8290A
Concentration Level: Low

Analyte	CAS Number	NM Sites Project Action Limit (mg/L)	NM Sites Action Limit Reference	IL Sites Project Action Limit (mg/L)	IL Sites Action Limit Reference	Project Quantitation Limit Goal (pg/L)	Achievable Laboratory Limits, Accutest Laboratories			Method Performance Criteria	
							LOQ (pg/L)	LOD (pg/L)	MDL (pg/L)	Bias Control Limits (%R) (LCS, MS)	Precision Limits (RPD) (LCSD, MSD)
Total Pentachlorodibenzofuran	30402-15-4	NA	NA	NA	NA	50	50	4	1.754	40-135	20
Total Hexachlorodibenzofuran	55684-94-1	NA	NA	NA	NA	50	50	4	1.310	40-135	20
Total Heptachlorodibenzofuran	38998-75-3	NA	NA	NA	NA	50	50	4	2.222	40-135	20

(USEPA 2009) Maximum contaminant level, USEPA National Drinking Water Regulations, Code of Federal Regulations, Title 40, Part 141, Subpart G.

Worksheet 15.17
Matrix: Soil
Analytical Group: Nitroaromatics and Nitramines - SW846 - 8330A
Concentration Level: Low

Analyte	CAS Number	NM Sites Project Comparison Criteria (mg/kg)	NM Sites Comparison Criteria Reference	IL Sites Project Comparison Criteria (mg/kg)	IL Sites Comparison Criteria Reference	Project Quantitation Limit Goal (µg/kg)[a]	Achievable Laboratory Limits, Accutest Laboratories			Method Performance Criteria	
							LOQ (µg/kg)	LOD (µg/kg)	MDL (µg/kg)	Bias Control Limits (%R) (LCS, MS)	Precision Limits (RPD) (LCSD, MSD)
Nitroaromatics and Nitramines 8330A											
HMX	2691-41-0	3.06E+03	NMED 2009	3.8E+03	USEPA 2011	1900000	200	100	80	75-156	27
RDX	121-82-4	4.42E+01	NMED 2009	5.6E+00	USEPA 2011	2800	200	100	80	77-131	28
1,3-Dinitrobenzene	99-65-0	6.1E+00	USEPA 2011	6.1E+00	USEPA 2011	3050	200	100	80	82-134	20
2,6-Dinitrotoluene	606-20-2	6.12E+01	NMED 2009	9.0E-01	IEPA 2007	450	200	100	87	86-142	17
2,4-Dinitrotoluene	121-14-2	1.57E+01	NMED 2009	9.0E-01	IEPA 2007	450	200	100	97	74-129	18
2-amino-4,6-Dinitrotoluene	35572-78-2	1.5E+02	USEPA 2011	1.5E+02	USEPA 2011	75000	200	100	80	83-123	22
4-amino-2,6-Dinitrotoluene	19406-51-0	1.5E+02	USEPA 2011	1.5E+02	USEPA 2011	75000	200	100	80	85-137	18
Nitrobenzene	98-95-3	4.94E+01	NMED 2009	3.9E+01	IEPA 2007	19500	200	100	93	82-138	19
o-Nitrotoluene	88-72-2	2.91E+01	NMED 2009	2.9E+00	USEPA 2011	1450	200	100	80	85-129	21
m-Nitrotoluene	99-08-1	1.56E+03	NMED 2009	6.1E+00	USEPA 2011	3050	200	100	80	85-136	22
p-Nitrotoluene	99-99-0	2.44E+02	NMED 2009	3.0E+01	USEPA 2011	15000	200	150	100	86-133	19
Tetryl	479-45-8	2.44E+02	NMED 2009	2.4E+02	USEPA 2011	120000	200	100	80	53-124	22
1,3,5-Trinitrobenzene	99-35-4	2.2E+03	USEPA 2011	2.2E+03	USEPA 2011	1100000	200	100	80	81-138	24
2,4,6-Trinitrotoluene	118-96-7	3.59E+01	NMED 2009	1.9E+01	USEPA 2012	9500	200	100	80	70-137	29
Surrogate Spike Compounds											
3,4-Dinitrotoluene	610-39-9	NA	NA	NA	NA	NA	NA	NA	NA	72-145	

[a]The Project Quantification Limit was calculated as half of the Project Comparison Criteria.

(NMED 2009) New Mexico Environment Department, Hazardous Waste Bureau and Ground Water Quality Bureau Voluntary Remediation Program Technical Background Document for Development of Soil Screening Levels, Revision 5.0, August 2009, Table A-1 NMED Soil Screening Levels December 2009 for Residential Soil

(USEPA 2011) U.S. Environmental Protection Agency, Mid-Atlantic Risk Assessment, Regional Screening Levels, on-line risk-based concentrations table for Residential Soil http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/index.htm

(IEPA 2007) Illinois Environmental Protection Agency, Illinois Administrative Code (IAC) Part 742 Appendix B, Table B-1 Soil Preliminary Remediation Goals (PRGs) (Including Migration to Class I Groundwater), February 23, 2007

Worksheet 15.18
Matrix: Water
Analytical Group: Nitroaromatics and Nitramines - SW846 - 8330A
Concentration Level: Low

Analyte	CAS Number	NM Sites Project Comparison Criteria (mg/L)	NM Sites Comparison Criteria Reference	IL Sites Project Comparison Criteria (mg/L)	IL Sites Comparison Criteria Reference	Project Quantitation Limit Goal (mg/L)[a]	Achievable Laboratory Limits, Accutest Laboratories			Method Performance Criteria	
							LOQ (µg/L)	LOD (µg/L)	MDL (µg/L)	Bias Control Limits (%R) (LCS, MS)	Precision Limits (RPD) (LCSD, MSD)
Nitroaromatics and Nitramines 8330A											
HMX	2691-41-0	tox	NMWQCC 2002	NA	NA	0.2	0.2	0.1	0.08	74-152	21
RDX	121-82-4	tox	NMWQCC 2002	NA	NA	0.2	0.2	0.1	0.08	80-124	20
1,3-Dinitrobenzene	99-65-0	NA	NA	NA	NA	0.2	0.2	0.1	0.097	84-123	23
2,6-Dinitrotoluene	606-20-2	tox	NMWQCC 2002	3.10E-04	IEPA 2007	0.2	0.2	0.1	0.08	84-133	23
2,4-Dinitrotoluene	121-14-2	tox	NMWQCC 2002	2.00E-05	IEPA 2007	0.01	0.2	0.1	0.08	77-116	26
2-amino-4,6-Dinitrotoluene	35572-78-2	NA	NA	NA	NA	0.2	0.2	0.1	0.08	78-117	28
4-amino-2,6-Dinitrotoluene	19406-51-0	NA	NA	NA	NA	0.2	0.2	0.1	0.082	84-123	27
Nitrobenzene	98-95-3	NA	NA	NA	NA	0.2	0.2	0.1	0.084	76-128	28
o-Nitrotoluene	88-72-2	NA	NA	NA	NA	0.2	0.2	0.1	0.08	76-120	30
m-Nitrotoluene	99-08-1	NA	NA	NA	NA	0.2	0.2	0.1	0.08	74-124	32
p-Nitrotoluene	99-99-0	NA	NA	NA	NA	0.2	0.2	0.1	0.08	81-125	34
Tetryl	479-45-8	NA	NA	NA	NA	0.2	0.2	0.1	0.08	62-117	28
1,3,5-Trinitrobenzene	99-35-4	NA	NA	NA	NA	0.2	0.2	0.1	0.08	85-127	21
2,4,6-Trinitrotoluene	118-96-7	tox	NMWQCC 2002	NA	NA	0.2	0.2	0.1	0.08	71-128	21
Surrogate Spike Compounds											
3,4-Dinitrotoluene	610-39-9									70-136	

[a]The Project Quantification Limit was calculated as half of the Project Comparison Criteria.

Comparison criteria is less than LOQ

(NMWQCC 2002) New Mexico Water Quality Control Commission Regulations, Section 20.6.2 of the New Mexico Administrative Code, New Mexico Water Quality Control Commission, Santa Fe, NM

(IEPA 2007) Table A-1. Groundwater (Class I) Preliminary Remediation Goals (PRGs) February 23, 2007

Worksheet 15.19
Matrix: Soil
Analytical Group: Metals - SW846 - 6010C/6020A
Concentration Level: Low

Analyte	CAS Number	NM Sites Project Comparison Criteria (mg/kg)	NM Sites Comparison Criteria Reference	IL Sites Project Comparison Criteria (mg/kg)	IL Sites Comparison Criteria Reference	Project Quantitation Limit Goal (µg/kg)[a]	Achievable Laboratory Limits, Accutest Laboratories			Method Performance Criteria	
							LOQ (mg/kg)	LOD (mg/kg)	MDL (mg/kg)	Bias Control Limits (%R) (LCS, MS)	Precision Limits (RPD) (LCSD, MSD)
Metals 6010C											
Aluminum	7429-90-5	7.81E+04	NMED 2009	7.7E+04	USEPA 2011	39000	10	1.25	1.2	80-120	20
Antimony	7440-36-0	3.13E+01	NMED 2009	5.0E+00	IEPA 2007[b]	16	1	0.1	0.1	80-120	20
Arsenic	7440-38-2	3.90E+00	NMED 2009	2.9E+01	IEPA 2007[b]	2	0.5	0.1	0.1	80-120	20
Barium	7440-39-3	1.56E+04	NMED 2009	1.7E+03	IEPA 2007[b]	2750	10	0.5	0.5	80-120	20
Beryllium	7440-41-7	1.56E+02	NMED 2009	1.4E+02	IEPA 2007[b]	80	0.25	0.05	0.05	80-120	20
Cadmium	7440-43-9	7.79E+01	NMED 2009	1.1E+01	IEPA 2007[b]	39	0.2	0.05	0.05	80-120	20
Calcium	7440-70-2	NE	NE	NE	NA	4650	250	5	5	80-120	20
Chromium	7440-47-3	1.13E+05	NMED 2009	3.6E+01	IEPA 2007[b]	115	0.5	0.05	0.05	80-120	20
Cobalt	7440-48-4	2.3E+01	USEPA 2011	2.3E+01	IEPA 2007[b]	2350	2.5	0.05	0.05	80-120	20
Copper	7440-50-8	3.13E+03	NMED 2009	2.0E+05	IEPA 2007[b]	1450	1.25	0.1	0.1	80-120	20
Iron	7439-89-6	5.48E+04	NMED 2009	5.5E+04	IEPA 2007[b]	11500	15	2.5	1.7	80-120	20
Lead	7439-92-1	4.00E+02	NMED 2009	1.07E+02	IEPA 2007[b]	200	1	0.05	0.05	80-120	20
Magnesium	7439-95-4	NE	NE	NE	NA	162500	250	5	5	80-120	20
Manganese	7439-96-5	1.07E+04	NMED 2009	1.8E+03	USEPA 2011	800	0.75	0.05	0.05	80-120	20
Molybdenum	7439-98-7	3.91E+02	NMED 2009	3.9E+02	USEPA 2011	195	2.5	0.05	0.05	80-120	20
Nickel	7440-02-0	1.56E+03	NMED 2009	1.8E+02	IEPA 2007[b]	800	2	0.05	0.05	80-120	20
Potassium	7440-09-7	NE	NE	NE	NA	634	500	25	25	80-120	20
Selenium	7782-49-2	3.91E+02	NMED 2009	4.5E+00	IEPA 2007[b]	195	1	0.2	0.2	80-120	20
Silver	7440-22-4	3.91E+02	NMED 2009	1.3E+01	IEPA 2007[b]	195	0.5	0.05	0.05	80-120	20
Sodium	7440-23-5	NE	NE	NE	NA	65	500	100	55	80-120	20
Strontium	7440-24-6	4.69E+04	NMED 2009	4.7E+04	USEPA 2011	23464	0.5	0.05	0.05	80-120	20
Thallium	7440-28-0	5.16E+00	NMED 2009	3.0E+00	IEPA 2007[b]	3	0.5	0.25	0.13	80-120	20
Tin	7440-31-5	4.7E+04	USEPA 2011	4.7E+04	USEPA 2011	23500	2.5	0.05	0.05	80-120	20
Titanium	7440-32-6	NE	NE	NE	NA	0.5	0.5	0.1	0.1	80-120	20
Vanadium	7440-62-2	3.91E+02	NMED 2009	9.8E+02	IEPA 2007[b]	275	2.5	0.05	0.05	80-120	20
Zinc	7440-66-6	2.35E+04	NMED 2009	7.5E+03	IEPA 2007[b]	11500	1	0.25	0.25	80-120	20

Worksheet 15.19 (Continued)
Matrix: Soil
Analytical Group: Metals - SW846 - 6010C/6020A
Concentration Level: Low

Analyte	CAS Number	NM Sites Project Comparison Criteria (mg/kg)	NM Sites Comparison Criteria Reference	IL Sites Project Comparison Criteria (mg/kg)	IL Sites Comparison Criteria Reference	Project Quantitation Limit Goal (µg/kg)[a]	Achievable Laboratory Limits, Accutest Laboratories			Method Performance Criteria	
							LOQ (mg/kg)	LOD (mg/kg)	MDL (mg/kg)	Bias Control Limits (%R) (LCS, MS)	Precision Limits (RPD) (LCSD, MSD)
Metals 6020A											
Aluminum	7429-90-5	7.81E+04	NMED 2009	7.7E+04	USEPA 2011	39000	10	15	0.697	80-120	20
Antimony	7440-36-0	3.13E+01	NMED 2009	5.0E+00	IEPA 2007[b]	16	1	0.15	0.073	80-120	20
Arsenic	7440-38-2	3.90E+00	NMED 2009	2.9E+01	IEPA 2007[c]	2	0.5	0.15	0.029	80-120	20
Barium	7440-39-3	1.56E+04	NMED 2009	1.7E+03	IEPA 2007[b]	2750	10	0.3	0.079	80-120	20
Beryllium	7440-41-7	1.56E+02	NMED 2009	1.4E+02	IEPA 2007[b]	78	0.25	0.15	0.002	80-120	20
Cadmium	7440-43-9	7.79E+01	NMED 2009	1.1E+01	IEPA 2007[b]	39	0.2	0.15	0.01	80-120	20
Calcium	7440-70-2	NE	NE	NE	NA	4650	250	75	7.21	80-120	20
Chromium	7440-47-3	1.13E+05	NMED 2009	3.6E+01	IEPA 2007[b]	115	0.5	0.6	0.085	80-120	20
Cobalt	7440-48-4	2.30E+01	USEPA 2011	2.3E+01	USEPA 2011	12	2.5	0.15	0.002	80-120	20
Copper	7440-43-9	3.13E+03	NMED 2009	2.0E+05	IEPA 2007[b]	1450	1.25	0.6	0.04	80-120	20
Iron	7439-89-6	5.48E+04	NMED 2009	5.5E+04	USEPA 2011	11500	15	15	2.6	80-120	20
Lead	7439-92-1	4.00E+02	NMED 2009	1.07E+02	IEPA 2007[b]	200	1	0.15	0.008	80-120	20
Magnesium	7439-95-4	NE	NE	NE	NA	162500	250	75	2.34	80-120	20
Manganese	7439-96-5	1.07E+04	NMED 2009	1.8E+03	USEPA 2011	800	0.75	0.15	0.018	80-120	20
Nickel	7440-02-0	1.56E+03	NMED 2009	1.8E+02	IEPA 2007[b]	782	2	0.6	0.256	80-120	20
Potassium	7440-09-7	NE	NE	NE	NA	634	500	75	4.9	80-120	20
Selenium	7782-49-2	3.91E+02	NMED 2009	4.5E+00	IEPA 2007[b]	195	1	0.15	0.06	80-120	20
Silver	7440-22-4	3.91E+02	NMED 2009	1.3E+01	IEPA 2007[b]	195	0.5	0.15	0.009	80-120	20
Sodium	7440-23-5	NE	NE	NE	NA	65	500	75	3.84	80-120	20

Worksheet 15.19 (Concluded)
Matrix: Soil
Analytical Group: Metals - SW846 - 6010C/6020A
Concentration Level: Low

Analyte	CAS Number	NM Sites Project Comparison Criteria (mg/kg)	NM Sites Comparison Criteria Reference	IL Sites Project Comparison Criteria (mg/kg)	IL Sites Comparison Criteria Reference	Project Quantitation Limit Goal (µg/kg)[a]	Achievable Laboratory Limits, Accutest Laboratories			Method Performance Criteria	
							LOQ (mg/kg)	LOD (mg/kg)	MDL (mg/kg)	Bias Control Limits (%R) (LCS, MS)	Precision Limits (RPD) (LCSD, MSD)
Thallium	7440-28-0	5.16E+00	NMED 2009	3.0E+00	IEPA 2007[b]	3	0.5	0.15	0.035	80-120	20
Vanadium	7440-62-2	3.91E+02	NMED 2009	9.8E+02	IEPA 2007[b]	196	2.5	0.6	0.144	80-120	20
Zinc	7440-66-6	2.35E+04	NMED 2009	7.5E+03	IEPA 2007[b]	11500	1	1.2	0.466	80-120	20

[a]The Project Quantification Limit was calculated as half of the Project Comparison Criteria.
[b]Ingestion Standard.
[c]Inhalation Standard.

(NMED 2009) New Mexico Environment Department, Hazardous Waste Bureau and Ground Water Quality Bureau Voluntary Remediation Program Technical Background Document for Development of Soil Screening Levels, Revision 5.0, August 2009, Table A-1 NMED Soil Screening Levels December 2009 for Residential Soil

(USEPA 2011) U.S. Environmental Protection Agency, Mid-Atlantic Risk Assessment, Regional Screening Levels, on-line risk-based concentrations table for Residential Soil http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/index.htm

(IEPA 2007) Illinois Environmental Protection Agency, Illinois Administrative Code (IAC) Part 742 Appendix B, Table C pH Specific Soil Remediation Objectives for Inorganics and Ionizing Organics for the Soil Component of the Groundwater Ingestion Route (Class I Groundwater).

Worksheet 15.20
Matrix: Water
Analytical Group: Metals - SW846 - 6010C/6020A
Concentration Level: Low

Analyte	CAS Number	NM Sites Project Comparison Criteria (mg/L)	NM Sites Comparison Criteria Reference	IL Sites Project Comparison Criteria (mg/L)	IL Sites Comparison Criteria Reference	Project Quantitation Limit Goal (µg/L)[a]	Achievable Laboratory Limits, Accutest Laboratories			Method Performance Criteria	
							LOQ (µ/L)	LOD (µg/L)	MDL (µg/L)	Bias Control Limits (%R) (LCS, MS)	Precision Limits (RPD) (LCSD, MSD)
Metals 6010C											
Aluminum	7429-90-5	5.00E+00	NMWQCC 2002	3.5E+00	IEPA 2007	1750	200	25	25	80-120	20
Antimony	7440-36-0	6.00E-03	USEPA 2009	6.0E-03	IEPA 2007	6	6	2	2	80-120	20
Arsenic	7440-38-2	1.00E-01	NMWQCC 2002	5.0E-02	IEPA 2007	25	10	2	2	80-120	20
Barium	7440-39-3	1.00E+00	NMWQCC 2002	2.0E+00	IEPA 2007	1000	200	5	5	80-120	20
Beryllium	7440-41-7	4.00E-03	USEPA 2009	4.0E-03	IEPA 2007	4	4	1	1	80-120	20
Cadmium	7440-43-9	1.00E-02	NMWQCC 2002	5.0E-03	IEPA 2007	5	5	1	1	80-120	20
Calcium	7440-70-2	NA	NA	NA	NA	1	1000	100	100	80-120	20
Chromium	7440-47-3	5.00E-02	NMWQCC 2002	1.0E-01	IEPA 2007	50	10	1	1	80-120	20
Cobalt	7440-48-4	5.00E-02	NMWQCC 2002	1.0E+00	IEPA 2007	25	50	1	1	80-120	20
Copper	7440-43-9	1.00E+00	NMWQCC 2002	6.5E-01	IEPA 2007	325	25	2	2	80-120	20
Iron	7439-89-6	1.00E+00	NMWQCC 2002	5.0E+00	IEPA 2007	500	300	50	35	80-120	20
Lead	7439-92-1	5.00E-02	NMWQCC 2002	7.5E-03	IEPA 2007	5	5	1	1	80-120	20
Magnesium	7439-95-4	NA	NA	NA	NA	5	5000	100	100	80-120	20
Manganese	7439-96-5	2.00E-01	NMWQCC 2002	1.5E-01	IEPA 2007	75	15	1	1	80-120	20
Molybdenum	7439-98-7	1.00E+00	NMWQCC 2002	3.5E-02	IEPA 2007	17.5	50	2	2	80-120	20
Nickel	7440-02-0	2.00E-01	NMWQCC 2002	1.0E-01	IEPA 2007	50	40	2	2	80-120	20
Potassium	7440-09-7	NA	NA	NA	NA	10	10000	500	500	80-120	20
Selenium	7782-49-2	5.00E-02	NMWQCC 2002	5.0E-02	IEPA 2007	25	10	2	2	80-120	20
Silver	7440-22-4	5.00E-02	NMWQCC 2002	5.0E-02	IEPA 2007	25	10	1	1	80-120	20
Sodium	7440-23-5	NA	NA	NA	NA	10	10000	2000	1900	80-120	20
Strontium	7440-24-6	NA	NA	NA	NA	10	10	1	1	80-120	20
Thallium	7440-28-0	2.00E-03	USEPA 2009	2.0E-03	IEPA 2007	1	10	2	1.85	80-120	20
Tin	7440-31-5	NA	NA	NA	NA	50	50	1	1	80-120	20
Titanium	7440-32-6	NA	NA	NA	NA	10	10	2	2	80-120	20
Vanadium	7440-62-2	NA	NA	4.9E-02	IEPA 2007	24.5	50	1	1	80-120	20
Zinc	7440-66-6	1.00E+01	NMWQCC 2002	5.0E+00	IEPA 2007	2500	20	5	5	80-120	20

Worksheet 15.20 (Concluded)
Matrix: Water
Analytical Group: Metals - SW846 - 6010C/6020A
Concentration Level: Low

Analyte	CAS Number	NM Sites Project Comparison Criteria (mg/L)	NM Sites Comparison Criteria Reference	IL Sites Project Comparison Criteria (mg/L)	IL Sites Comparison Criteria Reference	Project Quantitation Limit Goal (µg/L)[a]	Achievable Laboratory Limits, Accutest Laboratories			Method Performance Criteria	
							LOQ (µ/L)	LOD (µg/L)	MDL (µg/L)	Bias Control Limits (%R) (LCS, MS)	Precision Limits (RPD) (LCSD, MSD)
Metals 6020A											
Aluminum	7429-90-5	5.00E+00	NMWQCC 2002	3.5E+00	IEPA 2007	1750	50	25	5.27	80-120	20
Antimony	7440-36-0	6.00E-03	USEPA 2009	6.0E-03	IEPA 2007	3	1	0.5	0.361	80-120	20
Arsenic	7440-38-2	1.00E-01	NMWQCC 2002	5.0E-02	IEPA 2007	25	1	0.5	0.093	80-120	20
Barium	7440-39-3	1.00E+00	NMWQCC 2002	2.0E+00	IEPA 2007	1000	2	1	0.055	80-120	20
Beryllium	7440-41-7	4.00E-03	USEPA 2009	4.0E-03	IEPA 2007	2	1	0.5	0.023	80-120	20
Cadmium	7440-43-9	1.00E-02	NMWQCC 2002	5.0E-03	IEPA 2007	2.5	1	0.5	0.023	80-120	20
Calcium	7440-70-2	NA	NA	NA	NA	500	500	100	24.25	80-120	20
Chromium	7440-47-3	5.00E-02	NMWQCC 2002	1.0E-01	IEPA 2007	50	2	1	0.114	80-120	20
Cobalt	7440-48-4	5.00E-02	NMWQCC 2002	1.0E+00	IEPA 2007	25	1	0.5	0.024	80-120	20
Copper	7440-43-9	1.00E+00	NMWQCC 2002	6.5E-01	IEPA 2007	325	2	1	0.252	80-120	20
Iron	7439-89-6	1.00E+00	NMWQCC 2002	5.0E+00	IEPA 2007	500	50	25	4.27	80-120	20
Lead	7439-92-1	5.00E-02	NMWQCC 2002	7.5E-03	IEPA 2007	3.75	1	0.5	0.106	80-120	20
Magnesium	7439-95-4	NA	NA	NA	NA	500	500	250	3.68	80-120	20
Manganese	7439-96-5	2.00E-01	NMWQCC 2002	1.5E-01	IEPA 2007	75	1	0.5	0.089	80-120	20
Nickel	7440-02-0	2.00E-01	NMWQCC 2002	1.0E-01	IEPA 2007	50	2	1.5	1.19	80-120	20
Potassium	7440-09-7	NA	NA	NA	NA	500	500	100	15.8	80-120	20
Selenium	7782-49-2	5.00E-02	NMWQCC 2002	5.0E-02	IEPA 2007	25	1	0.5	0.165	80-120	20
Silver	7440-22-4	5.00E-02	NMWQCC 2002	5.0E-02	IEPA 2007	25	1	0.5	0.021	80-120	20
Sodium	7440-23-5	NA	NA	NA	NA	500	500	100	24.1	80-120	20
Thallium	7440-28-0	2.00E-03	USEPA 2009	2.0E-03	IEPA 2007	1	1	0.5	0.249	80-120	20
Vanadium	7440-62-2	NA	NA	4.9E-02	IEPA 2007	24.5	2	1	0.258	80-120	20
Zinc	7440-66-6	1.00E+01	NMWQCC 2002	5.0E+00	IEPA 2007	2500	4	3	2.21	80-120	20

[a]The Project Quantification Limit Goal was calculated as half of the Project Comparison Criteria.

Comparison criteria is less than LOQ

(NMWQCC 2002) New Mexico Water Quality Control Commission Regulations, Section 20.6.2 of the New Mexico Administrative Code, New Mexico Water Quality Control Commission, Santa Fe, NM

(USEPA 2009) Maximum contaminant level, USEPA National Drinking Water Regulations, Code of Federal Regulations, Title 40, Part 141, Subpart G.

(IEPA 2007) Table A-1. Groundwater (Class I) Preliminary Remediation Goals (PRGs) February 23, 2007

Worksheet 15.21
Matrix: Soil
Analytical Group: Metals - SW846 - 7471B – Mercury
Concentration Level: Low

Analyte	CAS Number	NM Sites Project Comparison Criteria (mg/kg)	NM Sites Comparison Criteria Reference	IL Sites Project Comparison Criteria (mg/kg)	IL Sites Comparison Criteria Reference	Project Quantitation Limit Goal (mg/kg)[a]	Achievable Laboratory Limits, Accutest Laboratories			Method Performance Criteria	
							LOQ (mg/kg)	LOD (mg/kg)	MDL (mg/kg)	Bias Control Limits (%R) (LCS, MS)	Precision Limits (RPD) (LCSD, MSD)
Mercury 7471B											
Mercury	7439-97-6	7.71E+00	NMED 2009	1.0E+01	IEPA 2007	4	0.083	NA	0.0103	80-120	20

[a]The Project Quantification Limit was calculated as half of the Project Comparison Criteria.

(NMED 2009) New Mexico Environment Department, Hazardous Waste Bureau and Ground Water Quality Bureau Voluntary Remediation Program Technical Background Document for Development of Soil Screening Levels, Revision 5.0, August 2009, Table A-1 NMED Soil Screening Levels December 2009 for Residential Soil

(IEPA 2007) Illinois Environmental Protection Agency, Illinois Administrative Code (IAC) Part 742 Appendix B, Table B-1 Soil Preliminary Remediation Goals (PRGs) (Including Migration to Class I Groundwater), February 23, 2007

Worksheet 15.22
Matrix: Water
Analytical Group: Metals - SW846 - 7470A – Mercury
Concentration Level: Low

Analyte	CAS Number	NM Sites Project Comparison Criteria (mg/L)	NM Sites Comparison Criteria Reference	IL Sites Project Comparison Criteria (mg/L)	IL Sites Comparison Criteria Reference	Project Quantitation Limit Goal (µg/L)[a]	Achievable Laboratory Limits, Accutest Laboratories			Method Performance Criteria	
							LOQ (µg/L)	LOD (µg/L)	MDL (µg/L)	Bias Control Limits (%R) (LCS, MS)	Precision Limits (RPD) (LCSD, MSD)
Mercury 7470A											
Mercury	7439-97-6	2.0E-03	NMWQCC 2002	2.0E-03	IEPA 2007	1	1	NA	0.071	80-120	20

[a]The Project Quantification Limit was calculated as half of the Project Comparison Criteria.

(NMWQCC 2002) New Mexico Water Quality Control Commission Regulations, Section 20.6.2 of the New Mexico Administrative Code, New Mexico Water Quality Control Commission, Santa Fe, NM

(IEPA 2007) Table A-1. Groundwater (Class I) Preliminary Remediation Goals (PRGs) February 23, 2007

Worksheet 15.23
Matrix: Soil
Analytical Group: Total Cyanide - SW846 - 9012B
Concentration Level: Low

Analyte	CAS Number	NM Sites Project Comparison Criteria (mg/kg)	NM Sites Comparison Criteria Reference	IL Sites Project Comparison Criteria (mg/kg)	IL Sites Comparison Criteria Reference	Project Quantitation Limit Goal (mg/kg)[a]	Achievable Laboratory Limits, Accutest Laboratories			Method Performance Criteria	
							LOQ (mg/kg)	LOD (mg/kg)	MDL (mg/kg)	Bias Control Limits (%R) (LCS, MS)	Precision Limits (RPD) (LCSD, MSD)
Total Cyanide 9012B											
Total Cyanide	74-90-8	1.56E+03	NMED 2009	1.60E+03	MSA 2007	800	0.12	NA	0.06	75-118	30

[a]The Project Quantification Limit was calculated as half of the Project Comparison Criteria.

(NMED 2009) New Mexico Environment Department, Hazardous Waste Bureau and Ground Water Quality Bureau Voluntary Remediation Program Technical Background Document for Development of Soil Screening Levels, Revision 5.0, August 2009, Table A-1 NMED Soil Screening Levels December 2009 for Residential Soil

(IEPA 2006) Illinois USEPA Illinois Administrative Code (IAC) Part 742, Subpart K, Appendix A Tables G & H

Worksheet 15.24
Matrix: Water
Analytical Group: Total Cyanide - USEPA 335.4/SW846 - 9012B
Concentration Level: Low

Analyte	CAS Number	NM Sites Project Comparison Criteria (mg/L)	NM Sites Comparison Criteria Reference	IL Sites Project Comparison Criteria (mg/L)	IL Sites Comparison Criteria Reference	Project Quantitation Limit Goal (mg/L)[a]	Achievable Laboratory Limits, Accutest Laboratories			Method Performance Criteria	
							LOQ (mg/L)	LOD (mg/L)	MDL (mg/L)	Bias Control Limits (%R) (LCS, MS)	Precision Limits (RPD) (LCSD, MSD)
Total Cyanide 9012B											
Total Cyanide	74-90-8	2.0E-01	NMWQCC 2002	2.0E-01	IEPA 2007	0.1	0.01	NA	0.005	90-110	20

[a]The Project Quantification Limit was calculated as half of the Project Comparison Criteria.

(NMWQCC 2002) New Mexico Water Quality Control Commission Regulations, Section 20.6.2 of the New Mexico Administrative Code, New Mexico Water Quality Control Commission, Santa Fe, NM

(IEPA 2007) Table A-1. Groundwater (Class I) Preliminary Remediation Goals (PRGs) February 23, 2007

Worksheet 15.25
Matrix: Soil
Analytical Group: Tritium
Concentration Level: Low

Analyte	CAS Number	NM Sites Project Comparison Criteria (pCi/g)	NM Sites Comparison Criteria Reference	IL Sites Project Comparison Criteria (pCi/g)	IL Sites Comparison Criteria Reference	Project Quantitation Limit Goal (pCi/g)	Achievable Laboratory Limits, Accutest Laboratories			Method Performance Criteria	
							LOQ (pCi/g)	LOD (pCi/g)	MDC (pCi/g)	Bias Control Limits (%R) (LCS, MS)	Precision Limits (RPD) (LCSD, MSD)
Tritium											
Tritium	10028-17-8	NA	NA	NA	NA	6	NA	NA	6	75-125	20

Worksheet 15.26
Matrix: Water
Analytical Group: Tritium
Concentration Level: Low

Analyte	CAS Number	NM Sites Project Comparison Criteria (pCi/L)	NM Sites Comparison Criteria Reference	IL Sites Project Comparison Criteria (pCi/L)	IL Sites Comparison Criteria Reference	Project Quantitation Limit Goal (pCi/L)[a]	Achievable Laboratory Limits, Accutest Laboratories			Method Performance Criteria	
							LOQ (pCi/L)	LOD (pCi/L)	MDC (pCi/L)	Bias Control Limits (%R) (LCS, MS)	Precision Limits (RPD) (LCSD, MSD)
Tritium											
Tritium	10028-17-8	NA	NA	NA	NA	700	NA	NA	700	75-125	20

[a]The Project Quantification Limit was calculated as half of the Project Comparison Criteria.

Worksheet 15.27a
Matrix: Waste
Analytical Group: Toxic Characteristic Volatile Organic Compounds (TCLP VOC) - SW846 - 1311/8260B
Concentration Level: Low

Analyte	CAS Number	NM Sites Project Comparison Criteria (mg/L)	NM Sites Comparison Criteria Reference	IL Sites Project Comparison Criteria (mg/L)	IL Sites Comparison Criteria Reference	Project Quantitation Limit Goal (mg/L)[a]	Achievable Laboratory Limits, Accutest Laboratories			Method Performance Criteria	
							LOQ (mg/L)	LOD (mg/L)	MDL (mg/L)	Bias Control Limits (%R) (LCS, MS)	Precision Limits (RPD) (LCSD, MSD)
TCLP VOC 1311/8260B											
Benzene	71-43-2	5.0E-01	CFR 2006	5.0E-01	CFR 2006	0.25	0.01	0.005	0.002	83-124	11
Chlorobenzene	108-90-7	1.0E+02	CFR 2006	1.0E+02	CFR 2006	50	0.01	0.005	0.002	87-115	9
Chloroform	67-66-3	6.0E+00	CFR 2006	6.0E+00	CFR 2006	3	0.01	0.005	0.0022	85-123	10
Carbon tetrachloride	56-23-5	5.0E-01	CFR 2006	5.0E-01	CFR 2006	0.25	0.01	0.005	0.0025	74-139	13
1,1-Dichloroethylene	75-35-4	7.0E-01	CFR 2006	7.0E-01	CFR 2006	0.35	0.01	0.005	0.0023	75-133	13
1,2-Dichloroethane	107-06-2	5.0E-01	CFR 2006	5.0E-01	CFR 2006	0.25	0.01	0.005	0.002	76-122	11
p-Dichlorobenzene	106-46-7	7.5E+00	CFR 2006	7.5E+00	CFR 2006	3.75	0.01	0.005	0.0023	87-113	10
Methyl ethyl ketone	78-93-3	2.0E+02	CFR 2006	2.0E+02	CFR 2006	100	0.05	0.04	0.02	61-127	13
Tetrachloroethylene	127-18-4	7.0E-01	CFR 2006	7.0E-01	CFR 2006	0.35	0.01	0.005	0.0025	80-131	12
Trichloroethylene	79-01-6	5.0E-01	CFR 2006	5.0E-01	CFR 2006	0.25	0.01	0.005	0.0026	85-124	10
Vinyl chloride	75-01-4	2.0E-01	CFR 2006	2.0E-01	CFR 2006	0.1	0.01	0.005	0.0022	57-153	22
Surrogate Spike Compounds											
Dibromofluoromethane	1868-53-7	NA	NA	NA	NA	NA	NA	NA	NA	87-116	
1,2-Dichloroethane-D4	17060-07-0	NA	NA	NA	NA	NA	NA	NA	NA	76-127	
Toluene-D8	2037-26-5	NA	NA	NA	NA	NA	NA	NA	NA	86-112	
4-Bromofluorobenzene	460-00-4	NA	NA	NA	NA	NA	NA	NA	NA	84-120	

[a]The Project Quantification Limit was calculated as half of the Project Comparison Criteria.

(CFR 2006) 40 CFR 261.24 Toxicity Characteristic Table 1 FR 40259, July 14, 2006

Worksheet 15.27b
Matrix: Waste
Analytical Group: Toxic Characteristic Semi-volatile Organic Compounds (TCLP SVOC) - SW846 - 1311/8270D
Concentration Level: Low

Analyte	CAS Number	NM Sites Project Comparison Criteria (mg/L)	NM Sites Comparison Criteria Reference	IL Sites Project Comparison Criteria (mg/L)	IL Sites Comparison Criteria Reference	Project Quantitation Limit Goal (mg/L)[a]	Achievable Laboratory Limits, Accutest Laboratories			Method Performance Criteria	
							LOQ (mg/L)	LOD (mg/L)	MDL (mg/L)	Bias Control Limits (%R) (LCS, MS)	Precision Limits (RPD) (LCSD, MSD)
TCLP SVOC 1311/8270D											
2-Methylphenol	95-48-7	2.0E+02	CFR 2006	2.0E+02	CFR 2006	100	0.05	0.01	0.0054	35-91	30
3&4-Methylphenol		2.0E+02	CFR 2006	2.0E+02	CFR 2006	100	0.05	0.02	0.011	32-85	29
Pentachlorophenol	87-86-5	1.0E+02	CFR 2006	1.0E+02	CFR 2006	50	0.25	0.1	0.054	57-118	26
2,4,5-Trichlorophenol	95-95-4	4.0E+02	CFR 2006	4.0E+02	CFR 2006	200	0.05	0.01	0.005	59-106	23
2,4,6-Trichlorophenol	88-06-2	2.0E+00	CFR 2006	2.0E+00	CFR 2006	1	0.05	0.01	0.005	58-107	24
1,4-Dichlorobenzene	106-46-7	7.5E+00	CFR 2006	7.5E+00	CFR 2006	3.75	0.05	0.02	0.01	40-100	28
2,4-Dinitrotoluene	121-14-2	1.3E-01	CFR 2006	1.3E-01	CFR 2006	0.065	0.05	0.01	0.005	60-109	20
Hexachlorobenzene	118-74-1	1.3E-01	CFR 2006	1.3E-01	CFR 2006	0.065	0.05	0.01	0.0056	62-107	20
Hexachlorobutadiene	87-68-3	5.0E-01	CFR 2006	5.0E-01	CFR 2006	0.25	0.05	0.02	0.01	38-107	30
Hexachloroethane	67-72-1	3.0E+00	CFR 2006	3.0E+00	CFR 2006	1.5	0.05	0.02	0.01	35-101	29
Nitrobenzene	98-95-3	2.0E+00	CFR 2006	2.0E+00	CFR 2006	1	0.05	0.01	0.0059	52-105	28
Pyridine	110-86-1	5.0E+00	CFR 2006	5.0E+00	CFR 2006	2.5	0.1	0.02	0.016	15-67	40
2-Fluorophenol	367-12-4	NA	NA	NA	NA	NA	NA	NA	NA	14-62	
Phenol-d5	4165-62-2	NA	NA	NA	NA	NA	NA	NA	NA	10-40	
2,4,6-Tribromophenol	118-79-6	NA	NA	NA	NA	NA	NA	NA	NA	33-118	
Nitrobenzene-d5	4165-60-0	NA	NA	NA	NA	NA	NA	NA	NA	42-108	
2-Fluorobiphenyl	321-60-8	NA	NA	NA	NA	NA	NA	NA	NA	40-106	
Terphenyl-d14	1718-51-0	NA	NA	NA	NA	NA	NA	NA	NA	39-121	

[a]The Project Quantification Limit was calculated as half of the Project Comparison Criteria.

(CFR 2006) 40 CFR 261.24 Toxicity Characteristic Table 1 FR 40259, July 14, 2006

Worksheet 15.27c
Matrix: Waste
Analytical Group: Toxic Characteristic Organochlorine Pesticides (TCLP PEST) - SW846 - 1311/8081B
Concentration Level: Low

Analyte	CAS Number	NM Sites Project Comparison Criteria (mg/L)	NM Sites Comparison Criteria Reference	IL Sites Project Comparison Criteria (mg/L)	IL Sites Comparison Criteria Reference	Project Quantitation Limit Goal (mg/L)[a]	Achievable Laboratory Limits, Accutest Laboratories			Method Performance Criteria	
							LOQ (mg/L)	LOD (mg/L)	MDL (mg/L)	Bias Control Limits (%R) (LCS, MS)	Precision Limits (RPD) (LCSD, MSD)
TCLP VOC 1311/8081B											
gamma-BHC (Lindane)	58-89-9	4.0E-01	CFR 2006	4.0E-01	CFR 2006	0.2	0.0005		0.00005	80-136	17
Chlordane	12789-03-6	3.0E-02	CFR 2006	3.0E-02	CFR 2006	0.015	0.005		0.002	70-130	20
Endrin	72-20-8	2.0E-02	CFR 2006	2.0E-02	CFR 2006	0.01	0.001		0.0001	75-139	15
Heptachlor	76-44-8	8.0E-03	CFR 2006	8.0E-03	CFR 2006	0.004	0.0005		0.00005	71-143	15
Heptachlor epoxide	1024-57-3	8.0E-03	CFR 2006	8.0E-03	CFR 2006	0.004	0.0005		0.00005	78-129	17
Methoxychlor	72-43-5	1.0E+01	CFR 2006	1.0E+01	CFR 2006	5	0.001		0.0002	63-140	20
Toxaphene	8001-35-2	5.0E-01	CFR 2006	5.0E-01	CFR 2006	0.25	0.025		0.01	50-150	20
Surrogate Spike Compounds											
Tetrachloro-m-xylene	877-09-8									42-127	
Decachlorobiphenyl	2051-24-3									27-127	

[a]The Project Quantification Limit was calculated as half of the Project Comparison Criteria.

(CFR 2006) 40 CFR 261.24 Toxicity Characteristic Table 1 FR 40259, July 14, 2006

Worksheet 15.27d
Matrix: Waste
Analytical Group: Toxic Characteristic Herbicides (TCLP HERB) - SW846 - 1311/8151A
Concentration Level: Low

Analyte	CAS Number	NM Sites Project Comparison Criteria (mg/L)	NM Sites Comparison Criteria Reference	IL Sites Project Comparison Criteria (mg/L)	IL Sites Comparison Criteria Reference	Project Quantitation Limit Goal (mg/L)[a]	Achievable Laboratory Limits, Accutest Laboratories			Method Performance Criteria	
							LOQ (mg/L)	LOD (mg/L)	MDL (mg/L)	Bias Control Limits (%R) (LCS, MS)	Precision Limits (RPD) (LCSD, MSD)
TCLP VOC 1311/8151A											
2,4-D	94-75-7	10	CFR 2006	10	CFR 2006	5	1.0	0.5	0.25	40-140	30
2,4,5-TP (Silvex)	93-72-1	1	CFR 2006	1	CFR 2006	0.5	0.1	0.05	0.036	40-140	30
Surrogate Spike Compounds											
2,4-DCAA	19719-28-9	NA	NA	NA	NA	NA	NA	NA	NA	40-140	

[a]The Project Quantification Limit was calculated as half of the Project Comparison Criteria.

(CFR 2006) 40 CFR 261.24 Toxicity Characteristic Table 1 FR 40259, July 14, 2006

Worksheet 15.27e
Matrix: Waste
Analytical Group: Toxic Characteristic Metals (TCLP MET) - SW846 - 1311/6010C/7470A
Concentration Level: Low

Analyte	CAS Number	NM Sites Project Comparison Criteria (mg/L)	NM Sites Comparison Criteria Reference	IL Sites Project Comparison Criteria (mg/L)	IL Sites Comparison Criteria Reference	Project Quantitation Limit Goal (mg/L)[a]	Achievable Laboratory Limits, Accutest Laboratories			Method Performance Criteria	
							LOQ (mg/L)	LOD (mg/L)	MDL (mg/L)	Bias Control Limits (%R) (LCS, MS)	Precision Limits (RPD) (LCSD, MSD)
TCLP Metals 1311/6010C/7470A											
Arsenic	7440-38-2	5	CFR 2006	5	CFR 2006	2.5	0.05	NA	0.002	80-120	20
Barium	7440-39-3	100	CFR 2006	100	CFR 2006	50	1.0	NA	0.005	80-120	20
Cadmium	7440-43-9	1	CFR 2006	1	CFR 2006	0.5	0.005	NA	0.001	80-120	20
Chromium	7440-47-3	5	CFR 2006	5	CFR 2006	2.5	0.01	NA	0.001	80-120	20
Lead	7439-92-1	5	CFR 2006	5	CFR 2006	2.5	0.05	NA	0.001	80-120	20
Mercury	7439-97-6	0.2	CFR 2006	0.2	CFR 2006	0.1	0.01	NA	0.001	80-120	20
Selenium	7782-49-2	1	CFR 2006	1	CFR 2006	0.5	0.05	NA	0.002	80-120	20
Silver	7440-22-4	5	CFR 2006	5	CFR 2006	2.5	0.01	NA	0.001	80-120	20

[a]The Project Quantification Limit was calculated as half of the Project Comparison Criteria.

(CFR 2006) 40 CFR 261.24 Toxicity Characteristic Table 1 FR 40259, July 14, 2006

Worksheet 15.27f
Matrix: Waste
Analytical Group: Hazardous Waste Characteristics Reactivity, Corrosivity, Ignitibility (RCI) - SW846 - 9012B/1010/SW846-Ch.7/9045
Concentration Level: Low

Analyte	CAS Number	NM Sites Project Comparison Criteria (mg/L)	NM Sites Comparison Criteria Reference	IL Sites Project Comparison Criteria (mg/L)	IL Sites Comparison Criteria Reference	Project Quantitation Limit Goal (mg/L)[a]	Achievable Laboratory Limits, Accutest Laboratories			Method Performance Criteria	
							LOQ	LOD	MDL	Bias Control Limits (%R) (LCS, MS)	Precision Limits (RPD) (LCSD, MSD)
Hazardous Waste Characteristics RCI											
Cyanide, Reactive	57-12-5						1.5 mg/kg	NA	1.5 mg/kg	0-100	30
Sulfide, Reactive	NA						50 mg/kg	NA	50 mg/kg	0-100	30
Ignitability (Flashpoint)	NA						>200 Deg. F	NA	NA	NA	25
Corrosivity as pH	NA						0.01 S.U.	NA	NA	NA	NA
Paint Filter Test	NA						0.5 mL/100 g	NA	NA	NA	NA

[a]The Project Quantification Limit was calculated as half of the Project Comparison Criteria.

(CFR 2006) 40 CFR 261.24 Toxicity Characteristic Table 1 FR 40259, July 14, 2006

SAP/QAPP WORKSHEET #16 –
PROJECT SCHEDULE/TIMELINE TABLE

Worksheet #16 summarizes SAP/QAPP-related timetable items. The overall schedule for the project and site work is presented in the PMP (Shaw 2011). The site-specific schedules will be developed as part of the site-specific Work Plans. An example of site-specific SAP/QAPP-related project schedule items is shown as follows:

Activities	Organization	Dates		Deliverable	Deliverable Due Date
		Anticipated Date(s) of Initiation	Anticipated Date of Completion		
Overview of Project Schedule is Provided in the Site-Specific Work Plan	Shaw	Task-Specific	Task-Specific	Field Activities	NA
Data Review	Shaw	After data received from laboratory	15–21 Days after receipt of hardcopy data	None	None
Data Validation	Shaw or data validator	After data received from laboratory	15–21 Days after receipt of hardcopy data	Final Report	See Site-Specific Work Plan Section
ERPIMS Submission	Shaw	After data received from Shaw or third-party validation company	Within 1 year after validation completed and reviewed by Shaw	Upload to ERPIMS	Annually

SAP/QAPP WORKSHEET #17 – SAMPLING DESIGN AND RATIONALE

This section describes some typical sampling procedures for most commonly used sampling techniques. Each site-specific SAP/QAPP will describe in detail the procedures applicable to the particular site.

17.1 Sampling Design

This section describes the sampling strategy that Shaw will implement during sampling activities conducted under this program. This is a general overview of a sampling design process, and each project will have an individual sampling design detailed in the site-specific SAP/QAPP Worksheet #17.

17.1.1 Sampling Strategy

The site-specific SAP/QAPP will describe the sampling strategy and the rationale for the selection of sampling points. The SAP/QAPP will also discuss field screening, explain how the screening data will be used, explain how definitive laboratory data will be used, and discuss soil stockpile management and IDW accumulation and sampling procedures for disposal characterization.

17.1.2 Surface Soil

The site-specific SAP/QAPP will describe planned surface soil sampling activities, including sampling locations, sample types (grab or composite), sample frequency, required analysis, and appropriate QA/QC samples. The SAP/QAPP will include figures of sampling grids, if necessary.

17.1.3 Subsurface Soil

The site-specific SAP/QAPP will describe planned subsurface soil sampling activities, including soil boring locations, sample types (grab or composite), sampling depths and frequency, required analysis, and appropriate QA/QC samples. The SAP/QAPP will include figures of soil boring locations.

17.1.4 Groundwater

The site-specific SAP/QAPP will describe the planned groundwater sampling activities, including well locations, required analysis, and appropriate QA/QC samples. The SAP/QAPP will include figures showing well locations.

17.1.5 Air or Vapor

The site-specific SAP/QAPP will describe planned air or vapor sample collection activities, including sampling points, frequency of collection, and required analysis. The SAP/QAPP will include flow diagrams or well locations to identify sampling points.

17.1.6 Stockpile Characterization

The site-specific SAP/QAPP will describe stockpile sampling, including stockpile volumes, sample types (grab vs. composite) sample frequency, and required analysis. If the purpose of sampling is disposal/waste characterization, then sampling and DQOs will conform to waste acceptance criteria of the disposal contractor or applicable regulations. If the purpose is backfill characterization, the SAP/QAPP will require collecting QA/QC samples in accordance with project DQOs. The SAP/QAPP will include figures showing the grid system on a stockpile, if necessary.

17.1.7 IDW Wastewater

The site-specific SAP/QAPP will describe wastewater sampling requirements, including the frequency of sampling and required analysis. QA/QC samples will be collected in accordance with project DQOs.

17.2 Equipment Decontamination

Decontamination of nondisposable, reusable sampling equipment that comes into contact with samples (such as sleeve rings and the split-spoon sampling device) will be performed to prevent the introduction of extraneous material into samples and to prevent cross-contamination between samples. All sampling equipment will be decontaminated by steam cleaning or washing with a nonphosphate detergent such as Liquinox™ or equivalent. Decontamination water will be collected in appropriately sized containers (e.g., 5-gallon buckets, 55-gallon, U.S. Department of Transportation [DOT]-approved drums, or poly-tank) and may require sampling and analysis for characterization prior to disposal.

The following procedures will be used for decontamination of nondisposable sampling equipment:

1. Dry brush or wipe with paper towels, rags, or similar. Rinse with clean nonpotable or tap water. This step will decrease the gross contamination and reduce the frequency at which the nonphosphate detergent and water solution need to be changed.

2. Wash with the nonphosphate detergent and water solution. This step will remove remaining contamination from the equipment. Dilute the nonphosphate detergent as directed by the manufacturer.

3. Rinse with potable water. This step will rinse the detergent solution from the equipment.

4. Rinse with deionized water. This step will rinse any detergent solution and potable water residues. Rinsing will be done by applying the deionized water from a clean squeeze or spray bottle (or equivalent) while holding equipment over a bucket.

5. Decontamination of drilling equipment will be done by hot water pressure-washing.

17.3 Field Screening

Field screening with test instruments may be performed in accordance with health and safety requirements for specification of personal protective equipment and engineering controls, or to locate and delineate contaminated areas, or areas for investigation and sampling. Field screening may include measurements for volatile organic compounds, metals or radioactivity. All field screening instruments will be operated by trained personnel following manufacturer instructions for calibration, operation, and maintenance. Per example, a portable PID may be used at sites to field-screen soil for evidence of VOC contamination. The PID measures the presence of volatile, ionizable contaminants in vapor. The PID will be operated and calibrated daily according to the manufacturer's directions. The procedure for PID operation is summarized as follows:

1. Turn on instrument according to the manufacturer's directions and allow the lamp to stabilize.

2. Establish "zero" for the PID calibration using atmospheric air.

3. Verify the instrument is in calibration by reading a known concentration, usually 50 to 100 parts per million by volume of isobutylene in air (calibration gas). If the instrument reading deviation is more than 20% true value, recalibrate the PID following manufacturer's directions.

4. Attach inlet of the meter to the location requiring monitoring (i.e., breathing space, sealed plastic bag or jar containing soil, top of well or vapor sampling port).

5. Collect the reading from the instrument, and record it in the field logbook.

SAP/QAPP WORKSHEET #18 –
SAMPLING LOCATIONS AND METHODS/SOP REQUIREMENTS TABLE

SAP/QAPP Worksheet #18 is used to summarize all samples to be collected for the specific site. If special conditional sampling (i.e., step-out hot-spot sampling) is necessary for the site-specific work plan, notes can be added to Worksheet #18 to describe the special sampling condition and decisions. Site-specific sampling locations and methods will be documented in each site-specific plan.

SAP/QAPP Worksheet #18 – Sampling Locations and Methods/SOP Requirements Table

Sampling Location/ID Number	Matrix	Depth (units)	Analytical Group	Concentration Level	Estimated Number of Samples (identify field duplicates)	Sampling SOP Reference[a]	Rationale for Sampling Location
TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD

[a]Field sampling methods are described in the Project Sampling SOP References Table (Worksheet #21).

SAP/QAPP WORKSHEET #19 –
ANALYTICAL SOP REQUIREMENTS TABLE, ACCUTEST LABORATORIES

Matrix	Analytical Group	Concentration Level	Analytical and Preparation Method/SOP Reference[a]	Sample Size	Containers (number, size, and type)[b]	Preservation Requirements (chemical, temperature, light protected)	Maximum Holding Time (preparation/analysis)
Soil	Metals– ICP/CVAA	Low	SW-846 3050B 6010B/7471B SOP# MET104/MET100/MET105	5 grams	(2)-8oz jar	None specified per Ch.3 of SW-846	6 months/28 days for Hg
Soil	Semivolatiles	Low	SW-846 3550B 8270C/ SOP #OP007/MS011	30 grams		Cool <6°C	14 days to extraction/ 40 days for analysis
Soil	Pesticide	Low	SW-846 3550B 8081B/ SOP #OP009/GC015	30 grams		Cool <6°C	14 days to extraction/ 40 days for analysis
Soil	PCB	Low	SW-846 3550B 8082A/ SOP # OP009/GC014	30 grams		Cool <6°C	14 days to extraction/ 40 days for analysis
Soil	Herbicides	Low	SW-846 3550B 8151A/ SOP# OP037/GC031	30 grams		Cool <6°C	14 days to extraction/ 40 days for analysis
Soil	Dioxins/Furans	Low	SW-846 8290A BRL SOP-00406, 405, 407	10 grams		Cool <6°C	30 days to extraction/45 days for analysis
Soil	Explosives	Low	SW-846 8330A/ SOP# OP019/GC016	2 grams		Cool <6°C	14 days to extraction/ 40 days for analysis
Soil	Cyanide, total	Low	SW-846 9012B/ SOP #GN113/GN115	15 grams		Cool <6°C	14 days to extraction/ 40 days for analysis
Soil	TPH DRO/ORO	Low	SW-846 3550B 8015M/ SOP # OP011/GC011	30 grams		Cool <6°C	14 days to extraction/ 40 days for analysis
Soil	TPH GRO	Low	SW-846 5035A 8015M/ SOP #OP020/GC010	10 grams	(2)-VOC pre-tared vials with 5 ml of MeOH	Cool <6°C	14 days
Soil	VOC	Low	SW-846 5035A 8260B/ SOP #OP020/MS005	15 grams	1 pre-tared VOC vial w/MeOH and 2 VOC vials with 5 ml water	Cool <6°C, freeze within 48 hours	14 days
Soil	Tritium	Low	USEPA 906.0 Mod GL-RAD-A-002/D-003/I-010/I-012	50 grams	(1)-4oz jar, plastic/glass	None	6 months
Water	Metals– ICP/CVAA	Low	SW-846 3010A 6010B/7470A SOP #MET 103/MET100/MET106	1000 mls	(1)-1 liter nalgene bottle	1:1 HNO_3, ambient	6 months/28 days for Hg
Water	Semivolatiles	Low	SW-846 3510C 8270D/ SOP #OP006/MS011	1 liter	(2)-1 liter amber bottle	Cool <6°C	7 days to extraction/ 40 days for analysis
Water	Pesticide	Low	SW-846 3510C 8081B/ SOP #OP008/GC015	1 liter	(2)-1 liter amber bottle	Cool <6°C	7 days to extraction/ 40 days for analysis
Water	PCB	Low	SW-846 3510C 8082A/ SOP #OP008/GC014	1 liter	(2)-1 liter amber bottle	Cool <6°C	7 days to extraction/ 40 days for analysis
Water	Herbicides	Low	SW-846 3510C 8151A/ SOP# OP038/GC031	1 liter	(2)-1 liter amber bottle	Cool <6°C	7 days to extraction/ 40 days for analysis
Water	Dioxins/Furans	Low	SW-846 8290A BRL SOP-00406, 405, 407	1 liter	(2)-1 liter amber bottle	Cool <6°C	30 days to extraction/45 days for analysis

SAP/QAPP WORKSHEET #19 –
ANALYTICAL SOP REQUIREMENTS TABLE, ACCUTEST LABORATORIES (Concluded)

Matrix	Analytical Group	Concentration Level	Analytical and Preparation Method/SOP Reference[a]	Sample Size	Containers (number, size, and type)[b]	Preservation Requirements (chemical, temperature, light protected)	Maximum Holding Time (preparation/analysis)
Water	Explosives	Low	SW-846 8330A/ SOP# OP018/GC016	1 liter	(2)-1 liter amber bottle	Cool <6°C	7 days to extraction/ 40 days for analysis
Water	Cyanide, total	Low	SW-846 9012B/ SOP# GN013, GN015	6 ml	(1)-500 ml nalgene bottle	Cool <6°C pH >10 with NaOH	14 days
Water	TPH DRO	Low	SW-846 3510C 8015D/ SOP#OP010/GC011	1 liter	(2)-1 liter amber bottle	Cool <6°C pH <2 with H2SO4	7 days to extraction/ 40 days for analysis
Water	TPH GRO	Low	SW-846 5030B 8015M/ SOP #OP021/GC010	5 ml	(3) 45-ml VOC vials	Cool <6°C pH <2 with HCl	14 days
Water	VOC	Low	SW-846 5030B 8260B/ SOP #OP021/MS005	5 ml	(3) 45-ml VOC vials	Cool <6°C pH <2 with HCl	14 days
Water	Tritium	Low	USEPA 906.0 Mod GL-RAD-A-002/D-003/I-010/I-012	20 ml	(1)-1 liter glass bottle	None	6 months
Solid	TCLP Volatiles	Low	SW-846 1311 5030B 8260B/ SOP #OP041/OP021/MS005	30 grams	(1)-4 oz glass jar	Cool <6°C	14 days to leaching/14 Days
Solid	TCLP Semivolatiles	Low	SW-846 1311 3510C 8270D/ SOP #OP040/OP006/MS011	30 grams	(3)-8oz jar	Cool <6°C	14 days to leaching 7 days/40 days
Solid	TCLP Pesticide	Low	SW-846 1311 3510C 8081B/ SOP # OP040/OP008/GC015	30 grams		Cool <6°C	14 days to leaching 7 days/40 days
Solid	TCLP Herbicides	Low	SW-846 1311 8151A/ SOP OP040/OP037/GC031	30 grams		Cool <6°C	14 days to leaching 7 days/40 days
Solid	TCLP Metals ICP	Low	SW-846 1311 3010A 6010C/ SOP# OP040/MET103/MET100	30 grams		Cool <6°C	180 Days
Solid	TCLP Metals Hg	Low	SW-846 1311 7470A/SOP # OP040/MET106	30 grams		Cool <6°C	28 days
Solid	Cyanide, Reactive	Low	SW-846 Ch.7/SOP #GN136	15 grams		Cool <6°C	14 Days
Solid	Sulfide, Reactive	Low	SW-846 Ch.7/SOP #GN136	15 grams		Cool <6°C	14 Days
Solid	Ignitability (Flashpoint)	Low	SW-846 1010/SOP #GN121	5 grams		Cool <6°C	14 Days
Solid	Corrosivity as pH	Low	SW-846 CHAP7/9045D/SOP #GN179	5 grams		Cool <6°C	ASAP per method

[a]Laboratory Standard Operating Procedures are subject to revision and updates during duration of the project, lab will use the most current revision of the SOP at the time of analysis.
[b]Sample size is a minimum, the containers listed will be filled to compensate for any required re-analysis or re-extractions. For samples requiring MS/MSD containers listed should be tripled.

SAP/QAPP WORKSHEET #20 – FIELD QUALITY CONTROL SAMPLE SUMMARY TABLE

Worksheet #20 is a numeric summary of the field samples and field QC samples to be collected for the project. This Worksheet will be completed for each applicable site in the site-specific SAP/QAPP.

SAP/QAPP Worksheet #20 – Field Quality Control Sample Summary Table

Matrix	Analytical Group	No. of Primary Sampling Locations	No. of Field Duplicates	No. of MS/MSDs	No. of Field Blanks	No. of Equipment Rinse Blanks	No. of Trip Blanks	Total No. of Samples to Laboratory
Soil	Site-specific	Site-specific	Site-specific	Site-specific	Site-specific	Site-specific	Site-specific	Site-specific
Water	Site-specific	Site-specific	Site-specific	Site-specific	Site-specific	Site-specific	Site-specific	Site-specific
Air	Site-specific	Site-specific	Site-specific	Site-specific	Site-specific	Site-specific	Site-specific	Site-specific
Waste Water	Site-specific	Site-specific	Site-specific	Site-specific	Site-specific	Site-specific	Site-specific	Site-specific
Waste Soil	Site-specific	Site-specific	Site-specific	Site-specific	Site-specific	Site-specific	Site-specific	Site-specific

SAP/QAPP WORKSHEET #21 – PROJECT SAMPLING SOP REFERENCES TABLE

Worksheet #21 will be used in site-specific plans to document the procedure or SOP used for sample collections. The project team can use published Shaw Corporate SOPs, the site-specific work plan, or SAP/QAPP Worksheet #17 to describe sampling procedures. Worksheet #21 should include copies of the SOPs as attachments (if referencing Shaw Corporate SOPs) or appropriately reference the location of each sampling procedure in Worksheet #17. Site-specific SAP/QAPPs will list all Shaw SOPs or references to Worksheet #17 for sampling methods associated with project sampling.

QAPP Worksheet 21 – Project Sampling SOP References Table

Reference Number	Title, Revision Date and/or Number	Originating Organization	Equipment Type	Modified for Project Work? (Y/N)	Comments
1	Field Logbook, 9/8/06, SOP EI-FS001	Shaw	NA	N	Documents observations, sampling information, and other pertinent information on project sites.
2	Field Logsheets, 9/8/06, SOP EI-FS002	Shaw	NA	N	Document single location/event information on project sites.
3	Chain of Custody Documentation – Paper, 9/8/06, SOP EI-FS003	Shaw	NA	N	Provides requirements for the completion of COC documentation.
4	Custody Seals, 9/8/06, SOP EI-FS005	Shaw	NA	N	Includes procedure for completion and attachment of custody seals on environmental samples and shipping containers.
5	Sample Labeling, 9/8/06, SOP EI-FS006	Shaw	NA	N	Provides requirements for completion and attachment of sample labels on environmental sample containers.
6	Sample Homogenization, 9/8/06, SOP EI-FS010	Shaw	NA	N	Establishes method for homogenizing soil, sediment, and other solid/semi-solid matrices so that a uniform matrix is available for sampling.
7	Sample Compositing, 9/8/06, SOP EI-FS011	Shaw	NA	N	Establishes method for compositing soil, sediment, and other solid/semi-solid matrices so that a uniform matrix is available for sampling.
8	Shipping and Packaging of Non Hazardous Samples, 9/8/06, SOP EI-FS012	Shaw	Shipping Container	N	Includes sample packaging, shipping, and requirements for Non Hazardous Samples.

QAPP Worksheet 21 – Project Sampling SOP References Table (Concluded)

Reference Number	Title, Revision Date and/or Number	Originating Organization	Equipment Type	Modified for Project Work? (Y/N)	Comments
9	Packaging and Shipping of DOT –Hazardous Samples, 9/5/06, SOP EI-FS013	Shaw	Shipping Container	N	Includes sample packaging, shipping, and requirements for Hazardous Samples.
10	Decontamination of Contact Sampling Equipment, 9/8/06, SOP EI-FS014	Shaw	NA	N	Standard to be implemented for decontamination of contact sampling equipment.
11	Data Usability Review, 9/8/06, SOP EI-FS020	Shaw	NA	N	Establish the means by which all subcontracted environmental analytical data will be reviewed for completeness and usability.
12	Hand Auger Sampling, 9/8/06, SOP EI-FS100	Shaw	Hand Auger	N	Methods/procedures for sampling of subsurface soils using hand auger.
13	Soil Sampling using a Soil Probe or Core-Type Sampler, 9/11/06, SOP EI-FS103	Shaw	Soil Probe or Core Type	N	Methods/procedures for sampling of subsurface soils using soil probe or core-type sampler.
14	Trowel/Spoon Surface Soil Sampling, 9/11/06, SOP EI-FS101	Shaw	Trowel/Spoon	N	Methods/procedures for sampling of surface soils using trowels/spoons.
15	Soil Encore VOCs, 6/05/03, SOP EI-FS104	Shaw	Encore Samplers	N	Methods/procedures for VOC sampling of soils using trowels/spoons.
16	Soil Preserved Vial VOCs, 8/23/03, SOP EI-FS105	Shaw	Corer/Vials	N	Methods/procedures for VOC sampling of soils using corer/vials.
17	Water Level Meas., 9/11/06, SOP EI-FS108	Shaw	Tape Measure w/Sounder	N	Methods/procedures for measuring water levels in monitoring wells.
18	Bailer, 9/21/06, SOP EI-FS109	Shaw	Bailers	N	Methods/procedures for sampling of groundwater using bailers.
19	Well Purging, 9/21/06, SOP EI-FS110	Shaw	Pump	N	Methods/procedures for purging a groundwater well for analytical sampling.
20	Low Flow Sampling, 9/21/06, SOP EI-FS111	Shaw	Low Flow Pump	N	Methods/procedures for sampling of groundwater using low flow techniques.

SAP/QAPP WORKSHEET #22 –
FIELD EQUIPMENT CALIBRATION, MAINTENANCE, TESTING, AND INSPECTION TABLE

Field equipment (i.e., water quality meters, PIDs) will be calibrated according to manufacturers' directions. Worksheet # identifies field equipment and instructions for calibration and testing. Field meters are generally received at the site with calibration records from the supplier/rental company. Field meter calibrations procedures for site-specific SAP/QAPPs will be documented on the site-specific SAP/QAPP Worksheet #22 (example shown as follows):

QAPP Worksheet 22 – Field Equipment Calibration, Maintenance, Testing, and Inspection Table

Field Equipment	Calibration Activity	Maintenance Activity	Testing Activity	Inspection Activity	Frequency	Acceptance Criteria	Corrective Action	Resp. Person	SOP Reference
Organic Vapor Monitor or Photo-ionization Detector	Daily calibration before use with 100 parts per million isobutylene gas	As required by manufacturer specifications	Screen for VOCs.	Check all sensors and battery charge.	At beginning of work activity before use	Within ±10% of calibration gas	Replace sensors if damaged Replace battery if not charged If calibration not within ±10%, repeat or tag as "out of calibration – do not use."	Shaw Site Mgr./Field Sampler	Manufacturer's Instrument Operating and Calibration Manual
Electronic Water Level Meter	Minimum: Calibrate with steel tape annually	As required by manufacturer specifications	Groundwater level measurement	Check all sensors, cables, and battery charge if applicable. Check for proper instrument response by inserting probe into water. Instrument typically indicates water with an intermittent light and tone.	At beginning of work activity before use	Meets specification. Cable must have graduations to 0.01 feet.	Replace battery if not charged. If meter doesn't register water, replace and tag as "needs service – do not use."	Shaw Site Mgr./Field Sampler	Manufacturer's Instrument Operating and Calibration Manual
Electrical Conductivity Probe/Meter	Minimum: Daily calibration before use and at conclusion of the day's sample event with two standards that bracket range of measurements	As required by manufacturer specifications	Measure groundwater quality field parameters (electrical conductivity) during purging and sampling.	Check all sensors, cable and battery charge.	Minimum: At beginning of work activity before use and at the conclusion of the day's sampling event	Within ±10% of calibration solution	Replace probe if damaged. Replace battery if not charged. If calibration not within ±10%, repeat or tag as "out of calibration – do not use."	Shaw Site Mgr./Field Sampler	Manufacturer's Instrument Operating and Calibration Manual

QAPP Worksheet 22 – Field Equipment Calibration, Maintenance, Testing, and Inspection Table (Continued)

Field Equipment	Calibration Activity	Maintenance Activity	Testing Activity	Inspection Activity	Frequency	Acceptance Criteria	Corrective Action	Resp. Person	SOP Reference
pH Probe/Meter	Minimum: Daily calibration before use and at conclusion of the day's sampling event, with two buffer solutions that bracket range of measurements	As required by manufacturer specifications	Measure groundwater quality field parameter (pH) during purging and sampling.	Check all sensors, cable, and battery charge.	Minimum: At beginning of work activity before use and at the conclusion of the day's sampling event	Within ±0.5 pH unit of calibration solution	Replace probe if damaged Replace battery if not charged If calibration not within ±0.5 pH unit, repeat or tag as "out of calibration – do not use."	Shaw Site Mgr./Field Sampler	Manufacturer's Instrument Operating and Calibration Manual
Temperature Probe/Meter	Self calibrating	As required by manufacturer specifications	Measure groundwater quality field parameter (temp.) during purging and sampling.	Check all sensors, cable, and battery charge.	Minimum: At beginning of work activity before use and at the conclusion of the day's sampling event	Meets internal specification	Replace sensor if damaged Replace battery if not charged If meter doesn't record temperature, repeat, or tag as "needs service – do not use."	Shaw Site Mgr./Field Sampler	Manufacturer's Instrument Operating and Calibration Manual
Dissolved Oxygen Probe/Meter	Minimum: Daily calibration before use and at the conclusion of the day's sampling event with temperature-corrected, air-saturated water	As required by manufacturer specifications	Collect groundwater quality field parameters (dissolved oxygen) during purging and sampling.	Check all sensors, cable, and battery charge.	Minimum: At beginning of work activity before use and at the conclusion of the day's sampling event	Within ±25% of calibration solution	Replace probe if damaged Replace battery if not charged If calibration not within ±25% repeat, or tag as "out of calibration – do not use."	Shaw Site Mgr./Field Sampler	Manufacturer's Instrument Operating and Calibration Manual
Turbidity Probe/Meter	Minimum: Daily calibration before use and at the conclusion of the day's sampling event, with standard within range of measurements	As required by manufacturer specifications	Collect groundwater quality field parameter (turbidity) during purging and sampling.	Check all sensors, cable, and battery charge.	Minimum: At beginning of work activity before use and at the conclusion of the day's sampling event	Within ±10% of calibration solution	Replace probe if damaged. Replace battery if not charged. If calibration not within ±10%, repeat or tag as "out of calibration – do not use."	Shaw Site Mgr./Field Sampler	Manufacturer's Instrument Operating and Calibration Manual

QAPP Worksheet 22 – Field Equipment Calibration, Maintenance, Testing, and Inspection Table (Concluded)

Field Equipment	Calibration Activity	Maintenance Activity	Testing Activity	Inspection Activity	Frequency	Acceptance Criteria	Corrective Action	Resp. Person	SOP Reference
ORP	Minimum: Daily calibration before use and at the conclusion of the day's sampling event, with standard within range of measurements	As required by manufacturer specifications	Collect groundwater quality field parameter (ORP) during purging and sampling.	Check all sensors, cable, and battery charge.	Minimum: At beginning of work activity before use and at the conclusion of the day's sampling event	Within ±10% of calibration solution	Replace probe if damaged. Replace battery if not charged. If calibration not within ±10%, repeat or tag as "out of calibration – do not use."	Shaw Site Mgr./Field Sampler	Manufacturer's Instrument Operating and Calibration Manual
Hand-Held Metal Detection Instrument	Calibrate in accordance with manufacturer's requirements Check sensitivity against surrogate verification strip-surrogates to mimic 75% of the metal footprint of a 60mm mortar	As required by manufacturer specifications	Detection of ferrous MEC anomalies	Check all sensors, cables, and battery charge if applicable. Check for proper instrument response by screening known metal object.	At beginning of work activity before use	Meets specification Instrument must respond to known metal object Instrument must detect all three surrogates in verification strip	Replace battery if not charged If instrument fails to respond to known metal object, replace and tag as "needs service – do not use." If instrument fails to detect all three surrogates in verification strip, check/adjust sensitivity and repeat	Shaw UXO Specialist	Manufacturer's Instrument Operating and Calibration Manual

SAP/QAPP WORKSHEET #23 –
ANALYTICAL SOP REFERENCES TABLE

23.1 Laboratory Quality Assurance and Quality Control Program

QA is a set of operating principles that, if strictly followed during sample collection and analysis, will produce defensible data of known quality. Included in QA are QC and quality assessments. QC is a set of measures within a sample analysis methodology to ensure that the process is in control. Quality assessment consists of procedures for determining the quality of laboratory measurements by use of data from internal and external QC measures.

A properly designed and executed QC program will result in a measurement system operating in a state of statistical control, which means that errors have been reduced to acceptable levels. An effective QA program includes the following elements:

- Certification of operator competence
- Internal QC checks, such as recovery of known additions through use of surrogate standards, matrix spikes, and LCSs
- Analysis of externally supplied standards
- Analysis of reagent blanks
- Calibration with standards using internal or external standard procedures
- Calibration verification with second source standard
- Analysis of duplicates
- Maintenance of control charts

The analytical laboratory will have written SOPs defining the instrument operation and maintenance, tuning, calibration, MDL determination, QC acceptance criteria, blank requirements, and stepwise procedures for each analytical method. Strict adherence to Good Laboratory Practices and consistent use of SOPs are also essential for a successful QC program.

SAP/QAPP Worksheet #23 – Analytical SOP References Table, Accutest Laboratories Southeast, Inc.

Reference Number	Title, Revision Date, and/or Number [1]	Definitive or Screening Data	Analytical Group	Instrument	Organization Performing Analysis	Modified for Project Work? (Y/N)
MET100	Metals by ICP, Oct 2010	Definitive	Metals – ICP 6010C	Trace 6000 Series	Accutest Laboratories Southeast, Inc., Orlando, FL	No
MET103	Digestion of Waters for ICP Analysis, Oct 2010	Definitive	Prep Method Metals – ICP SW-846 3010A	SCP Science	Accutest Laboratories Southeast, Inc., Orlando, FL	No
MET104	Digestion of Soils for ICP Analysis, Oct 2010	Definitive	Prep Method Metals – ICP SW-846 3050B	SCP Science	Accutest Laboratories Southeast, Inc., Orlando, FL	No
EMA226-04	Metals by ICP-MS	Definitive	Metals – ICP-MS 602A	Agilent 7700	Accutest Laboratories, Dayton, NJ	No
EMP070-14	Digestion of Waters for ICP-MS Analysis	Definitive	Prep Method Metals – ICP SW-846 3010A	Environmental Express	Accutest Laboratories, Dayton, NJ	No
EMP073-12	Digestion of Soils for ICP-MS Analysis	Definitive	Prep Method Metals – ICP SW-846 3050B	Environmental Express	Accutest Laboratories, Dayton, NJ	No
OP041	Standard Operating Procedure For The Toxicity Characteristic Leaching Of Volatile Organics (TCLP), Aug. 2011	Definitive	TCLP Volatiles ZHE SW-846 1311	Millipore Tumbler	Accutest Laboratories Southeast, Inc., Orlando, FL	No
OP040	Standard Operating Procedure For The Toxicity Characteristic Leaching Of Semivolatile Organics And Metals (TCLP), Aug. 2011	Definitive	TCLP Procedure Herbicides, Pesticides, Semivolatiles SW-846 1311	TCLP Tumbler	Accutest Laboratories Southeast, Inc., Orlando, FL	No
EGN141-03	Standard Operating Procedure For The Toxicity Characteristic Leaching Of Semivolatile Organics And Metals (TCLP)	Definitive	TCLP Procedure Herbicides, Pesticides, Semivolatiles SW-846 1311	TCLP Tumbler	Accutest Laboratories, Dayton, NJ	No
MS005	Analysis of Volatile Organics by USEPA Method 8260B, Dec 2010	Definitive	Volatiles SW-846 8260B	HP5890/5970, HP5890/5973, HP6890/5975	Accutest Laboratories Southeast, Inc., Orlando, FL	No
OP021	SOP for Sample Introduction via SW846-5030, Aug. 2011	Definitive	Prep Method Volatiles SW-846 5030B	OI 4560/4552 Archon	Accutest Laboratories Southeast, Inc., Orlando, FL	No
OP020	SOP for Sample Introduction via SW846-5035, Aug. 2011	Definitive	Prep Method Volatiles SW-846 5035A	OI 4560/4552 Archon	Accutest Laboratories Southeast, Inc., Orlando, FL	No
OP006	Standard Operating Procedure For The Extraction Of Base-Neutral And Acid (BNAS) Extractables From Water Samples, Feb. 2011	Definitive	Prep method for Semivolatiles SW-846 8270D	Glas-Col 3-D SepFunnel Shaker	Accutest Laboratories Southeast, Inc., Orlando, FL	No
OP007	Standard Operating Procedure For The Extraction Of Base-Neutral And Acid (BNAS) Extractables From Soil Samples, Feb. 2011	Definitive	Prep method for Semivolatiles SW-846 8270D	Sonic Disruptor	Accutest Laboratories Southeast, Inc., Orlando, FL	No
MS011	Analysis of Semivolatile Organics by method 8270, Oct. 2010	Definitive	Semivolatiles SW-846 8270D	HP6890/5973, HP6890/5975	Accutest Laboratories Southeast, Inc., Orlando, FL	No
OP010	SOP for the Extraction of Diesel-Range Organics from Aqueous Samples, Feb. 2011	Definitive	Prep Method DRO SW-846 3510C	Glas-Col 3-D SepFunnel Shaker	Accutest Laboratories Southeast, Inc., Orlando, FL	No

SAP/QAPP Worksheet #23 – Analytical SOP References Table, Accutest Laboratories Southeast, Inc. (Continued)

Reference Number	Title, Revision Date, and/or Number [1]	Definitive or Screening Data	Analytical Group	Instrument	Organization Performing Analysis	Modified for Project Work? (Y/N)
OP011	SOP for the Extraction of Diesel-Range Organics from Solid Samples, Feb. 2011	Definitive	Prep Method DRO SW-846 3510C	Sonic Disruptor	Accutest Laboratories Southeast, Inc., Orlando, FL	No
OP008	SOP for the Extraction of Pesticides/PCBs from Aqueous Samples, Feb. 2011	Definitive	Prep Method PCBs, Pesticides, PCBs SW-846 3510C	Glas-Col 3-D SepFunnel Shaker	Accutest Laboratories Southeast, Inc., Orlando, FL	No
OP009	SOP for the Extraction of Pesticides/PCBs from Solid Samples, Feb. 2011	Definitive	Prep Method PCBs, Pesticides, PCBs SW-846 3510C	Sonic Disruptor	Accutest Laboratories Southeast, Inc., Orlando, FL	No
OP018	SOP for the Extraction of Nitroaromatics/Nitramines from Aqueous Samples, Feb. 2011	Definitive	SW-846 8330A	Glas-Col 3-D SepFunnel Shaker	Accutest Laboratories Southeast, Inc., Orlando, FL	No
OP019	SOP for the Extraction of Nitroaromatics/Nitramines from Solid Samples, Feb. 2011	Definitive	SW-846 8330A	Sonic Disruptor	Accutest Laboratories Southeast, Inc., Orlando, FL	No
GC010	Analysis Of Gasoline-Range Organics By Gas Chromatography, FID SW-846 8015D, Oct 2010	Definitive	GRO SW-846 8015D	HP5890, HP6890, FID	Accutest Laboratories Southeast, Inc., Orlando, FL	No
GC011	Analysis Of Diesel-Range Organics By Gas Chromatography, FID SW-846 8015D, Oct 2010	Definitive	DRO/ORO SW-846 8015D	HP5890, HP6890, FID	Accutest Laboratories Southeast, Inc., Orlando, FL	No
GC014	Analysis Of PCBs By Gas Chromatography, Electron Capture Detector SW-846 8081, Oct 2010	Definitive	Pesticides SW-846 8082A	HP5890, HP6890, Dual ECD	Accutest Laboratories Southeast, Inc., Orlando, FL	No
GC015	Analysis Of Organochlorine Pesticides By Gas Chromatography, Electron Capture Detector SW-846 8081, Oct 2010	Definitive	Pesticides SW-846 8081B	HP5890, HP6890, Dual ECD	Accutest Laboratories Southeast, Inc., Orlando, FL	No
GC016	Analysis Of Nitroaromatics and Nitramines by HPLC, Dual DAD, Oct 2010	Definitive	Explosives SW-846 8330A	HP1100, Dual DAD	Accutest Laboratories Southeast, Inc., Orlando, FL	No
GC031	Herbicide analysis by Method 8151A Dual ECD; Oct. 2010	Definitive	Herbicides SW-846 8151A	HP6890/7673	Accutest Laboratories Southeast, Inc., Orlando, FL	No
OP038	SOP for the Extraction of Herbicides from Solid Samples, March 2011	Definitive	Herbicides analysis, SW-846 8151A	MARS Microwave	Accutest Laboratories Southeast, Inc., Orlando, FL	No
OP037	SOP for the Extraction of Herbicides from Aqueous Samples, March 2011	Definitive	Herbicides analysis, SW-846 8151A	Glas-Col 3-D SepFunnel Shaker	Accutest Laboratories Southeast, Inc., Orlando, FL	No
BRL SOP-00406	Dioxins and Furans by HRGC HRMS in Water and Soil (USEPA 8290) (Revision 10)	Definitive	Dioxins/Furans – HRMS – USEPA8290	Micromass Autospec Ultima	Maxxam Analytics Laboratories, Mississauga, ON, Canada	No
BRL SOP-00405	Dioxin and Furan Extracts Cleanup (Revision 2)	Definitive	Dioxins/Furans – HRMS – USEPA8290	Micromass Autospec Ultima	Maxxam Analytics Laboratories, Mississauga, ON, Canada	No

SAP/QAPP Worksheet #23 – Analytical SOP References Table, Accutest Laboratories Southeast, Inc. (Concluded)

Reference Number	Title, Revision Date, and/or Number [1]	Definitive or Screening Data	Analytical Group	Instrument	Organization Performing Analysis	Modified for Project Work? (Y/N)
BRL SOP-00407	Dioxin and Furan Extraction in Water and Soil Samples (Revision 3)	Definitive	Dioxins/Furans – HRMS – USEPA8290	Micromass Autospec Ultima	Maxxam Analytics Laboratories, Mississauga, ON, Canada	No
MET105	CVAA Analysis of Hg in Water, Oct. 2010	Definitive	Metals – Mercury 7471B	Leeman HydraAA/SCP Science	Accutest Laboratories Southeast, Inc., Orlando, FL	No
MET106	CVAA Analysis of Hg in Water, Oct. 2010	Definitive	Metals – Mercury 7470A	Leeman HydraAA/SCP Science	Accutest Laboratories Southeast, Inc., Orlando, FL	No
EMA228-03	CVAA Analysis of Hg in Soil	Definitive	Metals – Mercury 7471B	Leeman HydraAA	Accutest Laboratories, Dayton, NJ	No
EMA215-12	CVAA Analysis of Hg in Water	Definitive	Metals – Mercury 7470A	Leeman HydraAA	Accutest Laboratories, Dayton, NJ	No
GN113	Cyanide Distillation, July 2011	Definitive	Total Cyanide, SW-846 9012B	Lachat Hot Blockr	Accutest Laboratories Southeast, Inc., Orlando, FL	No
GN115	Cyanide Analysis by Automated Colorimetry, Apr. 2010	Definitive	Total Cyanide, SW-846 9012B	Lachat Auto Analyzer	Accutest Laboratories Southeast, Inc., Orlando, FL	No
GN136	Reactive Cyanide and Reactive Sulfide, Nov. 2010	Definitive	RCI, SW-846, Ch 7.	Burette; UV/VIS spec	Accutest Laboratories Southeast, Inc., Orlando, FL	No
GN121	Ignitability, Rev. Oct 2011	Definitive	Ignitability (Flashpoint) SW-846 1010	Pensky-Marten	Accutest Laboratories Southeast, Inc., Orlando, FL	No
GN166	Corrosivity in soil as pH, Rev. July 2011	Definitive	Corrosivity as pH SW-846 CHAP7	pH meter(Fisher)	Accutest Laboratories Southeast, Inc., Orlando, FL	No
GL-RAD-A-002	Determination of Tritium	Definitive	Radiochemistry	LSC	GEL Laboratories, LLC Charleston, SC	No
GL-RAD-D-003	Data Review, Validation, and Data Package Assembly, Rev. 29	Definitive	Radiochemistry	Radiochemistry	GEL Laboratories, LLC Charleston, SC	No
GL-RAD-I-010	Counting Room Instrumentation Maintenance, Rev.19	Definitive	Radiochemistry	Radiochemistry	GEL Laboratories, LLC Charleston, SC	No
GL-RAD-I-012	Managing Statistical Data in the Radiochemistry Laboratory, Rev. 22	Definitive	Radiochemistry	Radiochemistry	GEL Laboratories, LLC Charleston, SC	No

SAP/QAPP WORKSHEET #24 –
ANALYTICAL INSTRUMENT CALIBRATION TABLE

All analytical instruments will be calibrated and the calibration acceptance criteria met before samples are analyzed. The analytical laboratories will follow calibration procedures that are compliant with the DOD QSM (DOD, 2010). Calibration standards will be prepared with National Institute for Standards and Testing-traceable standards and analyzed per methods requirements. The initial calibration will meet one of the following requirements:

- The lowest concentration of the calibration standard is less than or equal to the LOQ based on the final volume of extract or sample.
- For each target analyte, at least one of the calibration standards will be at or below the regulatory limit (action level) as defined by the DQOs.
- Before samples are analyzed, initial calibration will be verified with a second source standard prepared at the midpoint of the calibration curve. Initial calibration verification will meet the acceptance criteria that are expressed in the laboratory SOPs.
- Daily calibration verification will be conducted at the method-prescribed frequencies, and will meet the acceptance criteria of applicable guidance documents. Daily calibration verification will not be used for quantitation of target analytes.
- Calibration data (calibration tables, chromatograms, instrument printouts, and laboratory logbooks) will be clearly labeled to identify the source and preparation of the calibration standard and therefore be traceable to the standard preparation records.

Worksheet #24 identifies all site-specific analytical instrumentation that requires maintenance, testing, or inspection and provides the SOP reference number for each.

SAP/QAPP Worksheet #24 – Analytical Instrument Calibration, Accutest Laboratories Southeast

Instrument	Calibration Procedure	Frequency of Calibration	Acceptance Criteria	CA	Person Responsible for CA	SOP Reference[1]
HP5890/5970, HP5890/5973, HP6890/5975	VOC, SW-846 8260B, 5 points minimum	Major maintenance (per method) or second consecutive failure of opening CCV warrants recalibration	ICAL %RSD <15%, or Correlation coefficient R≥0.995 ICV, CCV %D <20%	Instrument maintenance and leak check, standard inspection, retuning and recalibration	Laboratory Analyst	MS005
Thermo ICAP 6000 Series	Metals, SW-846 6010C	Initial calibration daily	ICAL %RSD <5%, or Correlation coefficient R≥0.995 ICV and CCV %D <10%	Instrument maintenance, nebulizer cleaning, torch inspection, standard inspection, recalibration	Laboratory Analyst	MET100
Agilent 7700	Metals, SW-846 6020A	Initial calibration daily	ICAL %RSD <5%, or Correlation coefficient R≥0.998 ICV and CCV %D <10%	Instrument maintenance, nebulizer cleaning, torch inspection, standard inspection, recalibration	Laboratory Analyst	EMA226-04
HP6890/7683, HP5890/7673, FID	GRO (SW-846 8015M)	Major maintenance (per method) or second consecutive failure of opening CCV warrants recalibration	ICAL %RSD <20%, or Correlation coefficient R≥0.995 CCV %D <15%	Instrument maintenance, standard inspection, recalibration	Laboratory Analyst	GC010
HP6890/7683, HP5890/7673, FID	DRO/ORO (SW-846 8015M)	Major maintenance (per method) or second consecutive failure of opening CCV warrants recalibration	ICAL %RSD <20%, or Correlation coefficient R≥0.995 CCV %D <15%	Instrument maintenance, standard inspection, recalibration	Laboratory Analyst	GC011
HP6890/5973, HP6890/5975	Semivolatiles, SW-846 8270D, 5 points minimum	Major maintenance (per method) or second consecutive failure of opening CCV warrants recalibration	ICAL %RSD <20%, or Correlation coefficient R≥0.995; Meet minimum RF as per method.	Instrument maintenance, standard inspection, retuning and recalibration	Laboratory Analyst	MS011
pH meter	pH by Electrode, 2-points	Daily with two buffer standards	Third buffer reading back within 0.05 s.u. of nominal value	Electrode cleaning or replacement, buffer standard inspection or replacement, recalibration	Laboratory Analyst	GN166
HP1110, Dual DAD	SW-846 8330A, 5-points minimum	Major maintenance (per method) or second consecutive failure of opening CCV warrants recalibration	ICAL %RSD <20%, or Correlation coefficient R≥0.995 ICV, CCV %D <15%	Instrument maintenance, leak check, Lamp test, pump test, standard inspection, recalibration	Laboratory Analyst	GC016
HP5890/7673, Dual ECD	Chlorinated Herbicides, SW-846 8151A, 5 points minimum	Major maintenance (per method) or second consecutive failure of opening CCV warrants recalibration	%RSD <20%, or Correlation coefficient R≥0.995, ICV, CCV %D<15%	Instrument maintenance, standard inspection, recalibration	Laboratory Analyst	GC031

SAP/QAPP Worksheet #24 – Analytical Instrument Calibration, Accutest Laboratories Southeast (Continued)

Instrument	Calibration Procedure	Frequency of Calibration	Acceptance Criteria	CA	Person Responsible for CA	SOP Reference[1]
HP5890, HP6890, Dual ECD	Organochlorine Pesticides, SW-846 8081B, 5 points min.	Major maintenance (per method) or second consecutive failure of opening CCV warrants recalibration	%RSD <20%, or Correlation coefficient R≥0.995, ICV, CCV %D<15%	Instrument maintenance, standard inspection, recalibration	Laboratory Analyst	GC015
Micromass Autospec Ultima	• USEPA 8290A • 5pt. Calibration	• USEPA 8290A • Midpoint CS3 every 12hrs 5 pt. as necessary	• USEPA 8290A • Unlabelled analytes < 20% RSD • Labeled analytes < 30% • Analyte retention time is within +3sec from internal • Signal to noise o > 10 standards o > 2.5 samples Ion Abundance Ratio ±15%	• Instrument Maintenance • Instrument parameters adjusted (retuned) • Standards reanalyzed	Laboratory Analyst	BRL–SOP–00406
HP5890, HP6890, Dual ECD	PCBs, SW-846 8082A, 5 points min.	Major maintenance (per method) or second consecutive failure of opening CCV warrants recalibration	%RSD <20%, or Correlation coefficient R≥0.995, ICV, CCV %D<15%	Instrument maintenance, standard inspection, recalibration	Laboratory Analyst	GC014
Lachat Auto Analyzer	Total Cyanide, 5 points and a cal blank	Minimum monthly, or as needed - major maintenance or second consecutive failure of opening CCV warrants recalibration	Correlation coefficient R≥0.995;ICV/CCV %D <10%	Instrument maintenance, tubing inspection and/or replacement, pump inspection, standard inspection, recalibration	Laboratory Analyst	GN115
SETAFLASH closed cup	Flashpoint, SW-846 1010mod, Xylene from two independent sources	Daily	Xylene flashpoint +/- 4F	Flash cup cleaning, thermometer inspection and recalibration.	Laboratory Analyst	GN121
UV/VIS spectrometer, Genesys 20	Reactive Cyanide, SW-846 Ch. 7, 5 points and a cal blank,	Minimum monthly, or as needed - after major maintenance or second consecutive failure of opening CCV	Correlation coefficient R≥0.995;ICV/CCV %D<10%	Instrument maintenance, cell cleaning, standard inspection, recalibration	Laboratory Analyst	GN136

SAP/QAPP Worksheet #24 – Analytical Instrument Calibration, Accutest Laboratories Southeast (Concluded)

Instrument	Calibration Procedure	Frequency of Calibration	Acceptance Criteria	Corrective Action (CA)	Person Responsible for CA	SOP Reference[1]
Micro burette, Class A	Reactive Sulfide, SW-846 Ch. 7	None, classified as Class A	None	Inspection for cracks and chips, stopcock fit. Replace if necessary	Laboratory Analyst	GN136
Leeman HydraAA/	Mercury, SW-846 7470A,/7471B, 5 points and a blank	Initial calibration daily	ICAL Correlation coefficient R≥0.995 ICV % <10%; CCV %D <20%	Instrument maintenance, Pump inspection, lamp inspection or replacement, standard inspection, recalibration	Laboratory Analyst	MET105, MET106 EMA215-12 EMP228-03
Liquid Scintillation Counter	Efficiency calibration is accomplished by preparing a series of quench standards that contain equal amounts of activity but vary in the level of quenching. The set of standards is counted and the efficiency is calculated for each standard. The data are then stored and used to develop a quench correction curve of degree of quench versus efficiency. The individual quench is measured for each sample counted using an external Cs-137 source located in the instrument. The sample is exposed to a Cs-137 source and the energy distribution pattern of Compton electrons induced in the cocktail is proportional to the amount of quench in the sample. The quench factor (H number) for the sample is then used to derive a counting efficiency from the quench curve data previously collected	Initial and Annual frequency	Per Laboratory SOP	The result for each verification source when calculated with the new efficiency must be within 10% of the known value.	Radiochemistry Analysts	GL-RAD-A-002

SAP/QAPP WORKSHEET #25 – ANALYTICAL INSTRUMENT AND EQUIPMENT MAINTENANCE, TESTING, AND INSPECTION, ACCUTEST LABORATORIES SOUTHEAST

Instrument/Equipment	Maintenance Activity	Testing Activity	Inspection Activity	Frequency	Acceptance Criteria	Corrective Action	Responsible Person	SOP Reference[a]
HP5890/5970, HP5890/5973, HP6890/5975	Injector port, column maintenance, source cleaning	SW-846 8260B	Leak test, column and injector port inspection, source insulator integrity	Need for maintenance determined by passing calibration and BFB – see MS005	Passing BFB and CCV, passing Internal Standard response	Column clipping and/or reconditioning, seal and liners replacement, filaments and insulators as needed	Laboratory Analyst	MS005
ICP 6500 series	Torch, nebulizer, spray chamber, autosampler, pump tubing maintenance,	SW-846 6010C	Check connections, flush lines, clean nebulizer	Frequency determined by instrument remaining in calibration and free of interference – Met 100	Passing calibration	Reconnect sample pathways, recalibrate, reanalyze affected samples	Laboratory Analyst	MET100
Agilent 7700	Torch, nebulizer, spray chamber, auto sampler, pump tubing maintenance,	SW-846 6020A	Check connections, flush lines, clean nebulizer	Frequency determined by instrument remaining in calibration and free of interference – EMA226-04	Passing calibration	Reconnect sample pathways, recalibrate, reanalyze affected samples	Laboratory Analyst	EMA226-04
HP6890/7683, HP5890/7673, FID	Injector port, column maintenance, purge-and-trap autosampler maintenance	SW-846 8015D	Leak test, column and injector port inspection	Frequency determined by instrument remaining in calibration and free of interference – GC010	Passing calibration	Column clipping, seals and liners replacement, recalibrate and reanalyze affected samples	Laboratory Analyst	GC010
HP6890/7683, HP5890/7673, FID	Injector port, column maintenance	SW-846 8015D	Leak test, column and injector port inspection	Frequency determined by instrument remaining in calibration and free of interference – GC011	Passing calibration	Column clipping, seals and liners replacement, recalibrate and reanalyze affected samples	Laboratory Analyst	GC011
HP6890/5973, HP6890/5975	Injector port, column maintenance, source cleaning	SW-846 8270D	Leak test, column and injector port inspection, source insulator integrity	Need for maintenance determined by passing calibration and DFTPP/DDT/PCP/ Benzidine breakdown – see MS011	Passing DFTPP etc. and CCV, passing Internal Standard response	Column clipping and/or reconditioning, seal and liners replacement, filaments and insulators as needed	Laboratory Analyst	MS011

SAP/QAPP WORKSHEET #25 – ANALYTICAL INSTRUMENT AND EQUIPMENT MAINTENANCE, TESTING, AND INSPECTION, ACCUTEST LABORATORIES SOUTHEAST (Continued)

Instrument/Equipment	Maintenance Activity	Testing Activity	Inspection Activity	Frequency	Acceptance Criteria	Corrective Action	Responsible Person	SOP Reference[a]
HP1110	Needle, needle seat, column filters, guard columns, pump piston seals, mobile phase filters	SW-846 8330A	Leak test, injection needle and needle seat inspection, filter inspection, lamp test as needed	Need for maintenance determined by passing calibration and chromatography – see GC016	Passing CCV	Column backflush, guard columns replacement, lamp replacement (as needed)	Laboratory Analyst	GC016
Leeman HydraAA/	Pump tubing, absorption cell, and lens cleaning.	SW-846 7470A/7471B MET105, MET106	Check connections, flush sample lines	Frequency determined by instrument remaining in calibration and free of interference – Met 105, 106, EMA215-12, EMA228-03	Passing calibration	Reconnect sample pathways, recalibrate, reanalyze affected samples	Laboratory Analyst	MET 105, MET106, EMA215-12, EMA228-03
HP5890, HP6890, Dual ECD	Injector port, column maintenance	SW-846 8081B	Leak test, column and injector port inspection	Need for maintenance determined by passing calibration and DDT/Endrin breakdown – see GC015	Passing DDT and Endrin breakdown; Passing CCV	Column clipping, seals and liners replacement, recalibrate and reanalyze affected samples	Laboratory Analyst	GC015
Micromass Autospec Ultima	Inner/Outer ion source Autosampler GC column Septa Injection port liner	USEPA 8290A	Helium flow Vacuum GC column performance	Frequency determined by instrument remaining in calibration and free of interference	Passing calibration	Retune Recalibrate Reinject affected samples Reanalyze affected samples	Laboratory Analyst	BRL–SOP–00406
HP5890, HP6890, Dual ECD	Injector port, column maintenance	SW-846 8082A	Leak test, column and injector port inspection	Need for maintenance determined by passing calibration– see GC014	Passing CCV	Column clipping, seals and liners replacement, recalibrate and reanalyze affected samples	Laboratory Analyst	GC014

SAP/QAPP WORKSHEET #25 – ANALYTICAL INSTRUMENT AND EQUIPMENT MAINTENANCE, TESTING, AND INSPECTION, ACCUTEST LABORATORIES SOUTHEAST (Concluded)

Instrument/Equipment	Maintenance Activity	Testing Activity	Inspection Activity	Frequency	Acceptance Criteria	Corrective Action	Responsible Person	SOP Reference[a]
HP5890, HP6890, Dual ECD	Injector port, column maintenance	SW-846 8151A	Leak test, column and injector port inspection	Frequency determined by instrument remaining in calibration and free of interference – See GC031	Passing calibration.	Column clipping, seals and liners replacement, recalibrate and reanalyze affected samples	Laboratory Analyst	GC031
Genesys UV/VIS	Cuvette and lamp	Reactive Cyanide	Cuvette inspection for cracks and deposits	Frequency determined by instrument remaining in calibration – GN166	Passing calibration	Replace lamp. Send for maintenance to the manufacturer	Laboratory Analyst	GN166
Burette	Manual titration method – none required	Reactive Sulfide	Check for leaks in the joints and cracks in the glass	Every day analysis is conducted	Free of defects	Replace burette	Laboratory Analyst	GN166
Lachat Auto Analyzer	Pump maintenance, photocell cleaning	USEPA 9012B	Clean or replace tubing, check connections	Frequency determined by instrument remaining in calibration and free of interference	Passing calibration	Reconnect tubes, check pump rate. Rerun calibration and samples	Laboratory Analyst	GN115
Liquid Scintillation Counter	Preventative	Radiochemistry	PM Replacement (Service Contract)	Annual	Meets manufacturer specifications	Call service contractor	Laboratory Analyst	GL-RAD-A-002

[a]Laboratory Standard Operating Procedures are subject to revision and updates during duration of the project, lab will use the most current revision of the SOP at the time of analysis.

SAP/QAPP WORKSHEET #26 – SAMPLE HANDLING SYSTEM

Worksheet #26 records personnel (or organizations) that are responsible for the proper handling, custody, storage, and disposal of field samples.

SAMPLE COLLECTION, PACKAGING, AND SHIPMENT
Sample Collection (Personnel/Organization): Shaw Field Technician, Geologist, Chemist; or subcontractor to be determined
Sample Packaging (Personnel/Organization): Shaw Field Technician, Geologist, Chemist; or subcontractor to be determined
Coordination of Shipment (Personnel/Organization): Shaw Field Technician, Geologist, Chemist; or subcontractor to be determined
Type of Shipment/Carrier: Laboratory Courier, UPS or FedEx
SAMPLE RECEIPT AND ANALYSIS
Sample Receipt (Personnel/Organization): Accutest Laboratories Southeast
Sample Custody and Storage (Personnel/Organization): Accutest Laboratories Southeast
Sample Preparation (Personnel/Organization): Accutest Laboratories Southeast
Sample Determinative Analysis (Personnel/Organization): Accutest Laboratories Southeast
SAMPLE ARCHIVING
Field Sample Storage (Number of days from sample collection): Shipped to laboratory the same day as collection if possible, if not possible to ship the same day; storage on site in refrigerator or ice-packed cooler in locked building under Chain of Custody.
Sample Extract/Digestate Storage (Number of days from extraction/digestion): Accutest Laboratories Southeast, 40 days after analysis
Biological Sample Storage (Number of days from sample collection): Accutest Laboratories Southeast – Not Applicable
SAMPLE DISPOSAL
Personnel/Organization: Accutest Laboratories Southeast
Number of Days from Analysis: Accutest Laboratories Southeast Hold samples for 90 days (all analyses). Hold metals samples for 6 months.

SAP/QAPP WORKSHEET #27 –
SAMPLE CUSTODY REQUIREMENTS TABLE

27.1 Sample Custody and Documentation

Sampling information will be recorded on a COC record form and/or spreadsheet and in a permanently bound field logbook or Sample Collection Log sheet. All entries will be legible and recorded in indelible ink.

27.2 Sample Labeling

Sample labels will be filled out with indelible ink and affixed to each sample container. Sample labels that may not be waterproof can be covered with clear tape. Sample containers will be placed in re-sealable plastic bags to protect the sample from moisture during transportation to the laboratory. Each sample container will be labeled with the following, at minimum:

- Sample identification number
- Sample collection date (month/day/year)
- Time of collection (24-hour clock)
- Sampler's name or initials
- Analyses to be performed
- Preservation (if any)

27.3 Chain of Custody

In addition to providing a custody exchange record for the samples, the COC record form serves as a formal request for sample analyses. The COC will be completed, signed, and distributed as follows:

- One copy retained by the field team for the sample coordinator and inclusion in the project files
- The original sent to the analytical laboratory with the sample shipment

After the laboratory receives the samples, the Sample Custodian will inventory each shipment before signing for it and note on the original COC form any discrepancy in the number of samples, temperature of the cooler, or broken samples. The Project Chemist will be notified immediately of any problems identified with shipped samples. The Project Chemist will in turn notify the QC Specialist, and together they will determine the appropriate course of action. The Project Chemist will also notify the PM if the project budget and schedule may be impacted.

The laboratory will initiate an internal COC that will track the sample within the various areas of the laboratory. The relinquishing signature of the Sample Custodian and the custody acceptance signature of the laboratory personnel transfer custody of the sample. This procedure is followed each time a sample changes hands. The laboratory will archive the samples and maintain its custody as required by the contract or until further notification from the Project Chemist, at which time the samples will be either returned to the project for disposal or disposed of by the laboratory.

27.4 Sample Packing and Shipment

After sample collection, sample labels will be affixed to each sample container. Each sample will be placed in a re-sealable plastic bag to keep the sample container and label dry. All glass sample containers

will be protected with bubble wrap (or other cushioning material) to prevent breakage. A temperature blank will be placed in every cooler with samples requiring temperature preservation.

Samples to be shipped by commercial carrier will be packed in a sample cooler lined with a plastic bag. If temperature preservation is required, ice, bagged in re-sealable bags, will be added to the cooler in sufficient quantity to keep the samples cooled to less than or equal to 6°C for the duration of the shipment to the laboratory. Sample cooler drain spouts will be taped on the inside and outside of the cooler to prevent any leakage. Saturday deliveries will be coordinated with the laboratory.

If samples are picked up by a laboratory courier service, the COC form will be completed and signed by the laboratory courier. The cooler will then be released to the courier for transportation to the laboratory.

If a commercial carrier is used, the COC form will be sealed in a re-sealable bag placed inside or taped to the inside of the sample cooler lid. The cooler will be taped shut with packing tape, and custody seals will be taped across the cooler lid. Clear tape will be applied to the custody seals to prevent accidental breakage during shipping. The samples will then be shipped to the analytical laboratory. A copy of the courier air bill, which is part of the sample custody records, will be retained for documentation.

The shipping of samples to the analytical laboratory by land delivery services will be performed according to DOT regulations. The International Air Transportation Association regulations will be adhered to when shipping samples by air courier services. Transportation methods will be selected to assure that the samples arrive at the laboratory in time to permit testing according to established holding times and project schedules. Samples will not be accepted by the receiving laboratory without a properly prepared COC record and properly labeled and sealed shipping container(s).

27.5 Field Logbooks

Permanently bound field logbooks or loose field log sheets (Field Activity Daily Log, Sample Collection Logs, etc.) will be used during the project to document activities. All entries will be recorded in indelible ink. Corrections will be made following the procedure described in Section 27.6, "Document Corrections." At the end of each workday, the responsible sampler will sign the logbook pages or field sheets; any unused portions of pages will be crossed out, initialed or signed, and dated.

At a minimum, the logbook or field sheets will contain the following information:

- Project name and location
- Date and time of collection for each sample
- Sample number
- Sample location (i.e., soil boring or sampling point)
- Sample type (i.e., soil and water)
- Composite or grab
- Composite type (the number of grab samples)
- Depth of sample
- Weather information (e.g., rain, sunny, approximate temperature, etc.)
- Containers used (e.g., metal liners, glass bottles, etc.)
- Requested analyses

On graph paper portions of the logbook or field sheets the sampler may fill in the following information:

- A map with sampling locations (drawn or pasted copy). Each sampling location must be clearly identified on the map. Several sampling locations may be presented on one map; however, the page with the map must be referred to on each of the individual sample pages.
- Field analyses performed, including results, instrument checks, problems, and calibration records for field instruments.
- Descriptions of deviations from this SAP/QAPP.
- Problems encountered and corrective action taken.
- Identification of field QC samples and list of QC activities.
- Verbal or written instructions from client personnel and/or Shaw PM.
- Any other events that may affect the samples.

27.6 Document Corrections

Changes or corrections to any project documentation will be made by crossing out the item with a single line, initialing by the person performing the correction, and dating the correction. The original item, although erroneous, will remain legible beneath the cross out. The new information will be written above or near the crossed-out item. Corrections will be written clearly and legibly with indelible ink.

SAP/QAPP WORKSHEET #28 – LABORATORY QC SAMPLES TABLE

28.1 Subcontract Laboratory Qualifications

The subcontract laboratory providing analytical services for the project will meet the requirements stated in the DOD QSM, Version 4.2, and hold a current DOD Environmental Laboratory Accreditation Program accreditation for all appropriate fields-of-testing.

QA personnel for the laboratory will be designated in the laboratory's QA Manual. The laboratory's QA Program will be compliant with the DOD QSM 4.2 (DOD, 2010). The analytical laboratory will designate a PM for each project.

28.2 Laboratory Quality Control Checks

The recovery of known additives is a part of laboratory analytical protocols. The use of additives at known concentrations allows project personnel to detect matrix interferences and to estimate the impact of these interferences when present. It also allows personnel to evaluate the efficiency of extraction procedures and the overall accuracy of analysis. Laboratory internal QC checks will include the following:

- LCS
- Laboratory control sample duplicate (LCSD)
- MS/MSD
- Laboratory duplicates
- Surrogate spikes
- Internal standards
- Method and instrument blanks
- Post-digestion spikes

SAP/QAPP Worksheet #28 will be used to define the acceptance limits for laboratory QC samples. A separate table will be completed for each analytical method and matrix (if necessary).

28.2.1 Laboratory Control Samples

LCSs are matrix-equivalent QC check samples (analyte-free water, laboratory sand, or sodium sulfate) spiked with a known quantity of specific analytes that are carried through the entire sample preparation and analysis process. The spiking solution used for LCS/LCSD preparation is of a source different from the stock that was used to prepare calibration standards.

28.2.2 Laboratory Duplicates

For laboratory sample duplicate analyses, a sample is prepared and analyzed twice. Laboratory sample duplicates are prepared and analyzed with each batch of samples for most inorganic analyses.

28.2.3 Matrix Spikes

MS samples are QC check samples that measure matrix-specific method performance. An MS sample is prepared by adding a known quantity of target analytes to a sample prior to sample digestion or extraction. In general, for organic compound and metal analyses, an MS/MSD pair is prepared and analyzed with each preparation batch or for every 20 field samples. The frequency of MS/MSD analysis

depends on the project DQOs. For inorganic compound analysis, a single matrix spike and a laboratory sample duplicate are often prepared and analyzed with each batch. The LCS results, together with MS results, allow verification of the presence of matrix effects.

28.2.4 Surrogate Spikes

Organic compound analyses include the addition, quantitation, and recovery calculation of surrogate spikes. Compounds selected to serve as surrogate spikes must meet all of the following requirements:

- They are not the target analytes.
- They do not interfere with the determination of target analytes.
- They are not naturally occurring, yet are chemically similar to the target analytes.
- They are compounds exhibiting similar response to target analytes.

Surrogate spikes are added to every project sample, blank sample, and QC check sample at the beginning of the sample preparation process. The surrogate spike recovery is used to monitor matrix effects and losses during sample preparation. Surrogate spike control criteria are applied to all analytical and QC check samples, and if surrogate criteria are not met, reextraction and reanalysis may be performed.

28.2.5 Internal Standards

Some organic compound analyses include the addition, quantitation, and recovery calculation of internal standards. Internal standards are usually synthetic compounds, which are similar in chemical behavior to the target analytes. They are added to sample extracts at the time of instrument analysis and used to quantify results through internal standards calibration procedure. Internal standard recoveries are used to correct for injection and detector variability. GC/MS must use internal standards and have acceptability limits for internal standard areas. Use of internal standard quantitation for GC methods is optional.

28.2.6 Method Blanks

A method blank is used to monitor the laboratory preparation and analysis systems for interferences and contamination from glassware, reagents, sample manipulations, and the general laboratory environment. A method blank is carried through the entire sample preparation process and is included with each batch of samples. Some methods of inorganic analysis do not have a distinctive preparation step. For these tests the instrument blank, which contains all reagents used with samples, is considered to be the method blank.

28.2.7 Instrument Blanks

An instrument blank is used to monitor the cleanliness of the instrument portion of a sample analytical process. Instrument blanks are usually just the solvent or acid solution of the standard used to calibrate the instrument. During metal analyses, 1 instrument blank is usually analyzed for every 10 samples. For GC and GC/MS analysis, instrument blanks are analyzed on an as-needed basis for troubleshooting and chromatography column carryover determination purposes.

28.2.8 Post-Digestion Spikes and the Method of Standard Addition

A post-digestion spike is used during metal analysis to assess analytical interferences that may be caused by general matrix effects or high concentrations of analytes present in the sample. A digested sample is spiked with the analyte of interest at a known concentration, and the spike recovery is used to estimate the presence and magnitude of interferences.

If a post-digestion spike recovery fails to meet acceptance criteria, the MSA may be used to quantify the sample result. The MSA technique compensates for a sample constituent that enhances or depresses the analyte signal. To perform the MSA, known amounts of a standard at different concentrations are added to two to three aliquots of digested sample, and each spiked sample and the original unspiked sample are analyzed. The absorbance is then plotted against the concentration, and the resulting line is extrapolated to zero absorbance. The point of interception with the concentration axis is the indigenous concentration of the analyte in the sample.

SAP/QAPP Worksheet #28a – Laboratory QC Samples Table
Volatile Organic Compounds

Matrix	Soil, Aqueous
Analytical Group	Volatiles
Concentration Level	Low
Sampling SOP	
Analytical Method/ SOP Reference	SW-846 8260/ LAB SOP#MS005
Sampler's Name	
Field Sampling Organization	
Analytical Organization	Accutest Laboratories Southeast, Inc.
Number of Sample Locations	

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	DQI	Measurement Performance Criteria
MS Tuning	Prior to calibration and every 12 hours during sample analysis	Refer to method for specific ion criteria.	Retune instrument and verify. Rerun affected samples. Flagging criteria are not appropriate and problem must be corrected. No samples may be accepted without a valid tune.	Analyst	Laboratory Accuracy	Refer to method for specific ion criteria.
Initial Retention Time window establishment (all targets)	Once per ICAL	Position set using mid-point calibration standard from ICAL	Not Applicable	Analyst	Laboratory Accuracy	Chromatographic system performance
ICAL	As needed (see CCV passing criteria below and SW-846 8000 method)	%RSD <15%, or Correlation coefficient R≥0.995 %RSD for CCC ≤30%, RF for SPCC ≥ 0.01 and 0.03	If the acceptance criteria were not met, re-calibration is performed before any samples may be analyzed.	Analyst	Laboratory Accuracy	%RSD <15%, or Correlation coefficient R≥0.995 %RSD for CCC ≤30%, RF for SPCC ≥ 0.01 and 0.03
ICV	1 per ICAL, analyzed after ICAL, before field samples	%D for CCC ≤25%, poor purgers ≥40%, RF see above	If the acceptance criteria were not met, re-calibration is performed before any samples may be analyzed.	Analyst	Laboratory Accuracy	%D for CCC ≤25%, poor purgers ≥40%, RF see above

SAP/QAPP Worksheet #28a – Laboratory QC Samples Table
Volatile Organic Compounds (Continued)

Matrix	Soil, Aqueous
Analytical Group	Volatiles
Concentration Level	Low
Sampling SOP	
Analytical Method/ SOP Reference	SW-846 8260/ LAB SOP#MS005
Sampler's Name	
Field Sampling Organization	
Analytical Organization	Accutest Laboratories Southeast, Inc.
Number of Sample Locations	

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	DQI	Measurement Performance Criteria
CCV	1 per analytical run. Analytical run not to exceed 12 hours.	%D for CCC ≤20%, RF see above	If the criterion has not achieved corrective action, re-calibration is performed before any samples may be analyzed. Corrective action may include re-analysis of the samples.	Analyst	Laboratory Accuracy	%D for CCC ≤20%, RF see above
Evaluation of absolute retention time shift (Internal Standards only)	Every CCV	Within 30 sec of initial Retention Time (ICAL mid-point)	Determine source of malfunction, perform maintenance and verify. Rerun affected samples. Rerun ICAL, if necessary. Flagging criteria are not appropriate and problem must be corrected	Analyst	Laboratory Accuracy	Overall chromatographic system performance
Evaluation of relative retention time shift (all targets)	Every injection following CCV	Within 0.06% of daily CCV RT	Determine source of malfunction, perform maintenance and verify. Rerun affected samples. Flagging criteria are not appropriate and problem must be corrected	Analyst	Laboratory Accuracy	Overall chromatographic system performance

SAP/QAPP Worksheet #28a – Laboratory QC Samples Table
Volatile Organic Compounds (Continued)

Matrix	Soil, Aqueous
Analytical Group	Volatiles
Concentration Level	Low
Sampling SOP	
Analytical Method/ SOP Reference	SW-846 8260/ LAB SOP#MS005
Sampler's Name	
Field Sampling Organization	
Analytical Organization	Accutest Laboratories Southeast, Inc.
Number of Sample Locations	

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	DQI	Measurement Performance Criteria
MB	1 per extraction batch	<1/2 RL	The source of the contamination is investigated and eliminated before proceeding with further analysis. Corrective actions are: 1. Samples ND – report without qualification 2. Samples >10X contamination level – report with qualification 3. Samples <10x contamination – re-extract and reanalyze. Insufficient sample - qualify and footnote	Analyst	Absence of interference/contamination	<1/2 RL

SAP/QAPP Worksheet #28a – Laboratory QC Samples Table
Volatile Organic Compounds (Continued)

Matrix	Soil, Aqueous
Analytical Group	Volatiles
Concentration Level	Low
Sampling SOP	
Analytical Method/ SOP Reference	SW-846 8260/ LAB SOP#MS005
Sampler's Name	
Field Sampling Organization	
Analytical Organization	Accutest Laboratories Southeast, Inc.
Number of Sample Locations	

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	DQI	Measurement Performance Criteria
LCS	1 per extraction batch	%Recovery = (Calculated Value/True Value) *100%	Source of poor recovery is investigated and eliminated before proceeding with further analysis, corrective actions are: 1. Biased high, samples ND – report without qualifications. 2. Biased low – re-extract and reanalyze. Insufficient volume – qualify and footnote	Analyst	Laboratory Accuracy/Method bias in ideal matrix	%Recovery = (Calculated Value/True Value) *100%
MS	1 per 20 samples or 1 for each extraction batch	%Recovery = (Calculated Value - Sample Value/True Value) *100%	If the recoveries indicate that the problem is procedure related, re-extraction and re-analysis is required. If the recoveries indicate that the failures are matrix-related, refer to Blank Spike as measure of method performance in clean matrix.	Analyst	Precision and Accuracy in field samples	%Recovery = (Calculated Value - Sample Value/True Value) *100%

SAP/QAPP Worksheet #28a – Laboratory QC Samples Table
Volatile Organic Compounds (Continued)

Matrix	Soil, Aqueous
Analytical Group	Volatiles
Concentration Level	Low
Sampling SOP	
Analytical Method/ SOP Reference	SW-846 8260/ LAB SOP#MS005
Sampler's Name	
Field Sampling Organization	
Analytical Organization	Accutest Laboratories Southeast, Inc.
Number of Sample Locations	

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	DQI	Measurement Performance Criteria
MSDs	1 per 20 samples or 1 for each extraction batch	%Recovery = (Calculated Value – Sample Value/True Value) *100% RPD (%) = [(XA-XB)/XM] * 100 Where: XA and XB are the concentration in the MS and MSD, and XM is the average value of the concentrations in the MS and MSD, (XA + XB)/2	See above	Analyst	Precision and Accuracy in field samples	%Recovery = (Calculated Value – Sample Value/True Value) *100% RPD (%) = [(XA-XB)/XM] * 100 Where: XA and XB are the concentration in the MS and MSD, and XM is the average value of the concentrations in the MS and MSD, (XA + XB)/2

SAP/QAPP Worksheet #28a – Laboratory QC Samples Table
Volatile Organic Compounds (Concluded)

Matrix	Soil, Aqueous
Analytical Group	Volatiles
Concentration Level	Low
Sampling SOP	
Analytical Method/ SOP Reference	SW-846 8260/ LAB SOP#MS005
Sampler's Name	
Field Sampling Organization	
Analytical Organization	Accutest Laboratories Southeast, Inc.
Number of Sample Locations	

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	DQI	Measurement Performance Criteria
Surrogate Spikes	Every sample	%Recovery = (Calculated Value/True Value) *100%	Reason for poor recoveries is investigated and eliminated before further analytical activities. Corrective actions are: 1. High bias, samples ND – report without qualification. 2. Low bias – re-extract and reanalyze. Insufficient volume – qualify and footnote	Analyst	Individual sample preparation efficiency control	%Recovery = (Calculated Value/True Value) *100%
Internal standards (IS)	Every sample	IS Area = -50% to +100% of CCV	If failure is due to instrument performance issues, the problem must be identified, corrected, and the sample must be re-analyzed. If no instrument problem is found the sample must be re-analyzed. If upon re-analysis the responses are still not within limits, the problem may be considered sample matrix interference.	Analyst	Instrument sensitivity control	IS Area = -50% to +100% of CCV

SAP/QAPP Worksheet #28b – Laboratory QC Samples Table
Semivolatile Organic Compounds

Matrix	Soil, Aqueous
Analytical Group	Semivolatiles
Concentration Level	Low
Analytical Method/ SOP Reference	SW-846 8270D/LAB SOP#MS011
Analytical Organization	Accutest Laboratories Southeast, Inc.

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	DQI	Measurement Performance Criteria
MS tuning – DFTPP/DDT/PCP/Benzidine	Prior to calibration and every 12 hours during sample analysis	Passing DFTPP breakdown criteria, DDT breakdown <20%, PCP and Benzidine tailing factor <2	Retune instrument and verify. Rerun affected samples. Flagging criteria are not appropriate and problem must be corrected. No samples may be accepted without a valid tune.	Analyst	Laboratory Accuracy	Refer to method for specific ion criteria.
ICAL	As needed (see CCV passing criteria below and SW-846 8000 method)	%RSD <20%, Correlation coefficient R>0.995	If the acceptance criteria were not met, re-calibration is performed before any samples may be analyzed.	Analyst	Laboratory Accuracy	%RSD <20%, Correlation coefficient R>0.995, minimum RF met for all analytes on all calibration levels
Initial Retention Time window establishment (all targets)	Once per ICAL	Position set using mid-point calibration standard from ICAL	Not Applicable	Analyst	Laboratory Accuracy	Chromatographic system performance
ICV	1 per ICAL, analyzed after ICAL, before field samples	%D for all analytes <20%, RF for SPCC >0.05, each calibration level	If the acceptance criteria were not met, re-calibration is performed before any samples may be analyzed.	Analyst	Laboratory Accuracy	%D for all analytes <20%,

SAP/QAPP Worksheet #28b – Laboratory QC Samples Table
Semivolatile Organic Compounds (Continued)

Matrix	Soil, Aqueous
Analytical Group	Semivolatiles
Concentration Level	Low
Analytical Method/ SOP Reference	SW-846 8270D/LAB SOP#MS011
Analytical Organization	Accutest Laboratories Southeast, Inc.

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	DQI	Measurement Performance Criteria
CCV	1 per analytical run. Analytical run not to exceed 12 hours.	%D for all analytes <20%, RF for SPCC >0.05, each calibration level	If the criterion has not achieved corrective action, re-calibration is performed before any samples may be analyzed. Corrective action may include re-analysis of the samples.	Analyst	Laboratory Accuracy	%D for all analytes <20%,
Evaluation of absolute retention time shift (Internal Standards only)	Every CCV	Within 30 sec of initial Retention Time (ICAL mid-point)	Determine source of malfunction, perform maintenance and verify. Rerun affected samples. Rerun ICAL, if necessary. Flagging criteria are not appropriate and problem must be corrected	Analyst	Laboratory Accuracy	Overall chromatographic system performance

SAP/QAPP Worksheet #28b – Laboratory QC Samples Table
Semivolatile Organic Compounds (Continued)

Matrix	Soil, Aqueous
Analytical Group	Semivolatiles
Concentration Level	Low
Analytical Method/ SOP Reference	SW-846 8270D/LAB SOP#MS011
Analytical Organization	Accutest Laboratories Southeast, Inc.

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	DQI	Measurement Performance Criteria
Evaluation of relative retention time shift (all targets)	Every injection following CCV	Within 0.06% of daily CCV RT	Determine source of malfunction, perform maintenance and verify. Rerun affected samples. Flagging criteria are not appropriate and problem must be corrected	Analyst	Laboratory Accuracy	Overall chromatographic system performance
MB	1 per extraction batch	<1/2 RL	The source of the contamination is investigated and eliminated before proceeding with further analysis. Corrective actions are: 1. Samples ND – report without qualification 2. Samples >10X contamination level – report with qualification 3. Samples <10x contamination – re-extract and reanalyze. Insufficient sample - qualify and footnote	Analyst/Prep analyst	Absence of interference/contamination	<1/2 RL

SAP/QAPP Worksheet #28b – Laboratory QC Samples Table
Semivolatile Organic Compounds (Continued)

Matrix	Soil, Aqueous
Analytical Group	Semivolatiles
Concentration Level	Low
Analytical Method/ SOP Reference	SW-846 8270D/LAB SOP#MS011
Analytical Organization	Accutest Laboratories Southeast, Inc.

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	DQI	Measurement Performance Criteria
LCS	1 per extraction batch	%Recovery = (Calculated Value/True Value) *100%	Source of poor recovery is investigated and eliminated before proceeding with further analysis, corrective actions are: 1. Biased high, samples ND – report without qualifications. 2. Biased low – re-extract and reanalyze. Insufficient volume – qualify and footnote	Analyst/Prep analyst	Laboratory Accuracy/Method bias in ideal matrix	%Recovery = (Calculated Value/True Value) *100%
MS	1 per 20 samples or 1 for each extraction batch	%Recovery = (Calculated Value - Sample Value/True Value) *100%	If the recoveries indicate that the problem is procedure related, re-extraction and re-analysis is required. If the recoveries indicate that the failures are matrix-related, refer to Blank Spike as measure of method performance in clean matrix. The project Chemist will be contacted and a decision will be made to either report the data as is with a notation in the analytical narrative or if the samples should be re-extract and re-analyzed.	Analyst/Prep analyst	Precision and Accuracy in field samples	%Recovery = (Calculated Value - Sample Value/True Value) *100%

SAP/QAPP Worksheet #28b – Laboratory QC Samples Table
Semivolatile Organic Compounds (Continued)

Matrix	Soil, Aqueous
Analytical Group	Semivolatiles
Concentration Level	Low
Analytical Method/ SOP Reference	SW-846 8270D/LAB SOP#MS011
Analytical Organization	Accutest Laboratories Southeast, Inc.

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	DQI	Measurement Performance Criteria
MSDs	1 per 20 samples or 1 for each extraction batch	%Recovery = (Calculated Value – Sample Value/True Value) *100% RPD (%) = [(XA-XB)/XM] * 100 Where: XA and XB are the concentration in the MS and MSD, and XM is the average value of the concentrations in the MS and MSD, (XA + XB)/2	See above	Analyst/Prep analyst	Precision and Accuracy in field samples	%Recovery = (Calculated Value – Sample Value/True Value) *100% RPD (%) = [(XA-XB)/XM] * 100 Where: XA and XB are the concentration in the MS and MSD, and XM is the average value of the concentrations in the MS and MSD, (XA + XB)/2
Surrogate Spikes	Every sample	%Recovery = (Calculated Value/True Value) *100%	Reason for poor recoveries is investigated and eliminated before further analytical activities. Corrective actions are: 1. High bias, samples ND – report without qualification. 2. Low bias – re-extract and reanalyze. Insufficient volume – qualify and footnote	Analyst/Prep analyst	Individual sample preparation efficiency control	%Recovery = (Calculated Value/True Value) *100%

SAP/QAPP Worksheet #28b – Laboratory QC Samples Table
Semivolatile Organic Compounds (Concluded)

Matrix	Soil, Aqueous
Analytical Group	Semivolatiles
Concentration Level	Low
Analytical Method/ SOP Reference	SW-846 8270D/LAB SOP#MS011
Analytical Organization	Accutest Laboratories Southeast, Inc.

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	DQI	Measurement Performance Criteria
IS	Every sample	IS Area = -50% to +100% of CCV	If failure is due to instrument performance issues, the problem must be identified, corrected, and the sample must be re-analyzed. If no instrument problem is found the sample must be re-analyzed. If upon re-analysis the responses are still not within limits, the problem may be considered sample matrix interference.	Analyst	Instrument sensitivity control	IS Area = -50% to +100% of CCV

SAP/QAPP Worksheet #28c – Laboratory QC Samples Table
Total Petroleum Hydrocarbons (TPH), Gasoline Range Organics (GRO)

Matrix	Soil, Aqueous
Analytical Group	GRO Petroleum
Concentration Level	Low
Analytical Method/ SOP Reference	SW-846 8015D/LAB SOP#GC010
Analytical Organization	Accutest Laboratories Southeast, Inc.

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	DQI	Measurement Performance Criteria
ICAL	As needed (see CCV passing criteria below and SW-846 8000 method)	%RSD <20%, or Correlation coefficient R≥0.995	If the acceptance criteria were not met, re-calibration is performed before any samples may be analyzed.	Laboratory Analyst	Laboratory Accuracy	%RSD <20%, or Correlation coefficient R≥0.995
ICV	1 per ICAL, analyzed after ICAL, before field samples	%D ≤15%	If the acceptance criteria were not met, re-calibration is performed before any samples may be analyzed.	Laboratory Analyst	Laboratory Accuracy	%D ≤15%
CCV	Opening CCV, then every 10 samples, with closing CCV	%D ≤15%	If the criterion has not achieved corrective action, re-calibration is performed before any samples may be analyzed. Corrective action may include re-analysis of the samples.	Laboratory Analyst	Laboratory Accuracy	%D ≤15%

SAP/QAPP Worksheet #28c – Laboratory QC Samples Table
Total Petroleum Hydrocarbons (TPH), Gasoline Range Organics (GRO) (Continued)

Matrix	Soil, Aqueous
Analytical Group	GRO Petroleum
Concentration Level	Low
Analytical Method/ SOP Reference	SW-846 8015D/LAB SOP#GC010
Analytical Organization	Accutest Laboratories Southeast, Inc.

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	DQI	Measurement Performance Criteria
MB	1 per extraction batch	<1/2 RL	The source of the contamination is investigated and eliminated before proceeding with further analysis. Corrective actions are: 1. Samples ND – report without qualification 2. Samples >10X contamination level – report with qualification 3. Samples <10x contamination – re-extract and reanalyze. Insufficient sample - qualify and footnote	Laboratory Analyst	Absence of interference/contamination	<1/2 RL
LCS	1 per extraction batch	%Recovery = (Calculated Value/True Value) *100%	Source of poor recovery is investigated and eliminated before proceeding with further analysis, corrective actions are: 1. Biased high, samples ND – report without qualifications. 2. Biased low – re-extract and reanalyze. Insufficient volume – qualify and footnote	Laboratory Analyst	Laboratory Accuracy/Method bias in ideal matrix	%Recovery = (Calculated Value/True Value) *100%

SAP/QAPP Worksheet #28c – Laboratory QC Samples Table
Total Petroleum Hydrocarbons (TPH), Gasoline Range Organics (GRO) (Continued)

Matrix	Soil, Aqueous
Analytical Group	GRO Petroleum
Concentration Level	Low
Analytical Method/ SOP Reference	SW-846 8015D/LAB SOP#GC010
Analytical Organization	Accutest Laboratories Southeast, Inc.

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	DQI	Measurement Performance Criteria
MS	1 per 20 samples or 1 for each extraction batch	%Recovery = (Calculated Value - Sample Value/True Value) *100%	If the recoveries indicate that the problem is procedure related, re-extraction and re-analysis is required. If the recoveries indicate that the failures are matrix-related, refer to Blank Spike as measure of method performance in clean matrix. The Shaw Chemist will be contacted and a decision will be made to either report the data as is with a notation in the analytical narrative or if the samples should be re-extract and re-analyzed.	Laboratory Analyst	Precision and Accuracy in field samples	%Recovery = (Calculated Value - Sample Value/True Value) *100%

SAP/QAPP Worksheet #28c – Laboratory QC Samples Table
Total Petroleum Hydrocarbons (TPH), Gasoline Range Organics (GRO) (Concluded)

Matrix	Soil, Aqueous
Analytical Group	GRO Petroleum
Concentration Level	Low
Analytical Method/ SOP Reference	SW-846 8015D/LAB SOP#GC010
Analytical Organization	Accutest Laboratories Southeast, Inc.

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	DQI	Measurement Performance Criteria
MSDs	1 per 20 samples or 1 for each extraction batch	%Recovery = (Calculated Value – Sample Value/True Value) *100% RPD (%) = [(XA-XB)/XM] * 100 Where: XA and XB are the concentration in the MS and MSD, and XM is the average value of the concentrations in the MS and MSD, (XA + XB)/2	See above	Laboratory Analyst	Precision and Accuracy in field samples	%Recovery = (Calculated Value – Sample Value/True Value) *100% RPD (%) = [(XA-XB)/XM] * 100 Where: XA and XB are the concentration in the MS and MSD, and XM is the average value of the concentrations in the MS and MSD, (XA + XB)/2
Surrogate Spikes	Every sample	%Recovery = (Calculated Value/True Value) *100%	Reason for poor recoveries is investigated and eliminated before further analytical activities. Corrective actions are: 1. High bias, samples ND – report without qualification. 2. Low bias – re-extract and reanalyze. Insufficient volume – qualify and footnote	Laboratory Analyst	Individual sample preparation efficiency control	%Recovery = (Calculated Value/True Value) *100%

SAP/QAPP Worksheet #28d – Laboratory QC Samples Table
Total Petroleum Hydrocarbons (TPH), Diesel Range (DRO) and Oil Range (ORO) Organics

Matrix	Soil, Aqueous
Analytical Group	DRO/ORO Petroleum
Concentration Level	Low
Analytical Method/ SOP Reference	SW-846 8015 DRO/LAB SOP#GC011
Analytical Organization	Accutest Laboratories Southeast, Inc.

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	DQI	Measurement Performance Criteria
ICAL	As needed (see CCV passing criteria below and SW-846 8000 method)	%RSD <20%, or Correlation coefficient R≥0.995	If the acceptance criteria were not met, re-calibration is performed before any samples may be analyzed.	Laboratory Analyst	Laboratory Accuracy	%RSD <20%, or Correlation coefficient R≥0.995
ICV	1 per ICAL, analyzed after ICAL, before field samples	%D ≤15%	If the acceptance criteria were not met, re-calibration is performed before any samples may be analyzed.	Laboratory Analyst	Laboratory Accuracy	%D ≤15%
CCV	Opening CCV, then every 10 samples, with closing CCV	%D ≤15%	If the criterion has not achieved corrective action, re-calibration is performed before any samples may be analyzed. Corrective action may include re-analysis of the samples.	Laboratory Analyst	Laboratory Accuracy	%D ≤15%

SAP/QAPP Worksheet #28d – Laboratory QC Samples Table
Total Petroleum Hydrocarbons (TPH), Diesel Range (DRO) and Oil Range (ORO) Organics (Continued)

Matrix	Soil, Aqueous
Analytical Group	DRO/ORO Petroleum
Concentration Level	Low
Analytical Method/ SOP Reference	SW-846 8015 DRO/LAB SOP#GC011
Analytical Organization	Accutest Laboratories Southeast, Inc.

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	DQI	Measurement Performance Criteria
MB	1 per extraction batch	<1/2 RL	The source of the contamination is investigated and eliminated before proceeding with further analysis. Corrective actions are: 1. Samples ND – report without qualification 2. Samples >10X contamination level – report with qualification 3. Samples <10x contamination – re-extract and reanalyze. Insufficient sample - qualify and footnote	Laboratory Analyst/Prep Analyst	Absence of interference/contamination	<1/2 RL
LCS	1 per extraction batch	%Recovery = (Calculated Value/True Value) *100%	Source of poor recovery is investigated and eliminated before proceeding with further analysis, corrective actions are: 1. Biased high, samples ND – report without qualifications. 2. Biased low – re-extract and reanalyze. Insufficient volume – qualify and footnote	Laboratory Analyst/Prep Analyst	Laboratory Accuracy/Method bias in ideal matrix	%Recovery = (Calculated Value/True Value) *100%

SAP/QAPP Worksheet #28d – Laboratory QC Samples Table
Total Petroleum Hydrocarbons (TPH), Diesel Range (DRO) and Oil Range (ORO) Organics (Continued)

Matrix	Soil, Aqueous
Analytical Group	DRO/ORO Petroleum
Concentration Level	Low
Analytical Method/ SOP Reference	SW-846 8015 DRO/LAB SOP#GC011
Analytical Organization	Accutest Laboratories Southeast, Inc.

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	DQI	Measurement Performance Criteria
MS	1 per 20 samples or 1 for each extraction batch	%Recovery = (Calculated Value - Sample Value/True Value) *100%	If the recoveries indicate that the problem is procedure related, re-extraction and re-analysis is required. If the recoveries indicate that the failures are matrix-related, refer to Blank Spike as measure of method performance in clean matrix. The Shaw Chemist will be contacted and a decision will be made to either report the data as is with a notation in the analytical narrative or if the samples should be re-extract and re-analyzed.	Laboratory Analyst/Prep Analyst	Precision and Accuracy in field samples	%Recovery = (Calculated Value - Sample Value/True Value) *100%

SAP/QAPP Worksheet #28d – Laboratory QC Samples Table
Total Petroleum Hydrocarbons (TPH), Diesel Range (DRO) and Oil Range (ORO) Organics (Concluded)

Matrix	Soil, Aqueous
Analytical Group	DRO/ORO Petroleum
Concentration Level	Low
Analytical Method/ SOP Reference	SW-846 8015 DRO/LAB SOP#GC011
Analytical Organization	Accutest Laboratories Southeast, Inc.

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	DQI	Measurement Performance Criteria
MSDs	1 per 20 samples or 1 for each extraction batch	%Recovery = (Calculated Value – Sample Value/True Value) *100% RPD (%) = [(XA-XB)/XM] * 100 Where: XA and XB are the concentration in the MS and MSD, and XM is the average value of the concentrations in the MS and MSD, (XA + XB)/2	See above	Laboratory Analyst/Prep Analyst	Precision and Accuracy in field samples	%Recovery = (Calculated Value – Sample Value/True Value) *100% RPD (%) = [(XA-XB)/XM] * 100 Where: XA and XB are the concentration in the MS and MSD, and XM is the average value of the concentrations in the MS and MSD, (XA + XB)/2
Surrogate Spikes	Every sample	%Recovery = (Calculated Value/True Value) *100%	Reason for poor recoveries is investigated and eliminated before further analytical activities. Corrective actions are: 1. High bias, samples ND – report without qualification. 2. Low bias – re-extract and reanalyze. Insufficient volume – qualify and footnote	Laboratory Analyst/Prep Analyst	Individual sample preparation efficiency control	%Recovery = (Calculated Value/True Value) *100%

SAP/QAPP Worksheet #28e – Laboratory QC Samples Table
Organochlorine Pesticides

Matrix	Aqueous, Soil
Analytical Group	Pesticides
Concentration Level	Low
Analytical Method/ SOP Reference	SW-846 8081B/LAB SOP#GC015
Analytical Organization	Accutest Laboratories Southeast, Inc.

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	DQI	Measurement Performance Criteria
ICAL	As needed (see CCV passing criteria below and SW-846 8000 method)	%RSD <20%, or Correlation coefficient R≥0.995	If the acceptance criteria were not met, re-calibration is performed before any samples may be analyzed.	Analyst	Laboratory Accuracy	%RSD <20%, or Correlation coefficient R≥0.995
ICV	1 per ICAL, analyzed after ICAL, before field samples	%D ≤20%	If the acceptance criteria were not met, re-calibration is performed before any samples may be analyzed.	Analyst	Laboratory Accuracy	%D ≤20%
CCV	Opening CCV, then every 10 samples, with closing CCV	%D ≤20%	If the criterion has not achieved corrective action, re-calibration is performed before any samples may be analyzed. Corrective action may include re-analysis of the samples.	Analyst	Laboratory Accuracy	%D ≤20%

SAP/QAPP Worksheet #28e – Laboratory QC Samples Table
Organochlorine Pesticides (Continued)

Matrix	Aqueous, Soil
Analytical Group	Pesticides
Concentration Level	Low
Analytical Method/ SOP Reference	SW-846 8081B/LAB SOP#GC015
Analytical Organization	Accutest Laboratories Southeast, Inc.

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	DQI	Measurement Performance Criteria
MB	1 per extraction batch	<1/2 RL	The source of the contamination is investigated and eliminated before proceeding with further analysis. Corrective actions are: 1. Samples ND – report without qualification 2. Samples >10X contamination level – report with qualification 3. Samples <10x contamination – re-extract and reanalyze. Insufficient sample - qualify and footnote	Analyst/Prep analyst	Absence of interference/contamination	<1/2 RL
LCS	1 per extraction batch	%Recovery = (Calculated Value/True Value) *100%	Source of poor recovery is investigated and eliminated before proceeding with further analysis, corrective actions are: 1. Biased high, samples ND – report without qualifications. 2. Biased low – re-extract and reanalyze. Insufficient volume – qualify and footnote	Analyst/Prep analyst	Laboratory Accuracy/Method bias in ideal matrix	%Recovery = (Calculated Value/True Value) *100%

SAP/QAPP Worksheet #28e – Laboratory QC Samples Table
Organochlorine Pesticides (Continued)

Matrix	Aqueous, Soil
Analytical Group	Pesticides
Concentration Level	Low
Analytical Method/ SOP Reference	SW-846 8081B/LAB SOP#GC015
Analytical Organization	Accutest Laboratories Southeast, Inc.

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	DQI	Measurement Performance Criteria
MS	1 per 20 samples or 1 for each extraction batch	%Recovery = (Calculated Value - Sample Value/True Value) *100%	If the recoveries indicate that the problem is procedure related, re-extraction and re-analysis is required. If the recoveries indicate that the failures are matrix-related, refer to Blank Spike as measure of method performance in clean matrix. The Shaw Chemist will be contacted and a decision will be made to either report the data as is with a notation in the analytical narrative or if the samples should be re-extract and re-analyzed.	Analyst/Prep analyst	Precision and Accuracy in field samples	%Recovery = (Calculated Value - Sample Value/True Value) *100%

SAP/QAPP Worksheet #28e – Laboratory QC Samples Table
Organochlorine Pesticides (Concluded)

Matrix	Aqueous, Soil
Analytical Group	Pesticides
Concentration Level	Low
Analytical Method/ SOP Reference	SW-846 8081B/LAB SOP#GC015
Analytical Organization	Accutest Laboratories Southeast, Inc.

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	DQI	Measurement Performance Criteria
MSDs	1 per 20 samples or 1 for each extraction batch	%Recovery = (Calculated Value – Sample Value/True Value) *100% RPD (%) = [(XA-XB)/XM] * 100 Where: XA and XB are the concentration in the MS and MSD, and XM is the average value of the concentrations in the MS and MSD, (XA + XB)/2	See above	Analyst/Prep analyst	Precision and Accuracy in field samples	%Recovery = (Calculated Value – Sample Value/True Value) *100% RPD (%) = [(XA-XB)/XM] * 100 Where: XA and XB are the concentration in the MS and MSD, and XM is the average value of the concentrations in the MS and MSD, (XA + XB)/2
Surrogate Spikes	Every sample	%Recovery = (Calculated Value/True Value) *100%	Reason for poor recoveries is investigated and eliminated before further analytical activities. Corrective actions are: 1. High bias, samples ND – report without qualification. 2. Low bias – re-extract and reanalyze. Insufficient volume – qualify and footnote	Analyst/Prep analyst	Individual sample preparation efficiency control	%Recovery = (Calculated Value/True Value) *100%

SAP/QAPP Worksheet #28f – Laboratory QC Samples Table
Chlorinated Herbicides

Matrix	Aqueous, Soil
Analytical Group	Herbicides
Concentration Level	Low
Analytical Method/ SOP Reference	SW-846 8151A/ LAB SOP#GC031
Analytical Organization	Accutest Laboratories Southeast, Inc.

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	DQI	Measurement Performance Criteria
ICAL	As needed (see CCV passing criteria below and SW-846 8000 method)	%RSD ≤20%	If the acceptance criteria were not met, re-calibration is performed before any samples may be analyzed.	Analyst	Laboratory Accuracy	%RSD ≤20%
ICV	1 per ICAL, analyzed after ICAL, before field samples	%D ≤15%	If the acceptance criteria were not met, ICV is reanalyzed, if the criterion is still not met after reanalysis, a new ICV is prepared with fresh ampule and the process repeated. If the criterion is still not met after re-preparation, re-calibration is performed before any samples may be analyzed.	Analyst	Laboratory Accuracy	%D ≤15%
CCV	Opening CCV, then every 10 samples, with closing CCV	%D ≤15%	If the criterion has not achieved corrective action, re-calibration is performed before any samples may be analyzed. Corrective action may include re-analysis of the samples.	Analyst	Laboratory Accuracy	%D ≤15%

SAP/QAPP Worksheet #28f – Laboratory QC Samples Table
Chlorinated Herbicides (Continued)

Matrix	Aqueous, Soil
Analytical Group	Herbicides
Concentration Level	Low
Analytical Method/ SOP Reference	SW-846 8151A/ LAB SOP#GC031
Analytical Organization	Accutest Laboratories Southeast, Inc.

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	DQI	Measurement Performance Criteria
MB	1 per extraction batch*	> MDL	The source of the contamination is investigated and eliminated before proceeding with further analysis. Corrective actions are: 1. Samples ND – report without qualification 2. Samples >10X contamination level – report with qualification 3. Samples <10x contamination – re-extract and reanalyze. Insufficient sample - qualify and footnote	Analyst/Prep analyst	Absence of interference/contamination	> MDL
BS/LCS	1 per extraction batch*	%Recovery = (Calculated Value/True Value) *100% % Recoveries are assessed using in house limits.	Source of poor recovery is investigated and eliminated before proceeding with further analysis, corrective actions are: 1. Biased high, samples ND – report without qualifications. 2. Biased low – re-extract and reanalyze. Insufficient volume – qualify and footnote	Analyst/Prep analyst	Laboratory Accuracy/Method bias in ideal matrix	%Recovery = (Calculated Value/True Value) *100% % Recoveries are assessed using in house limits.

SAP/QAPP Worksheet #28f – Laboratory QC Samples Table
Chlorinated Herbicides (Continued)

Matrix	Aqueous, Soil
Analytical Group	Herbicides
Concentration Level	Low
Analytical Method/ SOP Reference	SW-846 8151A/ LAB SOP#GC031
Analytical Organization	Accutest Laboratories Southeast, Inc.

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	DQI	Measurement Performance Criteria
MS	1 per extraction batch*	%Recovery = (Calculated Value - Sample Value/True Value) *100% % Recoveries are assessed using in house limits.	If the recoveries indicate that the problem is procedure related, re-extraction and re-analysis is required. If the recoveries indicate that the failures are matrix-related, refer to Blank Spike as measure of method performance in clean matrix. The Shaw Chemist will be contacted and a decision will be made to either report the data as is with a notation in the analytical narrative or if the samples should be re-extract and re-analyzed.	Analyst/Prep analyst	Precision and Accuracy in field samples	%Recovery = (Calculated Value - Sample Value/True Value) *100% % Recoveries are assessed using in house limits.

SAP/QAPP Worksheet #28f – Laboratory QC Samples Table
Chlorinated Herbicides (Concluded)

Matrix	Aqueous, Soil
Analytical Group	Herbicides
Concentration Level	Low
Analytical Method/ SOP Reference	SW-846 8151A/ LAB SOP#GC031
Analytical Organization	Accutest Laboratories Southeast, Inc.

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	DQI	Measurement Performance Criteria
MSDs	1 per extraction batch*	%Recovery = (Calculated Value – Sample Value/True Value) *100% RPD (%) = [(XA-XB)/XM] * 100 Where: XA and XB are the concentration in the MS and MSD, and XM is the average value of the concentrations in the MS and MSD, (XA + XB)/2	See above	Analyst/Prep analyst	Precision and Accuracy in field samples	%Recovery = (Calculated Value – Sample Value/True Value) *100% RPD (%) = [(XA-XB)/XM] * 100 Where: XA and XB are the concentration in the MS and MSD, and XM is the average value of the concentrations in the MS and MSD, (XA + XB)/2
Surrogate Spikes	Every sample and standard	%Recovery = (Calculated Value/True Value) *100%	Reason for poor recoveries is investigated and eliminated before further analytical activities. Corrective actions are: 1. High bias, samples ND – report without qualification. 2. Low bias – re-extract and reanalyze. Insufficient volume – qualify and footnote	Analyst/Prep analyst	Individual sample preparation efficiency control	%Recovery = (Calculated Value/True Value) *100%

SAP/QAPP Worksheet #28g – Laboratory QC Samples Table
Polychlorinated Biphenyls (PCB) Aroclors

Matrix	Soil, Aqueous
Analytical Group	PCBs
Concentration Level	Low
Analytical Method/ SOP Reference	SW-846 8082A/LAB SOP#GC014
Analytical Organization	Accutest Laboratories Southeast, Inc.

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	DQI	Measurement Performance Criteria
ICAL	As needed (see CCV passing criteria below and SW-846 8000 method)	%RSD ≤20%, or Correlation coefficient R≥0.995	If the acceptance criteria were not met, re-calibration is performed before any samples may be analyzed.	Analyst	Laboratory Accuracy	%RSD ≤20%, or Correlation coefficient R≥0.995
ICV	1 per ICAL, analyzed after ICAL, before field samples	%D ≤20%	If the acceptance criteria were not met, re-calibration is performed before any samples may be analyzed.	Analyst	Laboratory Accuracy	%D ≤20%
CCV	Opening CCV, then every 10 samples, with closing CCV	%D ≤20%	If the criterion has not achieved corrective action, re-calibration is performed before any samples may be analyzed. Corrective action may include re-analysis of the samples.	Analyst	Laboratory Accuracy	%D ≤20%
MB	1 per extraction batch	<1/2 RL	The source of the contamination is investigated and eliminated before proceeding with further analysis. Corrective actions are: 1. Samples ND – report without qualification 2. Samples >10X contamination level – report with qualification 3. Samples <10x contamination – re-extract and reanalyze. Insufficient sample - qualify and footnote	Analyst/Prep analyst	Absence of interference/contamination	<1/2 RL

SAP/QAPP Worksheet #28g – Laboratory QC Samples Table
Polychlorinated Biphenyls (PCB) Aroclors (Continued)

Matrix	Soil, Aqueous
Analytical Group	PCBs
Concentration Level	Low
Analytical Method/ SOP Reference	SW-846 8082A/LAB SOP#GC014
Analytical Organization	Accutest Laboratories Southeast, Inc.

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	DQI	Measurement Performance Criteria
LCS	1 per extraction batch	%Recovery = (Calculated Value/True Value) *100%	Source of poor recovery is investigated and eliminated before proceeding with further analysis, corrective actions are: 1. Biased high, samples ND – report without qualifications. 2. Biased low – re-extract and reanalyze. Insufficient volume – qualify and footnote	Analyst/Prep analyst	Laboratory Accuracy/Method bias in ideal matrix	%Recovery = (Calculated Value/True Value) *100%
MS	1 per 20 samples or 1 for each extraction batch	%Recovery = (Calculated Value - Sample Value/True Value) *100%	If the recoveries indicate that the problem is procedure related, re-extraction and re-analysis is required. If the recoveries indicate that the failures are matrix-related, refer to Blank Spike as measure of method performance in clean matrix.	Analyst/Prep analyst	Precision and Accuracy in field samples	%Recovery = (Calculated Value - Sample Value/True Value) *100%

SAP/QAPP Worksheet #28g – Laboratory QC Samples Table
Polychlorinated Biphenyls (PCB) Aroclors (Concluded)

Matrix	Soil, Aqueous
Analytical Group	PCBs
Concentration Level	Low
Analytical Method/ SOP Reference	SW-846 8082A/LAB SOP#GC014
Analytical Organization	Accutest Laboratories Southeast, Inc.

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	DQI	Measurement Performance Criteria
MSDs	1 per 20 samples or 1 for each extraction batch	%Recovery = (Calculated Value – Sample Value/True Value) *100% RPD (%) = [(XA-XB)/XM] * 100 Where: XA and XB are the concentration in the MS and MSD, and XM is the average value of the concentrations in the MS and MSD, (XA + XB)/2	See above	Analyst/Prep analyst	Precision and Accuracy in field samples	%Recovery = (Calculated Value – Sample Value/True Value) *100% RPD (%) = [(XA-XB)/XM] * 100 Where: XA and XB are the concentration in the MS and MSD, and XM is the average value of the concentrations in the MS and MSD, (XA + XB)/2
Surrogate Spikes	Every sample	%Recovery = (Calculated Value/True Value) *100%	Reason for poor recoveries is investigated and eliminated before further analytical activities. Corrective actions are: 1. High bias, samples ND – report without qualification. 2. Low bias – re-extract and reanalyze. Insufficient volume – qualify and footnote	Analyst/Prep analyst	Individual sample preparation efficiency control	%Recovery = (Calculated Value/True Value) *100%

SAP/QAPP Worksheet #28h – Laboratory QC Samples Table
Dioxin and Furans

Matrix	Soil, Aqueous
Analytical Group	Dioxins/Furans
Concentration Level	Low
Analytical Method/ SOP Reference	USEPA 8290A/BRL SOP-00406
Analytical Organization	Maxxam Analytics, Mississauga, ON

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	DQI	Measurement Performance Criteria
MS Tuning	Prior to calibration and every 12 hours during sample analysis	Refer to method for specific ion criteria.	Retune instrument and verify. Rerun affected samples. Flagging criteria are not appropriate and problem must be corrected. No samples may be accepted without a valid tune.	Analyst	Laboratory Accuracy	Refer to method for specific ion criteria.
ICAL	As needed	%RSD <20%, Unlabeled analytes %RSD <20%, Labeled analytes	If the acceptance criteria were not met, re-calibration is performed before any samples may be analyzed.	Analyst	Laboratory Accuracy	%RSD <20%, Native and Labeled Analytes
ICV	1 per ICAL, analyzed after ICAL, before field samples	%RSD ≤50 % for Native and Labeled analytes	If the acceptance criteria were not met, re-calibration is performed before any samples may be analyzed.	Analyst	Laboratory Accuracy	%RSD ≤50 % from ICal
CCV	1 per analytical run. Analytical run not to exceed 12 hours.	%RSD ‘ 20% Unlabeled Analytes %RSD ‘ 20% Labeled Analytes	If the criterion has not achieved corrective action, re-calibration is performed before any samples may be analyzed. Corrective action may include re-analysis of the samples.	Analyst	Laboratory Accuracy	%RSD ‘ 20% Unlabeled Analytes %RSD ‘ 20% Labeled Analytes

SAP/QAPP Worksheet #28h – Laboratory QC Samples Table
Dioxin and Furans (Continued)

Matrix	Soil, Aqueous
Analytical Group	Dioxins/Furans
Concentration Level	Low
Analytical Method/ SOP Reference	USEPA 8290A/BRL SOP-00406
Analytical Organization	Maxxam Analytics, Mississauga, ON

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	DQI	Measurement Performance Criteria
MB	1 per extraction batch	<1/2 RL	The source of the contamination is investigated and eliminated before proceeding with further analysis. Corrective actions are: 1. Samples ND – report without qualification 2. Samples >10X contamination level – report with qualification 3. Samples <10x contamination – re-extract and reanalyze. Insufficient sample - qualify and footnote	Analyst/Prep Analyst	Acceptable Level or Absence of interference/contamination	<1/2 RL

SAP/QAPP Worksheet #28h – Laboratory QC Samples Table
Dioxin and Furans (Continued)

Matrix	Soil, Aqueous
Analytical Group	Dioxins/Furans
Concentration Level	Low
Analytical Method/ SOP Reference	USEPA 8290A/BRL SOP-00406
Analytical Organization	Maxxam Analytics, Mississauga, ON

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	DQI	Measurement Performance Criteria
LCS	1 per extraction batch	%Recovery = (Calculated Value/True Value) *100%	Source of poor recovery is investigated and eliminated before proceeding with further analysis, corrective actions are: 1. Biased high, samples ND – report without qualifications. 2. Biased low – re-extract and reanalyze. Insufficient volume – qualify and footnote	Analyst/Prep Analyst	Laboratory Accuracy/Method bias in ideal matrix	%Recovery = (Calculated Value/True Value) *100%

SAP/QAPP Worksheet #28h – Laboratory QC Samples Table
Dioxin and Furans (Continued)

Matrix	Soil, Aqueous
Analytical Group	Dioxins/Furans
Concentration Level	Low
Analytical Method/ SOP Reference	USEPA 8290A/BRL SOP-00406
Analytical Organization	Maxxam Analytics, Mississauga, ON

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	DQI	Measurement Performance Criteria
MS	1 per 20 samples or 1 for each extraction batch	%Recovery = (Calculated Value - Sample Value/True Value) *100% Recovery if matrix spiked internal standards 40-135% Native analyte recoveries 80-140%	If the recoveries indicate that the problem is procedure related, re-extraction and re-analysis is required. If the recoveries indicate that the failures are matrix-related, refer to Blank Spike as measure of method performance in clean matrix. The project Chemist will be contacted and a decision will be made to either report the data as is with a notation in the analytical narrative or if the samples should be re-extract and re-analyzed.	Analyst/Prep Analyst	Precision and Accuracy in field samples	%Recovery = (Calculated Value - Sample Value/True Value) *100%

SAP/QAPP Worksheet #28h – Laboratory QC Samples Table
Dioxin and Furans (Continued)

Matrix	Soil, Aqueous
Analytical Group	Dioxins/Furans
Concentration Level	Low
Analytical Method/ SOP Reference	USEPA 8290A/BRL SOP-00406
Analytical Organization	Maxxam Analytics, Mississauga, ON

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	DQI	Measurement Performance Criteria
MSDs	1 per 20 samples or 1 for each extraction batch	%Recovery = (Calculated Value – Sample Value/True Value) *100% RPD (%) = [(XA-XB)/XM] * 100 Where: XA and XB are the concentration in the MS and MSD, and XM is the average value of the concentrations in the MS and MSD, (XA + XB)/2 Recovery if Matrix spiked internal standards 40-135% Recovery of Native analyte recoveries 80-140% RPD between Duplicates ≤20%	See above	Analyst/Prep Analyst	Precision and Accuracy in field samples	%Recovery = (Calculated Value – Sample Value/True Value) *100% RPD (%) = [(XA-XB)/XM] * 100 Where: XA and XB are the concentration in the MS and MSD, and XM is the average value of the concentrations in the MS and MSD, (XA + XB)/2

SAP/QAPP Worksheet #28h – Laboratory QC Samples Table
Dioxin and Furans (Concluded)

Matrix	Soil, Aqueous
Analytical Group	Dioxins/Furans
Concentration Level	Low
Analytical Method/ SOP Reference	USEPA 8290A/BRL SOP-00406
Analytical Organization	Maxxam Analytics, Mississauga, ON

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	DQI	Measurement Performance Criteria
Surrogate Spikes	Every sample	%Recovery = (Calculated Value/True Value) *100%	Reason for poor recoveries is investigated and eliminated before further analytical activities. Corrective actions are: 1. High bias, samples ND – report without qualification. 2. Low bias – re-extract and reanalyze. Insufficient volume – qualify and footnote	Analyst/Prep Analyst	Individual sample preparation efficiency control	%Recovery = (Calculated Value/True Value) *100%
IS	Every sample	40 – 135% as per method USEPA 8290	If failure is due to instrument performance issues, the problem must be identified, corrected, and the sample must be re-analyzed. If no instrument problem is found the sample must be re-extracted. If upon re-analysis the responses are still not within limits, the problem may be considered sample matrix interference and results flagged.	Analyst	Extraction efficiency control	Meets method acceptance criteria 40-135%

SAP/QAPP Worksheet #28i – Laboratory QC Samples Table
Nitroaromatics and Nitramines

Matrix	Soil, Aqueous
Analytical Group	Nitroaromatics/Nitramines
Concentration Level	Low
Analytical Method/ SOP Reference	SW-846 8330A/LAB SOP#GC016
Analytical Organization	Accutest Laboratories Southeast, Inc.

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	DQI	Measurement Performance Criteria
ICAL	As needed (see CCV passing criteria below and SW-846 8000 method)	%RSD ≤20%, or Correlation coefficient R≥0.995	If the acceptance criteria were not met, re-calibration is performed before any samples may be analyzed.	Analyst	Laboratory Accuracy	%RSD <20%, Correlation coefficient R≥0.995
ICV	1 per ICAL, analyzed after ICAL, before field samples	%D ≤15%	If the acceptance criteria were not met, re-calibration is performed before any samples may be analyzed.	Analyst	Laboratory Accuracy	%D ≤15%
CCV	Opening CCV, then every 10 samples, with closing CCV	%D ≤15%	If the criterion has not achieved corrective action, re-calibration is performed before any samples may be analyzed. Corrective action may include re-analysis of the samples.	Analyst	Laboratory Accuracy	%D ≤15%

SAP/QAPP Worksheet #28i – Laboratory QC Samples Table
Nitroaromatics and Nitramines (Continued)

Matrix	Soil, Aqueous
Analytical Group	Nitroaromatics/Nitramines
Concentration Level	Low
Analytical Method/ SOP Reference	SW-846 8330A/LAB SOP#GC016
Analytical Organization	Accutest Laboratories Southeast, Inc.

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	DQI	Measurement Performance Criteria
MB	1 per extraction batch	<1/2 RL	The source of the contamination is investigated and eliminated before proceeding with further analysis. Corrective actions are: 1. Samples ND – report without qualification 2. Samples >10X contamination level – report with qualification 3. Samples <10x contamination – re-extract and reanalyze. Insufficient sample - qualify and footnote	Analyst/Prep analyst	Absence of interference/contamination	<1/2 RL

SAP/QAPP Worksheet #28i – Laboratory QC Samples Table
Nitroaromatics and Nitramines (Continued)

Matrix	Soil, Aqueous
Analytical Group	Nitroaromatics/Nitramines
Concentration Level	Low
Analytical Method/ SOP Reference	SW-846 8330A/LAB SOP#GC016
Analytical Organization	Accutest Laboratories Southeast, Inc.

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	DQI	Measurement Performance Criteria
LCS	1 per extraction batch	%Recovery = (Calculated Value/True Value) *100%	Source of poor recovery is investigated and eliminated before proceeding with further analysis, corrective actions are: 1. Biased high, samples ND – report without qualifications. 2. Biased low – re-extract and reanalyze. Insufficient volume – qualify and footnote	Analyst/Prep analyst	Laboratory Accuracy/Method bias in ideal matrix	%Recovery = (Calculated Value/True Value) *100%

SAP/QAPP Worksheet #28i – Laboratory QC Samples Table
Nitroaromatics and Nitramines (Continued)

Matrix	Soil, Aqueous
Analytical Group	Nitroaromatics/Nitramines
Concentration Level	Low
Analytical Method/ SOP Reference	SW-846 8330A/LAB SOP#GC016
Analytical Organization	Accutest Laboratories Southeast, Inc.

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	DQI	Measurement Performance Criteria
MS	1 per 20 samples or 1 for each extraction batch	%Recovery = (Calculated Value - Sample Value/True Value) *100%	If the recoveries indicate that the problem is procedure related, re-extraction and re-analysis is required. If the recoveries indicate that the failures are matrix-related, refer to Blank Spike as measure of method performance in clean matrix. The project Chemist will be contacted and a decision will be made to either report the data as is with a notation in the analytical narrative or if the samples should be re-extract and re-analyzed.	Analyst/Prep analyst	Precision and Accuracy in field samples	%Recovery = (Calculated Value - Sample Value/True Value) *100%

SAP/QAPP Worksheet #28i – Laboratory QC Samples Table
Nitroaromatics and Nitramines (Concluded)

Matrix	Soil, Aqueous
Analytical Group	Nitroaromatics/Nitramines
Concentration Level	Low
Analytical Method/ SOP Reference	SW-846 8330A/LAB SOP#GC016
Analytical Organization	Accutest Laboratories Southeast, Inc.

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	DQI	Measurement Performance Criteria
MSDs	1 per 20 samples or 1 for each extraction batch	%Recovery = (Calculated Value – Sample Value/True Value) *100% RPD (%) = [(XA-XB)/XM] * 100 Where: XA and XB are the concentration in the MS and MSD, and XM is the average value of the concentrations in the MS and MSD, (XA + XB)/2	See above	Analyst/Prep analyst	Precision and Accuracy in field samples	%Recovery = (Calculated Value – Sample Value/True Value) *100% RPD (%) = [(XA-XB)/XM] * 100 Where: XA and XB are the concentration in the MS and MSD, and XM is the average value of the concentrations in the MS and MSD, (XA + XB)/2
Surrogate Spikes	Every sample	%Recovery = (Calculated Value/True Value) *100%	Reason for poor recoveries is investigated and eliminated before further analytical activities. Corrective actions are: 1. High bias, samples ND – report without qualification. 2. Low bias – re-extract and reanalyze. Insufficient volume – qualify and footnote	Analyst/Prep analyst	Individual sample preparation efficiency control	%Recovery = (Calculated Value/True Value) *100%

SAP/QAPP Worksheet #28j – Laboratory QC Samples Table
ICP Metals

Matrix	Soil, Aqueous
Analytical Group	ICP Metals
Concentration Level	Low
Analytical Method/ SOP Reference	SW-846 6010C/LAB SOP# Met100
Analytical Organization	Accutest Laboratories Southeast, Inc.

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	DQI	Measurement Performance Criteria
ICAL	As needed (see CCV passing criteria below)	%RSD <5%, or Correlation coefficient R>0.995	If the acceptance criteria were not met, re-calibration is performed before any samples may be analyzed.	Analyst	Laboratory Accuracy	%RSD <5%, or Correlation coefficient R>0.995
ICV	1 per ICAL, analyzed after ICAL, before field samples	%D <10%	If the acceptance criteria were not met, re-calibration is performed before any samples may be analyzed.	Analyst	Laboratory Accuracy	%D <10%
CCV	Opening CCV, then every 10 samples, with closing CCV	%D <10%	If the criterion has not achieved corrective action, re-calibration is performed before any samples may be analyzed. Corrective action may include re-analysis of the samples.	Analyst	Laboratory Accuracy	%D <10%

SAP/QAPP Worksheet #28j – Laboratory QC Samples Table
ICP Metals (Continued)

Matrix	Soil, Aqueous
Analytical Group	ICP Metals
Concentration Level	Low
Analytical Method/ SOP Reference	SW-846 6010C/LAB SOP# Met100
Analytical Organization	Accutest Laboratories Southeast, Inc.

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	DQI	Measurement Performance Criteria
Calibration Blank	After every ICV and CCV, including terminal CCV	No analytes detected above LOD	Determine source of contamination, correct problem. Qualify associated data with B qualifier and appropriate footnote. Corrective action may include reanalysis of CCB and reanalysis of associated samples.	Analyst	Absence of interference/contamination	<LOD
MB	1 per extraction batch	<1/2 RL	The source of the contamination is investigated and eliminated before proceeding with further analysis. Corrective actions are: 1. Samples ND – report without qualification 2. Samples >10X contamination level – report with qualification 3. Samples <10x contamination – re-extract and reanalyze. Insufficient sample - qualify and footnote	Analyst/Prep analyst	Absence of interference/contamination	<1/2 RL

SAP/QAPP Worksheet #28j – Laboratory QC Samples Table
ICP Metals (Continued)

Matrix	Soil, Aqueous
Analytical Group	ICP Metals
Concentration Level	Low
Analytical Method/ SOP Reference	SW-846 6010C/LAB SOP# Met100
Analytical Organization	Accutest Laboratories Southeast, Inc.

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	DQI	Measurement Performance Criteria
LCS	1 per extraction batch	%Recovery = (Calculated Value/True Value) *100%; 80%<%Recovery<120%	Source of poor recovery is investigated and eliminated before proceeding with further analysis, corrective actions are: 1. Biased high, samples ND – report without qualifications. 2. Biased low – re-extract and reanalyze. Insufficient volume – qualify and footnote	Analyst/Prep analyst	Laboratory Accuracy/Method bias in ideal matrix	%Recovery = (Calculated Value/True Value) *100%; 80%<%Recovery<120%
MS	1 per 20 samples or 1 for each extraction batch	%Recovery = (Calculated Value - Sample Value/True Value) *100%: 80%<%Recovery<120%	If the recoveries indicate that the problem is procedure related, re-extraction and re-analysis is required. If the recoveries indicate that the failures are matrix-related, refer to Blank Spike as measure of method performance in clean matrix.	Analyst/Prep analyst	Precision and Accuracy in field samples	%Recovery = (Calculated Value - Sample Value/True Value) *100%: 80%<%Recovery<120%

SAP/QAPP Worksheet #28j – Laboratory QC Samples Table
ICP Metals (Continued)

Matrix	Soil, Aqueous
Analytical Group	ICP Metals
Concentration Level	Low
Analytical Method/ SOP Reference	SW-846 6010C/LAB SOP# Met100
Analytical Organization	Accutest Laboratories Southeast, Inc.

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	DQI	Measurement Performance Criteria
MSD	1 per 20 samples or 1 for each extraction batch	%Recovery = (Calculated Value – Sample Value/True Value) *100% RPD (%) = [(XA-XB)/XM] * 100 Where: XA and XB are the concentration in the MS and MSD, and XM is the average value of the concentrations in the MS and MSD, (XA + XB)/2	See above	Analyst/Prep analyst	Precision and Accuracy in field samples	%Recovery = (Calculated Value – Sample Value/True Value) *100% RPD (%) = [(XA-XB)/XM] * 100 Where: XA and XB are the concentration in the MS and MSD, and XM is the average value of the concentrations in the MS and MSD, (XA + XB)/2
Linear dynamic range or High-level calibration check standard	Every 6 months	Within ±10%R of expected value.	Not Applicable	Analyst	Laboratory Accuracy	Within ±10%R of expected value.
Low-level calibration check standard	Daily, after one-point initial calibration	Within ±20%R of expected value. Low-level calibration check standard should be less than or equal to the reporting limit.	Correct problem then repeat initial calibration. Flagging criteria are not appropriate. Problem must be corrected. No samples may be run until ICAL has passed.	Analyst	Laboratory Accuracy	Within ±20%R of expected value. Low-level calibration check standard should be less than or equal to the reporting limit.

SAP/QAPP Worksheet #28j – Laboratory QC Samples Table
ICP Metals (Concluded)

Matrix	Soil, Aqueous
Analytical Group	ICP Metals
Concentration Level	Low
Analytical Method/ SOP Reference	SW-846 6010C/LAB SOP# Met100
Analytical Organization	Accutest Laboratories Southeast, Inc.

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	DQI	Measurement Performance Criteria
ICS	At the beginning of an analytical run.	ICS-A: Absolute value of concentration for all nonspiked analytes <2x MDL (unless they are a verified trace impurity from one of the spiked analytes) ICS-AB: Within ± 20% of expected value	Terminate analysis; locate and correct problem; reanalyze ICS. Flagging criteria are not appropriate. No samples may be analyzed without a valid ICS.	Analyst	Accuracy	ICS-A: Absolute value of concentration for all nonspiked analytes <2x MDL (unless they are a verified trace impurity from one of the spiked analytes) ICS-AB: Within ± 20% of expected value
Serial Dilution Test	Each preparatory batch or when a new or unusual matrix is encountered	Five-fold dilution must agree within ± 10% of the original determination. Only applicable for samples with concentrations >50x MDL for ICP.	Perform post-digestion spike (PDS) addition. Flagging criteria are not appropriate.	Analyst	Precision (field samples)	Five-fold dilution must agree within ± 10% of the original determination. Only applicable for samples with concentrations >50x MDL for ICP.
PDS addition	When dilution test fails or analyte concentration in all samples <50x MDL	Recovery within 75-125% of expected result. The spike addition should produce a level between 10x to 100x MDL.	Run samples by method of standard additions (MSA) or Apply J-flag to all sample results (for same matrix) for specific analyte(s) for all samples associated with the post-digestion spike addition.	Analyst	Accuracy	Recovery within 75-125% of expected result. The spike addition should produce a level between 10x to 100x MDL.

SAP/QAPP Worksheet #28k – Laboratory QC Samples Table
Mercury

Matrix	Aqueous, Solid
Analytical Group	Mercury
Concentration Level	Low
Analytical Method/ SOP Reference	SW-846 7471B, 7470A, LAB SOP#MET105, MET 106
Analytical Organization	Accutest Laboratories Southeast, Inc.

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	DQI	Measurement Performance Criteria
ICAL	As needed (see CCV passing criteria)	Minimum 5 standards and a Blank. Correlation coefficient R≥0.995	If the acceptance criteria were not met, re-calibration is performed before any samples may be analyzed.	Analyst	Laboratory Accuracy	Correlation coefficient R≥0.995
ICV	1 per ICAL, analyzed after ICAL, before field samples	%D ≤10%	If the acceptance criteria were not met, re-calibration is performed before any samples may be analyzed.	Analyst	Laboratory Accuracy	%D ≤10%
CCV	Opening CCV, then every 10 samples, with closing CCV	%D ≤20%	If the criterion has not achieved corrective action, re-calibration is performed before any samples may be analyzed. Corrective action may include re-analysis of the samples.	Analyst	Laboratory Accuracy	%D ≤20%

SAP/QAPP Worksheet #28k – Laboratory QC Samples Table
Mercury (Continued)

Matrix	Aqueous, Solid
Analytical Group	Mercury
Concentration Level	Low
Analytical Method/ SOP Reference	SW-846 7471B, 7470A, LAB SOP#MET105, MET 106
Analytical Organization	Accutest Laboratories Southeast, Inc.

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	DQI	Measurement Performance Criteria
MB	1 per digestion batch	<1/2 RL	The source of the contamination is investigated and eliminated before proceeding with further analysis. Corrective actions are: 1. Samples ND – report without qualification 2. Samples >10X contamination level – report with qualification 3. Samples <10x contamination – re-extract and reanalyze. Insufficient sample - qualify and footnote	Analyst/Prep analyst	Absence of interference/contamination	<1/2 RL

SAP/QAPP Worksheet #28k – Laboratory QC Samples Table
Mercury (Continued)

Matrix	Aqueous, Solid
Analytical Group	Mercury
Concentration Level	Low
Analytical Method/ SOP Reference	SW-846 7471B, 7470A, LAB SOP#MET105, MET 106
Analytical Organization	Accutest Laboratories Southeast, Inc.

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	DQI	Measurement Performance Criteria
LCS	1 per digestion batch	%Recovery = (Calculated Value/True Value) *100%; 80%≤%Recovery≤120%	Source of poor recovery is investigated and eliminated before proceeding with further analysis, corrective actions are: 1. Biased high, samples ND – report without qualifications. 2. Biased low – re-extract and reanalyze. Insufficient volume – qualify and footnote	Analyst/Prep analyst	Laboratory Accuracy/Method bias in ideal matrix	%Recovery = (Calculated Value/True Value) *100%; 80%≤%Recovery≤120%
MS	1 per 20 samples or 1 for each digestion batch	%Recovery = (Calculated Value - Sample Value/True Value) *100%: 80%≤%Recovery≤120%	If the recoveries indicate that the problem is procedure related, re-extraction and re-analysis is required. If the recoveries indicate that the failures are matrix-related, refer to Blank Spike as measure of method performance in clean matrix.	Analyst/Prep analyst	Precision and Accuracy in field samples	%Recovery = (Calculated Value - Sample Value/True Value) *100%: 80%≤%Recovery≤120%

SAP/QAPP Worksheet #28k – Laboratory QC Samples Table
Mercury (Concluded)

Matrix	Aqueous, Solid
Analytical Group	Mercury
Concentration Level	Low
Analytical Method/ SOP Reference	SW-846 7471B, 7470A, LAB SOP#MET105, MET 106
Analytical Organization	Accutest Laboratories Southeast, Inc.

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	DQI	Measurement Performance Criteria
MSDs	1 per 20 samples or 1 for each digestion batch	%Recovery = (Calculated Value – Sample Value/True Value) *100% RPD (%) = [(XA-XB)/XM] * 100 Where: XA and XB are the concentration in the MS and MSD, and XM is the average value of the concentrations in the MS and MSD, (XA + XB)/2: %RPD ≤ 20%	See above	Analyst/Prep analyst	Precision and Accuracy in field samples	%Recovery = (Calculated Value – Sample Value/True Value) *100% RPD (%) = [(XA-XB)/XM] * 100 Where: XA and XB are the concentration in the MS and MSD, and XM is the average value of the concentrations in the MS and MSD, (XA + XB)/2: %RPD ≤ 20%
Serial Dilution Test	Each preparatory batch or when a new or unusual matrix is encountered	Five-fold dilution must agree within ± 10% of the original determination. Only applicable for samples with concentrations >25x MDL for CVAA.	Perform matrix spike. Flagging criteria are not appropriate.	Analyst	Precision (field samples)	Five-fold dilution must agree within ± 10% of the original determination. Only applicable for samples with concentrations >25x MDL for CVAA.

SAP/QAPP Worksheet #28l – Laboratory QC Samples Table
Cyanide

Matrix	Aqueous, Solid
Analytical Group	Total Cyanide
Concentration Level	Low
Analytical Method/ SOP Reference	SW-846 9012B, LAB SOP#GN115
Analytical Organization	Accutest Laboratories Southeast, Inc.

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	DQI	Measurement Performance Criteria
ICAL	As needed (see CCV passing criteria)	Minimum 5 standards and a Blank. Correlation coefficient R≥0.995	If the acceptance criteria were not met, re-calibration is performed before any samples may be analyzed.	Analyst	Laboratory Accuracy	Correlation coefficient R≥0.995
ICV	1 per ICAL, analyzed after ICAL, before field samples	%D ≤10%	If the acceptance criteria were not met, re-calibration is performed before any samples may be analyzed.	Analyst	Laboratory Accuracy	%D ≤10%
CCV	Opening CCV, then every 10 samples, with closing CCV	%D ≤10%	If the criterion has not achieved corrective action, re-calibration is performed before any samples may be analyzed. Corrective action may include re-analysis of the samples associated with failing CCV(s).	Analyst	Laboratory Accuracy	%D ≤10%

SAP/QAPP Worksheet #28l – Laboratory QC Samples Table
Cyanide (Continued)

Matrix	Aqueous, Solid
Analytical Group	Total Cyanide
Concentration Level	Low
Analytical Method/ SOP Reference	SW-846 9012B, LAB SOP#GN115
Analytical Organization	Accutest Laboratories Southeast, Inc.

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	DQI	Measurement Performance Criteria
MB	1 per digestion batch	<1/2 RL	The source of the contamination is investigated and eliminated before proceeding with further analysis. Corrective actions are: 1. Samples ND – report without qualification 2. Samples >10X contamination level – report with qualification 3. Samples <10x contamination – re-extract and reanalyze. Insufficient sample - qualify and footnote	Analyst/Prep analyst	Absence of interference/contamination	<1/2 RL

SAP/QAPP Worksheet #28l – Laboratory QC Samples Table
Cyanide (Continued)

Matrix	Aqueous, Solid
Analytical Group	Total Cyanide
Concentration Level	Low
Analytical Method/ SOP Reference	SW-846 9012B, LAB SOP#GN115
Analytical Organization	Accutest Laboratories Southeast, Inc.

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	DQI	Measurement Performance Criteria
LCS	1 per digestion batch	%Recovery = (Calculated Value/True Value) *100%; Waters 90%≤%Recovery≤110%, Soil – statistically derived limits	Source of poor recovery is investigated and eliminated before proceeding with further analysis, corrective actions are: 1. Biased high, samples ND – report without qualifications. 2. Biased low – re-extract and reanalyze. Insufficient volume – qualify and footnote	Analyst/Prep analyst	Laboratory Accuracy/Method bias in ideal matrix	%Recovery = (Calculated Value/True Value) *100%; Waters 90%≤%Recovery≤110%, Soil – statistically derived limits
MS	1 per 20 samples or 1 for each digestion batch	%Recovery = (Calculated Value/True Value) *100%; Waters 90%≤%Recovery≤110%, Soil – statistically derived limits	If the recoveries indicate that the problem is procedure related, re-extraction and re-analysis is required. If the recoveries indicate that the failures are matrix-related, refer to Blank Spike as measure of method performance in clean matrix.	Analyst/Prep analyst	Precision and Accuracy in field samples	%Recovery = (Calculated Value/True Value) *100%; Waters 90%≤%Recovery≤110%, Soil – statistically derived limits

SAP/QAPP Worksheet #28l – Laboratory QC Samples Table
Cyanide (Concluded)

Matrix	Aqueous, Solid
Analytical Group	Total Cyanide
Concentration Level	Low
Analytical Method/ SOP Reference	SW-846 9012B, LAB SOP#GN115
Analytical Organization	Accutest Laboratories Southeast, Inc.

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	DQI	Measurement Performance Criteria
MSD	1 per 20 samples or 1 for each digestion batch	%Recovery = (Calculated Value – Sample Value/True Value) *100% RPD (%) = [(XA-XB)/XM] * 100 Where: XA and XB are the concentration in the MS and MSD, and XM is the average value of the concentrations in the MS and MSD, (XA + XB)/2: %RPD $\leq$ 20%	See above	Analyst/Prep analyst	Precision and Accuracy in field samples	%Recovery = (Calculated Value – Sample Value/True Value) *100% RPD (%) = [(XA-XB)/XM] * 100 Where: XA and XB are the concentration in the MS and MSD, and XM is the average value of the concentrations in the MS and MSD, (XA + XB)/2: %RPD $\leq$ 20%
Distilled high and low standards	Each calibration curve	Must agree within ± 10% of the target value.	Reanalyze curve and redistill standards. Flagging criteria are not appropriate.	Analyst	Accuracy	Distillation efficiency.

SAP/QAPP Worksheet #28m – Laboratory QC Samples Table
Tritium

Matrix	Soil, Aqueous
Analytical Group	
Concentration Level	
Analytical Method/ SOP Reference	
Analytical Organization	

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	DQI	Measurement Performance Criteria

SAP/QAPP Worksheet #28n – Laboratory QC Samples Table
Waste Characterization TCLP Volatiles

Matrix	Waste
Analytical Group	TCLP Volatiles
Concentration Level	Low
Analytical Method/ SOP Reference	SW-846 8260/LAB SOP#MS005
Analytical Organization	Accutest Laboratories Southeast, Inc.

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	DQI	Measurement Performance Criteria
MS Tuning	Prior to calibration and every 12 hours during sample analysis	Refer to method for specific ion criteria.	Retune instrument and verify. Rerun affected samples. Flagging criteria are not appropriate and problem must be corrected. No samples may be accepted without a valid tune.	Analyst	Laboratory Accuracy	Refer to method for specific ion criteria.
ICAL	As needed (see CCV passing criteria below and SW-846 8000 method)	%RSD <15%, or Correlation coefficient R>0.995 %RSD for CCC <30%, RF for SPCC > 0.01 and 0.03	If the acceptance criteria were not met, re-calibration is performed before any samples may be analyzed.	Analyst	Laboratory Accuracy	%RSD <15%, or Correlation coefficient R>0.995 %RSD for CCC <30%, RF for SPCC > 0.01 and 0.03
Initial Retention Time window establishment (all targets)	Once per ICAL	Position set using mid-point calibration standard from ICAL	Not Applicable	Analyst	Laboratory Accuracy	Chromatographic system performance

SAP/QAPP Worksheet #28n – Laboratory QC Samples Table
Waste Characterization TCLP Volatiles (Continued)

Matrix	Waste
Analytical Group	TCLP Volatiles
Concentration Level	Low
Analytical Method/ SOP Reference	SW-846 8260/LAB SOP#MS005
Analytical Organization	Accutest Laboratories Southeast, Inc.

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	DQI	Measurement Performance Criteria
ICV	1 per ICAL, analyzed after ICAL, before field samples	%D for CCC <25%, poor purgers >40%, RF see above	If the acceptance criteria were not met, re-calibration is performed before any samples may be analyzed.	Analyst	Laboratory Accuracy	%D for CCC <25%, poor purgers >40%, RF see above
CCV	1 per analytical run. Analytical run not to exceed 12 hours.	%D for CCC <20%, RF see above	If the criterion has not achieved corrective action, re-calibration is performed before any samples may be analyzed. Corrective action may include re-analysis of the samples.	Analyst	Laboratory Accuracy	%D for CCC <20%, RF see above
Evaluation of absolute retention time shift (Internal Standards only)	Every CCV	Within 30 sec of initial Retention Time (ICAL mid-point)	Determine source of malfunction, perform maintenance and verify. Rerun affected samples. Rerun ICAL, if necessary. Flagging criteria are not appropriate and problem must be corrected	Analyst	Laboratory Accuracy	Overall chromatographic system performance

SAP/QAPP Worksheet #28n – Laboratory QC Samples Table
Waste Characterization TCLP Volatiles (Continued)

Matrix	Waste
Analytical Group	TCLP Volatiles
Concentration Level	Low
Analytical Method/ SOP Reference	SW-846 8260/LAB SOP#MS005
Analytical Organization	Accutest Laboratories Southeast, Inc.

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	DQI	Measurement Performance Criteria
Evaluation of relative retention time shift (all targets)	Every injection following CCV	Within 0.06% of daily CCV RT	Determine source of malfunction, perform maintenance and verify. Rerun affected samples. Flagging criteria are not appropriate and problem must be corrected	Analyst	Laboratory Accuracy	Overall chromatographic system performance
MB	1 per extraction batch	<1/2 RL	The source of the contamination is investigated and eliminated before proceeding with further analysis. Corrective actions are: 1. Samples ND – report without qualification 2. Samples >10X contamination level – report with qualification 3. Samples <10x contamination – re-extract and reanalyze. Insufficient sample - qualify and footnote	Analyst	Absence of interference/contamination	<1/2 RL

SAP/QAPP Worksheet #28n – Laboratory QC Samples Table
Waste Characterization TCLP Volatiles (Continued)

Matrix	Waste
Analytical Group	TCLP Volatiles
Concentration Level	Low
Analytical Method/ SOP Reference	SW-846 8260/LAB SOP#MS005
Analytical Organization	Accutest Laboratories Southeast, Inc.

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	DQI	Measurement Performance Criteria
LCS	1 per extraction batch	%Recovery = (Calculated Value/True Value) *100%	Source of poor recovery is investigated and eliminated before proceeding with further analysis, corrective actions are: 1. Biased high, samples ND – report without qualifications. 2. Biased low – re-extract and reanalyze. Insufficient volume – qualify and footnote	Analyst	Laboratory Accuracy/Method bias in ideal matrix	%Recovery = (Calculated Value/True Value) *100%

SAP/QAPP Worksheet #28n – Laboratory QC Samples Table
Waste Characterization TCLP Volatiles (Continued)

Matrix	Waste
Analytical Group	TCLP Volatiles
Concentration Level	Low
Analytical Method/ SOP Reference	SW-846 8260/LAB SOP#MS005
Analytical Organization	Accutest Laboratories Southeast, Inc.

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	DQI	Measurement Performance Criteria
MS	1 per 20 samples or 1 for each extraction batch	%Recovery = (Calculated Value - Sample Value/True Value) *100%	If the recoveries indicate that the problem is procedure related, re-extraction and re-analysis is required. If the recoveries indicate that the failures are matrix-related, refer to Blank Spike as measure of method performance in clean matrix. The Shaw Chemist will be contacted and a decision will be made to either report the data as is with a notation in the analytical narrative or if the samples should be re-extract and re-analyzed.	Analyst	Precision and Accuracy in field samples	%Recovery = (Calculated Value - Sample Value/True Value) *100%

SAP/QAPP Worksheet #28n – Laboratory QC Samples Table
Waste Characterization TCLP Volatiles (Continued)

Matrix	Waste
Analytical Group	TCLP Volatiles
Concentration Level	Low
Analytical Method/ SOP Reference	SW-846 8260/LAB SOP#MS005
Analytical Organization	Accutest Laboratories Southeast, Inc.

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	DQI	Measurement Performance Criteria
MSDs	1 per 20 samples or 1 for each extraction batch	%Recovery = (Calculated Value – Sample Value/True Value) *100% RPD (%) = [(XA-XB)/XM] * 100 Where: XA and XB are the concentration in the MS and MSD, and XM is the average value of the concentrations in the MS and MSD, (XA + XB)/2	See above	Analyst	Precision and Accuracy in field samples	%Recovery = (Calculated Value – Sample Value/True Value) *100% RPD (%) = [(XA-XB)/XM] * 100 Where: XA and XB are the concentration in the MS and MSD, and XM is the average value of the concentrations in the MS and MSD, (XA + XB)/2

SAP/QAPP Worksheet #28n – Laboratory QC Samples Table
Waste Characterization TCLP Volatiles (Concluded)

Matrix	Waste
Analytical Group	TCLP Volatiles
Concentration Level	Low
Analytical Method/ SOP Reference	SW-846 8260/LAB SOP#MS005
Analytical Organization	Accutest Laboratories Southeast, Inc.

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	DQI	Measurement Performance Criteria
Surrogate Spikes	Every sample	%Recovery = (Calculated Value/True Value) *100%	Reason for poor recoveries is investigated and eliminated before further analytical activities. Corrective actions are: 1. High bias, samples ND – report without qualification. 2. Low bias – re-extract and reanalyze. Insufficient volume – qualify and footnote	Analyst	Individual sample preparation efficiency control	%Recovery = (Calculated Value/True Value) *100%
IS	Every sample	IS Area = -50% to +100% of CCV	If failure is due to instrument performance issues, the problem must be identified, corrected, and the sample must be re-analyzed. If no instrument problem is found the sample must be re-analyzed. If upon re-analysis the responses are still not within limits, the problem may be considered sample matrix interference.	Analyst	Instrument sensitivity control	IS Area = -50% to +100% of CCV

SAP/QAPP Worksheet #28n – Laboratory QC Samples Table
Waste Characterization TCLP Semivolatiles

Matrix	Waste
Analytical Group	TCLP Semivolatiles
Concentration Level	Low
Analytical Method/ SOP Reference	SW-846 8270D/LAB SOP#MS011
Analytical Organization	Accutest Laboratories Southeast, Inc.

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	DQI	Measurement Performance Criteria
MS tuning – DFTPP/DDT/PCP/ Benzidine	Prior to calibration and every 12 hours during sample analysis	Passing DFTPP breakdown criteria, DDT breakdown <20%, PCP and Benzidine tailing factor <2	Retune instrument and verify. Rerun affected samples. Flagging criteria are not appropriate and problem must be corrected. No samples may be accepted without a valid tune.	Analyst	Laboratory accuracy	System inertness and GC column performance
ICAL	As needed (see CCV passing criteria below and SW-846 8000 method)	%RSD <20%, Correlation coefficient R>0.995, minimum RF as per method	If the acceptance criteria were not met, re-calibration is performed before any samples may be analyzed.	Analyst	Laboratory Accuracy	%RSD <20%, Correlation coefficient R>0.995, minimum RF met for all analytes on all calibration levels
Initial Retention Time window establishment (all targets)	Once per ICAL	Position set using mid-point calibration standard from ICAL	Not Applicable	Analyst	Laboratory Accuracy	Chromatographic system performance
ICV	1 per ICAL, analyzed after ICAL, before field samples	%D <20%, minimum RF as per method	If the acceptance criteria were not met, re-calibration is performed before any samples may be analyzed.	Analyst	Laboratory Accuracy	%D for all analytes <20%,

SAP/QAPP Worksheet #28n – Laboratory QC Samples Table
Waste Characterization TCLP Semivolatiles (Continued)

Matrix	Waste
Analytical Group	TCLP Semivolatiles
Concentration Level	Low
Analytical Method/ SOP Reference	SW-846 8270D/LAB SOP#MS011
Analytical Organization	Accutest Laboratories Southeast, Inc.

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	DQI	Measurement Performance Criteria
CCV	1 per analytical run. Analytical run not to exceed 12 hours.	%D <20%, minimum RF as per method	If the criterion has not achieved corrective action, re-calibration is performed before any samples may be analyzed. Corrective action may include re-analysis of the samples.	Analyst	Laboratory Accuracy	%D for all analytes <20%,
Evaluation of absolute retention time shift (Internal Standards only)	Every CCV	Within 30 sec of initial Retention Time (ICAL mid-point)	Determine source of malfunction, perform maintenance and verify. Rerun affected samples. Rerun ICAL, if necessary. Flagging criteria are not appropriate and problem must be corrected	Analyst	Laboratory Accuracy	Overall chromatographic system performance
Evaluation of relative retention time shift (all targets)	Every injection following CCV	Within 0.06% of daily CCV RT	Determine source of malfunction, perform maintenance and verify. Rerun affected samples. Flagging criteria are not appropriate and problem must be corrected	Analyst	Laboratory Accuracy	Overall chromatographic system performance

SAP/QAPP Worksheet #28n – Laboratory QC Samples Table
Waste Characterization TCLP Semivolatiles (Continued)

Matrix	Waste
Analytical Group	TCLP Semivolatiles
Concentration Level	Low
Analytical Method/ SOP Reference	SW-846 8270D/LAB SOP#MS011
Analytical Organization	Accutest Laboratories Southeast, Inc.

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	DQI	Measurement Performance Criteria
MB	1 per extraction batch	<1/2 RL	The source of the contamination is investigated and eliminated before proceeding with further analysis. Corrective actions are: 1. Samples ND – report without qualification 2. Samples >10X contamination level – report with qualification 3. Samples <10x contamination – re-extract and reanalyze. Insufficient sample - qualify and footnote	Analyst/Prep analyst	Absence of interference/contamination	<1/2 RL

SAP/QAPP Worksheet #28n – Laboratory QC Samples Table
Waste Characterization TCLP Semivolatiles (Continued)

Matrix	Waste
Analytical Group	TCLP Semivolatiles
Concentration Level	Low
Analytical Method/ SOP Reference	SW-846 8270D/LAB SOP#MS011
Analytical Organization	Accutest Laboratories Southeast, Inc.

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	DQI	Measurement Performance Criteria
LCS	1 per extraction batch	%Recovery = (Calculated Value/True Value) *100%	Source of poor recovery is investigated and eliminated before proceeding with further analysis, corrective actions are: 1. Biased high, samples ND – report without qualifications. 2. Biased low – re-extract and reanalyze. Insufficient volume – qualify and footnote	Analyst/Prep analyst	Laboratory Accuracy/Method bias in ideal matrix	%Recovery = (Calculated Value/True Value) *100%

SAP/QAPP Worksheet #28n – Laboratory QC Samples Table
Waste Characterization TCLP Semivolatiles (Continued)

Matrix	Waste
Analytical Group	TCLP Semivolatiles
Concentration Level	Low
Analytical Method/ SOP Reference	SW-846 8270D/LAB SOP#MS011
Analytical Organization	Accutest Laboratories Southeast, Inc.

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	DQI	Measurement Performance Criteria
MS	1 per 20 samples or 1 for each extraction batch	%Recovery = (Calculated Value - Sample Value/True Value) *100%	If the recoveries indicate that the problem is procedure related, re-extraction and re-analysis is required. If the recoveries indicate that the failures are matrix-related, refer to Blank Spike as measure of method performance in clean matrix. The Shaw Chemist will be contacted and a decision will be made to either report the data as is with a notation in the analytical narrative or if the samples should be re-extract and re-analyzed.	Analyst/Prep analyst	Precision and Accuracy in field samples	%Recovery = (Calculated Value - Sample Value/True Value) *100%

SAP/QAPP Worksheet #28n – Laboratory QC Samples Table
Waste Characterization TCLP Semivolatiles (Continued)

Matrix	Waste
Analytical Group	TCLP Semivolatiles
Concentration Level	Low
Analytical Method/ SOP Reference	SW-846 8270D/LAB SOP#MS011
Analytical Organization	Accutest Laboratories Southeast, Inc.

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	DQI	Measurement Performance Criteria
MSD	1 per 20 samples or 1 for each extraction batch	%Recovery = (Calculated Value – Sample Value/True Value) *100% RPD (%) = [(XA-XB)/XM] * 100 Where: XA and XB are the concentration in the MS and MSD, and XM is the average value of the concentrations in the MS and MSD, (XA + XB)/2	See above	Analyst/Prep analyst	Precision and Accuracy in field samples	%Recovery = (Calculated Value – Sample Value/True Value) *100% RPD (%) = [(XA-XB)/XM] * 100 Where: XA and XB are the concentration in the MS and MSD, and XM is the average value of the concentrations in the MS and MSD, (XA + XB)/2
Surrogate Spikes	Every sample	%Recovery = (Calculated Value/True Value) *100%	Reason for poor recoveries is investigated and eliminated before further analytical activities. Corrective actions are: 1. High bias, samples ND – report without qualification. 2. Low bias – re-extract and reanalyze. Insufficient volume – qualify and footnote	Analyst/Prep analyst	Individual sample preparation efficiency control	%Recovery = (Calculated Value/True Value) *100%

SAP/QAPP Worksheet #28n – Laboratory QC Samples Table
Waste Characterization TCLP Semivolatiles (Concluded)

Matrix	Waste
Analytical Group	TCLP Semivolatiles
Concentration Level	Low
Analytical Method/ SOP Reference	SW-846 8270D/LAB SOP#MS011
Analytical Organization	Accutest Laboratories Southeast, Inc.

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	DQI	Measurement Performance Criteria
IS	Every sample	IS Area = -50% to +100% of CCV	If failure is due to instrument performance issues, the problem must be identified, corrected, and the sample must be re-analyzed. If no instrument problem is found the sample must be re-analyzed. If upon re-analysis the responses are still not within limits, the problem may be considered sample matrix interference.	Analyst	Instrument sensitivity control	IS Area = -50% to +100% of CCV

SAP/QAPP Worksheet #28n – Laboratory QC Samples Table
Waste Characterization TCLP Pesticides

Matrix	Waste
Analytical Group	TCLP Pesticides
Concentration Level	Low
Analytical Method/ SOP Reference	SW-846 8081A/LAB SOP#GC015
Analytical Organization	Accutest Laboratories Southeast, Inc.

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	DQI	Measurement Performance Criteria
ICAL	As needed (see CCV passing criteria below and SW-846 8000 method)	%RSD <20%, or Correlation coefficient R≥0.995	If the acceptance criteria were not met, re-calibration is performed before any samples may be analyzed.	Analyst	Laboratory Accuracy	%RSD <20%, or Correlation coefficient R≥0.995
ICV	1 per ICAL, analyzed after ICAL, before field samples	%D ≤20%	If the acceptance criteria were not met, re-calibration is performed before any samples may be analyzed.	Analyst	Laboratory Accuracy	%D ≤20%
CCV	Opening CCV, then every 10 samples, with closing CCV	%D ≤20%	If the criterion has not achieved corrective action, re-calibration is performed before any samples may be analyzed. Corrective action may include re-analysis of the samples.	Analyst	Laboratory Accuracy	%D ≤20%

SAP/QAPP Worksheet #28n – Laboratory QC Samples Table
Waste Characterization TCLP Pesticides (Continued)

Matrix	Waste
Analytical Group	TCLP Pesticides
Concentration Level	Low
Analytical Method/ SOP Reference	SW-846 8081A/LAB SOP#GC015
Analytical Organization	Accutest Laboratories Southeast, Inc.

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	DQI	Measurement Performance Criteria
MB	1 per extraction batch	<1/2 RL	The source of the contamination is investigated and eliminated before proceeding with further analysis. Corrective actions are: 1. Samples ND – report without qualification 2. Samples >10X contamination level – report with qualification 3. Samples <10x contamination – re-extract and reanalyze. Insufficient sample - qualify and footnote	Analyst/Prep analyst	Absence of interference/contamination	<1/2 RL

SAP/QAPP Worksheet #28n – Laboratory QC Samples Table
Waste Characterization TCLP Pesticides (Continued)

Matrix	Waste
Analytical Group	TCLP Pesticides
Concentration Level	Low
Analytical Method/ SOP Reference	SW-846 8081A/LAB SOP#GC015
Analytical Organization	Accutest Laboratories Southeast, Inc.

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	DQI	Measurement Performance Criteria
LCS	1 per extraction batch	%Recovery = (Calculated Value/True Value) *100%	Source of poor recovery is investigated and eliminated before proceeding with further analysis, corrective actions are: 1. Biased high, samples ND – report without qualifications. 2. Biased low – re-extract and reanalyze. Insufficient volume – qualify and footnote	Analyst/Prep analyst	Laboratory Accuracy/Method bias in ideal matrix	%Recovery = (Calculated Value/True Value) *100%

SAP/QAPP Worksheet #28n – Laboratory QC Samples Table
Waste Characterization TCLP Pesticides (Continued)

Matrix	Waste
Analytical Group	TCLP Pesticides
Concentration Level	Low
Analytical Method/ SOP Reference	SW-846 8081A/LAB SOP#GC015
Analytical Organization	Accutest Laboratories Southeast, Inc.

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	DQI	Measurement Performance Criteria
MS	1 per 20 samples or 1 for each extraction batch	%Recovery = (Calculated Value - Sample Value/True Value) *100%	If the recoveries indicate that the problem is procedure related, re-extraction and re-analysis is required. If the recoveries indicate that the failures are matrix-related, refer to Blank Spike as measure of method performance in clean matrix. The Shaw Chemist will be contacted and a decision will be made to either report the data as is with a notation in the analytical narrative or if the samples should be re-extract and re-analyzed.	Analyst/Prep analyst	Precision and Accuracy in field samples	%Recovery = (Calculated Value - Sample Value/True Value) *100%

SAP/QAPP Worksheet #28n – Laboratory QC Samples Table
Waste Characterization TCLP Pesticides (Concluded)

Matrix	Waste
Analytical Group	TCLP Pesticides
Concentration Level	Low
Analytical Method/ SOP Reference	SW-846 8081A/LAB SOP#GC015
Analytical Organization	Accutest Laboratories Southeast, Inc.

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	DQI	Measurement Performance Criteria
MSDs	1 per 20 samples or 1 for each extraction batch	%Recovery = (Calculated Value – Sample Value/True Value) *100% RPD (%) = [(XA-XB)/XM] * 100 Where: XA and XB are the concentration in the MS and MSD, and XM is the average value of the concentrations in the MS and MSD, (XA + XB)/2	See above	Analyst/Prep analyst	Precision and Accuracy in field samples	%Recovery = (Calculated Value – Sample Value/True Value) *100% RPD (%) = [(XA-XB)/XM] * 100 Where: XA and XB are the concentration in the MS and MSD, and XM is the average value of the concentrations in the MS and MSD, (XA + XB)/2
Surrogate Spikes	Every sample	%Recovery = (Calculated Value/True Value) *100%	Reason for poor recoveries is investigated and eliminated before further analytical activities. Corrective actions are: 1. High bias, samples ND – report without qualification. 2. Low bias – re-extract and reanalyze. Insufficient volume – qualify and footnote	Analyst/Prep analyst	Individual sample preparation efficiency control	%Recovery = (Calculated Value/True Value) *100%

SAP/QAPP Worksheet #28n – Laboratory QC Samples Table
Waste Characterization TCLP Herbicides

Matrix	Waste
Analytical Group	TCLP Herbicides
Concentration Level	Low
Analytical Method/ SOP Reference	SW-846 8151A/ LAB SOP#GC031
Analytical Organization	Accutest Laboratories Southeast, Inc.

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	DQI	Measurement Performance Criteria
ICAL	As needed (see CCV passing criteria below and SW-846 8000 method)	%RSD ≤20%	If the acceptance criteria were not met, re-calibration is performed before any samples may be analyzed.	Analyst	Laboratory Accuracy	%RSD ≤20%
ICV	1 per ICAL, analyzed after ICAL, before field samples	%D ≤15%	If the acceptance criteria were not met, ICV is reanalyzed, if the criterion is still not met after reanalysis, a new ICV is prepared with fresh ampule and the process repeated. If the criterion is still not met after re-preparation, re-calibration is performed before any samples may be analyzed.	Analyst	Laboratory Accuracy	%D ≤15%
CCV	Opening CCV, then every 10 samples, with closing CCV	%D ≤15%	If the criterion has not achieved corrective action, re-calibration is performed before any samples may be analyzed. Corrective action may include re-analysis of the samples.	Analyst	Laboratory Accuracy	%D ≤15%

SAP/QAPP Worksheet #28n – Laboratory QC Samples Table
Waste Characterization TCLP Herbicides (Continued)

Matrix	Waste
Analytical Group	TCLP Herbicides
Concentration Level	Low
Analytical Method/ SOP Reference	SW-846 8151A/ LAB SOP#GC031
Analytical Organization	Accutest Laboratories Southeast, Inc.

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	DQI	Measurement Performance Criteria
MB	1 per extraction batch*	<1/2 RL	The source of the contamination is investigated and eliminated before proceeding with further analysis. Corrective actions are: 1. Samples ND – report without qualification 2. Samples >10X contamination level – report with qualification 3. Samples <10x contamination – re-extract and reanalyze. Insufficient sample - qualify and footnote	Analyst/Prep analyst	Absence of interference/contamination	<1/2 RL

SAP/QAPP Worksheet #28n – Laboratory QC Samples Table
Waste Characterization TCLP Herbicides (Continued)

Matrix	Waste
Analytical Group	TCLP Herbicides
Concentration Level	Low
Analytical Method/ SOP Reference	SW-846 8151A/ LAB SOP#GC031
Analytical Organization	Accutest Laboratories Southeast, Inc.

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	DQI	Measurement Performance Criteria
BS/LCS	1 per extraction batch*	%Recovery = (Calculated Value/True Value) *100% % Recoveries are assessed using in house limits.	Source of poor recovery is investigated and eliminated before proceeding with further analysis, corrective actions are: 1. Biased high, samples ND – report without qualifications. 2. Biased low – re-extract and reanalyze. Insufficient volume – qualify and footnote	Analyst/Prep analyst	Laboratory Accuracy/Method bias in ideal matrix	%Recovery = (Calculated Value/True Value) *100% % Recoveries are assessed using in house limits.

SAP/QAPP Worksheet #28n – Laboratory QC Samples Table
Waste Characterization TCLP Herbicides (Continued)

Matrix	Waste
Analytical Group	TCLP Herbicides
Concentration Level	Low
Analytical Method/ SOP Reference	SW-846 8151A/ LAB SOP#GC031
Analytical Organization	Accutest Laboratories Southeast, Inc.

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	DQI	Measurement Performance Criteria
MS	1 per extraction batch*	%Recovery = (Calculated Value - Sample Value/True Value) *100% % Recoveries are assessed using in house limits.	If the recoveries indicate that the problem is procedure related, re-extraction and re-analysis is required. If the recoveries indicate that the failures are matrix-related, refer to Blank Spike as measure of method performance in clean matrix. The Shaw Chemist will be contacted and a decision will be made to either report the data as is with a notation in the analytical narrative or if the samples should be re-extract and re-analyzed.	Analyst/Prep analyst	Precision and Accuracy in field samples	%Recovery = (Calculated Value - Sample Value/True Value) *100% % Recoveries are assessed using in house limits.

SAP/QAPP Worksheet #28n – Laboratory QC Samples Table
Waste Characterization TCLP Herbicides (Continued)

Matrix	Waste
Analytical Group	TCLP Herbicides
Concentration Level	Low
Analytical Method/ SOP Reference	SW-846 8151A/ LAB SOP#GC031
Analytical Organization	Accutest Laboratories Southeast, Inc.

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	DQI	Measurement Performance Criteria
MSDs	1 per extraction batch*	%Recovery = (Calculated Value – Sample Value/True Value) *100% RPD (%) = [(XA-XB)/XM] * 100 Where: XA and XB are the concentration in the MS and MSD, and XM is the average value of the concentrations in the MS and MSD, (XA + XB)/2	See above	Analyst/Prep analyst	Precision and Accuracy in field samples	%Recovery = (Calculated Value – Sample Value/True Value) *100% RPD (%) = [(XA-XB)/XM] * 100 Where: XA and XB are the concentration in the MS and MSD, and XM is the average value of the concentrations in the MS and MSD, (XA + XB)/2

SAP/QAPP Worksheet #28n – Laboratory QC Samples Table
Waste Characterization TCLP Herbicides (Concluded)

Matrix	Waste
Analytical Group	TCLP Herbicides
Concentration Level	Low
Analytical Method/ SOP Reference	SW-846 8151A/ LAB SOP#GC031
Analytical Organization	Accutest Laboratories Southeast, Inc.

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	DQI	Measurement Performance Criteria
Surrogate Spikes	Every sample and standard	%Recovery = (Calculated Value/True Value) *100%	Reason for poor recoveries is investigated and eliminated before further analytical activities. Corrective actions are: 1. High bias, samples ND – report without qualification. 2. Low bias – re-extract and reanalyze. Insufficient volume – qualify and footnote	Analyst/Prep analyst	Individual sample preparation efficiency control	%Recovery = (Calculated Value/True Value) *100%

SAP/QAPP Worksheet #28n – Laboratory QC Samples Table
Waste Characterization TCLP ICP Metals

Matrix	Waste
Analytical Group	TCLP ICP Metals
Concentration Level	Low
Analytical Method/ SOP Reference	SW-846 6010C/LAB SOP# Met 100, Met 103
Analytical Organization	Accutest Laboratories Southeast, Inc.

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	DQI	Measurement Performance Criteria
ICAL	As needed (see CCV passing criteria below)	%RSD <5%, or Correlation coefficient R>0.995	If the acceptance criteria were not met, re-calibration is performed before any samples may be analyzed.	Analyst	Laboratory Accuracy	%RSD <5%, or Correlation coefficient R>0.995
ICV	1 per ICAL, analyzed after ICAL, before field samples	%D <10%	If the acceptance criteria were not met, re-calibration is performed before any samples may be analyzed.	Analyst	Laboratory Accuracy	%D <10%
CCV	Opening CCV, then every 10 samples, with closing CCV	%D <10%	If the criterion has not achieved corrective action, re-calibration is performed before any samples may be analyzed. Corrective action may include re-analysis of the samples.	Analyst	Laboratory Accuracy	%D <10%

Calibration Blank	After every ICV and CCV, including terminal CCV	No analytes detected above LOD	Determine source of contamination, correct problem. Qualify associated data with B qualifier and appropriate footnote. Corrective action may include reanalysis of CCB and reanalysis of associated samples.	Analyst	Absence of interference/contamination	<LOD

SAP/QAPP Worksheet #28n – Laboratory QC Samples Table
Waste Characterization TCLP ICP Metals (Continued)

Matrix	Waste
Analytical Group	TCLP ICP Metals
Concentration Level	Low
Analytical Method/ SOP Reference	SW-846 6010C/LAB SOP# Met 100, Met 103
Analytical Organization	Accutest Laboratories Southeast, Inc.

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	DQI	Measurement Performance Criteria
MB	1 per extraction batch	<1/2 RL	The source of the contamination is investigated and eliminated before proceeding with further analysis. Corrective actions are: 1. Samples ND – report without qualification 2. Samples >10X contamination level – report with qualification 3. Samples <10x contamination – re-extract and reanalyze. Insufficient sample - qualify and footnote	Analyst/Prep analyst	Absence of interference/contamination	<1/2 RL

SAP/QAPP Worksheet #28n – Laboratory QC Samples Table
Waste Characterization TCLP ICP Metals (Continued)

Matrix	Waste
Analytical Group	TCLP ICP Metals
Concentration Level	Low
Analytical Method/ SOP Reference	SW-846 6010C/LAB SOP# Met 100, Met 103
Analytical Organization	Accutest Laboratories Southeast, Inc.

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	DQI	Measurement Performance Criteria
LCS	1 per extraction batch	%Recovery = (Calculated Value/True Value) *100%; 80%<%Recovery<120%	Source of poor recovery is investigated and eliminated before proceeding with further analysis, corrective actions are: 1. Biased high, samples ND – report without qualifications. 2. Biased low – re-extract and reanalyze. Insufficient volume – qualify and footnote	Analyst/Prep analyst	Laboratory Accuracy/Method bias in ideal matrix	%Recovery = (Calculated Value/True Value) *100%; 80%<%Recovery<120%

SAP/QAPP Worksheet #28n – Laboratory QC Samples Table
Waste Characterization TCLP ICP Metals (Continued)

Matrix	Waste
Analytical Group	TCLP ICP Metals
Concentration Level	Low
Analytical Method/ SOP Reference	SW-846 6010C/LAB SOP# Met 100, Met 103
Analytical Organization	Accutest Laboratories Southeast, Inc.

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	DQI	Measurement Performance Criteria
MS	1 per 20 samples or 1 for each extraction batch	%Recovery = (Calculated Value - Sample Value/True Value) *100%: 80%<%Recovery<120%	If the recoveries indicate that the problem is procedure related, re-extraction and re-analysis is required. If the recoveries indicate that the failures are matrix-related, refer to Blank Spike as measure of method performance in clean matrix. The Shaw Chemist will be contacted and a decision will be made to either report the data as is with a notation in the analytical narrative or if the samples should be re-extract and re-analyzed.	Analyst/Prep analyst	Precision and Accuracy in field samples	%Recovery = (Calculated Value - Sample Value/True Value) *100%: 80%<%Recovery<120%

SAP/QAPP Worksheet #28n – Laboratory QC Samples Table
Waste Characterization TCLP ICP Metals (Concluded)

Matrix	Waste
Analytical Group	TCLP ICP Metals
Concentration Level	Low
Analytical Method/ SOP Reference	SW-846 6010C/LAB SOP# Met 100, Met 103
Analytical Organization	Accutest Laboratories Southeast, Inc.

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	DQI	Measurement Performance Criteria
MSD	1 per 20 samples or 1 for each extraction batch	%Recovery = (Calculated Value – Sample Value/True Value) *100% RPD (%) = [(XA-XB)/XM] * 100 Where: XA and XB are the concentration in the MS and MSD, and XM is the average value of the concentrations in the MS and MSD, (XA + XB)/2	See above	Analyst/Prep analyst	Precision and Accuracy in field samples	%Recovery = (Calculated Value – Sample Value/True Value) *100% RPD (%) = [(XA-XB)/XM] * 100 Where: XA and XB are the concentration in the MS and MSD, and XM is the average value of the concentrations in the MS and MSD, (XA + XB)/2
Serial Dilution Test	Each preparatory batch or when a new or unusual matrix is encountered	Five-fold dilution must agree within ± 10% of the original determination. Only applicable for samples with concentrations >50x MDL for ICP.	Perform post-digestion spike (PDS) addition. Flagging criteria are not appropriate.	Analyst	Precision (field samples)	Five-fold dilution must agree within ± 10% of the original determination. Only applicable for samples with concentrations >50x MDL for ICP.

SAP/QAPP Worksheet #28n – Laboratory QC Samples Table
Waste Characterization TCLP Mercury

Matrix	Waste
Analytical Group	TCLP Mercury
Concentration Level	Low
Analytical Method/ SOP Reference	SW-846 7470A, LAB SOP#MET106
Analytical Organization	Accutest Laboratories Southeast, Inc.

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	DQI	Measurement Performance Criteria
ICAL	As needed (see CCV passing criteria)	Correlation coefficient R≥0.995	If the acceptance criteria were not met, re-calibration is performed before any samples may be analyzed.	Analyst	Laboratory Accuracy	Correlation coefficient R≥0.995
ICV	1 per ICAL, analyzed after ICAL, before field samples	%D ≤10%	If the acceptance criteria were not met, re-calibration is performed before any samples may be analyzed.	Analyst	Laboratory Accuracy	%D ≤10%
CCV	Opening CCV, then every 10 samples, with closing CCV	%D ≤20%	If the criterion has not achieved corrective action, re-calibration is performed before any samples may be analyzed. Corrective action may include re-analysis of the samples.	Analyst	Laboratory Accuracy	%D ≤20%

SAP/QAPP Worksheet #28n – Laboratory QC Samples Table
Waste Characterization TCLP Mercury (Continued)

Matrix	Waste
Analytical Group	TCLP Mercury
Concentration Level	Low
Analytical Method/ SOP Reference	SW-846 7470A, LAB SOP#MET106
Analytical Organization	Accutest Laboratories Southeast, Inc.

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	DQI	Measurement Performance Criteria
MB	1 per extraction batch	<1/2 RL	The source of the contamination is investigated and eliminated before proceeding with further analysis. Corrective actions are: 1. Samples ND – report without qualification 2. Samples >10X contamination level – report with qualification 3. Samples <10x contamination – re-extract and reanalyze. Insufficient sample - qualify and footnote	Analyst/Prep analyst	Absence of interference/contamination	<1/2 RL

SAP/QAPP Worksheet #28n – Laboratory QC Samples Table
Waste Characterization TCLP Mercury (Continued)

Matrix	Waste
Analytical Group	TCLP Mercury
Concentration Level	Low
Analytical Method/ SOP Reference	SW-846 7470A, LAB SOP#MET106
Analytical Organization	Accutest Laboratories Southeast, Inc.

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	DQI	Measurement Performance Criteria
LCS	1 per extraction batch	%Recovery = (Calculated Value/True Value) *100%; 80%≤%Recovery≤ 120%	Source of poor recovery is investigated and eliminated before proceeding with further analysis, corrective actions are: 1. Biased high, samples ND – report without qualifications. 2. Biased low – re-extract and reanalyze. Insufficient volume – qualify and footnote	Analyst/Prep analyst	Laboratory Accuracy/Method bias in ideal matrix	%Recovery = (Calculated Value/True Value) *100%; 80%≤%Recovery≤120 %

SAP/QAPP Worksheet #28n – Laboratory QC Samples Table
Waste Characterization TCLP Mercury (Continued)

Matrix	Waste
Analytical Group	TCLP Mercury
Concentration Level	Low
Analytical Method/ SOP Reference	SW-846 7470A, LAB SOP#MET106
Analytical Organization	Accutest Laboratories Southeast, Inc.

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	DQI	Measurement Performance Criteria
MS	1 per 20 samples or 1 for each extraction batch	%Recovery = (Calculated Value - Sample Value/True Value) *100%: 80%≤%Recovery≤ 120%	If the recoveries indicate that the problem is procedure related, re-extraction and re-analysis is required. If the recoveries indicate that the failures are matrix-related, refer to Blank Spike as measure of method performance in clean matrix. The Shaw Chemist will be contacted and a decision will be made to either report the data as is with a notation in the analytical narrative or if the samples should be re-extract and re-analyzed.	Analyst/Prep analyst	Precision and Accuracy in field samples	%Recovery = (Calculated Value - Sample Value/True Value) *100%: 80%≤%Recovery≤120 %

SAP/QAPP Worksheet #28n – Laboratory QC Samples Table
Waste Characterization TCLP Mercury (Continued)

Matrix	Waste
Analytical Group	TCLP Mercury
Concentration Level	Low
Analytical Method/ SOP Reference	SW-846 7470A, LAB SOP#MET106
Analytical Organization	Accutest Laboratories Southeast, Inc.

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	DQI	Measurement Performance Criteria
MSDs	1 per 20 samples or 1 for each extraction batch	%Recovery = (Calculated Value – Sample Value/True Value) *100% RPD (%) = [(XA-XB)/XM] * 100 Where: XA and XB are the concentration in the MS and MSD, and XM is the average value of the concentrations in the MS and MSD, (XA + XB)/2: %RPD $\leq$ 20%	See above	Analyst/Prep analyst	Precision and Accuracy in field samples	%Recovery = (Calculated Value – Sample Value/True Value) *100% RPD (%) = [(XA-XB)/XM] * 100 Where: XA and XB are the concentration in the MS and MSD, and XM is the average value of the concentrations in the MS and MSD, (XA + XB)/2: %RPD $\leq$ 20%

SAP/QAPP Worksheet #28n – Laboratory QC Samples Table
Waste Characterization Reactive Cyanide

Matrix	Waste
Analytical Group	Cyanide
Concentration Level	Low
Analytical Method/ SOP Reference	SW-8346 Ch. 7/GN136
Analytical Organization	Accutest Laboratories Southeast, Inc.

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	DQI	Measurement Performance Criteria
ICAL	As needed (see CCV passing criteria below)	Correlation coefficient R≥0.995; Intercept < RL	If the acceptance criteria were not met, re-calibration is performed before any samples may be analyzed.	Laboratory Analyst	Laboratory Accuracy	Correlation coefficient R≥0.995; Intercept < RL
ICV	1 per ICAL, analyzed after ICAL, before field samples	%D ≤15%	If the acceptance criteria were not met, re-calibration is performed before any samples may be analyzed.	Laboratory Analyst	Laboratory Accuracy	%D ≤15%
CCV	Opening CCV, then every 10 samples, with closing CCV	%D ≤10%	If the criterion has not achieved corrective action, re-calibration is performed before any samples may be analyzed. Corrective action may include re-analysis of the samples.	Laboratory Analyst	Laboratory Accuracy	%D ≤10%

SAP/QAPP Worksheet #28n – Laboratory QC Samples Table
Waste Characterization Reactive Cyanide (Continued)

Matrix	Waste
Analytical Group	Cyanide
Concentration Level	Low
Analytical Method/ SOP Reference	SW-8346 Ch. 7/GN136
Analytical Organization	Accutest Laboratories Southeast, Inc.

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	DQI	Measurement Performance Criteria
MB	1 per extraction batch	< RL	The source of the contamination is investigated and eliminated before proceeding with further analysis. Corrective actions are: 1. Samples ND – report without qualification 2. Samples >10X contamination level – report with qualification 3. Samples <10x contamination – re-extract and reanalyze. Insufficient sample - qualify and footnote	Laboratory Analyst/Prep Analyst	Absence of interference/contamination	< RL

SAP/QAPP Worksheet #28n – Laboratory QC Samples Table
Waste Characterization Reactive Cyanide (Concluded)

Matrix	Waste
Analytical Group	Cyanide
Concentration Level	Low
Analytical Method/ SOP Reference	SW-8346 Ch. 7/GN136
Analytical Organization	Accutest Laboratories Southeast, Inc.

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	DQI	Measurement Performance Criteria
LCS	1 per extraction batch	%Recovery = (Calculated Value/True Value) *100%; 0%≤%Recovery≤100 %	Source of poor recovery is investigated and eliminated before proceeding with further analysis, corrective actions are: 1. Biased high, samples ND – report without qualifications. 2. Biased low – re-extract and reanalyze. Insufficient volume – qualify and footnote	Laboratory Analyst/Prep Analyst	Laboratory Accuracy/Method bias in ideal matrix	%Recovery = (Calculated Value/True Value) *100%; 0%≤%Recovery≤100 %
DUPs	1 per 20 samples or 1 for each preparation batch	RPD (%) = [(XA-XB)/XM] * 100 Where: XA and XB are the concentration in the Sample and DUP, and XM is the average value of the concentrations in the MS and MSD, (XA + XB)/2: %RPD ≤ 30%	See above	Laboratory Analyst	Precision and Accuracy in field samples	RPD (%) = [(XA-XB)/XM] * 100 Where: XA and XB are the concentration in the Sample and DUP, and XM is the average value:(XA + XB)/2: %RPD ≤ 30%

SAP/QAPP Worksheet #28n – Laboratory QC Samples Table
Waste Characterization Reactive Sulfide

Matrix	Waste
Analytical Group	Reactivity
Concentration Level	Low
Analytical Method/ SOP Reference	SW-846 Ch.7/LAB SOP#GN136
Analytical Organization	Accutest Laboratories Southeast, Inc.

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	DQI	Measurement Performance Criteria
MB	1 per batch	< RL	The source of the contamination is investigated and eliminated before proceeding with further analysis. Corrective actions are: 1. Samples ND – report without qualification 2. Samples >10X contamination level – report with qualification 3. Samples <10x contamination – re-extract and reanalyze. Insufficient sample - qualify and footnote	Laboratory Analyst/Prep Analyst	Absence of interference/contamination	< RL

SAP/QAPP Worksheet #28n – Laboratory QC Samples Table
Waste Characterization Reactive Sulfide (Concluded)

Matrix	Waste
Analytical Group	Reactivity
Concentration Level	Low
Analytical Method/ SOP Reference	SW-846 Ch.7/LAB SOP#GN136
Analytical Organization	Accutest Laboratories Southeast, Inc.

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	DQI	Measurement Performance Criteria
LCS	1 per batch	%Recovery = (Calculated Value/True Value) *100%; 0%≤%Recovery≤100%	Source of poor recovery is investigated and eliminated before proceeding with further analysis, corrective actions are: 1. Biased high, samples ND – report without qualifications. 2. Biased low – re-extract and reanalyze. Insufficient volume – qualify and footnote	Laboratory Analyst	Laboratory Accuracy/Method bias in ideal matrix	%Recovery = (Calculated Value/True Value) *100%; 0%≤%Recovery≤100%
DUPs	1 per 20 samples or 1 for each preparation batch	RPD (%) = [(XA-XB)/XM] * 100 Where: XA and XB are the concentration in the Sample and DUP, and XM is the average value of the concentrations in the MS and MSD, (XA + XB)/2: %RPD ≤ 30%	See above	Laboratory Analyst	Precision and Accuracy in field samples	RPD (%) = [(XA-XB)/XM] * 100 Where: XA and XB are the concentration in the Sample and DUP, and XM is the average value:(XA + XB)/2: %RPD ≤ 30%

SAP/QAPP Worksheet #28n – Laboratory QC Samples Table
Waste Characterization Ignitability (Flashpoint)

Matrix	Waste
Analytical Group	Flash Point
Concentration Level	Low
Analytical Method/ SOP Reference	SW-846 1010/LAB SOP#GN121
Analytical Organization	Accutest Laboratories Southeast, Inc.

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	DQI	Measurement Performance Criteria
p-Xylene, second source	1 per day	flash point of p-Xylene is 77 ± 4.3°F	Second analyst witnessing flash. Calibrate thermometer	Laboratory Analyst	Laboratory Accuracy	flash point of p-Xylene is 81 ± 4.3°F
p-Xylene, first source	Opening sequence, then every 10 samples and at the end	flash point of p-Xylene is 77 ± 4.3°F	Second analyst witnessing flash. Calibrate thermometer	Laboratory Analyst	Laboratory Accuracy	flash point of p-Xylene is 81 ± 4.3°F

SAP/QAPP Worksheet #28n – Laboratory QC Samples Table
Waste Characterization Corrosivity (pH)

Matrix	Waste
Analytical Group	pH
Concentration Level	Low
Analytical Method/ SOP Reference	SW-846 9045D/LAB SOP#GN166
Analytical Organization	Accutest Laboratories Southeast, Inc.

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	DQI	Measurement Performance Criteria
CCV	Every 10 samples	Within 0.05 pH units of true value	Rerun standard, and/or recalibrate instrument and reanalyzed all samples since last acceptable CCV.	Laboratory Analyst	Laboratory Accuracy	Within 0.05 pH units of true value
Duplicate samples	Every 20 samples	%RPD $\leq$ 10%	If sufficient sample volume is available, reanalyze affected samples. Qualify data as needed.	Laboratory Analyst	Laboratory Accuracy	%RPD $\leq$ 10%

SAP/QAPP WORKSHEET #29 –
PROJECT DOCUMENTS AND RECORDS TABLE

Document	Where Maintained
Final Work Plan and Sampling and Analysis Plans	Shaw Project file Project Repository and Administrative Record
Field notes/logbook	Shaw Project file
Chain of custody forms	Shaw Project file
Laboratory raw data package	Shaw Project file
Audit/assessment checklists/reports	Shaw Project file and laboratory
Corrective action forms/reports	Shaw Project file and laboratory
Laboratory equipment calibration logs	Accutest Laboratories, Southeast
Sample preparation logs	Accutest Laboratories, Southeast
Run logs	Accutest Laboratories, Southeast
Sample disposal records	Accutest Laboratories, Southeast
Validated data	Shaw Project file

SAP/QAPP WORKSHEET #30 – ANALYTICAL SERVICES TABLE

Worksheet #30 identifies the laboratory (or laboratories) providing analytical services for the project.

SAP/QAPP Worksheet #30 – Analytical Services Table

Matrix	Analytical Group	Sample Locations/ ID Numbers	Analytical Method	Data Package Turnaround Time	Laboratory/Organization (Name, Address, Contact, & Telephone #)	Backup Laboratory (Name, Address, Contact, & Telephone #)
Soil	VOC SVOC TPH Pesticides Herbicides PCB Dioxin/Furans Explosives Cyanide Metals Tritium	Site-specific	8260B 8270C 8015B 8081B 8151A 8082A 8290A 8330A 9012B 6010B/6020/7471B DOE 906.0	15 working days	Accutest Laboratories Southeast 4405 Vineland Road Suite C-15 Orlando, FL 32811 Phone: (407) 425-6700 Fax: (407) 425-0707 Sue Bell (813) 741-3338 sueb@accutest.com	Accutest Laboratories Southeast 4405 Vineland Road Suite C-15 Orlando, FL 32811 Phone: (407) 425-6700 Fax: (407) 425-0707 Norm Farmer (407) 425-6700 normf@accutest.com
Groundwater	VOC SVOC TPH Pesticides Herbicides PCB Dioxin/Furans Explosives Cyanide Metals Tritium	Site-specific	8260B 8270C 8015B 8081B 8151A 8082A 8290A 8330A 9012B 6010B/6020/7471B DOE 906.0	15 working days	Accutest Laboratories Southeast 4405 Vineland Road Suite C-15 Orlando, FL 32811 Phone: (407) 425-6700 Fax: (407) 425-0707 Sue Bell (813) 741-3338 sueb@accutest.com	Accutest Laboratories Southeast 4405 Vineland Road Suite C-15 Orlando, FL 32811 Phone: (407) 425-6700 Fax: (407) 425-0707 Norm Farmer (407) 425-6700 normf@accutest.com

SAP/QAPP Worksheet #30 – Analytical Services Table (Concluded)

Matrix	Analytical Group	Sample Locations/ ID Numbers	Analytical Method	Data Package Turnaround Time	Laboratory/Organization (Name, Address, Contact, & Telephone #)	Backup Laboratory (Name, Address, Contact, & Telephone #)
Investigation-Derived Waste	TCLP Extraction TCLP Metals TCLP VOC TCLP SVOC TCLP Pesticides TCLP Herbicides Ignitibility Corrosivity Reactivity Paint Filter Test	Site-specific	1311 1311/6010B/7470B 1311/8260B 1311/8270C 1311/8081B 1311/8151A 1010A 9045 SW-846, Chapter 7	15 working days	Accutest Laboratories Southeast 4405 Vineland Road Suite C-15 Orlando, FL 32811 Phone: (407) 425-6700 Fax: (407) 425-0707 Sue Bell (813) 741-3338 sueb@accutest.com	Accutest Laboratories Southeast 4405 Vineland Road Suite C-15 Orlando, FL 32811 Phone: (407) 425-6700 Fax: (407) 425-0707 Norm Farmer (407) 425-6700 normf@accutest.com

Sub-contracted laboratory performing dioxin/furans analysis Method 8290A is Maxxam Laboratories, Mississauga, Ontario, Canada.
Sub-contracted laboratory performing tritium analysis is GEL Laboratories, Charleston, SC.

SAP/QAPP WORKSHEET #31 – PLANNED PROJECT ASSESSMENTS TABLE

Worksheet #31 summarizes the planned project assessment activities for each site-specific task.

SAP/QAPP Worksheet #31 – Planned Project Assessments Table

Assessment Type	Frequency	Internal or External	Organization Performing Assessment	Person(s) Responsible for Performing Assessment	Person(s) Responsible for Responding to Assessment Findings	Person(s) Responsible for Identifying and Implementing CAs	Person(s) Responsible for Monitoring Effectiveness of CA
Review of Work Plans and QAPP with Field Staff	1/prior to sampling start	I	Shaw	Shaw Project Manager or Field Lead	Shaw Environmental Sampling Field Lead	Shaw Environmental Sampling Field Lead	Shaw Project Manager or Field Lead
Daily QC Report	Daily	I	Shaw	Shaw Field Lead or Field QC	Shaw Environmental Sampling Field Lead	Shaw Environmental Sampling Field Lead	Shaw Project Manager or Field Lead
Daily Tailgate Safety Meeting	Daily	I	Shaw	Shaw Site Safety Officer	Shaw, Project Manager or Field Lead; Shaw H&S Manager	Shaw, Project Manager or Field Lead; Shaw H&S Manager	Shaw Site Safety Officer
Field Sampling and COC Review Against QAPP Requirements	Daily	I	Shaw	Shaw Field Lead or Shaw Project Chemist	Shaw Environmental Sampling Field Lead	Shaw Environmental Sampling Field Lead	Shaw Field Lead or Shaw Project Chemist
Laboratory TSA	If deemed necessary prior to start of sampling activities	E	Shaw	Shaw Project Chemist	Laboratory Quality Assurance (QA) Officer	Laboratory QA Officer	Laboratory QA Officer and Shaw Project Chemist
Performance evaluation samples	If deemed necessary during sampling activities	I/E	Shaw	Project Chemist	Shaw Project Chemist and Laboratory QA Officer	Shaw Project Chemist and Laboratory QA Officer	Shaw Project Chemist or Laboratory QA Officer
Initial Inspection/ Preparatory Meeting	Prior to the start of sampling activities	I	Shaw	Shaw QC Specialist or Project Chemist	Shaw Field Lead, Field Chemist, or Sample Technician	Shaw QC Specialist or Project Chemist	Project Chemist or QC Specialist
Field audits	As needed as the project progresses	I	Shaw or Army QA Officer	Shaw or Army QA Officer	Shaw Field Lead, Field Chemist	Shaw QC Specialist or Project Chemist	Shaw QC Specialist or Project Chemist

SAP/QAPP WORKSHEET #32 –
ASSESSMENT FINDINGS AND CORRECTIVE ACTION RESPONSES

Worksheet #32 describes the activities for correcting any problems identified during project assessments (Worksheet #31).

SAP/QAPP Worksheet #32 – Assessment Findings and Corrective Action Responses

Assessment Type	Nature of Deficiencies Documentation	Individual(s) Notified of Findings	Timeframe of Notification	Nature of CA Response Documentation	Individual(s) Receiving CA Response	Timeframe for Response
Field Sampling TSA	Written Audit Report	(Shaw Task Manager)	48 hours after audit	E-Mail or letter	Field Technician, Shaw Project Chemist, Shaw QC Specialist	24 hours after notification
Off-Site Laboratory Audit (if performed for project)	Written Audit Report	Laboratory QA Manager, Laboratory PM	5 days after Audit	Corrective Action Plan	Shaw Project Chemist, Shaw QC Specialist	10 business days after receiving report
Laboratory Data Review Findings	Memo	Laboratory QA Manager, Laboratory PM	48 hours after audit	E-Mail or letter	Shaw Project Chemist	3 days after notification

SAP/QAPP WORKSHEET #33 – QA MANAGEMENT REPORTS TABLE

Worksheet #33 describes the process for addressing QA management reports for the project. Copies of QA management reports should be included in the final report for the project where appropriate.

SAP/QAPP Worksheet #33 – QA Management Reports Table

Type of Report	Frequency	Projected Delivery Date(s)	Person(s) Responsible for Report Preparation	Report Recipient(s)
Field Sampling, Audit Report Initial and Follow up inspections	At least once at the beginning of sampling activities and then as needed as the project progresses	Within 24 hours of Field Sampling Audit	Shaw QC Specialist or Shaw Project Chemist	Shaw Task Manager or Shaw PM
Off-Site Laboratory TSA Report (if performed)	Prior to sample receipt at laboratory	Within 48 hours of on-site audit	Shaw Project Chemist	Laboratory QA Manager, Laboratory PM
Data Review Report	After sample and analysis data reviewed by Project Chemist	As received from laboratory	Shaw Project Chemist	Shaw Task Manager or Shaw PM
Data Validation Report	After all data packages are received from laboratory	Within 2 weeks of data package receipt	Shaw Chemist or Independent 3rd party data validation company	Shaw Project Chemist
Final Project Report	After completion of all fieldwork activities	Project document delivery schedule is provided in the Work Plan	Shaw Task Manager or Shaw PM	AFCEE COR and regulatory agencies

SAP/QAPP WORKSHEET #34 – VERIFICATION (STEP I) PROCESS TABLE

Worksheet #34 describes the process for data review and verification for the projects. The internal/external designation refers to the organization generating the data.

SAP/QAPP Worksheet #34 – Verification (Step I) Process Table

Verification Input	Description	Internal (I)/ External (E)	Responsible for Verification (Name, Organization)
Chain-of-custody forms	Chain of custody forms will be reviewed internally upon their completion and verified against the packed sample coolers they represent. The shipper's signature on the chain of custody should be initialed by the reviewer, a copy of the chain of custody retained in the project file, and the original any remaining copies placed inside the cooler for shipment.	I	Field sampling team leader or Field Chemist
Field notes/logbook	Field notes will be reviewed internally and placed in the project file upon project completion.	I	Shaw Field Lead, or QC Specialist, or Project Chemist
Audit reports	Upon report completion, a copy of all audit reports will be placed in the project file. If corrective actions are required, a copy of the documented corrective action taken will be attached to the appropriate audit report in the project file. At the beginning of each week, and at the completion of the site work, project file audit reports will be reviewed internally to ensure that all appropriate corrective actions have been taken and that corrective action reports are attached. If corrective actions have not been taken, the PM will be notified to ensure action is taken.	I	Shaw Project Technical Manager or Shaw PM
Laboratory data	All laboratory data packages will be verified internally by the laboratory performing the work for completeness and technical accuracy prior to submittal. All received data packages will be verified by the Shaw Chemist and a data reviewer according to the data validation procedures specified in this Sampling and Analysis Plan.	I/E	Laboratory, Shaw Project Chemist, and/or data reviewer
Electronic data deliverables	All EDDs will be verified internally by the subcontract laboratory for completeness and technical accuracy prior to submittal to Shaw. All received EDDs will be verified by Shaw or the data reviewer against the hardcopy laboratory reports	I/E	Laboratory, Shaw Project Chemist, and/or data reviewer

SAP/QAPP WORKSHEET #35 – VALIDATION (STEPS IIA AND IIB) PROCESS TABLE

Worksheets #35 and #36 describe the process for documenting, reviewing, and validating data collected for the project. Validation procedures are documented in the site-specific plans to ensure that data collected are evaluated completely and consistently to provide usable data that meet the DQOs. Worksheets #35 and #36 identify the criteria by which data will be validated.

SAP/QAPP Worksheet #35 – Validation (Steps IIa and IIb) Process Table

Step IIa/IIb	Validation Input	Description	Responsible for Validation
IIa	Sampling Methods and Procedures	Ensure that the required sampling methods were used to collect project samples, and any field changes or deviations are noted in the field documentation. Review field sample logs for compliance with the Approved SAP/QAPP.	Shaw QC Specialist or Project Chemist
IIa	Holding times	Ensure the samples were analyzed within the recommended USEPA holding times. If holding times were not met, verify that deviations were documented and proper notifications were made.	Analyst – Laboratory PM
IIa	Analytes	Ensure that the required list of analytes was reported per project requirements.	Analyst – Laboratory PM, Shaw Project Chemist
IIa	Hardcopy data packages	Review data package for compliance with USEPA Method Requirements, approved SAP/QAPP, and DOD QSM requirements.	Shaw Project Chemist or data reviewer/validator
IIa	Documentation of all USEPA Method QC sample Results; 100% Level III data review	Determine whether all USEPA Method-required QC samples were analyzed and met required control limits per SAP/QAPP and DOD QSM requirements when applicable.	Shaw Project Chemist or data reviewer/validator
IIa	5% Level IV Raw Data Review	Recalculation of laboratory raw data to confirm laboratory calculation of final results	Shaw Project Chemist or data reviewer/validator

SAP/QAPP Worksheet #35 – Validation (Steps IIa and IIb) Process Table (Continued)

Step IIa/IIb	Validation Input	Description	Responsible for Validation
IIb	Documentation of all SAP/QAPP QC sample results	Determine whether all SAP/QAPP-required QC samples were collected and met required control limits per SAP/QAPP and DOD QSM requirements when applicable.	Shaw Project Chemist or data reviewer/validator
IIb	Sampling Plan	Determine whether the SAP/QAPP was executed as specified (number, location, type of field samples collected).	Shaw QC Specialist or Project Chemist
IIb	Sampling Procedures	Evaluate whether sampling procedures were followed with respect to techniques, decontamination, sample volume and preservation.	Shaw QC Specialist or Project Chemist
IIb	Field duplicate precision	Compare results for field duplicates with criteria established in the SAP/QAPP.	Project Chemist or data reviewer/validator
IIb	Project Reporting Limits	Review all laboratory data to ensure that site-specific quantitation limit goals specified in the SAP/QAPP are met.	Project Chemist or data reviewer/validator
IIb	Method performance criteria	Evaluate laboratory QC data against site-specific criteria.	Project Chemist or data reviewer/validator

IIa Compliance with methods, procedures, and contracts
IIb Comparison with measurement performance criteria in the SAP/QAPP

SAP/QAPP WORKSHEET #36 –
ANALYTICAL DATA VALIDATION (STEPS IIA AND IIB) SUMMARY TABLE

Step IIa/IIb	Matrix	Analytical Group	Validation Criteria	Data Validator
IIa	Soil	VOC SVOC TPH Pesticides Herbicides PCB Dioxin/Furans Explosives Cyanide Metals Tritium	In accordance with laboratory SOP, project specific SAP/QAPP, and USEPA Level III and IV guidance	Analytical Laboratory PM, Shaw Project Chemist or data reviewer/validator
IIa	Water	VOC SVOC TPH Pesticides Herbicides PCB Dioxin/Furans Explosives Cyanide Metals Tritium	In accordance with laboratory SOP, project specific SAP/QAPP, and USEPA Level III and IV guidance	Analytical Laboratory PM, Shaw Project Chemist or data reviewer/validator
IIb	Soil	VOC SVOC TPH Pesticides Herbicides PCB Dioxin/Furans Explosives Cyanide Metals Tritium	In accordance with data validation SOP DOD QSM, and USEPA National Functional Guidelines	Analytical Laboratory PM, Shaw Project Chemist or data reviewer/validator

SAP/QAPP WORKSHEET #36 –
ANALYTICAL DATA VALIDATION (STEPS IIA AND IIB) SUMMARY TABLE (Concluded)

Step IIa/IIb	Matrix	Analytical Group	Validation Criteria	Data Validator
IIb	Water	VOC SVOC TPH Pesticides Herbicides PCB Dioxin/Furans Explosives Cyanide Metals Tritium	In accordance with data validation SOP DOD QSM, and USEPA National Functional Guidelines	Analytical Laboratory PM, Shaw Project Chemist or data reviewer/validator

IIa Compliance with methods, procedures, and contracts
IIb Comparison with measurement performance criteria in the SAP/QAPP

SAP/QAPP WORKSHEET #37 – USABILITY ASSESSMENT

37.1 Data Quality Assessment Report

Based on data validation/review, the Shaw Project Chemist, or designee, will determine whether the project quality objectives have been met and will calculate data completeness. To reconcile the collected data with project PQOs and to establish and document data usability, the data will be reviewed against data quality indicators (Section 37.2).

The Project Chemist, or designee, will prepare a DQA Report. The DQA Report will cover the following topics:

- Implementation of sampling design and analysis according to the approved SAP/QAPP (or sample completeness and representativeness)
- Proper frequency of field QC samples and the adequacy of field decontamination procedures
- Accuracy and precision of the data collected
- Data comparability, if appropriate
- Data usability for project decisions

DQA reports will be included in the Final Project Report.

37.2 Data Quality Indicators

This section defines the DQIs and their use for assessment of data quality. DQIs consist of PARCC parameters.

37.2.1 Precision

Precision measures the reproducibility of measurements under a given set of conditions. The following equation illustrates the method for calculating precision as RPD to assess a method's precision:

$$\text{Precision as RPD} = \frac{\text{Absolute (Result – Duplicate Result)}}{\text{Average (Result + Duplicate Result)}} \times 100$$

The laboratory uses matrix spike MS/MSD pairs to assess the precision of analytical procedures, with one MS/MSD pair analyzed for every batch of up to 20 samples. In order to determine whether matrix interferences may be present, MS/MSD should be performed on field samples.

The laboratory uses LCS/LCD pairs when matrix spikes are not practical due to the nature of the sample or analytical method used and are prepared and analyzed with each batch of samples instead of MS/MSD samples. LCS/LCD samples may also be prepared in place of an MS/MSD in the case that a sufficient sample volume was not obtained in the field to perform the MS/MSD analysis. For inorganic analyses, analytical precision is usually calculated based on the sample and sample duplicate results.

The analytical laboratory will have statistically based acceptability limits for RPDs established for each method of analysis and sample matrix. The laboratory will review the QC samples to ensure that internal QC data are within the limits of acceptability. Any suspect trends will be investigated and corrective actions taken.

Collocated soil field duplicate samples will be used to assess the heterogeneity of contaminant or constituent distribution, not analytical precision. Collocated soil field duplicates will not be used to assess analytical precision.

37.2.2 Accuracy

Accuracy measures the bias of an analytical system by comparing the difference of a measurement with a reference value. The percent recovery of an analyte, which has been added to the environmental samples at a known concentration before extraction and analysis, provides a quantitation tool for analytical accuracy. The spiking solutions used for accuracy determinations are not used for instrument calibrations. The following equation illustrates how accuracy is evaluated:

$$\text{Accuracy as percent recovery} = \frac{\text{Spiked Sample Result-Sample Result}}{\text{Spike True Value}} \times 100$$

Percent recoveries for MS, MSD, LCS, and LCSD samples that are analyzed for every batch of up to 20 samples serve as a measure of analytical accuracy. Surrogate spikes added to all GC, GC/MS organic analysis samples, blanks, MS/MSD, and LCS/LCSD are used to evaluate the method's accuracy and to help determine matrix interferences.

As a general rule, the recovery of most compounds spiked into samples is expected to fall within a range of 70 to 130%. This range represents the USEPA advisory acceptability limits for MS and LCS recoveries for organic analytical methods. The surrogate standard advisory acceptability limits are also 70 to 130% for all organic analyses. Laboratories may use the advisory limits until the in-house, statistically-based control limits are developed for each method of organic analysis and sample matrix.

Control limits are defined as the mean recovery, plus-or-minus three standard deviations, of the 20 data points, with the warning limits set as the mean plus-or-minus two standard deviations. The laboratory will review the QC samples and surrogate standard recoveries for each analysis to ensure that internal QC data are within the limits of acceptability. The laboratory will investigate any suspect trends and take appropriate corrective actions.

37.2.3 Representativeness

Unlike precision and accuracy, which can be expressed in quantitative terms, representativeness is a qualitative parameter. Representativeness is the degree to which sample data accurately and precisely represent a characteristic of a population, parameter variations at a sampling point, or an environmental condition. It is a qualitative parameter that depends on proper design of the sampling program.

Field personnel will be responsible for ensuring that samples are representative of field conditions by collecting and handling samples according to the approved site-specific SAP, this SAP/QAPP, and field SOPs. Errors in sample collection, packaging, preservation, or COC procedures may result in samples being judged nonrepresentative and may form a basis for rejecting the data.

Data generated by the laboratory must be representative of the laboratory database of accuracy and precision measurements for analytes in different matrices. Laboratory procedures for sample preparation

will ensure that aliquots used for analysis are representative of the whole sample. Aliquots to be analyzed for volatile parameters will be removed before the laboratory composites/homogenizes the samples, to avoid losing volatile compounds during mixing.

37.2.4 Comparability

Comparability is a qualitative parameter expressing the confidence with which one data set can be compared with another, whether it was generated by a single laboratory or during inter- laboratory studies. The use of standardized field and analytical procedures ensures comparability of analytical data.

Sample collection and handling procedures will adhere to USEPA-approved protocols. Laboratory procedures will follow standard analytical protocols, use standard units, standardized report formats, follow the calculations as referenced in approved analytical methods, and use a standard statistical approach for QC measurements.

37.2.5 Completeness

Completeness is a measure of whether all the data necessary to meet the project objectives have been collected. For the data to be considered complete they must meet all acceptance criteria including accuracy and precision and other criteria specified for an analytical method. The data will be reviewed and/or validated to keep invalid data from being processed through data collection. Completeness is evaluated using the following equation:

$$\text{Completeness} = \frac{\text{Acceptable Number of Results}}{\text{Total Number of Results}} \times 100$$

The goal for completeness for all QC parameters, except holding times, will be 90%. The goal for holding times will be 100%. If these goals are not achieved, the sources of nonconformances will be evaluated to determine whether resampling and reanalysis is necessary.

37.3 Project-Required Detection and Quantitation Limits

The laboratory will determine the MDL following the procedure described in Title 40, Code of Federal Regulations, Part 136B. The MDL and defined as the minimum concentration of a substance that can be measured and reported with 99% confidence that the analyte concentration is greater than zero.

Additionally the laboratory will determine the LOD for each analyte and matrix. The LOD study involves preparation/digestion and analysis of seven replicates of a given matrix spiked with target analytes at concentrations two to five times greater than the estimated LOD. At a minimum, the laboratory will conduct annual LOD studies or quarterly LOD verification in accordance with DOD QSM requirements (DOD, 2010).

The laboratory will select the LOQ for each analyte, method, and matrix as concentrations greater than the corresponding LOD by factors of from 2 to 10. The LOQ is equivalent to the Reporting Limit, or Practical Quantitation Limit.

Environmental remediation projects and sampling and analysis tasks performed at for the Midwest PBR contract under this SAP/QAPP generally should have laboratory LOQs less than applicable comparison criteria. For soil samples the laboratory LOQ should be less than the NMED Hazardous Waste Bureau's current SSLs for the residential scenario (NMED, 2009), IEPA TACO values for residential scenario, or

USEPA's regional screening levels or preliminary remediation goals as appropriate. Additionally, established, statistically based background values for metals and PAH may serve as regulatory comparison or action limits. Groundwater sample analytical LOQs should be less than the USEPA MCL (USEPA, 2001b) or NMWQCC standards (NMWQCC, 2002). Individual projects may require different laboratory LOQs and have different comparison action limits as enumerated in the site-specific plans.

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USEPA, see U.S. Environmental Protection Agency.

Final
Construction Quality Plan
Midwestern Region Performance-Based Remediation

Prepared for U.S. Air Force Center for Engineering and the Environment
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Contract No. FA8903-09-D-8580, Task Order No. 0013
Project No. 144106
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Table of Contents

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-8

Table of Contents (continued)

List of Tables

List of Figures

List of Appendixes

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-8

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-8

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Acronyms and Abbreviations

AFB	Air Force Base
AFCEE	Air Force Center for Engineering and the Environment
AFRPA	Air Force Real Property Agency
CQC	construction quality control
CQP	Construction Quality Plan
DFW	definable feature of work
DCQCR	Daily Construction Quality Control Report
IAC	Illinois Administrative Code
IEPA	Illinois Environmental Protection Agency
ISM	Interim Stabilization Measure
NMAC	New Mexico Administrative Code
NMED	New Mexico Environment Department
PBR	Performance-Based Remediation
PM	Project Manager
RI	Remedial Investigation
QA	quality assurance
QAPP	Quality Assurance Project Plan
QC	quality control
QPP	Quality Project Plan
RCRA	Resource Conservation and Recovery Act
RFI	RCRA Facility Investigation
RSL	Regional Screening Level
SAP	Sampling and Analysis Plan
SC	Site closure
Shaw	Shaw Environmental & Infrastructure, Inc.
TACO	Tiered Approach to Corrective Action Objectives
TO	Task Order
USAF	U.S. Air Force
UFP	Uniform Federal Policy
USEPA	U.S. Environmental Protection Agency
UST	underground storage tank

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-8

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-8

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1.0 INTRODUCTION

This Construction Quality Plan (CQP) comprises part of the Quality Project Plan (QPP). The QPP applies to work performed under the Performance-Based Remediation (PBR) Contract FA8903-09-D-8580, Task Order (TO) No. 0013 for firm-fixed price environmental remediation services issued by issued by the 772nd Enterprise Sourcing Squadron, Lackland AFB on September 22, 2011.

The work will be performed by Shaw Environmental & Infrastructure, Inc. (Shaw) at 80 sites at four U.S. Air Force (USAF) bases within the USAF Midwestern Region: Scott Air Force Base (AFB) in Illinois and Cannon AFB, Holloman AFB, and Kirtland AFB in New Mexico. This CQP applies contract-wide and will be used as a reference for all site-specific technical work plans.

Shaw's responsibilities include the planning, programming, administration, and management necessary to provide work as specified. Shaw will conduct all work in strict accordance with the contract and all applicable federal, state, and local laws, regulations, codes, and directives. Shaw will complete all work and services under the contract in accordance with the QPP, technical work plans, and the documents and schedules established for each site. Submittal dates will be provided by Shaw in the project schedule. The type and number of submittals, the dates, and review meeting locations will be established for each major task or for each site.

1.1 Purpose

The purpose of this CQP is to define the methodology and practices to control construction work quality during the performance of work. This CQP provides the description of the general construction work quality control (QC) measures to be implemented for all environmental restoration activities at the three New Mexico bases (Cannon AFB, Holloman AFB, and Kirtland AFB) and Scott AFB in Illinois. Table 1-1 summarizes the performance objectives, provides a brief description of the technical approach, and identifies the projected closure date for the sites covered under this TO.

This CQP provides the framework and criteria to plan, monitor, verify, and assess quality-related services to assure construction and related tasks are of the highest standard. The Shaw procedures referenced in this document are provided on the project SharePoint portal.

1.2 Regulatory Framework

Work at Scott AFB in Illinois will be performed pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act with regulatory coordination by

the Illinois Environmental Protection Agency (IEPA). Performance and remediation standards will be in accordance with Title 35, Part 742 of the Illinois Administrative Code (35 IAC 742), Tiered Approach to Corrective Action Objectives (TACO).

Each of the New Mexico installations has a RCRA Hazardous Waste Facility Permit that establishes the general and specific standards and activities for managing hazardous waste pursuant generally to Subtitle C of the RCRA, the New Mexico Hazardous Waste Act, and the New Mexico Hazardous Waste Management Regulations. Cannon AFB, Holloman AFB, and Kirtland AFB permits were finalized in 2003, 2004, and 2010, respectively (NMED, 2003; NMED, 2004; NMED, 2010). The New Mexico Environment Department (NMED), Hazardous Waste Bureau provides regulatory oversight. The current active permits for Cannon AFB, Holloman AFB, and Kirtland AFB are discussed in the General Work Plan.

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-8

Project tasks at individual sites will vary based the performance objective, installation location, and on contaminants and contaminated media. Nature and extent of contamination in the investigated media will be determined for each site, as appropriate. Comparison of the validated analytical results for sampled media will be compared to the appropriate medium-specific screening values, as specified by the IEPA for Scott AFB and as specified in each New Mexico installation's RCRA Permit.

The cleanup levels for Scott AFB will be the IEPA Tier 1, Tier 2, or Tier 3 values (as appropriate) for residential exposure to soil and/or to groundwater (35 IAC 742). Soil background concentrations for Scott AFB are obtained from the Scott Air Force Base *Final Background Investigation* (SAFB, 2008) and Illinois TACO Appendix A, Table G–Concentrations of Inorganic Chemicals in Background Soils, and Table H-Concentrations of Polynuclear Aromatic Hydrocarbon Chemicals in Background Soils(35 IAC 742).

In general, applicable screening levels for the New Mexico installations include the most recent values of:

- New Mexico soil screening levels (NMED, 2009) for residential exposure,
- U.S. Environmental Protection Agency (USEPA) Regional Soil Screening Levels (USEPA, 2011) for residential exposure,
- New Mexico Water Quality Control Commission Standards for Ground Water (20.6.2.3103 New Mexico Administrative Code [NMAC]),

- USEPA National Primary Drinking Water Standards, maximum contaminant limits (USEPA, 2010), and
- New Mexico Water Quality Standards for Interstate and Intrastate Streams (20.6.4 NMAC).

Holloman AFB and Kirtland AFB developed installation-specific background concentrations for metals in soil and groundwater that are approved by the NMED (NMED, 1997; NMED, 2011) and Cannon AFB developed installation-specific background concentrations for inorganics and pesticides in soil (NMED, 2006). These background concentrations will be included in the reports, as applicable.

Project action limits are presented in UFP-QAPP Worksheet #15, "Reference Limits and Evaluation Tables." The Worksheet #15 tables also include the soil residential medium-specific concentrations. Additionally, any site-specific cleanup goals will be included in the site-specific technical work plans.

1.3 Background

1.3.1 Cannon AFB

This TO includes 43 sites at Cannon AFB, shown on Figure 1-1. Shaw's approach achieves site closure (SC) at 20 sites, response complete at 22 sites, and completion of an Interim/Stabilization Measure (ISM) and draft RCRA Facility Investigation (RFI).

1.3.2 Holloman AFB

This TO includes 29 sites at Holloman AFB, shown on Figure 1-1. Shaw's approach achieves SC at 20 sites and draft RFIs at the remaining 9 sites.

1.3.3 Kirtland AFB

This TO includes five sites at Kirtland AFB, shown on Figure 1-1. Shaw's approach achieves SC at one site, and completion of draft RFIs at the remaining four sites.

1.3.4 Scott AFB

This TO includes three sites at Scott AFB, shown on Figure 1-2. Shaw's approach achieves Remedial Investigation at all three sites (35 IAC 750).

1.4 Project Description

This CQP addresses general construction quality requirements for various construction and investigation activities required to complete the site investigations and environmental restorations scoped for this project. The expected activities are listed below.

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-8

- Contaminated soil excavation and offsite disposal
- Underground storage tank (UST) and septic tank removal or in-place abandonment
- Exploratory trenching
- Clean backfilling and compaction
- New monitoring well installation and well abandonment, as appropriate

Details of these activities for each site will be provided in task- or site-specific technical work plans.

1.5 Project Organization

Overall project organization is provided in the UFP-QAPP in Worksheet #5 with roles and responsibilities presented in Worksheet #7. Task- and site-specific technical work plans will provide updates to Worksheet #7, as appropriate.

1.6 Quality Objectives

The primary objective of the CQP is to assure that the quality of environmental restoration construction activities are of the highest standard for each major task or site project, and that it meets or exceeds Shaw's proposed performance objectives for each site (**Table 1-1**). To meet this objective, the following standards have been established:

- Guidelines and requirements will be followed as prepared and documented in the task-/site-specific technical work plans, related drawings, and specifications
- Construction verification will be performed by inspection and verification testing to ensure that the design features are implemented as intended
- Any variance to the design and/or applicable construction code will be evaluated to determine its effect upon system performance
- Documentation will be prepared and maintained during and after construction activities to demonstrate that the design has been implemented and that performance requirements of the specifications have been met.

Tests and inspections will be planned and performed for each definable feature of work (DFW) in accordance with the applicable specifications developed and included within the task-/site-specific technical work plans. A DFW can be defined as any task which is separate and distinct from other tasks, has separate control requirements, or is identified by different trades or disciplines.

1.7 Site-Specific Technical Work Plan Construction Quality Control Requirements

Appendix A provides a typical Site-Specific Construction Quality Control and Startup Testing and Inspection Requirement Worksheet.

The site-specific CQC testing and inspection requirements will be identified in the Site-Specific Construction Quality Control Testing and Inspection Requirement Worksheet in each site-specific technical work plan. A testing and inspection worksheet will be provided for each applicable DFW. Additional test or inspection requirements may be added to the worksheet if approved by the Program QA/QC Manager.

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-8

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-8

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Table 1-1
Summary Table of Sites, Technical Approach, Performance Objectives, and Site Closure Dates

Site ID	Site Name	Proposed Performance Objective	Proposed Date of Achieving Performance Objective	Description of Tech Approach	Projected Closeout Date
Cannon AFB					
TU/US-C050	Inactive POL Storage Tank 4028B	Site Closure	October 2012	Prepare a Class III permit modification request to document New Mexico Environment Department (NMED) approval of CAC (CAC) without controls	4th Quarter 2012
RS-C103	North Playa Lake	Interim Stabilization Measures (ISM) and Draft Resource Conservation and Recovery Act (RCRA) Facility Investigation (RFI)	November 2012	Prepare Interim Stabilization Measures (ISM) and Resource Conservation and Recovery Act (RCRA) Facility Investigation (RFI) Work Plans; perform ISM (up to 40 cubic yards [yd^3] of sediment removed),sampling; prepare a draft RFI for U.S. Air Force (USAF) review and approval	Indefinite, depends on USAF funding/future remedial actions
TU/US-C079	UST at Fire Training Area 1	Site Closure	October 2012	Prepare a Class III permit modification request to document NMED approval of CAC without controls	4th Quarter 2012
TU/US-C124	Inactive UST 1	Site Closure	October 2012	Prepare a Class III permit modification request to document NMED approval of CAC without controls	4th Quarter 2012
OW-C390	OWS 390	Site Closure	October 2012	Prepare a Class III permit modification request to document NMED approval of CAC without controls	4th Quarter 2012
TU/US-C002	Recovered Tank 108	Response Complete	December 2012	Prepare a Class III permit modification request to document NMED approval of CAC with controls	Indefinite, closed with controls
TU/US-C004	Recovered Tank 121	Response Complete	December 2012	Prepare a Class III permit modification request to document NMED approval of CAC with controls	Indefinite, closed with controls
TU/US-C006	Petroleum, Oil, or Lubricant Tank 129	Response Complete	December 2012	Prepare a Class III permit modification request to document NMED approval of CAC with controls	Indefinite, closed with controls
TU/US-C010	POL Tank 170	Site Closure	October 2012	Prepare a Class III permit modification request to document NMED approval of CAC without controls	4th Quarter 2012
TU/US-C125	Inactive UST 2	Site Closure	October 2012	Prepare a Class III permit modification request to document NMED approval of CAC without controls	4th Quarter 2012
WL-C098	Sanitary Sewer Line	Site Closure	October 2012	Prepare a Class III permit modification request to document NMED approval of CAC without controls	4th Quarter 2012
WL-C102	Wastewater Treatment Effluent Discharge	Response Complete	December 2012	Prepare a Class III permit modification request to document NMED approval of CAC with controls	Indefinite, closed with controls
SD-15	SWMU 34	Response Complete Permit Modification	December 2012 September 2013	Perform detailed records search, Prepare supplemental sampling work plan; perform additional sampling; prepare a summary report /CAC petition (CACP); prepare a Class III permit modification request to document NMED approval of CAC with controls	Indefinite, closed with controls
FT-06	SWMU 78	Response Complete Permit Modification	December 2012 September 2013	Perform detailed records search; prepare supplemental sampling work plan (if necessary); perform additional sampling; prepare a summary report/CACP; prepare a Class III permit modification request to document NMED approval of CAC with controls	Indefinite, closed with controls
SD-12	SWMU 85	Response Complete Permit Modification	December 2012 September 2013	Perform detailed records search; prepare supplemental sampling work plan; perform additional sampling; prepare a summary report/CACP; prepare a Class III permit modification request to document NMED approval of CAC with controls	Indefinite, closed with controls
SD-20	SWMU 95	Response Complete Permit Modification	December 2012 September 2013	Perform detailed records search; prepare supplemental sampling work plan; perform additional sampling; prepare a summary report/CACP; prepare a Class III permit modification request to document NMED approval of CAC with controls	Indefinite, closed with controls
FT-08	SWMU 107	Site Closure	January 2014	Perform detailed records search; prepare supplemental sampling work plan; perform additional sampling; prepare a summary report/CACP; prepare a Class III permit modification request to document NMED approval of CAC with controls	3rd Quarter 2013
SS-19	AOC A	Site Closure	January 2014	Perform detailed records search; prepare supplemental sampling work plan; perform additional sampling; prepare a summary report/CACP; prepare a Class III permit modification request to document NMED approval of CAC with controls	3rd Quarter 2013

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-8

Table 1-1 *(continued)*
Summary Table of Sites, Technical Approach, Performance Objectives, and Site Closure Dates

Site ID	Site Name	Proposed Performance Objective	Proposed Date of Achieving Performance Objective	Description of Tech Approach	Projected Closeout Date
Cannon AFB (continued)					
MY-C031	SWMU 31	Response Complete Permit Modification	December 2012 September 2013	Perform detailed records search; prepare supplemental sampling work plan; perform additional sampling; prepare a summary report/CACP; prepare a Class III permit modification request to document NMED approval of CAC with controls	Indefinite, closed with controls
TU/US-C071	SWMU 71	Response Complete Permit Modification	January 2014	Perform detailed records search; prepare supplemental sampling work plan; perform additional sampling; prepare a summary report/CACP; prepare a Class III permit modification request to document NMED approval of CAC with controls	Indefinite, closed with controls
TA/AS-C091	SWMU 91	Site Closure	January 2014	Perform detailed records search; prepare supplemental sampling work plan; perform additional sampling; prepare a summary report/CACP; prepare a Class III permit modification request to document NMED approval of CAC with controls	3rd Quarter 2013
FT-C109	SWMU 109	Response Complete Permit Modification	December 2012 September 2013	Perform detailed records search; prepare supplemental sampling work plan; perform additional sampling; prepare a summary report/CACP; prepare a Class III permit modification request to document NMED approval of CAC with controls	Indeterminate, closed with controls
FT-C110	SWMU 1110	Response Complete Permit Modification	December 2012 September 2013	Perform detailed records search; prepare supplemental sampling work plan; perform additional sampling; prepare a summary report/CACP; prepare a Class III permit modification request to document NMED approval of CAC with controls	Indefinite, closed with controls
FT-C111	SWMU 111	Response Complete Permit Modification	December 2012 September 2013	Perform detailed records search; prepare supplemental sampling work plan; perform additional sampling; prepare a summary report/CACP; prepare a Class III permit modification request to document NMED approval of CAC with controls	Indefinite, closed with controls
FT-C112	SWMU 112	Response Complete Permit Modification	December 2012 September 2013	Perform detailed records search; prepare supplemental sampling work plan; perform additional sampling; prepare a summary report/CACP; prepare a Class III permit modification request to document NMED approval of CAC with controls	Indefinite, closed with controls
TU/US-C126	SWMU 126	Response Complete Permit Modification	December 2012 September 2013	Perform detailed records search; prepare supplemental sampling work plan; perform additional sampling; prepare a summary report/CACP; prepare a Class III permit modification request to document NMED approval of CAC with controls	Indefinite, closed with controls
OW-C127	SWMU 127	Response Complete Permit Modification	December 2012 September 2013	Perform detailed records search; prepare supplemental sampling work plan; perform additional sampling; prepare a summary report/CACP; prepare a Class III permit modification request to document NMED approval of CAC with controls	Indefinite, closed with controls
TA/AS-C129	SWMU 129	Response Complete Permit Modification	December 2012 September 2013	Perform detailed records search; prepare supplemental sampling work plan; perform additional sampling; prepare a summary report/CACP; prepare a Class III permit modification request to document NMED approval of CAC with controls	Indefinite, closed with controls
SD-13	Sanitary sewer lift station overflow pit	Site Closure	October 2012	Prepare a Class III permit modification request to document NMED approval of CAC without controls	4th Quarter 2012
DP-16	Solvent disposal site	Site Closure	October 2012	Prepare a Class III permit modification request to document NMED approval of CAC without controls	4th Quarter 2012
LF-02	Landfill No. 2	Response Complete	December 2012	Prepare a Class III permit modification request to document NMED approval of CAC with controls	Indefinite, closed with controls
SD-12	Stormwater collection point (South Playa)	Response Complete Permit Modification	December 2012 September 2013	Perform detailed records search; prepare supplemental sampling work plan; perform additional sampling; prepare a summary report/CACP; prepare a Class III permit modification request to document NMED approval of CAC with controls	Indefinite, closed with controls
SD-11	Engine test cell	Site Closure	October 2012	Prepare a Class III permit modification request to document NMED approval of CAC without controls	4th Quarter 2012
SD-11	Former overflow pit	Site Closure	October 2012	Prepare a Class III permit modification request to document NMED approval of CAC without controls	4th Quarter 2012
SD-11	Former leach field	Site Closure	October 2012	Prepare a Class III permit modification request to document NMED approval of CAC without controls	4th Quarter 2012
SD-11	Evaporation pond	Site Closure	October 2012	Prepare a Class III permit modification request to document NMED approval of CAC without controls	4th Quarter 2012

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-8

Table 1-1 *(continued)*
Summary Table of Sites, Technical Approach, Performance Objectives, and Site Closure Dates

Site ID	Site Name	Proposed Performance Objective	Proposed Date of Achieving Performance Objective	Description of Tech Approach	Projected Closeout Date
Cannon AFB (continued)					
SD-11	Oil/water separator No. 5114	Site Closure	October 2012	Prepare a Class III permit modification request to document NMED approval of CAC without controls	4th Quarter 2012
SD-20	NE stormwater drainage area	Response Complete Permit Modification	December 2012 September 2013	Perform detailed records search; prepare supplemental sampling work plan; perform additional sampling; prepare a summary report/CACP; prepare a Class III permit modification request to document NMED approval of CAC with controls	Indefinite, closed with controls
SD-17	Old entomology rinse area	Response Complete	December 2012	Prepare a Class III permit modification request to document NMED approval of CAC with controls	Indeterminate, closed with controls
FT-07	Fire Training Area No. 2	Site Closure	October 2012	Prepare a Class III permit modification request to document NMED approval of CAC without controls	4th Quarter 2012
OT-10	JP-4 fuel spill	Site Closure	October 2012	Prepare a Class III permit modification request to document NMED approval of CAC without controls	4th Quarter 2012
SS-18	Blown capacitors site	Site Closure	October 2012	Prepare a Class III permit modification request to document NMED approval of CAC without controls	4th Quarter 2012
FL-C070	Oil/water separator & leach field 326	Response Complete	October 2012	Prepare a Class III permit modification request to document NMED approval of CAC with controls	Indefinite, closed with controls
Holloman AFB					
OT-C530	Building 308	Site Closure	September 2013	Prepare a Voluntary Corrective Measures (VCM) Request; close septic tanks in place in accordance with 20.7.3.307 New Mexico Administrative Code (NMAC); prepare a VCM Report and a CACP; prepare a Class III permit modification request to document NMED approval of CAC without controls	3rd Quarter 2013
OT-C531	Buildings 920, 921, 922	Site Closure	September 2013	Prepare a VCM Request; close septic tanks in place in accordance with 20.7.3.307 NMAC; prepare VCM Report and a CACP; prepare a Class III permit modification request to document NMED approval of CAC without controls	3rd Quarter 2013
OT-C532	Building 924	Site Closure	September 2013	Prepare a VCM Request; close septic tanks in place in accordance with 20.7.3.307 NMAC; prepare a VCM Report and a CACP; prepare a Class III permit modification request to document NMED approval of CAC without controls	3rd Quarter 2013
OT-C533	Building 1190	Site Closure	September 2013	Prepare a VCM Request; close septic tanks in place in accordance with 20.7.3.307 NMAC; prepare a VCM Report and a CACP; prepare a Class III permit modification request to document NMED approval of CAC without controls	3rd Quarter 2013
OT-C534	Building 1194	Site Closure	September 2013	Prepare a VCM Request; close septic tanks in place in accordance with 20.7.3.307 NMAC; prepare a VCM Report and a CACP; prepare a Class III permit modification request to document NMED approval of CAC without controls	3rd Quarter 2013
OT-C535	Building 1196	Site Closure	September 2013	Prepare a VCM Request; close septic tanks in place in accordance with 20.7.3.307 NMAC; prepare a VCM Report and a CACP; prepare a Class III permit modification request to document NMED approval of CAC without controls	3rd Quarter 2013
OT-C536	Building 1199	Site Closure	September 2013	Prepare a VCM Request; close septic tanks in place in accordance with 20.7.3.307 NMAC; prepare a VCM Report and a CACP; prepare a Class III permit modification request to document NMED approval of CAC without controls	3rd Quarter 2013
OT-C537	Building 1200	Site Closure	September 2013	Prepare a VCM Request; close septic tanks in place in accordance with 20.7.3.307 NMAC; prepare a VCM Report and a CACP; prepare a Class III permit modification request to document NMED approval of CAC without controls	3rd Quarter 2013
OT-C538	Building 1201	Site Closure	September 2013	Prepare a VCM Request; close septic tanks in place in accordance with 20.7.3.307 NMAC; prepare a VCM Report and a CACP; prepare a Class III permit modification request to document NMED approval of CAC without controls	3rd Quarter 2013
OT-C539	Building 1221	Site Closure	September 2013	Prepare a VCM Request; close septic tanks in place in accordance with 20.7.3.307 NMAC; prepare a VCM Report and a CACP; prepare a Class III permit modification request to document NMED approval of CAC without controls	3rd Quarter 2013

Table 1-1 *(continued)*
Summary Table of Sites, Technical Approach, Performance Objectives, and Site Closure Dates

Site ID	Site Name	Proposed Performance Objective	Proposed Date of Achieving Performance Objective	Description of Tech Approach	Projected Closeout Date
Holloman AFB (continued)					
OT-C540	Building 1251	Site Closure	September 2013	Prepare a VCM Request; close septic tanks in place in accordance with 20.7.3.307 NMAC; prepare a VCM Report and a CACP; prepare a Class III permit modification request to document NMED approval of CAC without controls	3rd Quarter 2013
OT-C541	Building 1269	Site Closure	September 2013	Prepare a VCM Request; close septic tanks in place in accordance with 20.7.3.307 NMAC; prepare a VCM Report and a CACP; prepare a Class III permit modification request to document NMED approval of CAC without controls	3rd Quarter 2013
OT-C542	Building 1166	Site Closure	September 2013	Prepare a VCM Request; close septic tanks in place in accordance with 20.7.3.307 NMAC; prepare a VCM Report and a CACP; prepare a Class III permit modification request to document NMED approval of CAC without controls	3rd Quarter 2013
OT-C543	Building 1175	Site Closure	September 2013	Prepare a VCM Request; close septic tanks in place in accordance with 20.7.3.307 NMAC; prepare a VCM Report and a CACP; prepare a Class III permit modification request to document NMED approval of CAC without controls	3rd Quarter 2013
OT-C544	Building 1176	Site Closure	September 2013	Prepare a VCM Request; close septic tanks in place in accordance with 20.7.3.307 NMAC; prepare a VCM Report and a CACP; prepare a Class III permit modification request to document NMED approval of CAC without controls	3rd Quarter 2013
TU/US-C500	Building 300	ISM and Draft RFI	January 2013	Perform records search to obtain former underground storage tank (UST) location and removal information; prepare an RFI Work Plan and VCM Work Plan; perform investigation and soil removal, and collect confirmation samples; prepare an RFI Report	Indefinite, depends on USAF funding and future remedial actions
TU/US-C501	Building 1113	ISM and Draft RFI	January 2013	Perform records search to obtain former UST location and removal information; prepare an RFI Work Plan and VCM Work Plan; perform investigation and soil removal, and collect confirmation samples; prepare an RFI Report	Indefinite, depends on USAF funding and future remedial actions
TU/US-C502	Building 2395	Site Closure	October 2013	Perform records search for former UST location and removal information; prepare VCM Request and RFI Work Plan; perform investigation and soil removal; prepare VCM/RFI Report; prepare CACP and Class III permit modification request to document NMED approval of CAC without controls	3rd Quarter 2013
TU/US-C503	Building 221	ISM and Draft RFI	January 2013	Perform records search to obtain former UST location and removal information; prepare an RFI Work Plan and VCM Work Plan; perform investigation and soil removal, and collect confirmation samples; prepare an RFI Report	Indefinite, depends on USAF funding and future remedial actions
TU/US-C504	Building 301	ISM and Draft RFI	January 2013	Perform records search to obtain former UST location and removal information; prepare an RFI Work Plan and VCM Work Plan; perform investigation and soil removal, and collect confirmation samples; prepare an RFI Report	Indefinite, depends on USAF funding and future remedial actions
TU/US-C505	Building 1097	ISM and Draft RFI	January 2013	Perform records search to obtain former UST location and removal information; prepare an RFI Work Plan and VCM Work Plan; perform investigation and soil removal, and collect confirmation samples; prepare an RFI Report	Indefinite, depends on USAF funding and future remedial actions
TU/US-C506	Building 901	ISM and Draft RFI	January 2013	Perform records search to obtain former UST location and removal information; prepare an RFI Work Plan and VCM Work Plan; perform investigation and soil removal, and collect confirmation samples; prepare an RFI Report	Indefinite, depends on USAF funding and future remedial actions
TU/US-C507	Building 1272	Site Closure	October 2013	Perform records search to obtain former UST location and removal information; prepare VCM Request and RFI Work Plan; perform investigation and soil removal; prepare VCM/RFI Report; prepare CACP and Class III permit modification request to document NMED approval of CAC without controls	3rd Quarter 2013

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-8

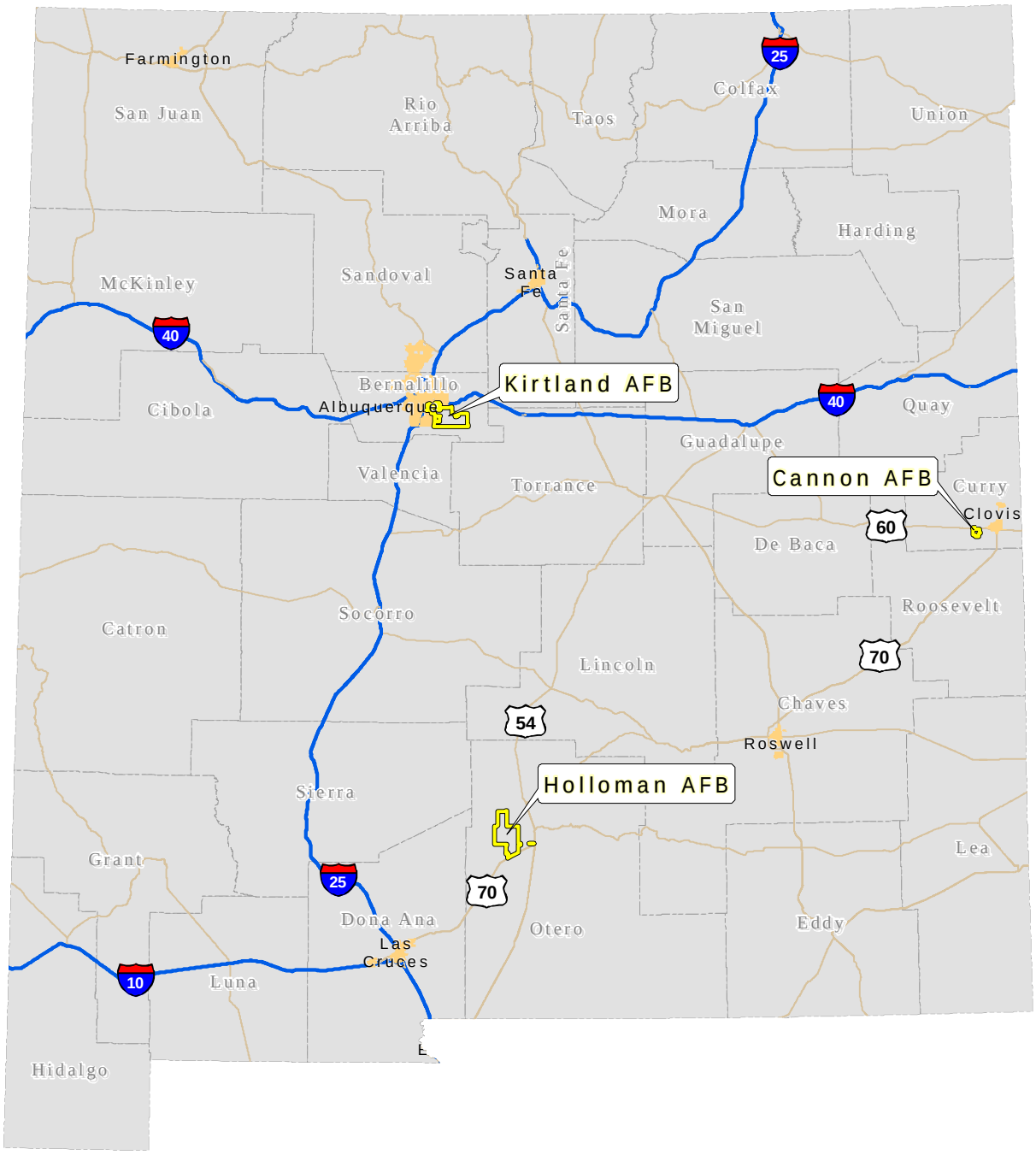
Table 1-1 *(continued)*
Summary Table of Sites, Technical Approach, Performance Objectives, and Site Closure Dates

Site ID	Site Name	Proposed Performance Objective	Proposed Date of Achieving Performance Objective	Description of Tech Approach	Projected Closeout Date
Holloman AFB (continued)					
TU/US-C508	Building 298	ISM and Draft RFI	January 2013	Perform records search to obtain former UST location and removal information; prepare an RFI Work Plan and VCM Work Plan; perform investigation and soil removal, and collect confirmation samples; prepare an RFI Report	Indefinite, depends on USAF funding and future remedial actions
TU/US-C513	Building 898	ISM and Draft RFI	January 2013	Perform records search to obtain former UST location and removal information; prepare an RFI Work Plan and VCM Work Plan; perform investigation and soil removal, and collect confirmation samples; prepare an RFI Report	Indefinite, depends on USAF funding and future remedial actions
TU/US-C514	Building 882	Site Closure	October 2013	Perform records search to obtain former UST location and removal information; prepare VCM Request and RFI Work Plan; perform investigation and soil removal; prepare VCM/RFI Report; prepare CACP and Class III permit modification request to document NMED approval of CAC without controls	3rd Quarter 2013
TU/US-C515	Building 889	Site Closure	October 2013	Perform records search to obtain former UST location and removal information; prepare VCM Request and RFI Work Plan; perform investigation and soil removal; prepare VCM/RFI Report; prepare CACP and Class III permit modification request to document NMED approval of CAC without controls	3rd Quarter 2013
TU/US-C516	Building 684	Site Closure	October 2013	Perform records search to obtain former UST location and removal information; prepare VCM Request and RFI Work Plan; perform investigation and soil removal; prepare VCM/RFI Report; prepare CACP and Class III permit modification request to document NMED approval of CAC without controls	3rd Quarter 2013
TU/US-C518	UST 7003	ISM and Draft RFI	January 2013	Perform records search for former UST location and removal information; prepare an RFI Work Plan and VCM Work Plan; perform investigation and soil removal, and collect confirmation samples; prepare an RFI Report	Indefinite, depends on USAF funding and future remedial actions
Kirtland AFB					
CW-C571	Zia Park	ISM and Draft RFI	December 2012	Prepare an RFI Work Plan; prepare an Accelerated Corrective Measures (ACM) Work Plan; perform soil characterization and excavation of contaminated soil (if any) up to 40 yds^3; prepare an RFI Report	Indefinite, depends on USAF funding and future remedial actions
OT-C572	Bldg 5700-1(also known as Building 57001)	ISM and Draft RFI	December 2012	Prepare an RFI Work Plan; prepare an ACM Work Plan; perform soil characterization and excavation of contaminated soil (if any) up to 40 yds^3; prepare an RFI Report	Indefinite, depends on USAF funding and future remedial actions
OT-C573	Asphalt Dump Area	ISM and Draft RFI	December 2012	Prepare an RFI Work Plan; prepare an ACM Work Plan; perform soil characterization and excavation of contaminated soil (if any) up to 40 yds^3; prepare an RFI Report	Indefinite, depends on USAF funding and future remedial actions
SS-C574	Bldg 20676 Spill Site	Site Closure	September 2013	Prepare an ACM Work Plan; perform soil characterization and excavation; prepare an ACM Report; prepare a CACP; prepare a Class III permit modification request to document NMED approval of CAC without controls	3rd Quarter 2013
SS-C575	Transient Alert Pad	ISM and Draft RFI	December 2012	Prepare an RFI Work Plan; prepare an ACM Work Plan; perform soil characterization and excavation of contaminated soil (if any) up to 40 yds^3; prepare an RFI Report	Indefinite, depends on USAF funding and future remedial actions

Table 1-1 *(continued)*
Summary Table of Sites, Technical Approach, Performance Objectives, and Site Closure Dates

Site ID	Site Name	Proposed Performance Objective	Proposed Date of Achieving Performance Objective	Description of Tech Approach	Projected Closeout Date
Scott AFB					
UK-C500	Building 39	Draft Remedial Investigation (RI)	January 2013	Prepare a Remedial Investigation (RI) Work Plan; perform soil and groundwater characterization. Prepare an RI Report.	Indefinite, depends on USAF funding and future remedial actions
UK-C501	Scott Club	Draft RI	January 2013	Prepare an RI Work Plan; perform soil and groundwater characterization. Prepare an RI Report.	Indefinite, depends on USAF funding and future remedial actions
UK-C510	South Ditch	Draft RI	January 2013	Prepare an RI Work Plan; perform soil and groundwater characterization. Prepare an RI Report.	Indefinite, depends on USAF funding and future remedial actions

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-8



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Legend

New Mexico Site Locations

N

WGS 84 UTM ZONE 13N METERS

0 20 40 80
Kilometers

0 12.5 25 50
Miles

Shaw

Figure 1-1

New Mexico Locations

New Mexico

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-8

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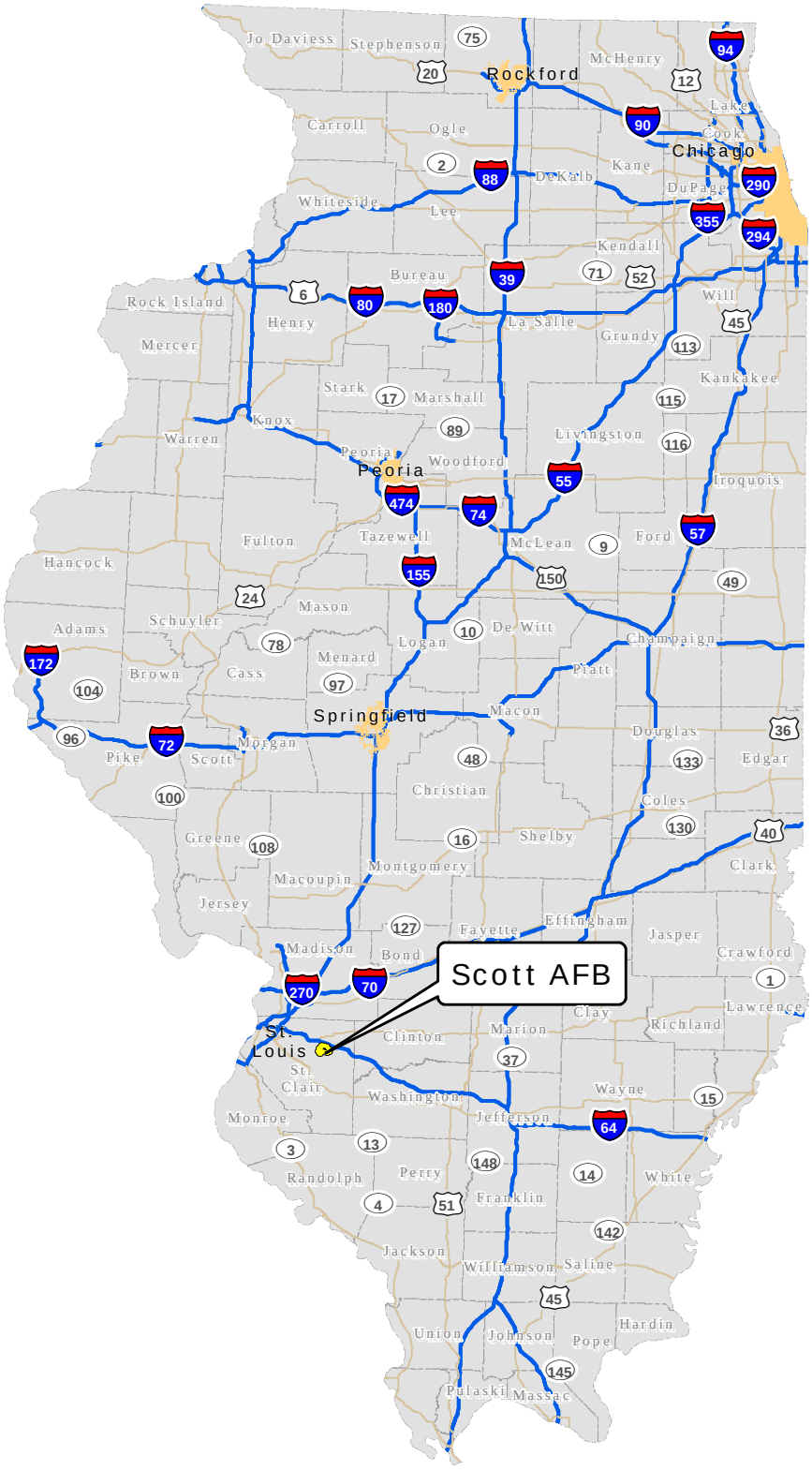

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Date	10/17/2011
Approved By	Initial
Checked By	Initial
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Scott AFB Location

N

NAD 83 UTM Zone 16N
Meters

0 10 20 30 40 50
Kilometers

0 5.5 11 16.5 22 27.5
Miles

Shaw

Figure 1-2

Scott AFB Location

Illinois

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-8

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2.0 QUALITY CONTROL PROCESS

This section describes the QC processes that will be implemented to assure acceptable quality levels are achieved for site-specific DFWs.

2.1 Definable Features of Work

Site-specific construction activities will be executed at various sites as required by the final site-specific technical work plans. Construction work covered by this CQP includes, but is not limited to, the following major DFWs:

- Site work: surveying, clearing, grubbing, grading, installing fences, removing/disposing of debris, and landscaping
- Soil excavation, backfill, and compaction
- Monitoring well installation and abandonment
- UST and septic tank removal or in-place abandonment
- Exploratory trenching

The specific DFW for each site will be identified during the execution phase of this work and will be detailed in the task-/site-specific technical work plans.

2.2 Pre-Fieldwork Inspections

Shaw will perform supplier, material, and equipment inspection QC activities prior to the initiation of fieldwork that may include, but is not limited to the following:

- Define those activities and methods to be used to ensure that purchased equipment and material to be used or installed during the construction and installation of the facility conform to procurement document requirements.
- Provide such activities and methods during the procurement process, which include, but are not limited to, monitoring suppliers' performance by qualified personnel.
- Identify and describe the qualifications needed for suppliers prior to their inclusion on the listing of approved suppliers.
- Evaluate suppliers' capabilities to produce intended equipment and materials, and their ability to execute an acceptable quality management system.
- Ensure requirements of applicable standards, specifications, drawings, etc. are reflected in procurement documents.

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-8

- Monitor purchase orders and ensure suppliers have conveyed procurement requirements properly, including inspection requirements to all tiers of order placement.
- Compile and deliver quality records pertaining to the procurement of equipment and material.
- Document deviation from established requirements that would improve the schedule, efficiency, safety, maintainability, or operability of the facility.

Shaw will maintain records attesting to the satisfactory performance of procurement activities affecting quality. Shaw will record the results of each inspection it performs at suppliers' facilities. Such reports will denote the acceptability of inspected material or equipment based on the listed inspection requirements, including such information as measurements and test data, any points of rejection, and the resolution of any problems encountered during the inspection.

2.3 Three-Phase Quality Control System

Construction QC for this project is based on a three-phase inspection process as described in Shaw procedure EI-Q005, "Inspection."

The measures required to verify that the quality of work performed is in compliance with the specified requirements include inspection of materials and workmanship before, during, and after each DFW. The QC inspections consist of the following:

- Phase 1: Preparatory Inspections
- Phase 2: Initial Inspection
- Phase 3: Follow-up Inspections.

2.4 Phase I: Preparatory Inspections

The first phase of the QC process involves the preparation and review of plans and certifications required by the project specifications and the task-/site-specific technical work plans. The plans will provide for measures to verify and document that the work performed complies with the requirements specified in the contract documents. Certifications will be used to verify that personnel are qualified to perform the activities to which they are assigned.

The preparatory inspections will be performed prior to starting any DFWs that have control requirements. Preparatory control meetings will be initiated by the Shaw On-Site Officer and

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-8

attended by the responsible staff personnel and any applicable subcontractor personnel involved with the DFW. These inspections include the following:

- A review of the scope of work, specifications, and contract requirements with project personnel
- Verification that provisions have been made to provide required field control testing and inspection
- Documented tolerances and workmanship standards
- Examination of the work area to ascertain that all preliminary work has been completed
- Verification of field dimensions, lines, and grades
- Physical examination of materials and equipment
- Confirmation of measuring and test equipment calibrations
- Assurance that required hazards analyses and safety inspections have taken place and been passed.

Preparatory control meetings will be documented using the standard form contained in the UFP-QAPP. In addition, separate minutes of the meeting may be prepared by the Shaw On-Site QA/QC Officer and attached to the checklist, if appropriate. Preparatory inspections will be reported on the weekly project progress report with the inspection checklist.

2.5 Phase II: Initial Quality Control Inspections/Tests

The second phase of the QC process will be the initial inspections and tests. Monitoring activities will be performed by the Shaw On-Site QA/QC Officer or their designated representative.

An initial QC inspection will be conducted for each DFW. Initial QC will include participation of the responsible personnel, including appropriate subcontractors and the QC personnel involved with the DFW. The inspection will be performed when it is determined that a sufficient portion of the DFW has been accomplished to evaluate compliance with specifications, drawings, and other contract requirements. The inspection will include the following criteria:

- Establishing the quality and level of workmanship required
- Verifying that acceptable workmanship standards and contractual requirements are met

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-8

- Verifying required control inspection and testing requirements
- Verifying compliance with the activity hazard analysis and safety plans.

Initial inspections will be documented using the combined Preparatory/Initial/Follow-up Inspection Form found in the UFP-QAPP. When required to cover inspection items not on the checklist, separate notes will be prepared by the Shaw On-Site QA/QC Officer or by appropriate personnel and attached to the checklist. The initial inspections will be reported on the on-site weekly project progress reports and the checklist included as an attachment. Whenever inspections indicate the workmanship has become unacceptable, deficiencies will be corrected and documented.

The Site-Specific Construction Quality Control and Start-up Testing and Inspection Requirement Worksheets (Appendix A) will provide the site-specific QC testing requirements for each DFW. Applicable site-specific CQC test requirements will be presented in the task-/site-specific technical work plans. The Shaw On-Site QA/QC Officer may monitor the field equipment to verify the following:

- Execution of all required tests
- Proper calibration of equipment
- Location of tests
- Timely and accurate reporting of test results
- Correct frequency of tests
- Completeness of documentation.

Results of each QC test performed by Shaw will be recorded on the Field CQC Test Report. QC tests will also be recorded (listed) on the Daily Construction Quality Control Report (DCQCR). Blank copies of these standard report forms are provided in the UFP-QAPP.

Test reports and written certification that the work has met or will be capable of meeting the applicable standards and design parameters will be submitted with the appropriate site-specific reports. Any deficiencies will be reported and recommendations for corrective action will be provided.

2.6 Phase III: Follow-Up Quality Control Inspections

The third phase of the QC process will be the follow-up inspections and tests. The frequency of the follow-up inspections will depend on the extent of work being performed on each particular DFW. All deficiencies will be corrected prior to starting new work. Follow-up inspections will be documented using the combined Initial/Follow-up Inspection Form. The

follow-up inspections will be reported as part of the DCQCR with copies of the Follow-up Inspection Forms attached.

As part of the follow-up inspection phase, at the completion of each DFW or increment, the work will be inspected for compliance with the contract plans and specifications. The Shaw On-Site QA/QC Officer is responsible for initiating the completion inspection and verifying development of a punch list of items that do not conform to the specified requirements, including incomplete work items. The punch list will identify all nonconforming or incomplete tasks. Upon completion of the punch list items, a second inspection will be conducted by the Shaw On-Site QA/QC Officer to verify that all of the items conform to the requirements. When the Shaw On-Site QA/QC Officer is satisfied that all of the work inspected meets the specified requirements, the Project Manager (PM), or the PM's designee, will notify the USAF representative, who may request a joint inspection by the USAF and Shaw. Results of the final inspection, if any, will be documented on the Final Inspection Form. The timeframe, nature of corrective action response documentation, and individuals responsible for documentation and actions are presented in UFP-QAPP Worksheet #32 "Assessment Findings and Corrective Action Responses."

2.7 Inspection Documentation

The Shaw On-Site QA/QC Officer is responsible for the maintenance of inspection records. Inspection records will be legible and will clearly provide all information necessary to verify that items or activities inspected conform to the specified requirements or, in the case of nonconforming conditions, provide evidence that the conditions were brought into conformance or otherwise accepted by the USAF. All inspection records will be available to the USAF. The timeframe, nature of corrective action response documentation, and individuals responsible for documentation and actions are presented in the UFP-QAPP Worksheet #32.

2.8 Nonconformance Reports

The Shaw On-Site QA/QC Officer will be responsible for Nonconformance Reporting and Corrective Action Requests in accordance with Shaw procedure EI-Q007, "Nonconformance Reporting," and EI-Q008, "Corrective Action Requests." The Shaw On-Site QA/QC Officer will prepare a Nonconformance Report that describes the nonconforming items, corrective actions to be taken, and verification that corrective actions were completed. A list of nonconforming items will be maintained on the Nonconformance Tracking Log. The Shaw PM, Program QA/QC Manager, and Shaw On-Site QA/QC Officer will review this list and initiate a Corrective Action Request if a nonconforming item is not satisfactorily corrected in a timely manner or systematic adverse conditions are affecting the construction quality.

Unresolved nonconformance issues will be identified to the USAF and pertinent parties. Blank copies of these standard report forms are provided in the UFP-QAPP.

The Shaw PM will review unresolved Nonconformance Reports and take appropriate measures to ensure that the corrective actions are completed on schedule. The Shaw On-Site QA/QC Officer will conduct an inspection to verify that the Corrective Action is resolved, update the Nonconformance Tracking Log, and note this in the DCQCR.

2.9 Variance Request

Inspection or test results that do not meet the specified criteria in the Site-Specific Construction Quality Control Requirements Worksheet and for which corrective actions have not corrected the deficiency may require a specific variance. A variance may be granted provided the deficiency does not substantially affect the overall product quality, provides adequate engineering or design margins of safety, and has been approved by the USAF. All variance requests will be documented on an appropriate Variance Report Form and will provide sufficient justification and documentation on the requested variance. A log of all variances granted will be maintained by the Shaw On-Site QA/QC Officer.

2.10 Project Reporting

Shaw will provide a monthly management report to the USAF that will include a Program CQC summary, as well as discussions and explanations of CQC deviations via inspection documentation, nonconformance reporting, and/or variances. Regularly scheduled project review meetings and coordination meetings may also include discussions of CQC inspections, nonconformances, and corrective actions.

On-site weekly project progress reports will be provided by Shaw during the field execution phase of work activities. The weekly project progress report will include a CQC summary of activities.

2.10.1 Communications

Communication pathways are identified in UFP-QAPP Worksheet #6, “Communication Pathways.” This worksheet identifies communication drivers, responsible parties, and communication pathways for various communication needs including field QA/QC. Formal communication will be directed through the USAF for all decision-making requirements. Informal communication regarding CQC issues may include teleconferences, on-site meetings, emails, written correspondence, or direct conversations. Information, discussions, or decisions communicated will be documented through written meeting/telecommunication notes, email, oral recordings, or transcripts. The Shaw On-Site QA/QC Officer will participate in meetings pertaining to QA.

2.10.2 Document Distribution

A document distribution list is provided in UFP-QAPP Worksheet #3, "Distribution List." A document distribution matrix will be maintained as part of the project files to indicate what type of QA/QC and CQC documents are distributed to individual recipients and the format of that distribution.

2.11 Records Management

Records management procedures are described in this section. Additional details are provided in UFP-QAPP Worksheet #14, "Summary of Project Tasks" subsection "Documentation and Records."

2.11.1 Project Files

Project construction files will be maintained in accordance with the following Shaw procedures:

- Procedure EIG-RM-001, "Records Management Procedure"
- Procedure EIP-G-010, "Project Document Management."

To facilitate communications and submittal of technical documents with the AFCEE and Air Force Real Property Agency (AFRPA), Shaw has created a project SharePoint internet portal at https://shawxnet.shawgrp.com/sites/mwpbr/records

This portal will serve as a collaborative workspace between Shaw and AFCEE/AFRPA and between Shaw/AFCEE/AFRPA and regulators. Electronic files of deliverables, data, presentations, etc. in portable document format will be placed on the portal.

2.11.2 Field Construction Quality Control Correspondence

All field CQC correspondence to the USAF will be copied to the Shaw PM, Program QA/QC Manager, and Shaw Installation Lead. Correspondence will be numbered sequentially.

2.11.3 Field Submittals

Field submittals are required to regulate a timely flow of materials into the work activities and to demonstrate that the proposed materials and workmanship are in compliance with the contract. Submittals are indispensable in assuring and controlling construction quality and must be given attention. Submittals will be sequentially numbered and a log of all submittals will be kept by Shaw.

Daily reports of the Site Superintendent, Site Health and Safety Officer, and On-Site QA/QC Officer shall accurately and completely reflect the daily activities at each site by task or DFW, including such items as the name, number and location of sampling points; type and

number of field investigation/remediation equipment, materials, and supplies; all personnel and subcontractors on site, health and safety observation and monitoring, QC testing and inspection, site visitors, and weather conditions.

Project deliverables will be submitted to the Installation Lead for review and approval prior to implementation. QC documentation for this project includes, but is not limited to the following:

- Certifications and documentation of the submittal review process
- Daily QC Reports, attachments, checklists, and forms identified task-/site-specific technical work plans
- Equipment vendor data and submittals
- Meeting minutes
- Reports.

Operational, technical/scientific, and safety related field documents will be submitted via the project SharePoint portal for independent review assignments by the Installation Lead. Table 2-1, "List of Construction Quality Control Field Forms Generated in the Field," lists the standard CQC forms anticipated to be completed in the field.

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-8

Table 2-1
List of Construction Quality Control Field Forms

Documentation	Frequency of Completion
Daily Quality Control Report	Daily (every day work is performed)
3-Phase Inspection Checklist	Once (prior to the start of each Definable Feature of Work [DFW]); once (at the initiation of each DFW); periodic follow-up (while work is performed on that particular DFW)
Receipt Inspection Form	Once for each inspection performed
Field Construction Quality Control (CQC) Test Report	One (at least) for each applicable construction DFW
Instrument Calibration Form	Each day instrument is used
Stop Work Order Form	Once for each Stop Work Order
Nonconformance Report (NCR)	Once for each nonconformance
Stop Work Order	Once for each Stop Work Order
Field Work Variance (FWV) Form	Once for each FWV(s) request
NCR Tracking Log	Updated upon issuance/close-out of each NCR
FWV Tracking Log	Updated upon issuance/approval of each FWV
Audit Checklist	Once for each audit
Audit Plan	Once for each audit
Audit Report	Once for each audit
Surveillance Checklist	Once for each surveillance
Surveillance Report	Once for each surveillance

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-8

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-8

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3.0 FIELD ENGINEERING QUALITY CONTROL

In addition to the Three-Phase Inspection procedures completed by the Shaw On-Site QA/QC Officer, field engineering assessments will be completed, as applicable, by competent personnel.

3.1 Engineering

Where applicable field engineering and design QC activities will be performed that may include but are not limited to the following:

- Field engineering and designing the facility to meet site-specific requirements for the construction, commissioning, and testing of the facility
- Verifying general and local conditions at the construction site to ascertain existing grades, tie-in locations, and other conditions that may affect the work
- Preparing field drawings and other documents for the work according to applicable procedures
- Preparing for, conducting, and participating in design and constructability reviews of drawings and other detailed design documents
- Proposing waivers to owners' standards, specifications, and/or procedures that the project deems technically and/or commercially justified
- Following and ensuring that suppliers follow specified standards, specifications, and procedures that apply to the fieldwork
- Reviewing suppliers' drawings, specifications, data sheets, and other documents for conformity with the requirements
- Identifying suggestions to modify or deviate from established requirements that would improve the schedule, efficiency, safety, maintainability, or operability of the facility.

Shaw will maintain records attesting to the satisfactory performance of field engineering activities affecting quality as described in UFP-QAPP Worksheet #14, "Summary of Project Tasks—Verification of Technical Work Products." CQC related to engineering will include field checking, verification, and coordination with engineering design documents. Shaw procedures EI-Q011, "Verification of Figures, Drawings, Table, and Logs," and EI-Q012 "Verification of Calculations, Spreadsheets, and Databases" provide the specific procedures for CQC related to engineering documents and calculations.

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-8

3.2 Field Material Receiving and Inspection

Shaw will ensure that incoming products are inspected and verified for conformance to requirements in accordance with Shaw procedure EI-Q004 "Receipt Inspection." Shaw will ensure that final inspections and testing are carried out to provide complete evidence of conformance of the finished product to specified requirements. Shaw will ensure specified inspections and tests, including those specified either on receipt of the product, or in-process, are carried out, and confirm that the data/products meet specified requirements.

No product will be dispatched until all activities have been satisfactorily completed and the associated data and documentation is available and authorized.

Shaw will ensure that records are established and maintained, which gives evidence that the product has passed inspection and/or tests within the defined acceptable criteria.

3.3 Status of Inspections and Tests

Shaw will ensure that inspection and test status of products are identified by using markings, stamps, tags, inspection records, or other suitable means that indicate the status of the product with regard to inspections and tests performed. This identification of inspection or test status will be maintained as necessary throughout the installation activity of the item to ensure that only acceptable items are dispatched, used, or installed.

3.4 Control of Nonconforming Items

Shaw will ensure that items that do not conform to the specified requirements are prevented from inadvertent use or installation. Control will provide for identification, documentation, evaluation, segregation (where practical), and disposition of nonconforming items.

3.5 Handling, Storage, Packing and Delivery

Shaw will ensure procedures for handling, storage, packaging, and delivery of items are established, documented, and maintained in accordance with the manufacturer's recommendations.

Procedures established for handling of items will ensure that methods and means of handling prevent damage to or deterioration of the items.

Procedures established for storage of items will ensure that secure storage areas or stock rooms are provided to prevent damage or deterioration of the item, pending use or installation. Appropriate methods for authorizing receipt and release form storage areas will be stipulated. The condition of the item in storage will be assessed at appropriate intervals after receipt and placing of the item in storage to detect deterioration.

Shaw will verify that packaging preservation and marking processes are controlled to the extent necessary to ensure conformance to the specified requirements. The Shaw On-Site QA/QC Officer will identify, preserve, and segregate all items from the time of receipt until the item is turned over to the owner and Shaw responsibility ceases.

Shaw will arrange for and verify the protection of the quality of the item after final inspection and tests in the supplier's fabrication facility.

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-8

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-8

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4.0 SUBCONTRACTOR QUALITY CONTROL

All subcontractors for this project are responsible for compliance with the QC requirements of their respective subcontract. Shaw will vet and pre-qualify all subcontractors in accordance with Shaw procedure EIG-PS-104, "Qualification of Sources."

The requirements for personnel qualifications, technical performance levels, QC procedures, acceptability criteria, and documentation will be included as a part of the subcontract documents. The Shaw On-Site QA/QC Officer, or his or her designee, will review the subcontract procurement documents to verify all of the QC requirements are communicated to the subcontractor.

Each subcontractor will be required to identify an adequately qualified individual within its organization to perform QC duties. The qualifications of this individual will be submitted to the Program QA/QC Manager for review and approval. The Shaw On-Site QA/QC Officer will coordinate all QC functions with the designated subcontractor QC representative. The PM, or the PM's authorized designee, will assist the Shaw On-Site QA/QC Officer in managing subcontractor QC.

The Shaw On-Site QA/QC Officer is responsible for the performance of inspections, surveillance, document reviews, audits, and other QC functions to verify compliance with the subcontract requirements. These activities will be documented on inspection reports, checklists, audit reports, field logs, or other forms appropriate to the function performed.

For field operations, the Shaw On-Site QA/QC Officer will provide QC inspections before and during the subcontractor activities, to the extent required, to verify that the subcontractor is in compliance with the QC requirements of the contract and the applicable subcontract documents.

Audits of subcontractor activities will be conducted by the Program QA/QC Manager as necessary to verify compliance with the CQP. Objective evidence of conformance to the subcontract documents will be reviewed during the audits.

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-8

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-8

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5.0 START-UP AND TESTING

As applicable Shaw will verify that installation and erection activities are conducted in accordance with established requirements. Mechanical completion activities will be performed in accordance with established procedures to ensure that performance and acceptance criteria are met and to verify the satisfactory completion of systems in preparation for pre-commissioning.

Start-up and testing activities include all forms of static, dynamic, and performance tests. The effective implementation of start-up and testing activities will confirm the quality of design, manufacture, fabrication, and construction by demonstrating that functional and performance requirements have been met. Demonstration of functional and performance requirements will be intimately linked to proper operation of the equipment or facilities.

Shaw will maintain records attesting to the satisfactory performance of start-up and testing activities affecting quality.

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-8

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-8

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6.0 QUALITY AUDITS AND SURVEILLANCE

A quality audit and surveillance program will be implemented in accordance with Shaw procedures EI-Q006, "Surveillance" and EI-Q009, "Quality Audits," to ensure all elements of this CQP are implemented effectively and in a timely manner. Specifically, the quality audit program includes the following:

- The submittal of a quality audit schedule by the Program QA/QC Manager to the PM that is updated as necessary to cover project activities.
- Routine quality surveillance in addition to scheduled quality audits.
- The submittal of a quality audit report to the PM, the Director of Quality Assurance, management of applicable project organizations, and the Program QA/QC Manager upon the completion of each quality audit and surveillance that includes, as applicable, the subject activity, the findings, any areas of concern, and cited nonconformities. Cited nonconformities will be investigated to determine their root cause(s), the extent of the condition, and acceptable proposals of preventive/corrective action(s) taken in a timely manner.

A qualified lead auditor will manage all quality audits in accordance with pre-established, written procedures and checklists and/or annotated procedures. Audits and surveillance will be documented using standard forms in the UFP-QAPP. Technical specialists will be incorporated into the audit team, as necessary, to evaluate processes and the products resulting from those processes. The auditor(s) will not have direct responsibilities in the areas being audited. Quality audits will be initiated early enough to assure effective QA during all phases of the work.

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-8

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-8

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7.0 STANDARD OPERATING PROCEDURES

Shaw has an established and maintained system of written procedures necessary for the implementation of the quality management system elements applicable to the project scope of work. Shaw CQC-specific procedures are provided on the project SharePoint portal and forms are included in the UFP-QAPP.

Project personnel are responsible for advising the Shaw PM of any changes to procedures that, if in effect, would revise the previously established requirements for their work. Moreover, project personnel are encouraged to propose any changes or procedures that would, if in effect, increase productivity without compromising established quality requirements. Revised procedures will be reviewed, approved, distributed, and controlled the same as their original issue.

Shaw standard project and general procedures will be used to the extent they provide an effective means of implementing project requirements and comply with USAF requirements and unique project conditions.

When additional USAF requirements or unique project conditions require additional procedural direction, existing standard project procedures may be supplemented by generation of a project-specific procedure. (Note: General procedure requirements may not be revised unless to meet specific client requirements. Changes to general procedure requirements require the approval of the procedure owner/approver.) To the extent required, Shaw will establish, document, and maintain project-specific procedures to ensure compliance with USAF requirements and unique project conditions that are not adequately addressed in existing standard project and general procedures. The general procedure provides the requirements and controls that apply to the application of project-specific procedures.

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-8

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-8

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8.0 TRAINING

The PM will indoctrinate and familiarize key project personnel with this CQP and applicable implementing procedures. Appropriate records of training shall be maintained.

Shaw will use this CQP as an aid in understanding how it will fulfill established quality requirements. Emphasis will be placed on the identification of actual or potential quality problems and the initiation of preventive/remedial measures.

Project roles that have project-specific QA/QC training requirements include the following:

- On-Site QA/QC Officer
- Materials Inspectors

Other training for other roles and responsibilities may be required and will be documented in the task-/site-specific technical work plans with an updated UFP-QAPP Worksheet #8.

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-8

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-8

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9.0 QUALITY RECORDS

Procedures will be developed and agreed to by Shaw and the USAF for the retention and transmittal of quality records to the USAF on schedule and in an acceptable record medium.

All documentation will be in the English language, legible, and suitable for scanning. Records will be protected against loss by theft, fire, flooding, and deterioration by extremes in temperature or humidity.

Documentation control will address identifying, retrieving, filing, indexing, numbering, distributing, and maintaining the reproduction quality of QC records.

Suppliers' QC records will also be identified, collected, and maintained to demonstrate achievement of the required quality and the effective operation of their quality management system.

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-8

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-8

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Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-8

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Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-8

Appendix A
Site-Specific Construction Quality Control and Start-up Testing and Inspection Requirement Worksheets

SITE-SPECIFIC CONSTRUCTION QUALITY CONTROL TESTING AND INSPECTION REQUIREMENT WORKSHEET

Worksheet Number:	Date of Issue:
Reference Site ID:	Reference Specifications:
Definable Feature of Work:	Other Reference:
Reference Drawings:	
Reference Codes:	

Inspection/Test Identification	Inspection/Test Procedure	Inspection/Test Frequency	Inspection/Test Criteria	Acceptance Criteria
Submittals				
Materials				
Workmanship				
Task-Specific				

Notes:

_____

_____

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Date Checked: _____ SIGNED: _____

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-8

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SITE-SPECIFIC START-UP TESTING AND INSPECTION REQUIREMENT WORKSHEET

Worksheet Number:	Date of Issue:
Reference Site ID:	Reference Specifications:
Definable Feature of Work:	Other Reference:
Reference Drawings:	
Reference Codes:	

Inspection/Test Identification	Inspection/Test Procedure	Inspection/Test Frequency	Inspection/Test Criteria	Acceptance Criteria
Submittals				
Materials				
Workmanship				
Task-Specific				

Notes:

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Date Checked: _____ SIGNED: _____

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • January 2012 • WERC-09-13-002-8

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Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • February 2012 • WERC-09-13-019

Appendix B
Project Forms

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Ref. Document # _____

Page _____ of ____

Shaw E & I Chain of Custody Form

Project Number: _____

Project Name / Location: _____

Purchase Order #: _____

Shipment Date: _____

Waybill/Airbill Number: _____

Lab Destination: _____

Lab Contact Name / ph. #: _____

Project Contact: _____ (Name & phone #)

Send Report To: _____

Phone/Fax Number: _____

Address: _____

City: _____

Sampler's Name(s): _____

Sample ID Number	Sample Description	Collection Information			Matrix	# of containers	Container type	Preservative						Analyses Requested									Turn Around Time Requested
		Date	Time	G/C				HCL	NaOH	HNO_3	H_2SO_4	Ice											

Special Instructions:

QC/Data Package Level Required:

I II III IV/Project Specific: _____

Relinquished By:	Date:	Received By:	Date:
	Time:		Time:
Relinquished By:	Date:	Received By:	Date:
	Time:		Time:
Relinquished By:	Date:	Received By:	Date:
	Time:		Time:

G/C Codes

C = Composite G = Grab

Matrix Codes

DW = Drinking Water	SO =Soil
GW = Ground Water	SL = Sludge
WW = Waste Water	CP = Chip Samples
SW = Surface Water	WP = Wipe Samples
LIQ = Other Liquid	SOL = Other Solid
AS = Air Sample	SED = Sediment

Shaw® Shaw E & I

Shaw E & I COC Continuation Page

COC Ref. Document # _____ Page _____ of _____

Project Number: _____ Shipment Date: _____

Project Name / Location: _____

Sample ID Number	Sample Description	Collection Information			Matrix	# of containers	Container type	Preservative						Analyses Requested										Turn Around Time Requested
		Date	Time	G/C				HCL	NaOH	HNO_3	H_2SO_4	Ice												

Shaw Environmental, Inc.

FIELD ACTIVITY DAILY LOG

DAILY LOG	DATE			
	NO.			
	SHEET OF			

PROJECT NAME:	PROJECT NO.:
FIELD ACTIVITY SUBJECT:	
DESCRIPTION OF DAILY ACTIVITIES AND EVENTS:	

VISITORS ON SITE:	CHANGES FROM PLANS AND SPECIFICATIONS, AND OTHER SPECIAL ORDERS AND IMPORTANT DECISIONS:
WEATHER CONDITIONS:	IMPORTANT TELEPHONE CALLS:
SHAW PERSONNEL ON SITE:	
SIGNATURE:	DATE:

Attachment 1
ASTM Soil Classification & USCS Group Symbols

					Group Symbol				Group Name
>50% Sand & Gravel	GRAVEL % gravel > % sand	≤5% fines	Well-graded		GW	<15% sand			Well-graded GRAVEL
						≥15% sand			Well-graded GRAVEL with Sand
			Poorly-graded		GP	<15% sand			Poorly graded GRAVEL
						≥15% sand			Poorly graded GRAVEL with Sand
		10% fines	Well-graded	fines - ML or MH	GW-GM	<15% sand			Well-graded GRAVEL with Silt
						≥15% sand			Well-graded GRAVEL with Silt and Sand
				fines - CL or CH	GW-GC	<15% sand			Well-graded GRAVEL with Clay
						≥15% sand			Well-graded GRAVEL with Clay and Sand
			Poorly-graded	fines - ML or MH	GP-GM	<15% sand			Poorly graded GRAVEL with Silt
						≥15% sand			Poorly graded GRAVEL with Silt and Sand
				fines - CL or CH	GP-GC	<15% sand			Poorly graded GRAVEL with Clay
						≥15% sand			Poorly graded GRAVEL with Clay and Sand
		≥15% fines		fines - ML or MH	GM	<15% sand			Silty GRAVEL
						≥15% sand			Silty GRAVEL with Sand
				fines - CL or CH	GC	<15% sand			Clayey GRAVEL
						≥15% sand			Clayey GRAVEL with Sand
	SAND % sand > % gravel	≤5% fines	Well-graded		SW	<15% gravel			Well-graded SAND
						≥15% gravel			Well-graded SAND with Gravel
			Poorly-graded		SP	<15% gravel			Poorly graded SAND
						≥15% gravel			Poorly graded SAND with Gravel
		10% fines	Well-graded	fines - ML or MH	SW-SM	<15% gravel			Well-graded SAND with Silt
						≥15% gravel			Well-graded SAND with Silt and Gravel
				fines - CL or CH	SW-SC	<15% gravel			Well-graded SAND with Clay
						≥15% gravel			Well-graded SAND with Clay and Gravel
			Poorly-graded	fines - ML or MH	SP-SM	<15% gravel			Poorly graded SAND with Silt
						≥15% gravel			Poorly graded SAND with Silt and Gravel
				fines - CL or CH	SP-SC	<15% gravel			Poorly graded SAND with Clay
						≥15% gravel			Poorly graded SAND with Clay and Gravel
		≥15% fines		fines - ML or MH	SM	<15% gravel			Silty SAND
						≥15% gravel			Silty SAND with Gravel
				fines - CL or CH	SC	<15% gravel			Clayey SAND
						≥15% gravel			Clayey SAND with Gravel
50% or More Fines	Low-Plasticity Clay				CL	<30% sand & gravel	<15% Sand and Gravel		Lean CLAY
							15-25% sand & gravel	% sand ≥ % gravel	Lean CLAY with Sand
								% sand < % gravel	Lean CLAY with Gravel
						≥30% sand & gravel	% sand ≥ % of gravel	< 15% gravel	Sandy lean CLAY
								≥ 15% gravel	Sandy lean CLAY with Gravel
							% sand < % gravel	< 15% sand	Gravelly lean CLAY
								≥ 15% sand	Gravelly lean CLAY with Sand
	Low-Permeability Silt				ML	<30% sand & gravel	15% sand & gravel		SILT
							15-25% sand & gravel	% sand ≥ % gravel	SILT with Sand
								% sand < % gravel	SILT with Gravel
						≥30% sand & gravel	% sand ≥ % of gravel	< 15% gravel	Sandy SILT
								≥ 15% gravel	Sandy SILT with Gravel
							% sand < % gravel	< 15% sand	Gravelly Silt
								≥ 15% sand	Gravelly Silt with Sand
	Plastic Clay				CH	<30% sand & gravel	< 15% sand & gravel		Fat CLAY
							15-25% sand & gravel	% sand ≥ % gravel	Fat CLAY with Sand
								% sand < % gravel	Fat CLAY with Gravel
						≥30% sand & gravel	% sand ≥ % of gravel	< 15% gravel	Sandy fat CLAY
								≥ 15% gravel	Sandy fat CLAY with Gravel
							% sand < % gravel	< 15% sand	Gravelly fat CLAY
								≥ 15% sand	Gravelly fat CLAY with Sand
	Plastic Silt				MH	<30% sand & gravel	< 15% sand & gravel		Elastic SILT
							15-25% sand & gravel	% sand > % gravel	Elastic SILT with Sand
								% sand < % gravel	Elastic SILT with Gravel
						≥30% sand & gravel	% sand ≥ % of gravel	< 15% gravel	Sandy elastic SILT
								≥ 15% gravel	Sandy elastic SILT with Gravel
							% sand < % gravel	< 15% sand	Gravelly elastic SILT
								≥ 15% sand	Gravelly elastic SILT with Sand
	Organics (Peat or Bay Mud)				OL/OH	<30% sand & gravel	< 15% sand & gravel		Organic SOIL
							15-25% sand & gravel	% sand ≥ % gravel	Organic SOIL with Sand
								% sand < % gravel	Organic SOIL with Gravel
						≥30% sand & gravel	% sand ≥ % of gravel	< 15% gravel	Sandy Organic SOIL
								≥ 15% gravel	Sandy Organic SOIL with Gravel
							% sand < % gravel	< 15% sand	Gravelly Organic SOIL
								≥ 15% sand	Gravelly Organic SOIL with Sand

Shaw® Shaw E & I

Example
Visual Classification of Soils

PROJECT NUMBER:	PROJECT NAME:		
BORING NUMBER:	COORDINATES:		DATE:
ELEVATION:	GWL: Depth	Date/Time	DATE STARTED:
ENGINEER/GEOLOGIST:	Depth	Date/Time	DATE COMPLETED:
DRILLING METHODS:			PAGE: OF

DEPTH ( )	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER ( )	RECOVERY ( )	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	WELL CONSTRUCTION	REMARKS

NOTES:

Drilling Contractor: _____

Drilling Equipment: _____

Driller: _____

_____

1651-9-02

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CONSISTENCY OF COHESIVE SOILS

CONSISTENCY	UNCONFINED COMPRESSIVE STRENGTH (TONS PER SQUARE FOOT)
VERY SOFT	LESS THAN 0.25
SOFT	0.25 to 0.50
FIRM	0.50 to 2.0
HARD	2.0 to 4.0
VERY HARD	MORE THAN 4.0

DENSITY OF GRANULAR SOILS

DENSITY	STANDARD PENETRATION RESISTANCE [1]
VERY LOOSE	0-4
LOOSE	5-10
MEDIUM DENSE	11-30
DENSE	31-50
VERY DENSE	OVER 50

[1] STANDARD PENETRATION RESISTANCE IS THE NUMBER OF BLOWS REQUIRED TO DRIVE A 2-INCH O.D. SPLIT BARREL SAMPLER 12 INCHES USING A 140-POUND HAMMER FALLING FREELY THROUGH 30 INCHES. THE SAMPLER IS DRIVEN 18 INCHES AND THE NUMBER OF BLOWS RECORDED FOR EACH 6-INCH INTERVAL. THE SUMMATION OF THE FINAL TWO INTERVALS IS THE STANDARD PENETRATION RESISTANCE.

GRAIN SIZE IN MM

COBBLES	GRAVEL		SAND			SILT AND CLAY
	COARSE	FINE	COARSE	MEDIUM	FINE	

USCS CLASSIFICATION FOR SOILS

COARSE-GRAINED SOILS

CLEAN GRAVELS (LITTLE OR NO FINES)	GW	WELL-GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES
	GP	POORLY GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES
GRAVELS WITH FINES (APPRECIABLE AMOUNT OF FINES)	GM	SILTY GRAVELS, GRAVEL-SAND-SILT MIXTURES
	GC	CLAYEY GRAVELS, GRAVEL-SAND-CLAY MIXTURES
CLEAN SANDS (LITTLE OR NO FINES)	SW	WELL-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
	SP	POORLY-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
SANDS WITH FINES (APPRECIABLE AMOUNT OF FINES)	SM	SILTY SANDS, SAND-SILT MIXTURES
	SC	CLAYEY SANDS, SAND-CLAY MIXTURES

FINE-GRAINED/HIGHLY ORGANIC SOILS

SILTS AND CLAYS LIQUID LIMIT (LESS THAN 50)	ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY
	CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS SILTY CLAYS, LEAN CLAYS
	OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
SILTS AND CLAYS LIQUID LIMIT (GREATER THAN 50)	MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SANDY OR SILTY SOILS
	CH	INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS
	OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
HIGHLY ORGANIC SOILS	PT	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS

Soil / Sediment Field Logsheet

Shaw™ Shaw E & I

Site Name: Project #:

Sample ID:	Sample Location Sketch:
Sample Type*:	
*: SED=Sediment; SUR=Surface soil; SUB=Subsurface Soil; OTH=Other. grab=Grab, comp=Composite	
Date Sampled:	
Time Sampled:	
Depth (ft bgs):	
Physical description:	
Analyses requested:	Photograph Log #:
PID:	Calibration Date:
O2/LEL:	Calibration Date:
Weather:	
Temperature: ° F	
Sampling Equipment:	
Equipment Decontamination Technique:	
QC Samples:	
Analytical Laboratory:	
Comments:	
Field Technician: (Print)	Date:

Groundwater Logsheet

Shaw™ Shaw E & I

Site Name: Project #:

Sample ID:	Sample Location Sketch:
Sample Type*:	
*: grab = Grab, comp = Composite	
Date Sampled:	
Time Sampled:	
Depth (ft bgs):	
~~Physical description:~~	
~~Analyses requested:~~	
	Photograph Log #:
PID:	Calibration Date:
O2/LEL:	Calibration Date:
Weather:	
Temperature: ° F	
Sampling Equipment:	
Equipment Decontamination Technique:	
QC Samples:	
Analytical Laboratory:	
Comments:	
Field Technician: (Print)	Date:

Shaw™ Shaw E & I

Jar Headspace Screening Results Log

Site: _____

Location: _____

Sample ID	Date	Headspace Reading	Comments

Page _____

Shaw™ Shaw Environmental, Inc.

TEST EQUIPMENT LIST AND CALIBRATION LOG

Project Name: _____ Project No. _____

Equipent Number and Use (Screening or Analytical)	Equipment Name (Manufacturer and Model ID)	Date and Time (of Califbration)	Calibration Standard Used (Mnaufacturer and Lot Number)	Equipment Reading (Include Units and Tolerances)	Comments (and/or Observations)	Initials (of Person)

Example Calibration Log

Shaw Environmental, Inc.

CALIBRATION FIELD LOG

Project Name: _____ Sample Location: _____
Project No.: _____ Date and Time: _____
Information Recorded by: _____

Sampling Team

Name Printed

_____
_____
_____
_____

EQUIPMENT

Equipment Type: **Portable PID**
Equipment/ID No.: _____

Analyte	Cal. Std.	Spike Amt. (ppm)	Measured Value (ppm)	Calibration Required? (Y/N)	Post-Calibration Value (ppm)
VOCs (solvents and TPH)	Reference Std.				

Equipment Type: **Water Quality Field Instrument**
Equipment/ID No.: _____

Analyte	Cal. Std.	Spike Amt.	Acceptance Criteria	Measured Value	Recalibration Required? (Y/N)	Post-Calibration Value
Conductivity	Reference Std. (mS/cm)		± 10%			
Turbidity	1.0 NTU	1.0	± 10%			
	10.0 NTU	10.0	± 10%			
ORP	Reference Std. (mV)	200-275	± 10%			
pH	7.0 pH units	7.0	6.95 - 7.05			
	10.0 pH units	10.0	9.95 - 10.05			
Dissolved Oxygen*	Reference Std. (100.0%)	100 %	± 10%	%		%
	Note the DO (mg/L) here after calibrating to 100.0% -->					mg/L

Barometric Pressure

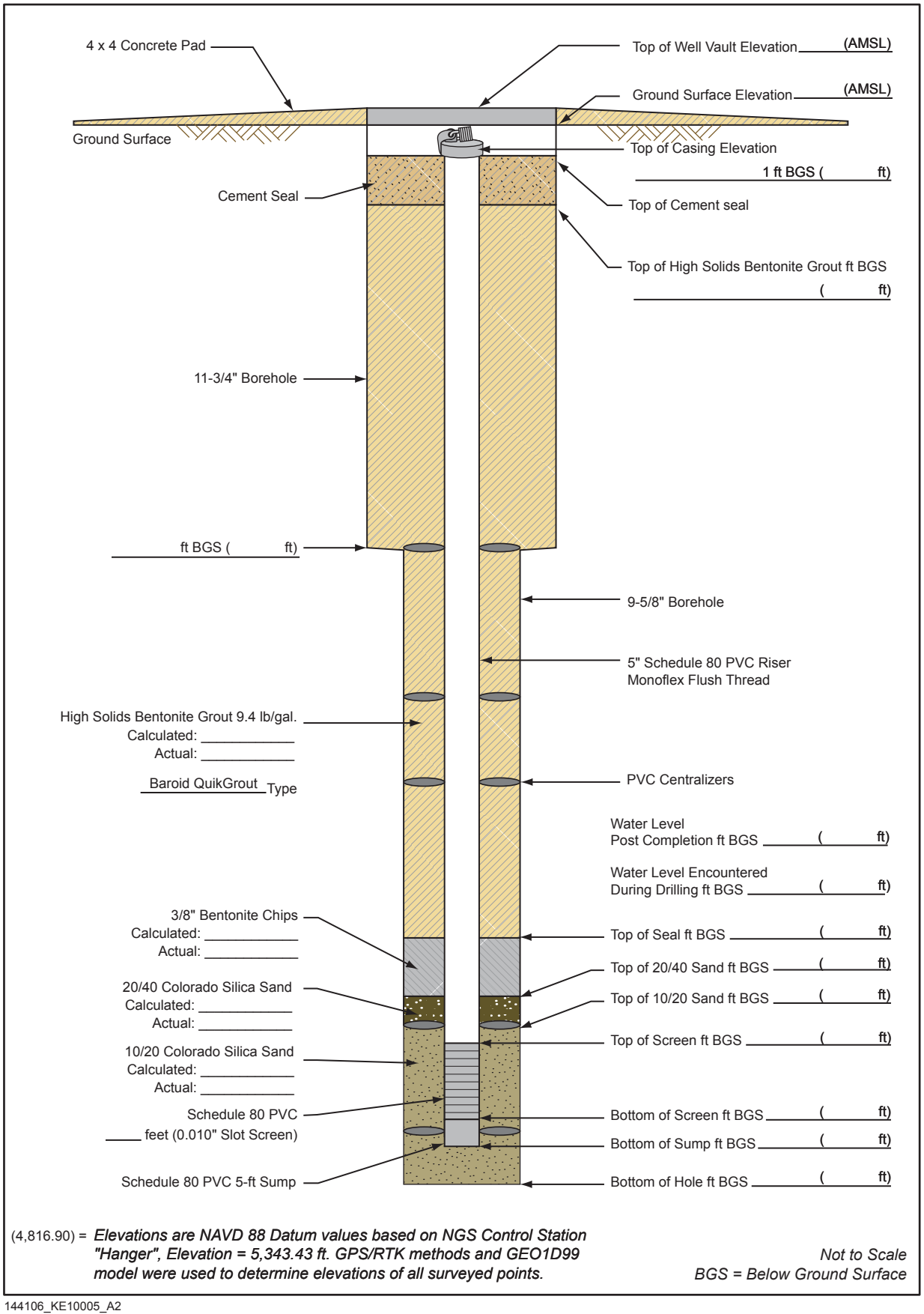
Local Barometric Pressure, if available (mm of Hg) _____ Adjust Instrument? Y N

Comments: _____
_____
_____
_____
_____
_____

*** Note**: When calibrating DO, calibrate to 100%. After DO has been calibrated, note the mg/L in the given field.

Monitoring Well Completion Diagram _____

Installation Start Date/Time: _____
Installation End Date/Time: _____



(4,816.90) = *Elevations are NAVD 88 Datum values based on NGS Control Station "Hanger", Elevation = 5,343.43 ft. GPS/RTK methods and GEO1D99 model were used to determine elevations of all surveyed points.*

Not to Scale
BGS = Below Ground Surface

144106_KE10005_A2

Shaw® Shaw E & I

EXAMPLE
WELL PURGE RECORD

Project Name: _____

Location: _____ Well/Piez. No.: _____

Personnel: _____ Date Installed: _____

Date (Start/End): _____ Csg. Diameter (I.D.): _____

Method of Development: _____ Total Depth (ft. TOC): _____

❑ Surging ❑ Bailing ❑ Pumping ❑ Other (State Method) _____

❑ Original Development ❑ Redevelopment Development Date:_____

Depth to water before developing well:_____

		Volume (V)	Purge Factor	Volume To Purge
Height of Water Column:	_____ feet_____	=_____gal.*	_____	= _____

$V = (B * r_c^2 * L_c * 7.48)+(B*(r_w-r_c)^2*L_s*ø_s*7.48)$=_____gallons (See Notes below)

Depth purging from:_____ feet Time purging begins:_____

Weather:_____ Screened Interval (ft. BGL): _____

Equipment Nos.: pH Meter _____ EC Meter _____ Turbidity Meter_____

Equipment decontaminated prior to development Y _____ N _____

Describe _____

Date	Time	Water Level (ft. below TOC)	Volume Removed (gal.)	Temp (C or F)	pH	EC	Turbidity	D.O.	Comments

Notes:

- Water levels – Reported to the nearest 0.01 foot.
- pH – Reading rounded to 0.1 pH units
- Electrical conductivity (EC) – Reported to the nearest 10% mhos/cm or
- µmho/cm @25 C or in mS/cm of instrument set range
- Water temperature – Reported to the nearest 0.1 C or F feet
- Dissolved oxygen (D.O.) report in 0.1 mg/L
- Turbidity report in NTV nearest whole #

Where:

B=3.14

$ø_s$=porosity of the sand pack

r_c =radius of the well casing and screen in feet

L_c=length of water column inside the casing and screen in feet

r_w =radius of the well bore in feet

L_s =length of saturated portion of the sand pack in feet

7.48 gallons/cubic foot=conversion from cubic feet to gallons

Shaw The Shaw Group Inc.™

TAILGATE SAFETY MEETING

Division/Subsidiary **Shaw Environmental Inc.** Facility _____

Date _____ Time _____ Job Number _____

Customer _____ Address _____

Specific Location _____

Type of Work _____

Chemicals Used _____

OBTAIN MATERIAL SAFETY DATA SHEETS (MSDS) FOR CHEMICALS TO BE USED ONSITE

SAFETY TOPICS PRESENTED

Protective Clothing/Equipment _____

Chemical Hazards _____

Physical Hazards _____

.

Emergency Procedures _____

Hospital/Clinic _____ Phone _____ Paramedic Phone _____

Hospital Address _____

Special Equipment _____

Other _____

ATTENDEES

NAME PRINTED	SIGNATURE

Shaw The Shaw Group Inc.™

TAILGATE SAFETY MEETING

NAME PRINTED	SIGNATURE

Meeting conducted by:

NAME PRINTED	SIGNATURE

Supervisor _____

Project Manager _____

SAFETY MEETING LOG/JOB SAFETY ANALYSIS

Date/Time: _____ Job No.:_____

Location of Job (Unit/Location on Project):		**Job Task Analyzed**	
Required PPE:	**Safety Access/ Location**	Supervisor of Work:	
	Safe Haven:	JSA Prepared By:	
	Wind Direction:	Are other crews in area?	
Pre-Job Preparation 1. Fill out JSA 2. Review JSA (EVERYONE) 3. Sign JSA (EVERYONE)	Evacuation Route: Assembly Point::	New:	
		Revised:	

Job Task (What you are doing)	**Audit the Job:** Audit Time:
Potential Hazards	**Supervisor's Comments:**
Recommended Action or Procedure	**Supervisor's Initials:**

Crew Name Signatures:		

PROJECT SAFETY INSPECTION REPORT

DATE _____

BUSINESS LINE: _____

PROJECT NAME/NUMBER: _____

PROGRAM MANAGER: _____ PROJECT MANAGER: _____

GENERAL PROJECT DESCRIPTION: _____

SITE ACTIVITIES AT TIME OF INSPECTION: _____

_____

_____

INTERVIEWED EMPLOYEE: _____

SAFETY ISSUE: _____

CORRECTIVE ACTION: _____

_____

ASSIGNED TO: _____ FOLLOW-UP DATE: _____

CORRECTION VERIFIED BY: _____ DATE: _____

INTERVIEWED EMPLOYEE: _____

SAFETY ISSUE: _____

CORRECTIVE ACTION: _____

_____

ASSIGNED TO: _____ FOLLOW-UP DATE: _____

CORRECTION VERIFIED BY: _____ DATE: _____

INSPECTION COMPLETED BY: _____ DATE: _____

HEALTH AND SAFETY REVIEW BY: _____ DATE: _____

PROJECT SAFETY INSPECTION REPORT

PROJECT _____ **DATE** _____

	YES	NO	N/A
FIRST AID			
1. Are first aid kit locations identified and accessible?			
2. Are emergency eye wash/safety showers available and inspected monthly?			
3. Are first aid kits inspected weekly?			
4. Is a qualified first aid/CPR provider on-site?			
PERSONAL PROTECTIVE EQUIPMENT			
1. Have levels of personnel protection been established?			
2. Are respirators decontaminated, inspected, and stored according to standard procedures?			
3. Have employees been fit-tested?			
4. Is defective personal protective equipment tagged and taken out of service?			
5. Does compressed breathing air meet CGA Grade "D" minimum?			
6. Are there sufficient sizes and quantities of protective equipment?			
7. At a minimum, are employees utilizing safety glasses, hard hats, and steel toe boots?			
FIRE PREVENTION			
1. Are employees smoking only in designated outdoor areas?			
2. Are fire lanes established and maintained?			
3. Are flammable liquid dispensing systems bonded?			
4. Are approved safety cans available for storage of flammable liquids?			
5. Has the local fire department been contacted?			
6. Are fire extinguishers available and inspected monthly?			
7. Are flammables and combustibles properly stored?			
8. Are flammable storage cabinets available and used when needed?			
AIR MONITORING			
1. Is required air monitoring being conducted?			
2. Are air monitoring instruments calibrated daily?			
3. Are air monitoring logs up to date?			
4. Are instrument user manuals available?			
5. Are instruments being maintained?			
6. Are employees notified of personal sampling results within 5 days of receipt?			
WELDING AND CUTTING			
1. Are fire extinguishers present at welding and cutting operations?			
2. Are confined spaces evaluated prior to and during cutting and welding operations?			
3. Have Hot Work Permits been completed?			
4. Are proper helmets, goggles, aprons, and gloves available for welding and cutting operations?			
5. Are welding machines properly grounded?			
6. Are oxygen and fuel gas cylinders stored a minimum of 20 feet apart?			
7. Are only trained personnel permitted to operate welding and cutting equipment?			
8. Are gas cylinders transported in a secured vertical position with caps in place?			
HAND AND POWER TOOLS			
1. Are defective hand and power tools tagged and taken out of service?			
2. Is eye protection available and used when operating power tools?			
3. Are guards and safety devices in place on power tools?			
4. Are power tools inspected before each use?			
5. Are nonsparking tools available when necessary?			

PROJECT SAFETY INSPECTION REPORT

PROJECT _____ **DATE** _____

	YES	NO	N/A
HAND AND POWER TOOLS (continued)			
6. Is the correct tool being used for the job?			
MOTOR VEHICLES			
1. Are vehicles regularly inspected?			
2. Are personnel licensed for the vehicles they operate?			
3. Are unsafe vehicles tagged and reported to supervision?			
4. Is vehicle's safety equipment operating properly?			
5. Are loads secure?			
6. Are vehicle occupants using safety belts?			
7. Are current insurance cards and blank accident report forms located in vehicles?			
EMERGENCY PLANS			
1. Are emergency telephone numbers posted?			
2. Have emergency escape routes been designated?			
3. Are employees familiar with the emergency signal?			
4. Has the emergency route to the hospital been established and posted?			
5. Is a vehicle on site that can transport injured employees to the hospital?			
MATERIALS HANDLING			
1. Are materials stacked and stored to prevent sliding or collapsing?			
2. Are tripping hazards identified?			
3. Are semi-trailers chocked?			
4. Are fixed jacks used under semi-trailers?			
5. Are riders prohibited on materials handling equipment?			
6. Are approved manlifts provided for the lifting of personnel?			
7. Are personnel in manlifts wearing approved fall protection devices?			
FIRE PROTECTION			
1. Has a fire alarm system been established?			
2. Do employees know the location and use of all fire extinguishers?			
3. Are fire extinguisher locations posted?			
4. Are combustible materials segregated from open flames?			
5. Have fire extinguishers been professionally inspected during the last year?			
6. Are fire extinguishers visually inspected monthly?			
ELECTRICAL			
1. Is electrical equipment and wiring properly guarded and maintained in good condition?			
2. Are extension cords kept out of wet areas?			
3. Is damaged electrical equipment tagged and taken out of service?			
4. Have underground electrical lines been identified by proper authorities?			
5. Has a lockout/tagout system been established?			
6. Are GFCIs being used on all temporary electrical systems and as needed?			
7. Are extension cords being inspected daily (i.e., group pin in place, no unapproved splices)?			
8. Are warning signs exhibited on high voltage equipment (250V or greater)?			
9. Is adequate distance maintained from overhead electrical lines?			
10. Are switches, circuit breakers, and switchboards installed in wet locations enclosed in weatherproof enclosures?			

PROJECT SAFETY INSPECTION REPORT

PROJECT _____ **DATE** _____

	YES	NO	N/A
CRANES AND RIGGING			
1. Are cranes inspected daily prior to use?			
2. Are crane swing areas barricaded or demarked?			
3. Is all rigging equipment tagged with an identification number and rated capacity?			
4. Is rigging equipment inspection documented?			
5. Are slings, chains, and rigging inspected before each use?			
6. Are damaged slings, chains, and rigging tagged and taken out of service?			
7. Are slings padded or protected from sharp corners?			
8. Do employees keep clear of suspended loads?			
9. Are rated load capacities and special hazard warnings posted on crane?			
10. Are the records of annual crane inspection available?			
11. Has accessible areas within the swing radius of the rear of the crane been barricaded?			
12. Do crane operators have required training/certification?			
COMPRESSED GAS CYLINDERS			
1. Are breathing air cylinders charged only to prescribed pressures?			
2. Are like cylinders segregated and stored in well-ventilated areas?			
3. Is smoking prohibited in cylinder storage areas?			
4. Are cylinders stored secure and upright?			
5. Are cylinders protected from snow, rain, etc.?			
6. Are cylinder caps in place before cylinders are moved?			
7. Are fuel gas and oxygen cylinders stored a minimum of 20 feet apart?			
8. Are propane cylinders stored and used only outside of buildings?			
SCAFFOLDING			
1. Is scaffolding placed on a flat, firm surface?			
2. Are scaffold planks free of mud, ice, grease, etc.?			
3. Is scaffolding inspected before each use?			
4. Are defective scaffold parts taken out of service?			
5. Have employees completed scaffold user training?			
6. On scaffolds where platforms are overlapped, is planking overlapped a minimum of 12 inches?			
7. Does scaffold planking extend over end supports between 6 to 18 inches (dependent upon platform length)?			
8. Are employees restricted from working on scaffolds during storms and high winds?			
9. Are all pins in place and wheels locked?			
10. Is required perimeter guarding (top rail, mid rail, and toe board) present?			
11. Has a competent person been designated to oversee scaffold construction?			
12. Are employees prohibited from moving mobile scaffold horizontally while employees are on them?			
13. Are all scaffold components manufactured by the same company?			
WALKING AND WORKING SURFACES			
1. Are ladders regularly inspected?			
2. Are accessways, stairways, ramps, and ladders clean of ice, mud, snow, or debris?			
3. Are ladders being used in a safe manner?			
4. Are ladders kept out of passageways, doors, or driveways?			
5. Are broken or damaged ladders tagged and taken out of service?			
6. Are metal ladders prohibited in electrical service?			

WALKING AND WORKING SURFACES (continued)			
7. Are stairways and floor openings guarded?			
8. Are safety feet installed on straight and extension ladders?			
9. Is general housekeeping being maintained?			
10. Are ladders tied off?			
11. Are handrails and side rails installed along the unprotected sides of stairways having 4 or more risers or rising more than 30 inches?			
SITE SAFETY PLAN			
1. Is a site safety plan available on site or accessible to all employees?			
2. Does the safety plan accurately reflect site conditions and tasks?			
3. Have potential hazards been described to employees on site?			
4. Is there a designated safety official on site?			
5. Have all employees signed the safety plan acknowledgment form?			
SITE POSTERS			
1. Are the following posters displayed in a prominent and accessible area?			
A. Minimum Wage			
B. OSHA Job Protection			
C. Equal Employment Opportunity			
2. Are all required state-specific posters displayed?			
SITE CONTROL			
1. Are work zones clearly marked?			
2. Are support trailers located to minimize exposure from a potential release?			
3. Are support trailers accessible for approach by emergency vehicles?			
4. Is the site properly secured during and after work hours?			
5. Is an exclusion zone sign-in/sign-out log maintained?			
6. Are only employees with current training and physicals permitted in exclusion zone?			
HEAVY EQUIPMENT			
1. Is heavy equipment inspected as prescribed by the manufacturer?			
2. Is defective heavy equipment tagged and taken out of service?			
3. Are project roads and structures inspected for load capacities and proper clearances?			
4. Is heavy equipment shut down for fueling and maintenance?			
5. Are backup alarms installed and working on mobile equipment?			
6. Have qualified equipment operators been designated?			
7. Are riders prohibited on heavy equipment?			
8. Are guards and safety appliances in place and used?			
9. Are operators using the "three point" system when mounting/dismounting equipment?			
EXCAVATION			
1. Has a "competent person" been designated to oversee excavation activities?			
2. Prior to opening excavations, are utilities located and marked?			
3. Has a professional engineer evaluated all excavations greater than 20 feet deep?			
4. Is there rescue equipment on site and accessible to the excavation area?			
5. Is excavated material placed a minimum of 24 inches from the excavation?			
6. Are the sides of excavations sloped or shored to prevent cave ins?			
EXCAVATION (continued)			
7. Have excavations greater than 4 feet deep been monitored for hazardous atmospheres (i.e., LEL/O_2 deficiency)?			
8. Are ladders or ramps used in excavations over 4 feet deep?			
9. Are means of egress available so as to require no more than 25 feet of lateral travel?			

PROJECT SAFETY INSPECTION REPORT

PROJECT _____ **DATE** _____

	YES	NO	N/A
10. Are barriers, i.e., guardrails or fences, placed around excavations near pedestrian or vehicle thoroughfares?			
11. Is excavation inspected daily by competent persons and documented?			
CONFINED SPACES			
1. Have employees been trained in the hazards of confined spaces?			
2. Are confined space permits posted at entrance to confined space?			
3. Is a copy of the confined space entry procedure available?			
4. Has a rescue plan been established?			
5. Is an entry supervisor present at each permit-required entry?			
6. Are required extraction/fall protection devices being used?			
DECONTAMINATION			
1. Are decontamination stations set up on site?			
2. Is decontamination water properly contained and disposed of?			
3. Are all pieces of equipment inspected for proper decontamination before leaving the site?			
4. Are shin/metatarsal guards being used during power washing activities?			
HAZARD COMMUNICATION			
1. Is there a copy of the HAZCOM procedure on site?			
2. Are their MSDSs for required materials/chemicals present on site?			
3. Are all containers properly labeled, as to content, hazard?			
4. Have employees been trained in accordance with the HAZCOM procedure?			
5. Do employees (including subcontractors) know and understand the effects of exposure from the chemicals on site?			
6. Have all personnel signed the HAZCOM acknowledgment form?			
7. Is there an updated list of chemicals maintained on site?			
TRAINING			
1. Are tailgate safety meetings being conducted daily?			
2. Are current training/medical records maintained on site?			
DOCUMENTATION			
1. Is an OSHA 300 Log maintained on site and posted during the months of February, March, and April?			
2. Are accident report forms available?			
3. Is a copy of health and safety policy and procedures available on site?			

PROJECT SAFETY INSPECTION REPORT

PROJECT _____ **DATE** _____

ALL NEGATIVE RESPONSES	CORRECTIVE ACTION	ASSIGNED TO	DATE ASSIGNED	DATE COMPLETED	VERIFIED BY

DESCRIBE POSITIVE SAFETY OBSERVATIONS

Shaw® Shaw E & I

FIELD CHANGE NOTICE LOG

FCN Number	Type	Preparer	Date of Initiation	Reviewer(s)	Engineering Document(s)	Rev.	Reason for Change	Appv'd / Disappv'd	Date	Date of Incorp.
	I, II,III	Name		Name(s)	Title, Dwg, #, Spec. #			A or D		

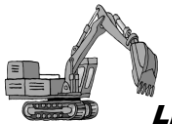
Change Request Log Form 0203

Equipment No: _____ **Date:** _____

Equipment Type: _____ **Location:** _____

Equipment Hrs: _____ **Supervisor:** _____

Shaw™
Shaw Environmental & Infrastructure, Inc.



DAILY EQUIPMENT INSPECTION

List Quantities And Kinds of Fluids Added In Space At Bottom Of Sheet

ITEM		OK	Add	N/A	Comments
1	Check Engine Oil Level And Engine Compartment For Trash, Debris, etc.	☐	☐	☐	☐
2	Check Hydraulic Oil Level, Cap And Vent.	☐	☐	☐	☐
3	Check Radiator Coolant Level And Radiator Fins For Dirt, Leaves, etc.	☐	☐	☐	☐
4	Check Transmission Oil Level (Dozers) or Swing Case (Excavators).	☐	☐	☐	☐
5	Check Oil Level in Frame Joint Bearing, Consult Manual. (Volvo A-40 only)	☐	☐	☐	☐
6	Check For Oil or Coolant Leaks.	☐	☐	☐	☐
7	Check Wheels / Tires / Tracks For Damage, Cuts And Proper Inflation PSI._____	☐	☐	☐	☐
8	Check Ground Engaging Implements, Cutting Edges, Teeth, Blade, etc.	☐	☐	☐	☐
9	Inspect Visible Hydraulic Hoses / Lines For Scuffs, Wear, Leaks, etc.	☐	☐	☐	☐
10	Inspect ROPS, FOPS, For Any Obvious Signs Of Loose Mounts, etc.	☐	☐	☐	☐
11	Check All Guages, Lights, Controls, Backup Alarms, Horn, etc.	☐	☐	☐	☐
12	Inspect Operators Compartment For Debris And Fire Extinguisher Charge. Check Floor For Build-up Of Dirt Around Pedals. Inspect Seat Belts, Lap Bar, Etc. Clean The Windows And Note Any Cracks.	☐	☐	☐	☐
13	Do a Walk Around Inspection Looking For Obvious Signs Of Future Problem Areas. Check Grab Handles and Step Treads, etc.	☐	☐	☐	☐
14	Check Operation Of All Systems, Boom, Bucket, Dump Bed, Grapple, Shears. Look for Leaks, Damage, Warning Signs, Excess Slack, Obvious Wear, etc.	☐	☐	☐	☐
15	Check Under The Machine For Any Loose Or Hanging Objects, Leaks, Or Anything Out Of The Ordinary.	☐	☐	☐	☐
16	Check Fuel Level And Cap Condition, Fill Tank Prior To Beginning Daily Operation.	☐	☐	☐	☐
17	**Lube All Moving Parts**, Such As Blade, Bucket, Stick, Connecting Links Equalizer bar, Cylinder Pins And Any Point That Is Subject To Grease Being Pushed Or Worn Out Due To Daily Use. Consult Manual For Grease Points.	☐	☐	☐	☐
18	Check Breathing Air Sustem (If Used). Make Sure Bottle Is Full And Mask / Hose Assembly Is Clean And In Good Working Condition Before Each Use.	☐	☐	☐	☐
19	**Verify The Presence Of The Operations / Maintenance Manual.**	☐	☐	☐	☐

Report All Damage To Supervisor Immediately

COMMENTS:

USE LINE NUMBER, BE SPECIFIC, NOTIFY REGIONAL MAINTENANCE COORDINATOR IF IMMEDIATE ATTENTION IS NEEDED.

EMPLOYEE NAME: **EMPLOYEE NUMBER:**

THESE SHEETS ARE TO BE RETAINED ON THE PROJECT FOR REVIEW BY ESG PERSONNEL.

Unit #		**Start Date**	
Mileage		**Project #**	
Vehicle Type		**License #**	
Inspected By		**Fuel Front**	
Employee #		**Fuel Rear**	

DAILY VEHICLE INSPECTION (Weekly Log)

For Authorized repairs on Donlen Vehicles, Call 1-800-323-1483

N/A = Not Applicable C = Comments O = Okay N = Needs Attention	**SAT**	**SUN**	**MON**	**TUE**	**WED**	**THU**	**FRI**
Exterior/Interior Clean							
Lights: Head-Tail-Turn-Stop-Emergency-Back Up							
Operating Controls/ Gauges							
Battery/ Starter/ Horn							
Air Conditioner/ Heater/ Defroster							
Back-up Alarm (Trucks)							
Windshield, Other Glass, Wipers/Washer							
Mirrors: Inside-Outside (Convex-Trucks)							
Insurance Card & Accident Report Kit							
Emergency Phone Number List							
Map to Urgent Care Facility & Hospital							
Current Registration, Plates							
Service Brakes, Emergency/Parking Brake							
Trailer Aux. Brake Controller/Electrical Connection							
Coupling Devices/Safety Chain Anchor Point							
Wheel Chocks (When Equipped with Trailer)							
Engine Oil, Oil Pressure							
Transmission Oil & Drive Line							
Radiator/Cooling System							
Exhaust/ Muffler							
Front Axle/Steering/Suspension System							
Donlen Coupon Book							
First Aid Kit							
Fire Extinguisher (mounted/accessible/charged)							
Emergency Flares or Reflective Markers							
Tires/Wheels/Rims							
Spare Tire, Jack, Lug Wrench							
Frame/Bumpers							
Seat Belts (One for Each Passenger)							
Visible Damage to Body							
Driver Safety Notification Sticker							
Other, Please Enter Comments Below							

Was Unit Serviced? Yes/ No Date Serviced Miles

Comments:

I have been authorized and I am licensed to operate this vehicle.

INSPECTORS SIGNATURE: **DATE:**

PLEASE REPORT ALL DEFICIENCIES TO YOUR SUPERVISOR

RETAIN THIS INSPECTION DOCUMENT IN PROJECT FILES

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • February 2012 • WERC-09-13-019

Appendix C
Shaw Standard Operating Procedures

Shaw Standard Operating Procedures

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CONTENTS

Section

CONTENTS (Concluded)

Acronyms and Abbreviations

%	percentage
<	less than
=	equal to
>	greater than
µm	micrograms
^{0}C	degrees Celsius
^{0}F	degrees Fahrenheit
ABS (plastic)	acrylonitrile-butadiene-styrene copolymers
AST	Above ground storage tank
ASTM	American Society for Testing and Materials
bgl	below ground level
bgs	below ground surface
BLM	Business Line Manager
COC	Chain of Custody
COLIWASA	Composite Liquid Waste Sampler
CPDO training	Competent Person – Drilling Oversight Training
DI water	deionized water
DNAPL	dense non-aqueous phase liquid
DO	dissolved oxygen
DOT	U.S. Department of Transportation
DTB	depth to bottom
DTW	depth to water
DUR	Data Usability Review
DWC	depth of the water column
ECP	Environmental Compliance Plan

Acronyms and Abbreviations (Continued)

EPA	U.S. Environmental Protection Agency
FAQ	Frequently Asked Question
FID	Flame Ionization Detector
ft	feet/foot
FTL	Field Team Leader
g	grams
gal	gallon
GC	Gas Chromatograph
GPR	Ground Penetrating Radar
GRO	gasoline range organics
HASP	project specific Health and Safety Plan
HazCat	Hazard Categorization
HAZWOPER	Hazardous Waste Operations and Emergency Response
HDPE	high density polyethylene
HS	Health and Safety
HSO	Health and Safety Officer
IATA	International Air Transport Association
ID	Identification
IDW	Investigative Derived Waste
in	inch/inches
IP	Ionization Potential
IT	Information Technologies
JSA	Job Safety Analysis
kV	kilovolts
L/min	liters per minute

Acronyms and Abbreviations (Continued)

LCB	laboratory control blank
LCS	laboratory control spike
LEL	lower explosive limit
LNAPL	light non-aqueous phase liquid
MFG name	manufacturing name
mL	milliliters
mm	millimeters
MS	Matrix Spike
MSD	Matrix Spike Duplicate
MSDS	Material Safety Data Sheet
N/A	Not Available/ Not Applicable
NA #	North American hazardous chemicals number
NAPL	non-aqueous phase liquid
NCR	nonconformance reports
NFPA	National Fire Protection Association
NTUs	Nephelometric turbidity units
ORP	oxidation/reduction potential
OSHA	Occupational Safety and Health Administration
OVA	Organic Vapor Analyzer
oz	ounce
PCBs	polychlorinated biphenyls
pH	potential of Hydrogen
PID	Photo Ionization Detector
PM	Project Manager
PPE	Personal Protection Equipment

Acronyms and Abbreviations (Continued)

PPM	parts-per-million
PS/SCA	Procurement Specialists/Subcontract Administrators
PTFE	Teflon
PVC	polyvinyl chloride
QA	Quality Assurance
QA/QC	Quality Assurance/ Quality Control
QAPP	Quality Assurance Program Plan
QC	Quality Control
RCRA	Resource Conservation and Recovery Act
RPD	Relative Percent Difference
SAP	Sampling and Analysis Plan
SCBA	Self-Contained Breathing Apparatus
Shaw E & I	Shaw Group Environmental & Infrastructure
SOP	Standard Operating Procedure
SS	Stainless Steel
SSHO	Site Safety and Health Officer
SSO	Site Safety Officer
SVOCs	semi-volatile organic compounds
TCLP	Toxicity Characteristic Leaching Procedure
TD	Total Depth
TOC	top of casing
TSDS	Tank Sampling Data Sheet
UN #	United Nations hazardous chemicals number
USCS	Unified Soil Classification System
UST	Underground Storage Tank

Acronyms and Abbreviations (Concluded)

UV	ultraviolet
VOA	volatile organic analysis
VOCs	Volatile Organic Compounds
WC	workers compensation
ZHE	Zero Headspace Extraction

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1. PURPOSE

This procedure is intended to communicate the requirements for selection, use, and maintenance of all field logbooks. Field logbooks are often used to document observations, sampling information, and other pertinent information on project sites. They are considered legal documents and should be maintained and documented accordingly as part of the project file.

2. SCOPE

This procedure is applicable to all Shaw E & I site operations where field logbooks are utilized to document all site activities and pertinent information.

3. REFERENCES

- Nielsen Environmental Field School, 1997, *Field Notebook Guidelines*

4. DEFINITIONS

- **Significant detail**—Any piece and/or pieces of information or an observation that can be considered pertinent to the legal reconstruction of events, description of conditions, or documentation of samples and/or sampling procedures.
- **Significant event**—Any event or events that could influence or be considered pertinent to a specific task or function and therefore require documentation in the Field Logbook.
- **Field Logbook**—Logbooks used at field sites that contain detailed information regarding site activities that must include dates, times, personnel names, activities conducted, equipment used, weather conditions, etc. Field logbooks can be used by a variety of different field personnel and are part of the project file.

5. RESPONSIBILITIES

5.1 Procedure Responsibility

The Field Sampling Discipline Lead is responsible for maintenance, management, and revision of this procedure. Questions, comments, or suggestions regarding this technical SOP should be directed to the Field Sampling Discipline Lead.

5.2 Project Responsibility

Shaw employees performing this task, or any portion thereof, are responsible for meeting the requirements of this procedure. Shaw employees conducting technical review of task performance are also responsible for following appropriate portions of this SOP.

For those projects where the activities of this SOP are conducted, the Project Manager, or designee, is responsible for ensuring that those activities are conducted in accordance with this and other appropriate procedures. Project participants are responsible for documenting information in sufficient detail to provide objective documentation (i.e. checkprints, calculations, reports, etc.) that the requirements of this SOP have been met. Such documentation shall be retained as project records.

6. PROCEDURE

6.1 General

Each site or operation, as applicable, will have one current Logbook, which will serve as an index of all activities performed at the site or in the task performance. The Logbook is initiated at the start of the first applicable activity. Summary entries are made for every day that covered activities take place. Multiple field logbooks may be used depending upon the number of different types of field personnel conducting work and the various activities at the site. These field logbooks and the site logbooks shall be made part of the project files.

Information recorded in field logbooks includes observations (significant events and details), data, calculations, time, weather, and descriptions of the data collection activity, methods, instruments, and results. Additionally, the field logbook may contain descriptions of wastes, biota, geologic material, and site features including sketches, maps, or drawings as appropriate.

6.2 Equipment and Materials

- Logbook(s), bound with numbered pages, hard-covered, waterproof preferred. One per project or separate significant task (example-treatment residual composite collection).
- Indelible black or dark blue ink pen
- Other items needed to perform required tasks: compass, ruler, calculator, etc.

6.3 Preparation

Site personnel responsible for maintaining field logbooks must be familiar with the SOPs for all tasks to be performed.

Field logbooks are project files and should remain with project documentation when not in use. *Personnel should not keep Field logbooks in their possession when not in use. Field logbooks should only leave the project site for limited periods, and they should always be returned to the site files or the designated on-site location (Sampler's Trailer, etc.)*.

Field logbooks shall be bound with lined, consecutively numbered pages. All pages must be numbered prior to initial use of the field logbook.

The front cover shall include the following information:

- Project Number
- Project Name and Task(s) included in logbook
- Dates covered by logbook—the starting date must be entered on the first day of use
- Logbook number—if more than one logbook will be needed to cover project/task(s)

The inside front cover shall contain a listing and sign-off of each person authorized to make entries and/or review the logbook. All persons who make entries or review/approve such entries must signify their authority to enter into the logbook via their signature and the date of their signing on the inside front cover. If initials are used for entries instead of full names, the initials must be entered beside the full name on the inside cover.

6.4 Operation

The following requirements must be met when using a field logbook:

- Record significant details and/or events, work, observations, material quantities, calculations, drawings, and related information directly in the field logbook. If data-collection forms are in

use, the information on the form need not be duplicated in the field logbook. However, any forms used to record site information *must be referenced* in the field logbook.

- Information must be factual and unbiased.
- Do not start a new page until the previous one is full or has been marked with a single diagonal line so that additional entries cannot be made. Use both sides of each page.
- Write in black or dark blue indelible ink.
- Do not erase, scribble over, or blot out any entry. Do not use White-Out or like correction items. Before an entry has been signed and dated, changes may be made; however, care must be taken not to obliterate what was written originally. Indicate any deletion by a single line through the material to be deleted. Any change shall be initialed and dated. Error codes (Attachment 1) should be added to the end of the deleted entry. All error codes should be circled.
- Do not remove any pages from the book.
- Do not use loose paper and copy into the field logbook later.
- Record sufficient information to completely document field activities and all significant details/events applicable to the project/task(s) covered by the logbook.
- All entries should be neat and legible.

Specific requirements for field logbook entries include the following:

- Initial and date each page.
- Sign and date the final page of entries for each day.
- Initial, date, and if used, code all changes properly.
- Draw a diagonal line through the remainder of the final page at the end of the day.
- Record the following information on a daily basis:

  a) Date and time

  b) Name of individual making entry

  c) Detailed description of activity being conducted including well, boring, sampling, location number as appropriate

  d) Unusual site conditions

  e) Weather conditions (i.e., temperature, cloud cover, precipitation, wind direction and speed) and other pertinent data

  f) Sample pickup (chain-of-custody form numbers, carrier, time)

  g) Sampling activities/sample log sheet numbers

  h) Start and completion of borehole/trench/monitoring well installation or sampling activity

  i) Health and Safety issues, such as PPE upgrades, monitoring results, near-misses, and incidents associated with the logbook areas

  j) Instrumentation calibration details

Entries into the field logbook shall be preceded with the time of the observation. The time should be recorded frequently and at the point of events or measurements that are critical to the activity being logged. All measurements made and samples collected must be recorded unless they are documented by automatic methods (e.g., data logger) or on a separate form required by an operating procedure. In such cases, the field logbook must reference the automatic data record or form.

While sampling, make sure to record observations such as color and odor. Indicate the locations from which samples are being taken, sample identification numbers, the order of filling bottles, sample volumes, and parameters to be analyzed. If field duplicate samples are being collected, note the duplicate pair sample identification numbers. If samples are collected that will be used for matrix spike and/or matrix spike/matrix spike duplicate analysis, record that information in the field logbook.

A sketch of the station location may be warranted. All maps or sketches made in the field logbook should have descriptions of the features shown and a direction indicator. There must be at least one fixed point with measurements on any map drawn. Maps and sketches should be oriented so that north is towards the top of the page.

Other events and observations that should be recorded include (but are not limited to) the following:

- Changes in weather that impact field activities
- Visitors to the site associated with the covered task(s). Note their time of arrival and departure and provide a brief summary of their purpose on site.
- Subcontractor activities applicable to the covered task(s)
- Deviations from procedures outlined in any governing documents, including the reason for the deviation. Deviations from procedures must be accompanied with the proper authorization.
- Significant events that may influence data, such as vehicles in the vicinity of VOC sampling efforts
- Problems, downtime, or delays
- Upgrade or downgrade of personal protective equipment

6.5 Post-Operation

To guard against loss of data due to damage or disappearance of field logbooks, all original completed logbooks shall be securely stored by the project. All field logbooks will be copied at the end of each work shift and attached to the daily reports.

At the conclusion of each activity or phase of site work, the individual responsible for the field logbook will ensure that all entries have been appropriately signed and dated and that corrections were made properly (single lines drawn through incorrect information, initialed, coded, and dated). The completed field logbook shall be submitted to the project records file.

6.6 Restrictions/Limitations

Field logbooks constitute the official record of on-site technical work, investigations, and data collection activities. Their use, control, and ownership are restricted to activities pertaining to specific field operations carried out by Shaw personnel and their subcontractors. They are documents that may be used in court to indicate and defend dates, personnel, procedures, and techniques employed during site activities. Entries made in these notebooks should be factual,

clear, precise, and as non-subjective as possible. Field logbooks, and entries within, are not to be utilized for personal use.

7. ATTACHMENTS

- Attachment 1, Common Data Error Codes

8. FORMS

None

9. RECORDS

- Field Logbook

10. REVISION HISTORY AND APPROVAL

Revision Level Revision Date	Revision Description	Responsible Manager
00 6/5/2003	Initial Issue	N/A
01 9/8/2006	New template, new numbering of procedure, Section 1 Purpose- content added, Section 2 edited, Section 4-Definitions edited. Sections 6.2, 6.3, 6.4, 6.5 and 6.6 were all edited.	Guy Gallello
02 8/25/2011	Modified format only to align with Governance Management framework	Scott Logan

Attachment 1
Common Data Error Codes

COMMON DATA ERROR CODES

RE	Recording Error
CE	Calculation Error
TE	Transcription Error
SE	Spelling Error
CL	Changed for Clarity
DC	Original Sample Description Changed After Further Evaluation
WO	Write Over
NI	Not Initialed and Dated at Time of Entry
OB	Not Recorded at the Time of Initial Observation

All Error Codes should be circled.

1. PURPOSE

This procedure is intended to communicate the requirements for proper use and completion of Field Logsheets to document sample collection and data gathering activities. Field Logsheets are often utilized to document single location/event information. Examples include boring logs and drum/container logs. This procedure also provides several templates that *may* be utilized or modified to a particular need.

2. SCOPE

This procedure is applicable to all Shaw E & I projects where Field Logsheets are utilized to document data and/or sample collection information. This procedure does **not** mandate the use of Field Logsheets on all Shaw E & I data/sample collection efforts, and projects/programs are free to utilize other means (Field Logbooks, direct data entry, etc.) to document sample collection and other pertinent data gathering activities.

3. REFERENCES

- U.S. Environmental Protection Agency, 1998, *EPA Guidance for Quality Assurance Project Plans*, EPA/600/R-98/018, Washington, D.C.
- U.S. Army Corps of Engineers, 2001, *Requirements for the Preparation of Sampling and Analysis Plans*, EM200-1-3, Washington, D.C.

4. DEFINITIONS

None

5. RESPONSIBILITIES

5.1 Procedure Responsibility

The Field Sampling Discipline Lead is responsible for maintenance, management, and revision of this procedure. Questions, comments, or suggestions regarding this SOP should be directed to the Field Sampling Discipline Lead.

5.2 Project Responsibility

Shaw employees performing this task, or any portion thereof, are responsible for meeting the requirements of this procedure. Shaw employees conducting technical review of task performance are also responsible for following appropriate portions of this SOP.

For those projects where the activities of this SOP are conducted, the Project Manager, or designee, is responsible for ensuring that those activities are conducted in accordance with this and other appropriate procedures. Project participants are responsible for documenting information in sufficient detail to provide objective documentation (i.e. checkprints, calculations, reports, etc.) that the requirements of this SOP have been met. Such documentation shall be retained as project records.

6. PROCEDURE

Field Logsheets can be prepared to address the specific needs of each project and they can even be converted to laptop data entry forms. Field Logsheets are considered legally defensible, and all appropriate requirements must be observed.

6.1 Required Information

All Field Logsheets must contain entry lines for the following in addition to whatever sample/data gathering-specific information is desired:

- Site/Project Name
- Project Number
- Date (including time if required to properly document)
- Comments or Issues area to record any non-specified information pertinent to the sample/data collection effort
- Initial or signature line for person responsible for completion

6.2 Proper Completion/Use

Whenever Field Logsheets are utilized, the following requirements must be strictly followed and enforced:

- Field Logsheets are to be completed in **real-time.** They should not be filled out by transcription from another source.
- All corrections **must** be single-line cross-out with the initials of the person making the correction.
- All data/information areas **must** be completed. If an entry line/block is not applicable to a particular sample/data gathering effort, this must be indicated on the form by either a single line cross-out or the letters “NA” being written in the data line/block.

7. ATTACHMENTS

None

8. FORMS

- EID-FS-002.01, Waste Container Field Logsheet
- EID-FS-002.02, Soil/Sediment Field Logsheet
- EID-FS-002.03, Surface Water Field Logsheet
- EID-FS-002.04, Air Field Logsheet

9. RECORDS

- Field Logsheet

10. REVISION HISTORY AND APPROVAL

Revision Level Revision Date	Revision Description	Responsible Manager
00 6/5/2003	Initial issue	Guy Gallello
01 9/8/2006	Revised Section1 Purpose and Section 2 Scope. Revised section 6.1 Site Information. Changed Section 6.2 Sample Information, 6.3 Equipment Information, 6.4 Analytical to Section 6.2 being Proper Completion/Use.	Guy Gallello
02 1/23/2012	Modified format only to align with Governance Management framework.	Scott Logan

	Title: Field Logsheet	Form No: EID-FS-002.01_2

Uncontrolled when printed: Verify latest version on ShawNet/Governance

Waste Container Field Logsheet

Date: Time: Site:

Container Number: Project #:

Container Size: Weather:

Container Location: Photograph:

Container material of construction:		plastic	glass	metal	fiberboard
Container condition:	intact	bulging	leaking		
Lid type:	screw	bung	ring		
Lid material of construction:		plastic	glass	metal	fiberboard
Labels:	manufacturer:				
	address:				
	content name:				
	chemical name:				
	chemical formula:				
	other:				
Hazard	flammability:				
Label:	reactivity:				
	health:				
	other:				
PID:		Calibration Date:			
O2/LEL:		Calibration Date:			
Sampling Device:		Decontamination technique:			
Contents Description:					
	Amount:	1/4	1/2	3/4	full
	Color:				
	State:	solid	liquid	paste	other:
Sample Number:			Preservative:		
QC Samples:					
Analyses requested:					
Analytical Laboratory:					
Field Technician (Print):					
Comments:					

Soil / Sediment Field Logsheet

Site Name: Project #:

Sample ID:	Sample Location Sketch:
Sample Type*:	
*: SED=Sediment; SUR=Surface soil; SUB=Subsurface Soil; OTH=Other. grab=Grab, comp=Composite	
Date Sampled:	
Time Sampled:	
Depth (ft bgs):	
Physical description:	
Analyses requested:	Photograph Log #:
PID:	Calibration Date:
O2/LEL:	Calibration Date:
Weather:	
Temperature: ° F	
Sampling Equipment:	
Equipment Decontamination Technique:	
QC Samples:	
Analytical Laboratory:	
Comments:	
Field Technician: (Print)	Date:

	Title: Field Logsheet	Form No: EID-FS-002.03_2

Surface Water Field Logsheet

Site Name: Project #:

Sample ID:	Sample Location Sketch:
Date Sampled:	
Time Sampled:	
Depth (ft below surface):	

Analysis	Preservative

Field Reading	Calibration Date
Sp cond:	
pH:	
Temp:	
D.O.:	
Turbidity:	

Photograph Log #:	
Weather:	
Temperature:	° F
Sampling Equipment:	
Equipment Decon Technique:	

QC Samples:	
Analytical Laboratory:	
Comments:	
Field Technician: (Print)	Date:

	Title: Field Logsheet	Form No: EID-FS-002.04_2

Air Field Logsheet

Site Name: Project #:

Sample ID:	Sample Location Sketch:
Date Sampled:	
Time Sampled:	
Sampling Technique:	
Analyses:	
Field Reading / Calibration Date	
	Photograph Log #:
Weather:	
Temperature: ° F	
Sampling Equipment:	
Equipment Decon Technique:	
QC Samples:	
Analytical Laboratory:	
Comments:	
Field Technician: (Print)	Date:

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1. PURPOSE

The purpose of this procedure is to provide the requirements for completion of written Chain of Custody (COC) documentation and to provide a suggested Chain of Custody Form for project use.

2. SCOPE

This procedure is applicable to all Shaw E & I efforts where samples are transferred among parties, including to off-site testing facilities. Adherence to this procedure is not required whenever the same individual/team is performing the sampling and testing within the same workday, and transfer to the testing process is being documented by other means, e.g. sampling and then field-screening in a mobile laboratory.

3. REFERENCES

- U.S. Environmental Protection Agency, 1986, *Test Methods for Evaluating Solid Waste; Physical/Chemical Methods, SW-846*, Third Edition.
- U.S. Army Corps of Engineers, *Requirements for the Preparation of Sampling and Analysis Plans*, EM200-1-3.
- Shaw E & I, 2002, *Sampler's Training Course Handout*.

4. DEFINITIONS

- **Custody**—The legal term used to define the control and evidence traceability of an environmental sample. A sample is considered to be in an individual's custody when it is in actual physical possession of the person, is in view of the person, is locked in a container controlled by the person, or has been placed into a designated secure area by the person.
- **Chain of Custody Form**—A form used to document and track the custody and transfers of a sample from collection to analysis or placement in a designated secure area within the testing facility.
- **COC Continuation Page**—Additional page(s) that may be included with a Chain of Custody form. The continuation page(s) contain the information on additional samples contained within the *same* cooler/shipping container associated with the cooler/shipping container Chain of Custody form.

5. RESPONSIBILITIES

5.1 Procedure Responsibility

The Field Sampling Discipline Lead is responsible for maintenance, management, and revision of this procedure. Questions, comments, or suggestions regarding this technical SOP should be directed to the Field Sampling Discipline Lead.

5.2 Project Responsibility

Shaw E & I employees performing this task, or any portion thereof, are responsible for meeting the requirements of this procedure. Shaw employees conducting technical review of task performance are also responsible for following appropriate portions of this SOP.

For those projects where the activities of this SOP are conducted, the Project Manager, or designee, is responsible for ensuring that those activities are conducted in accordance with this and other appropriate procedures. Project participants are responsible for documenting information in sufficient detail to provide objective documentation (checkprints, calculations, reports, etc.) that the requirements of this SOP have been met. Such documentation shall be retained as project records.

6. PROCEDURE

6.1 Documentation

All Chain of Custody documentation must be completed in indelible ink. All corrections must be performed using standard single-line cross-out methods, and the initials of the individual making the change must be included beside the corrected entry.

6.2 Continuation Pages

Continuation pages may be utilized for shipping containers/coolers with sufficient samples/sample containers that all of the lines of the Chain of Custody form are used before the documentation of the cooler/shipping container is complete. The number of pages in total must be filled out. *All samples entered onto a Continuation Page must be included in the same cooler/shipping container as those on the Chain of Custody form itself.*

6.3 Header Information

- Each Chain of Custody form must be assigned a unique Reference Document Number–use the Project/proposal number followed by a unique numeric sequence or current date (if only one cooler sent per day). Continuation Pages should contain the same Document Reference Number as the Chain of Custody form that they are associated with. The project team should maintain a log of Chain of Custody Reference Document Numbers.
- The page identifier and total page count section must be completed. Total pages include the Chain of Custody form and any attached Continuation Pages.
- Project number, name, and location information must be completed for all forms.
- If available, the laboratory Purchase Order Number should be included on the appropriate line.
- The name and phone number of the *Project Contact* should be included; the Project Contact should be a responsible individual that the laboratory may access to address analytical issues. This person is usually the analytical lead for the project.
- The *Shipment Date* should be provided on the applicable lines.
- If shipping by carrier, the *Waybill/Airbill Number* must be included. Note: couriers will not sign custody documents. Therefore, inclusion of the waybill/airbill number on the Chain of Custody is the *only* means of documenting the transfer to the carrier.
- Laboratory Destination and Contact information should be provided.
- The Sampler(s) names should be provided on the appropriate line. This line should include all persons whose initials appear on any of the sample containers, to provide the laboratory a means of cross-referencing containers.
- The “Send Report To” information should be completed. If multiple reports/locations are needed, the information should be provided on a separate page included with the Chain of Custody documents.

6.4 Sample Information Section–Including on Continuation Page(s)

During actual sampling, each sample must be entered on the COC form at the time of collection in order to document possession. The sampler must not wait until sampling is completed before entering samples on the COC.

- Complete the *Sample ID Number* for each line. If there are multiple container types for a sample, use additional lines to indicate the needed information.
- Ensure that the *Sample Description* matches the description on the sample label–the laboratory will use this information for cross-referencing.
- Provide the *Collection Date* and *Time*. These must match those on the sample label and Field Logbook/Logsheets.
- Indicate whether the sample is a Grab or Composite sample.
- Indicate the *Matrix* of the sample. Use the Matrix Codes listed on the Chain of Custody form.
- Indicate the *Number of Containers* and the *Container Type*. If a sample has multiple container types, use multiple lines and cross-out the information spaces to the left of the container blocks. *Failure to do this may cause the laboratory to log-in each container type as a separate sample/lab-ID, resulting in a confused report and invoice.*
  - Alternatively, if each sample has the same number/type container types, use “various” in the *Container Type* block and provide detail in the *Special Instructions* section, e.g., “Each sample consists of one 16-oz jar, two pre-weighed VOC w/DI water, and one pre-weighed VOC w/Methanol.”
- Check the appropriate *Preservative* box for each line/container type.
- Write in and check the *Analyses Requested* boxes for each line/container type. The appropriate method number (e.g., EPA Method 8260C) must be written as well as the method name.
- Indicate the *Turn-around Time Requested* for each sample.
- Use the *Special Instructions* section to provide important information to the laboratory, e.g., samples that may require dilution or samples that will need to be composited by the laboratory. This section may also be used to inform the laboratory of additional information contained in attachments to the Chain of Custody package.
- Circle the appropriate *QC/Data Package Level* requested.

6.5 Custody Transfer Section

- The first *Relinquished By* space must be completed by the individual who will either transfer the samples or seal the shipping container.
- If the samples will be transferred to a courier, write the courier/carrier company in the *Received By* box and enter the Date and Time that the shipping container was closed.
- All other transfers must be performed in person, and the Relinquisher must witness the signing by the Receiver.
- A copy of the Chain of Custody form and all associated Continuation Pages should be maintained in the project files.

7. ATTACHMENTS

None

8. FORMS

- EID-FS-003.01, Shaw E & I Chain of Custody Form
- EID-FS-003.02, Shaw E & I COC Continuation Page

9. RECORDS

- EID-FS-003.01, Chain of Custody Form
- EID-FS-003.02, Chain of Custody Continuation Page(s)

10. REVISION HISTORY AND APPROVAL

Revision Level Revision Date	Revision Description	Responsible Manager
00 07/22/2003	Initial Issue	N/A
01 09/08/2006	New template, new numbering of procedure, Section 6.3 was edited, content was added in Section 6.4	Guy Gallello
02 08/25/2011	Modified format only to align with Governance Management framework	Scott Logan

1. PURPOSE

The purpose of this procedure is to provide the requirements for completion and attachment of Custody Seals on environmental samples and shipping containers.

2. SCOPE

This procedure is applicable to all Shaw E & I efforts where sample legal defensibility and custody integrity is desired. Adherence to this procedure is not required whenever the same individual/team is performing the sampling and testing within the same workday, and transfer to the testing process is being documented by other means, i.e. sampling and then field-screening in a mobile laboratory.

3. REFERENCES

- U.S. Environmental Protection Agency, 1986, *Test Methods for Evaluating Solid Waste; Physical/Chemical Methods, SW-846*, Third Edition.
- U.S. Army Corps of Engineers, *Requirements for the Preparation of Sampling and Analysis Plans, EM200-1-3*
- Shaw E & I, 2002, Sampler's Training Course Handout.

4. DEFINITIONS

- **Custody**—The legal term used to define the control and evidence traceability of an environmental sample. A sample is considered to be in one's custody if it is in actual physical possession of the person, is in view of the person, has been locked in a container controlled by the person, or has been placed into a designated secure area by the person.
- **Custody Seal**—Commercially available thin strips of adhesive paper with write-in lines for the date/time and identification of the using party. Custody seals are placed over the caps of sample containers and along the cover seals of shipping containers as a means to detect tampering before arrival at the testing facility. All Shaw E & I strategic alliance laboratories provide Custody Seals in their sample container supply kits.

5. RESPONSIBILITIES

5.1 Procedure Responsibility

The Field Sampling Discipline Lead is responsible for maintenance, management, and revision of this procedure. Questions, comments, or suggestions regarding this technical SOP should be directed to the Field Sampling Discipline Lead.

5.2 Project Responsibility

Shaw E & I employees performing this task, or any portion thereof, are responsible for meeting the requirements of this procedure. Shaw E & I employees conducting technical review of task performance are also responsible for following appropriate portions of this SOP.

For those projects where the activities of this SOP are conducted, the Project Manager, or designee, is responsible for ensuring that those activities are conducted in accordance with this and other appropriate procedures. Project participants are responsible for documenting

information in sufficient detail to provide objective documentation (i.e. checkprints, calculations, reports, etc.) that the requirements of this SOP have been met. Such documentation shall be retained as project records.

6. PROCEDURE

6.1 Completing the Custody Seal Information

- All Custody Seals must be completed in indelible ink. All corrections must be made using standard single-line cross-out methods, and the initials of the individual making the change must be included beside the corrected entry.
- Each Custody Seal attached must be completed by writing the *Date*, at a minimum, and signing with *full signature* by the person responsible for the sealing of the sample.
- If a space is provided, the *Time* should also be added.

6.2 Attaching the Custody Seals

Whenever possible, custody seals should be attached over the sample container lids during actual sampling and not when the samples are packaged for shipment. This will provide confidence in legal custody and will demonstrate non-tampering during the sample collection process.

Do not attach custody seals to VOC sample containers, as contamination may occur. For these samples, the custody seal should be used to seal the folded plastic zip bag that holds the sample containers.

- For sample jars, the completed Custody Seal should be placed across the top of the lid with the edges below the lid/jar interface and attached to the jar material. This will require the visible breaking of the seal in order to open the container.
- Sample coolers and shipping containers should have Custody Seals attached in such a manner that the seal extends lengthwise from the top edge of the lid to the side of the cooler/container.

7. ATTACHMENTS

None

8. FORMS

None

9. RECORDS

None

10. REVISION HISTORY AND APPROVAL

Revision Level Revision Date	Revision Description	Responsible Manager
00 08/14/2003	Initial Issue	N/A
01 09/08/2006	New template, new numbering of procedure, no content changes	Guy Gallello

Revision Level Revision Date	Revision Description	Responsible Manager
02 08/25/2011	Modified format only to align with Governance Management framework	Scott Logan

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1. PURPOSE

The purpose of this procedure is to provide the requirements for completion and attachment of sample labels on environmental sample containers.

2. SCOPE

This procedure is applicable to all Shaw E & I projects/proposals where samples will be collected.

3. REFERENCES

- U.S. Environmental Protection Agency, 1986, *Test Methods for Evaluating Solid Waste; Physical/Chemical Methods*, SW-846, Third Edition.
- U.S. Army Corps of Engineers, *Requirements for the Preparation of Sampling and Analysis Plans*, EM200-1-3
- Shaw E & I, 2002, Sampler's Training Course Handout.

4. DEFINITIONS

- **Sample Label**—Any writing surface with an adhesive backing that can be used to document sample identification information. The sample label is attached to the sample container as a means of identification and, in some commercially available or laboratory-supplied containers, may be pre-attached. All Shaw E & I strategic alliance laboratories provide sample labels or pre-labeled containers in their sample container supply kits.

5. RESPONSIBILITIES

5.1 Procedure Responsibility

The Field Sampling Discipline Lead is responsible for maintenance, management, and revision of this procedure. Questions, comments, or suggestions regarding this technical SOP should be directed to the Field Sampling Discipline Lead.

5.2 Project Responsibility

Shaw E & I employees performing this task, or any portion thereof, are responsible for meeting the requirements of this procedure. Shaw E & I employees conducting technical review of task performance are also responsible for following appropriate portions of this SOP.

For those projects where the activities of this SOP are conducted, the Project Manager, or designee, is responsible for ensuring that those activities are conducted in accordance with this and other appropriate procedures. Project participants are responsible for documenting information in sufficient detail to provide objective documentation (i.e. checkprints, calculations, reports, etc.) that the requirements of this SOP have been met. Such documentation shall be retained as project records.

6. PROCEDURE

- All sample labels must be completed in indelible ink. All corrections must be performed using standard single-line cross-out methods, and the initials of the individual making the change must be included beside the corrected entry.

- Sample labels should be completed and attached as samples are collected. Do not wait until final packaging to attach and/or complete the sample labels.
- Sample labels must be attached to the non-sealing portion of the container. Do not place labels on or across sample container caps.
- If the laboratory has provided pre-labeled containers, make sure to fill one for each parameter set needed. Laboratory pre-labeled containers are often bar-coded and it is important to provide a complete container set for each sample.
- The following information must be recorded on the Sample Label:
  - Sample Identification Number
  - Date and Time collected
  - Initials of person(s) responsible for collection
- If a space is provided, the *Analysis Requested* should also be added.
- If a *Description* is provided, remember it must match that on the Chain of Custody form for cross-referencing purposes.
- Cover the completed and attached label with clear plastic tape to prevent bleeding of the ink if it becomes wetted. *Do **not** perform this step for pre-weighed VOC vials, as the final weight values will be influenced by the mass of the tape. Protect these containers by enclosing the rack/holder in a plastic bag within the cooler.*

7. ATTACHMENTS

None

8. FORMS

None

9. RECORDS

None

10. REVISION HISTORY AND APPROVAL

Revision Level / Revision Date	Revision Description	Responsible Manager
00 09/08/2006	Initial issue	N/A
01 09/08/2006	Updated template, procedure numbering change, updated Section 2- Scope, Edited content in section 6.	Guy Gallello
02 08/28/2011	Modified format only to align with Governance Management framework	Scott Logan

1. PURPOSE

The purpose of this procedure is to establish the method for homogenizing samples prior to containerization. Proper homogenization is very important because it helps ensure that sample aliquots are representative of the whole collected sample and helps minimize sampling error so that other errors included in the measurement process, such as laboratory sample preparation and test measurement, can be better assessed.

2. SCOPE

This procedure applies to Shaw Environmental & Infrastructure (Shaw E & I) personnel responsible for the collection of environmental samples. The sample matrix must be amenable to mixing. This SOP applies to the collection of samples that are to be tested for all analytes except volatile analytes.

3. REFERENCES

- American Society for Testing and Materials (ASTM), 1998, Reducing Samples of Aggregate to Testing Size, C702.
- U.S. Army Corps of Engineers, Requirements for the Preparation of Sampling and Analysis Plans, EM 200-1-3, Section E-2, Homogenizing Techniques.

4. DEFINITIONS

- **Homogenize**—The use of physical mixing motions to make a uniform sample matrix.

5. RESPONSIBILITIES

5.1 Procedure Responsibility

The Field Sampling Discipline Lead is responsible for maintenance, management, and revision of this procedure. Questions, comments, or suggestions regarding this technical SOP should be sent to the Field Sampling Discipline Lead.

5.2 Project Responsibility

Shaw employees performing this task, or any portion thereof, are responsible for meeting the requirements of this procedure. Shaw employees conducting technical review of task performance are also responsible for following appropriate portions of this SOP.

For those projects where the activities of this SOP are conducted, the Project Manager, or designee, is responsible for ensuring that those activities are conducted in accordance with this and other appropriate procedures. Project participants are responsible for documenting information in sufficient detail to provide objective documentation (i.e. checkprints, calculations, reports, etc.) that the requirements of this SOP have been met. Such documentation shall be retained as project records.

6. PROCEDURE

Sampling equipment materials shall be selected so as to minimize contamination of samples. Sampling equipment shall be either new (never used previously), documented to have been decontaminated, or dedicated to each specific sampling point. Samples for organic

constituent/compound analysis should be collected and mixed using non-reactive material such as glass or stainless steel bowls, trowels, and/or spoons. Samples for metals analysis should be collected and mixed using equipment made of stainless steel, glass, or Teflon®.

Certain types of solid matrices may not be amenable to mixing using conventional techniques. For example, certain solids may require grinding and thorough mixing to ensure that the analytes of interest within the sample are homogeneously distributed. It is extremely important that soil and sediment samples be homogenized to ensure that the entire sample is as representative as possible of the media being sampled.

6.1 Solid Samples

The following two methods are examples for homogenizing solid samples. Other homogenization techniques may be employed using approved standard methods such as ASTM C702, Reducing Samples of Aggregate to Testing Size.

6.1.1 Quartering

- Place the sample on a hard, clean, level surface such as a pan. If such a surface is too small for the desired quantity, a clean sheet of plastic may be used.
- Mix the solid material by turning the entire quantity over three times with a trowel or shovel. For the third time, shovel the material into a cone-shaped pile.
- Carefully press down on the apex of the pile to create a soil layer of uniform thickness and diameter.
- Divide the material in the sample pan or on the plastic into quarters

  Option 1

  – Mix each quarter individually
  – Then mix two quarters to form halves
  – Mix each formed half and then fill the appropriate sample jars/containers

  Option 2

  – Remove two diagonally opposite quarters including any fine material
  – Mix the remaining material, build it into a cone, and press down to flatten as before
  – Divide the flattened material into quarters, discard two diagonally opposing sections, and repeat
  – Repeat the process until only enough sample remains to fill the required containers and proceed to fill the sample jars.

6.1.2 Mixing in a Bowl

- Place the sample in a bowl. Samples for organic constituent/compound analysis should be mixed using bowls and stirrers made of glass or stainless steel, while samples for metals analysis should be mixed using equipment made of glass, stainless steel, or hard plastic. Make sure the bowl is large enough to accommodate the sample, with extra volume to allow for mixing the sample.
- Mix the sample with the stirrer. If round bowls are used for sample mixing, adequate mixing is achieved by stirring the material in a circular fashion, reversing direction, and occasionally turning the material over. High moisture samples are more difficult to homogenize. Use an

adequate mixing motion for as long as needed to determine by visual observation that the sample media has taken on a uniform appearance.

6.2 Liquid Samples

Most aqueous samples do not require homogenization since water is well mixed due to diffusion and bulk convection. If the sample matrix is a viscous liquid, semi-solid, or an aqueous one with suspended solids, the sample will require mixing.

Do **not** shake the sample and do not agitate the sample in **any** way if collecting for volatile parameters. Volatile sample containers should be either filled directly from the sample source or if transferring from a large container, such as an automatic sampler reservoir, filled first and **without agitation**.

For non-volatile parameters, mix either using an appropriate stirrer or by gentle swirling and then immediately transfer the material into the appropriate containers. The sample should be mixed frequently during the container-filling step, in particular if there are a large number of containers, so that the condition of the bulk sampled fluid will be approximately the same when each parameter-specific sample container is filled.

7. ATTACHMENTS

None

8. FORMS

None

9. RECORDS

None

10. REVISION HISTORY AND APPROVAL

Revision Level Revision Date	Revision Description	Responsible Manager
00 06/05/2003	Initial Issue	N/A
01 09/08/2009	Updated template and changed numbering of procedure, edited Section 1-Purpose and Section 2-Scope, deleted Section 3.1, which was misc. matrix sampling SOPs to which sample mixing/homogenization may apply, Section 6.1 was broken down into subsections, Section 6.2 was converted from Aquous Samples to Liquid Samples and content was added.	Guy Gallello
02 08/25/2011	Modified format only to align with Governance Management Framework	Scott Logan

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1. PURPOSE

This procedure is intended to provide guidelines for the compositing of samples collected in the course of environmental program activities. Composites represent the average distribution of properties and can be used to reduce analytical costs or represent well-defined decision boundaries.

2. SCOPE

This procedure applies to the compositing of solid and liquid samples where no project-specific process is in place. Field composite methods are not appropriate for Volatile Organic Compounds (VOC) analysis of solids. Composites for these methods must be laboratory derived using either individual grab extracts or other laboratory methods.

3. REFERENCES

- U.S. Environmental Protection Agency, 1987, *Compendium of Superfund Field Operations Methods*, EPA 540/P-87/001a, OSWER 9355.0-14, Washington, DC.
- Shaw E & I Standard Operating Procedure EID-FS-010, *Sample Mixing/Homogenization*.

4. DEFINITIONS

- **Composite Sample**—A sample that is comprised of roughly equal amounts of discrete grabs from a set of sample locations or time/flow increments known as a *sample group.*
- **Sample Group**—A predetermined number or time/area span of discrete samples, which is composited into one sample for analytical purposes.

5. RESPONSIBILITIES

5.1 Procedure Responsibility

The Field Sampling Discipline Lead is responsible for maintenance, management, and revision of this procedure. Questions, comments, or suggestions regarding this technical SOP should be sent to the Field Sampling Discipline Lead.

5.2 Project Responsibility

Shaw E & I employees performing this task, or any portion thereof, are responsible for meeting the requirements of this procedure. Shaw E & I employees conducting technical review of task performance are also responsible for following appropriate portions of this SOP.

For those projects where the activities of this SOP are conducted, the Project Manager or designee is responsible for ensuring that those activities are conducted in accordance with this and other appropriate procedures. Project participants are responsible for documenting information in sufficient detail to provide objective documentation (i.e. checkprints, calculations, reports, etc.) that the requirements of this SOP have been met. Such documentation shall be retained as project records.

6. PROCEDURE

The discrete samples that are used to prepare a composite sample must be of equal volume and must each be collected in an identical manner. Field documentation must clearly indicate the composite elements on either a map or a composite logsheet. There are several types of composite samples.

Flow-proportioned composite—Flow-proportioned composite samples are collected proportional to the flow rate during the sampling period by either a time-varying/constant-volume or time-constant/varying-volume method. Flow-proportioned composite samples are typically collected using automatic samplers paced by a flow meter. This sampling method is commonly used for wastewaters.

Time composite—A time composite sample is composed of a discrete number of grab samples collected at equal time intervals during the sampling period. Time composite sampling is often used to sample wastewater discharges or streams.

Volume/mass composite—A volume/mass composite is composed of a discrete number of grab samples collected at defined volume or mass intervals. Volume/mass composite sampling is often used to sample the output of a process system such as a Thermal Destruction Unit or pug mill.

Area composite—Area composite samples are samples collected from individual grab samples located on a regularly spaced grid or along a pile at defined locations and depths. Each of the grab samples must be collected in an identical fashion and must be of equal volume.

Vertical or Depth composite—Vertical composites are composed of individual grab samples collected across a vertical cross section. Like area composites, the grab samples must be collected in an identical fashion and must be of equal volume. Soils and sediments can be used to create vertical composites.

6.1 Solid Composites

- To ensure the integrity of the composite, all discrete grab samples must be collected in an identical manner.
- Composite samples can be created by combining discrete grab samples into the same mixing/holding container as they are collected or by combining and mixing equal aliquots of containerized and homogenized discrete grab samples.
- Remove coarse fragments and organic material from the mixing bowl. Homogenize the sample as specified in SOP FS010, Sample Mixing/Homogenization.
- Remove sample aliquots and place into the appropriate sample containers for shipment to the laboratory.
- Label the sample and document the sampling event according to the project procedures.
- Package/ship the composite sample as required.

6.2 Liquid Composites

- Liquid composite samples should be created by combining equal aliquots of discrete samples.
- Assemble the containers that will comprise a given composite.
- Swirl or stir the individual containers to homogenize the contents just prior to removing the measured aliquots.

- Using clean glass pipets, deliver equal volumes from each grab container to the composite sample container that is to be shipped to the lab. For example, if there are five grab samples, and the composite sample requires 100 mL for the parameter of interest, pipet 20 mL from each of the grab samples into the composite sample container.
- Alternatively, measured volumes can be determined via a graduated cylinder/beaker and combined. The measuring container should be decontaminated between composites.
- Cap/seal the composite container and swirl to agitate. Stirring should be avoided as it increases the risk of introducing contamination to the sample.
- Label the sample(s), document the event, and package/ship the sample(s) as required.

7. ATTACHMENTS

None

8. FORMS

None

9. RECORDS

None

10. REVISION HISTORY AND APPROVAL

Revision Level / Revision Date	Revision Description	Responsible Manager
00 08/14/2003	Initial Issue	N/A
01 09/08/2006	Updated template and numbering of procedure changed, updated Section 2-Scope, added content to 6.1 and 6.2.	Guy Gallello
02 08/25/2011	Modified format only to align with Governance Management framework.	Scott Logan

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1. PURPOSE

The purpose of this procedure is to provide general instructions in the packaging and shipping of non-hazardous samples. The primary use of this procedure is for the transportation of samples collected on site to be sent off site for physical, chemical, and/or radiological analysis.

2. SCOPE

This procedure applies to the shipping and packaging of all non-hazardous samples. Non-hazardous samples are those that do not meet any hazard class definitions found in 49 CFR 107-178, including materials designated as Class 9 materials and materials that represent Reportable Quantities (hazardous substances) and/or materials that are not classified as *Dangerous Goods* under current IATA regulations.

In general most soil, air, and aqueous samples, including those that are acid or caustic preserved do **not** qualify as *hazardous materials* or *dangerous goods*. An exception is methanolic soil VOC vials: these containers are flammable in any quantity and **must** be packaged, shipped, and declared as *Dangerous Goods* whenever transported by air.

The Class 9 "Environmentally Hazardous" designation should only be applied to samples if they are known or suspected (via screening) to contain a sufficient concentration of contaminant to pose a health and/ or environmental risk if spilled in transport. Samples for which screening has shown a potential hazard (i.e. flammability) or those that are derived from a known hazard, including a site/facility with confirmed contamination by an *infectious substance* must also be shipped in accordance with the applicable DOT/IATA requirements. Refer to Shaw E & I SOP FS013.

Improper shipment of hazardous materials, especially willful misrepresentation and shipment as non-hazardous materials, is a violation of federal law and is punishable by fines and possible imprisonment of the guilty parties. It is also a violation of Shaw E & I policy and can result in disciplinary action up to and including termination of employment.

3. REFERENCES

- U.S. Army Corps of Engineers, 2001, *Requirements for the Preparation of Sampling and Analysis Plans*, EM200-1-3, Washington, D.C.
- U.S. Department of Transportation Regulations, 49 CFR Parts 108-178
- International Air Transport Association (IATA), *Dangerous Goods Regulations*, current edition.

4. DEFINITIONS

- **Cooler/Shipping Container**—Any hard-sided insulated container meeting DOT's or IATA's general packaging requirements.
- **Bubble Wrap**—Plastic sheeting with entrained air bubbles for protective packaging purposes.

5. RESPONSIBILITIES

5.1 Procedure Responsibility

The Field Sampling Discipline Lead is responsible for maintenance, management, and revision of this procedure. Questions, comments, or suggestions regarding this technical SOP should be sent to the Field Sampling Discipline Lead.

5.2 Project Responsibility

Shaw employees performing this task, or any portion thereof, are responsible for meeting the requirements of this procedure. Shaw employees conducting technical review of task performance are also responsible for following appropriate portions of this SOP.

For those projects where the activities of this SOP are conducted, the Project Manager, or designee, is responsible for ensuring that those activities are conducted in accordance with this and other appropriate procedures. Project participants are responsible for documenting information in sufficient detail to provide objective documentation (i.e. checkprints, calculations, reports, etc.) that the requirements of this SOP have been met. Such documentation shall be retained as project records.

6. PROCEDURE

6.1 Packaging

- Use tape and seal off the cooler drain on the inside and outside to prevent leakage.
- Place packing material on the bottom on the shipping container (cooler) to provide a soft impact surface.
- Place a large (30-55 gallon or equivalent) plastic bag into the cooler (to minimize possibility of leakage during transit).
- Starting with the largest glass containers, wrap each container with sufficient bubble wrap to ensure the best chance to prevent breakage of the container.
- Pack the largest glass containers in the bottom of the cooler, placing packing material between each of the containers to avoid breakage from bumping.
- Double-bag the ice (chips or cubes) in gallon- or quart-sized resealable plastic freezer bags and wedge the ice bags between the sample bottles.
- Add bagged ice across the top of the samples.
- When sufficiently full, seal the inner protective plastic bag, and place additional packing material on top of the bag to minimize shifting of containers during shipment.
- Tape a gallon-sized resealable plastic bag to the inside of the cooler lid, place the completed chain of custody document inside, and seal the bag shut.
- Tape the shipping container (cooler) shut using packing tape, duct tape, or other tear-resistant adhesive strips. Taping should be performed to ensure the lid cannot open during transport.
- Place a custody seal on two separate portions of the cooler, to provide evidence that the lid has not been opened prior to receipt by the intended recipient.

6.2 Labeling

- A “This Side Up” arrow should be adhered to all sides of the cooler, especially ones without obvious handles.
- The name and address of the receiver and the shipper must be on the top of the cooler.
- The airbill must be attached to the top of the cooler.

6.3 Shipping Documentation

- A Cooler Shipment Checklist (Attachment 1) should be completed and kept in the project file.

7. ATTACHMENTS

- Attachment 1, Shaw E & I Cooler Shipment Checklist

8. FORMS

None

9. RECORDS

- Chain of Custody Form
- Chain of Custody Continuation Page(s)
- Cooler Shipment Checklist

10. REVISION HISTORY AND APPROVAL

Revision Level / Revision Date	Revision Description	Responsible Manager
00 06/05/2003	Initial issue	N/A
01 09/08/2006	Updated template and numbering of procedure, content was added to Section 2-Scope	Guy Gallello
02 08/25/2011	Modified format only to align with Governance Management framework.	Scott Logan

Attachment 1
Sample Shipment Checklist

Project Name _____ Project Number _____

Address _____ Date_____ Time _____

City, State, Zip _____ Fax No._____

Site Contact No. _____

SAMPLE CHECKLIST	YES	NO	COMMENTS
SAMPLE LIDS ARE TIGHT AND CUSTODY SEALS IN PLACE?	❒	❒	
ARE ALL SAMPLE NUMBERS, DATES, TIMES AND OTHER LABEL INFORMATION LEGIBLE AND COMPLETE?	❒	❒	
HAVE ALL SAMPLE NUMBERS, DATES, TIMES AND OTHER SAMPLING DATA BEEN LOGGED INTO THE SAMPLE LOG BOOK?	❒	❒	
DO SAMPLE NUMBERS AND SAMPLE DESCRIPTIONS ON THE LABELS MATCH THOSE ON THE COC?	❒	❒	
HAVE THE SAMPLES BEEN PROPERLY PRESERVED?	❒	❒	
HAVE THE CHAIN OF CUSTODIES BEEN FILLED OUT COMPLETELY AND CORRECTLY?	❒	❒	
DOES THE ANALYTICAL SPECIFIED ON THE COC MATCH THE ANALYTICAL SPECIFIED IN THE SCOPE OF WORK?	❒	❒	
HAVE THE COC'S BEEN PROPERLY SIGNED IN THE TRANSFER SECTION?	❒	❒	

PACKAGING CHECKLIST	YES	NO	COMMENTS
HAS EACH SAMPLE BEEN PLACED INTO AN INDIVIDUAL PLASTIC BAG?	❒	❒	
HAS THE DRAIN PLUG OF THE COOLER BEEN TAPED CLOSED WITH WATER PROFF TAPE FROM THE INSIDE?	❒	❒	
HAVE ALL THE SAMPLES BEEN PLACED INTO THE COOLER IN AN UPRIGHT POSITION?	❒	❒	
IS THERE ADEQUATE SPACING OF SAMPLES SO THAT THEY WILL NOT TOUCH DURING SHIPMENT?	❒	❒	
HAVE AN ADEQUATE NUMBER OF BLUE ICE PACKS OR WATER ICE BEEN PLACED AROUND AND ON TOP OF THE SAMPLE?	❒	❒	
HAS FRESH BLUE ICE OR WATER ICE BEEN ADDED TO THE COOLER THE DAY OF THE SHIPMENT?	❒	❒	
HAS THE COOLER BEEN FILLED WITH ADDITIONAL CUSHIONING MATERIAL?	❒	❒	
HAS THE COC BEEN PLACE IN A ZIPLOCK BAG AND TAPED TO THE INSIDE OF THE LID OF THE COOLER?	❒	❒	
HAVE CUSTODY SEALS BEEN PLACED ONTO THE LID?	❒	❒	
HAS THE COOLER BEEN LABELED "THIS SIDE UP"?	❒	❒	
IF REQUIRED, HAS THE COOLER BEEN LABELED WITH THE DOT PROPER SHIPPING NAME, UN NUMBER AND LABEL?	❒	❒	
HAS THE LABORATORY PERFORMING THE ANALYSES BEEN NOTIFIED OF THE SHIPMENT OF SAMPLES?	❒	❒	

PROBLEMS/RESOLUTIONS: _____

_____

_____

PREPARED BY: _____ SIGNATURE _____

1. PURPOSE

This procedure is intended to provide minimal guidelines for the decontamination of contact sampling equipment. Contact sampling equipment is equipment that comes in direct contact with the sample or the portion of a sample that will undergo chemical analyses or physical testing.

2. SCOPE

This procedure applies to all instances where non-disposable direct contact sampling equipment is utilized for sample collection and no project-specific procedure is in place. This procedure is not intended to address decontamination of peristaltic or other sampling pumps and tubing. The steps outlined in this procedure must be executed between each distinct sample data point.

3. REFERENCES

- U.S. Environmental Protection Agency, Region 4, 2001, *Environmental Investigations Standard Operating Procedures and Quality Assurance Manual*, 980 College Station Road, Athens, Georgia. November.
- US Army Corp of Engineers, Washington, D.C., 2001, Requirements for the Preparation of Sampling and Analysis Plans (EM-200-1-3), February.

4. DEFINITIONS

- **Soap**—A standard brand of phosphate-free laboratory detergent, such as Liquinox®.
- **Organic Desorbing Agent**—A solvent used for removing organic compounds. The specific solvent would depend upon the type of organic compound to be removed. See Attachment 1 for recommendations.
- **Inorganic Desorbing Agent**—An acid solution for use in removing trace metal compounds. The specific acid solution would depend upon the type of inorganic compound to be removed. See Attachment 1 for recommendations.
- **Tap water**—Water obtained from any municipal water treatment system. An untreated potable water supply can be used as a substitute for tap water if the water does not contain the constituents of concern.
- **Distilled Water**—Water that has been purified via distillation. Distilled water can be purchased in most stores and is acceptable as a final rinse in non-trace analytical decontamination processes. Examples would include disposal profiling, HazCat, and other gross screening applications.
- **Analyte-free water**—Water that has been treated by passing through a standard deionizing resin column, and for organics either distillation or activated carbon units. At a minimum, the finished water should contain no detectable heavy metals or other inorganic compounds, and/or no detectable organic compounds (i.e., at or above analytical detection limits). Type I and Type II Reagent Grade Water meet this definition as does most laboratory-supplied blank water.

5. RESPONSIBILITIES

5.1 Procedure Responsibility

The Field Sampling Discipline Lead is responsible for maintenance, management, and revision of this procedure. Questions, comments, or suggestions regarding this technical SOP should be sent to the Field Sampling Discipline Lead.

5.2 Project Responsibility

Shaw employees performing this task, or any portion thereof, are responsible for meeting the requirements of this procedure. Shaw employees conducting technical review of task performance are also responsible for following appropriate portions of this SOP.

For those projects where the activities of this SOP are conducted, the Project Manager, or designee, is responsible for ensuring that those activities are conducted in accordance with this and other appropriate procedures. Project participants are responsible for documenting information in sufficient detail to provide objective documentation (checkprints, calculations, reports, etc.) that the requirements of this SOP have been met. Such documentation shall be retained as project records.

6. PROCEDURE

Wear appropriate eye protection including safety goggles when working with corrosive liquids, especially when diluting concentrated materials to create low-percentage solutions and follow all project Health and Safety requirements. Decontamination wastes are to be recovered and handled as impacted project waste materials and must be disposed of in accordance with regulatory requirements.

A decontamination area should be established. Implements can either be immersed in a 5-gallon bucket containing each solution/rinse or the solutions can be contained in hand-held units made of an inert and compatible material; such as a Teflon™ wash bottle. The analyte-free water needs to be placed in a container that will be free of any compounds of concern.

Consult Attachment 1 for the decontamination solutions/solvents appropriate to the task. The minimum steps for decontamination are as follows:

1. Remove particulate matter and other surface debris by brushing and/or dipping in the soap solution.
2. Rinse thoroughly with tap water.
3. If necessary, rinse with other applicable solutions/solvents. If hexane is used, be sure to follow it with isopropyl alcohol to allow for the final water rinses to properly mix and contact the surface.
4. Final rinse three times to make sure all residual solutions/solvents are removed.
5. Place decontaminated equipment on a clean surface appropriate for the compounds of concern and allow to air dry.

7. ATTACHMENTS

- Attachment 1, Recommended Decontamination Procedures.

8. FORMS

None

9. RECORDS

None

10. REVISION HISTORY AND APPROVAL

Revision Level Revision Date	Revision Description	Responsible Manager
00 06/05/2003	Initial issue	N/A
01 09/08/2006	Updated template and updated numbering of procedure, Sections 1 and 2 minor edits, added definition for Distilled Water, Section 6- extensive content changes	Guy Gallello
02 08/25/2011	Modified format only to align with Governance Management Framework	Scott Logan

Attachment 1
Recommended Decontamination Procedures

Compound	Detergent Wash	Tap Water	Inorganic Desorbing Agent	Tap Water	Organic Desorbing Agent1	Final Water Rinse4	Air Dry
Organic Constituents							
Volatile Organic Compounds	✓	✓			Methanol Purge & Trap grade	✓	✓
Base Neutrals/Acid Extractables/PCBs/Pesticides	✓	✓			Hexane followed by Isopropyl Alcohol	✓	✓
Organic Bases[2]	✓	✓	1% nitric acid	✓	Isopropyl Alcohol	✓	✓
Organic Acids[3]	✓	✓	1% nitric acid		Isopropyl Alcohol	✓	✓
Inorganic Constituents							
Trace Metals and Radio Isotopes	✓	✓	10% Nitric acid -Trace metals grade	✓		✓	✓
Cations/Anions	✓	✓				✓	✓
Acidic Compounds	✓	✓				✓	✓
Basic Compounds (caustic)	✓	✓	1% nitric acid	✓		✓	✓

1 – All organic solvents must be Pesticide Grade or better. The selection of appropriate solvent rinses should first consider if a *known or suspected* contaminant requires removal from sampling equipment. Secondly, identify whether the subsequent analytical protocol would be impacted by the proposed solvent or an impurity thereof (e.g., residual acetone present in isopropyl alcohol would be measured with certain volatile organics analysis).

2 - Organic bases include amines, hydrazines.

3 - Organic acids include phenols, thiols, nitro and sulfonic compounds.

4- Use a grade of water appropriate to the application. For trace level analysis this must be Analyte Free Water. For non-trace applications store-bought distilled water is sufficient

Adapted from: Appendix E, Requirements for the Preparation of Sampling and Analysis Plans (EM-200-1-3), February 2001. US Army Corp of Engineers, Washington, D.C.

1. PURPOSE

The purpose of this procedure is to establish the means by which all subcontracted environmental analytical data will be reviewed for completeness and usability based upon comparison to the project action/decision levels and Data Quality Objectives before use in the intended decision-making processes.

2. SCOPE

This procedure applies to all subcontracted analytical data including faxed or e-mailed preliminary reports.

By way of its requirements, this procedure prohibits verbal communication of analytical results and establishes minimum deliverable standards that must be provided for all subcontracted analytical data reports–including faxed or e-mailed preliminary reports. These minimum standards include the following:

- Sample Results
- Chain of Custody – unless already available to the reviewer
- Sample Receipt Documentation – unless already available to the reviewer
- QC Summary – Laboratory Control Blank, Laboratory Control Spike, Matrix Spike, Matrix Spike Duplicate, Post-digest Spike
- Surrogate Summary – (if applicable)
- Hold-time Compliance Summary – or signed certification that all requirements were met
- Initial and Continuing Calibration Information – or signed certification that it meets prescribed requirements
- GC/MS Tuning Information – (if applicable) or signed certification that it meets prescribed requirements

This procedure should be performed only by or under the oversight of properly qualified individuals. Oversight may be accomplished through provision of a project-specific and well-defined checklist, training in its use, regular QA checks, and real-time availability for issue resolution.

3. REFERENCES

- U.S. Environmental Protection Agency, *National Functional Guidelines for Inorganic Data Review*, EPA 540/R-94-013.
- U.S. Environmental Protection Agency, *National Functional Guidelines for Organic Data Review*, EPA 540/R-94-012.
- U.S. Department of Defense, 2002, Department of Defense Quality Systems Manual for Environmental Laboratories, Final, June.
- U.S. Army Corps of Engineers, Requirements for the Preparation of Sampling and Analysis Plans, EM-200-1-3.

4. DEFINITIONS

- **Data Usability Review (DUR)**—The cursory review of an analytical data package for completeness and compliance with the ordered analysis, specified quality, and method/project-specific protocols before the data is used as input to a particular project decision-making process. The DUR process identifies any potential data quality issues and informs the data users of the effect on the data usability.

- **Data Quality Objectives**—The empirical statements and quantitative measures necessary for a given set of measurements to be usable in the planned decision.

- **Data Quality Indicators**—Field and laboratory measures for which compliance with specified requirements or limits can be construed to support attainment of the Data Quality Objectives in a given data set.

- **Analytical Data Package**—The manner in which analytical results are provided from subcontractor laboratories. Analytical Data Packages can be received via fax, e-mail, or postal mail.

- **QC Summary**—A summary table of laboratory QC sample results.

- **Laboratory Control Blank (LCB)**—Reagent Water or Clean Solid Matrix analyzed in the same manner as a sample to determine the Target Analyte concentration contribution due to contamination in the entire analytical system.

- **Laboratory Control Spike (LCS)**—Reagent Water or Clean Solid Matrix spiked with a known concentration of target analytes and analyzed as a sample to determine the method accuracy of the analytical system.

- **Matrix Spike**—A sample spiked with a known concentration of target analyte and analyzed along with the rest of the analytical batch. The percent recovery of the target analytes is used to determine the effect on accuracy due to the sample matrix.

- **Matrix Spike Duplicate**—A duplicate of the Matrix Spike used to determine the analytical precision, expressed as Relative Percent Difference (RPD) of the analytical system.

- **Surrogate Compound**—In several organic methods, a compound similar in structure and chemical behavior to the target analytes, which is added to each Sample and QC Sample at a known concentration before the analysis begins. The surrogate recovery is used to approximate the recovery of the target compounds based upon the behavior of chemically similar analytes.

- **Post-digest Spike**—In metals analyses, used to determine the possibility of chemical interferences and digestion deficiencies. If the normal QC results are unacceptable, a known concentration of the target analyte is added to the sample digestate. The recovery is then used to determine if reanalysis or data qualification is warranted.

- **QC Acceptance Range**—The limits that define QC results demonstrating compliant accuracy and precision.

- **Qualified Person**—An individual capable through knowledge, education, formal training, and/or experience in the establishment and verification of analytical Data Quality Objectives. The Qualified Person is usually a chemist or environmental professional with several years of environmental analytical experience.

- **Trip Blank**—In VOC analysis, a container of Reagent Grade Water that is included in the sample cooler and analyzed by the laboratory to determine if cross-contamination may have occurred in shipping.
- **Ambient or Field Blank**—Reagent Grade Water containerized during sample collection activities and analyzed at the laboratory. The results are used to determine if sample results may be biased by site environmental factors.
- **Equipment Blank**—Final rinseate collected during sample equipment decontamination and analyzed by the laboratory. The results indicate the effectiveness of the decontamination procedure.
- **Field Duplicate**—An additional sample aliquot or, in some cases, a collocated sample that is collected and analyzed. The results are compared with the original samples as an indication of the overall precision of the entire sampling and analytical process.

5. RESPONSIBILITIES

5.1 Procedure Responsibility

The Field Sampling Discipline Lead is responsible for maintenance, management, and revision of this procedure. Questions, comments, or suggestions regarding this technical SOP should be directed to the Field Sampling Discipline Lead.

5.2 Project Responsibility

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6. PROCEDURE

6.1 First-Level Review of the Data Package

Verify that the package contains all of the required elements listed in Section 2. If any items are missing, contact the laboratory immediately and correct the situation.

Compare the reported results to the Chain of Custody request, and verify that all expected samples and analyses results were reported. If results are missing, contact the laboratory and correct the situation. If the “missing” data is not available yet, perform partial review of the data provided and hold the package for follow-up once the non-reported results are provided.

6.2 Second-Level Review

Consult the project Chemical Quality Plan (SAP, QAPP, etc.) for information concerning sample types and analysis requirements.

Compare the reported analytes, methods, and detection limits to those in the project plan for the specific analyses. Be sure to account for indicated and reasonable increased reporting limits due to dilutions or sample effects. Address any discrepancies with the laboratory directly.

Compare the results to project action-levels, and circle or otherwise mark all results above the limits.

6.3 QC Level Review

Consult the project Data Usability Review Checklists and/or the project Chemical Quality Plan and evaluate all provided QC results against project acceptance limits.

Mark or flag any results that are outside of the project limits and note on the applicable checklist (if using one).

Also evaluate any Field QC results such as Duplicates and Trip Blanks against requirements and note any issues.

6.4 Usability Review

If all QC results for all samples are within the acceptance ranges, complete the appropriate section of the checklist and then date and sign the completed checklist.

If all QC is acceptable and you are not using a checklist, you must indicate data usability directly on the data package itself or on a separate cover sheet. To do this, date and initial the QC Summary pages and write "QC acceptable data OK for use" on the cover sheet or QC Summary page.

If any QC is non-compliant, review its impact to use as project data by referencing the QC Results Impact Table attached to this SOP and consult with the Qualified Person to determine final acceptability. Note on the Data Report itself or checklist all discrepancies and the reasons for data acceptance, qualification, or rejection. If a Qualified Person has made the decision, this should also be noted.

If any of the data is determined to be unusable, immediately notify the Project Manager and project site personnel.

6.5 Reporting of Usability Review Results

Project personnel must be provided either a spreadsheet summary of the results with an attached, signed and dated Statement of Usability, or the complete Data Package with the project-specific Data Usability Review documentation. At **no time** are results to be communicated verbally.

7. ATTACHMENTS

- Attachment 1, Project QC Impact Table

8. FORMS

None

9. RECORDS

- Data Usability Results

10. REVISION HISTORY AND APPROVAL

Revision Level Revision Date	Revision Description	Responsible Manager
00	Initial issue.	N/A

Revision Level Revision Date	Revision Description	Responsible Manager
06/05/2003		
01 09/08/2006	Updated template and numbering of procedure	Guy Gallello
02 08/25/2011	Modified format only to align with Governance Management framework	Scott Logan

Attachment 1
Project QC Impact Table

QC Data Discrepancy	Result Non-detect	Result >10% Below Action-level	Result Within 10% of or Above Action-level	Result Greater than 10% Above Action-level
DISPOSAL				
Trip Blank Contaminated	No effect	No effect	No effect	No effect
LCB Contaminated	No effect on data	No effect on data	No effect unless contamination is >10% of action-level→reject	No effect unless contamination is =/> the difference between result and action-level
LCS Low Recovery	If MS/MSD are acceptable or Surrogates are acceptable and the RL is at most 20% of action-level→Data accepted	If MS/MSD are acceptable or Surrogates are acceptable→Data accepted Otherwise, flag and qualify that results may in fact be greater than action-level	If MS/MSD are acceptable or Surrogates are acceptable and LCS is within 10% of acceptance limit and result is above action-level→Data accepted Otherwise, flag and qualify result as suspected to be above action-level	No effect on data
LCS High Recovery	No effect on data	No effect on data	If MS/MSD are acceptable or Surrogates are acceptable evaluate potential bias in QC and accept data	No effect on data
Matrix Spike Low %R	If MSD and LCS acceptable and Surrogates or Post-spike within range Data is accepted with precision qualifier	If MSD and LCS acceptable and Surrogates or Post-spike within range Data is accepted with precision qualifier	No effect on data	No effect on data
Matrix Spike High %R	No effect on data	No effect on data	No effect on data	No effect on data
MS/MSD RPD High	No effect on data	No effect on data	No effect on data	No effect on data
Surrogate %R Low	If surrogate %R values are at least 70% of acceptance limit, Data is acceptable	If surrogate %R values are at least 70% of acceptance limit, Data is acceptable	No effect on data	No effect on data

QC Data Discrepancy	Result Non-detect	Result >10% Below Action-level	Result Within 10% of or Above Action-level	Result Greater than 10% Above Action-level
Surrogate %R High	No effect on data	No effect on data	If surrogate %R values are within 30% of acceptance limit→Data is acceptable	No effect on data
REMEDIATION or TREATMENT MONITORING				
Trip Blank Contaminated	No effect	No effect	If TB is greater than 10% of action-level or result→reject data	No effect
Duplicate Precision outside limits	No effect unless Duplicate is either above or within 50% of action-level - in this case qualify sample data and report with Duplicate result as "highest probable value"	No effect unless Duplicate is either above or within 30% of action-level - in this case qualify result as "assumed above action-level"	If Duplicate is either above or within 20% of action-level→qualify result as "assumed above action-level"	No effect-report result even if Duplicate is below action-level
LCB Contaminated	No effect on data	No effect on data	If LCB is greater than 10% of action-level or sample result→Data is unacceptable	No effect on data
LCS Low Recovery	If MS/MSD are acceptable or Surrogates are acceptable→Data accepted	If MS/MSD are acceptable or Surrogates are acceptable→Data accepted	If MS/MSD are acceptable or Surrogates are acceptable→Data accepted	No effect on data
LCS High Recovery	No effect on data	No effect on data	If MS/MSD are acceptable or Surrogates are acceptable evaluate for bias→Data accepted	No effect on data
Matrix Spike Low %R	If %R>50 and LCS acceptable-Data accepted	If %R>50 and LCS acceptable-Data accepted	If %R>50 LCS acceptable→Data accepted (evaluate potential low bias in results below action-level)	No effect
Matrix Spike High %R	No effect on data	No effect on data	If MSD and LCS acceptable and Surrogates or Post-spike within range→Data is accepted with precision qualifier	No effect on data

QC Data Discrepancy	Result Non-detect	Result >10% Below Action-level	Result Within 10% of or Above Action-level	Result Greater than 10% Above Action-level
MS/MSD RPD High	No effect on data unless perceived native concentration in MS or MSD result would be above action-level. In this case, reject data as highly suspect and advise review of sampling and lab sub-sampling procedures	No effect on data unless perceived MS or MSD native concentration would be above action-level. In this case, qualify results as potentially above action-level	If the perceived native result of either the MS or MSD is greater than 110% of action-level→qualify data as being above action-level	No effect on data
Surrogate %R Low	1) If confined to one Surrogate in a fraction, Data is acceptable 2) If surrogate %R values are at least 80% of acceptance limits, Data is acceptable	1) If confined to one Surrogate in a fraction, Data is acceptable 2) If surrogate %R values are at least 80% of acceptance limits, Data is acceptable	No effect on data	No effect on data
Surrogate %R High	No effect on data	No effect on data	If Surrogate %R is greater than 120% of acceptance limit, Data is unacceptable	No effect on data
VERIFICATION or CLOSURE ANALYSIS				
LCB Contaminated	No effect on data Comment LCB contamination	No effect on data Comment LCB contamination	If LCB is greater than 10% of action-level or sample result, Data is unacceptable	If LCB is greater than 10% of action-level or sample result, Data is unacceptable
LCS Low Recovery	If MS/MSD are acceptable or Surrogates are acceptable→Data accepted	If MS/MSD are acceptable or Surrogates are acceptable→Data accepted	If MS/MSD are acceptable or Surrogates are acceptable→Data accepted	If MS/MSD are acceptable or Surrogates are acceptable→Data accepted
LCS High Recovery	No effect on data	No effect on data	If MS/MSD are acceptable or Surrogates are acceptable→Data accepted (evaluate potential bias in reported result)	If MS/MSD are acceptable or Surrogates are acceptable→Data accepted
Matrix Spike Low %R	If MSD and LCS acceptable and Surrogates or Post-spike within range, Data is accepted with precision qualifier	If MSD and LCS acceptable and Surrogates or Post-spike within range, Data is accepted with precision qualifier	If MSD and LCS acceptable and Surrogates or Post-spike within range, Data is accepted with precision qualifier	If MSD and LCS acceptable and Surrogates or Post-spike within range, Data is accepted with precision qualifier

QC Data Discrepancy	Result Non-detect	Result >10% Below Action-level	Result Within 10% of or Above Action-level	Result Greater than 10% Above Action-level
Matrix Spike High %R	If MSD and LCS acceptable and Surrogates or Post-spike within range, Data is accepted with precision qualifier	If MSD and LCS acceptable and Surrogates or Post-spike within range, Data is accepted with precision qualifier	If MSD and LCS acceptable and Surrogates or Post-spike within range, Data is accepted with precision qualifier	If MSD and LCS acceptable and Surrogates or Post-spike within range, Data is accepted with precision qualifier
MS/MSD RPD High	No effect on data	If sample result is greater then 90% of action-level, Data is unacceptable	If RPD is greater than 110% of acceptance limit, Data is unacceptable	If RPD is greater than 110% of acceptance limit, Data is unacceptable
Surrogate %R Low	1) If confined to one Surrogate in a fraction, Data is acceptable 2) If surrogate %R values are at least 80% of acceptance limits, Data is acceptable	1) If confined to one Surrogate in a fraction, Data is acceptable 2) If surrogate %R values are at least 80% of acceptance limits, Data is acceptable	1) If confined to one Surrogate in a fraction, Data is acceptable 2) If surrogate %R values are at least 80% of acceptance limits, Data is acceptable	1) If confined to one Surrogate in a fraction, Data is acceptable 2) If surrogate %R values are at least 80% of acceptance limits, Data is acceptable
Surrogate %R High	1) If confined to one Surrogate in a fraction, Data is acceptable 2) If surrogate %R values are within 20% of acceptance limits, Data is acceptable	1) If confined to one Surrogate in a fraction, Data is acceptable 2) If surrogate %R values are within 20% of acceptance limits and other QC is within acceptance limits, Data is acceptable	If any Surrogate %R is greater than 110% of acceptance limit, Data is unacceptable	1) If confined to one Surrogate in a fraction, Data is acceptable 2) If surrogate %R values are within 20% of acceptance limits, Data is acceptable

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1. PURPOSE

The purpose of this document is to provide the methods and procedure for sampling of surface soils using trowels or spoons. Trowels or spoons can be used when matrices are composed of relatively soft and non-cemented formations and to depths of up to 12 inches into the ground surface, dependent on site conditions. Samples for Volatile Organic Compound (VOC) analysis should not be collected via trowel or spoon method. However, a trowel or spoon may be utilized to penetrate to and expose the undisturbed material at the desired depth for sampling by more applicable methods.

2. SCOPE

This procedure is applicable to all Shaw E & I projects where surface soil samples will be collected via trowel or spoon methods.

3. REFERENCES

- U.S. Army Corps of Engineers, 2001, *Requirements for the Preparation of Sampling and Analysis Plans*, Appendix C, SectionC.6, EM200-1-3, Washington, D.C.

4. DEFINITIONS

- **Trowel**—A sample collection device with a curved and pointed metal blade attached to a handle. All trace environmental samples should be collected using stainless steel blades.
- **Spoon**—A sample collection device with a round metal blade attached to a handle.
- **Surface Soil**—Soil that is removed from the surface no greater than 6 inches below grade after removing vegetation, rocks, twigs, etc.
- **Weathered Soil**—The top ⅛ to ¼ inch of soil impacted by heat from sun, rain, or foot traffic that could evaporate, dilute, or otherwise deposit contaminants from an adjacent location, thereby misrepresenting the actual soil characteristic.

5. RESPONSIBILITIES

5.1 Procedure Responsibility

The Field Sampling Discipline Lead is responsible for the maintenance, management, and revision of this procedure. Questions, comments, or suggestions regarding this technical SOP should be directed to the Field Sampling Discipline Lead.

5.2 Project Responsibility

Shaw employees performing this task, or any portion thereof, are responsible for meeting the requirements of this procedure. Shaw employees conducting technical review of task performance are also responsible for following appropriate portions of this SOP.

For those projects where the activities of this SOP are conducted, the Project Manager, or designee, is responsible for ensuring that those activities are conducted in accordance with this and other appropriate procedures. Project participants are responsible for documenting information in sufficient detail to provide objective documentation (checkprints, calculations,

reports, etc.) that the requirements of this SOP have been met. Such documentation shall be retained as project records.

6. PROCEDURE

6.1 Equipment

- Decontaminated trowel or spoon, stainless steel construction for trace environmental sampling. If samples will be collected at depth (0-6 inches), the trowel or spoon will require decontamination prior to collection of the targeted-depth sample. Alternatively, a different trowel or spoon can be used to remove the material to the targeted depth and the sample collected using a clean dedicated trowel or spoon.
- Engineers rule or stiff measuring tape
- Decontaminated stainless steel mixing bowl

6.2 Sampling

1. Don a pair of clean gloves.
2. If desired, place plastic sheeting around the targeted location to keep sampled material in place. Use a knife to cut an access hole for the sample location.
3. Remove any surficial debris (e.g. vegetation, rocks, twigs) from the sample location and surrounding area until the soil is exposed. Once exposed, the soil surface is designated as “at grade,” or 0 inches.
4. Use a trowel to scrape and remove the top 1/8 to 1/4 inch of weathered soil. (A spoon can be interchanged with trowel).
5. If collecting a sample that includes VOC analysis, collect the VOC sample aliquot first following more applicable methods.
6. With a new trowel, place the point of the blade on the ground. While holding the handle of the trowel, partially rotate the blade in a clockwise/counter-clockwise motion while pushing at a downward angle until the blade is inserted to the required depth or the blade is nearly covered. Be certain that the trowel is not inserted to a depth where the soil will touch the handle or other non-stainless steel portion of the trowel or the sampler’s hand.
7. With a prying motion lift up the trowel with soil on the blade and place soil into the stainless steel mixing bowl.
8. Repeat steps 6 and 7 until the required depth of soil is placed into the mixing bowl.
9. Measure the depth of the sample location with a rule or tape to verify the sampling depth and record in the field logbook.
10. Homogenize the non-VOC sample and transfer the sample directly into the sample container(s). Cap the sample container(s), label the containers, complete the documentation, and place the containers into the sample cooler.

7. ATTACHMENTS

None

8. FORMS

None

9. RECORDS

- Measurements recorded in Field Logbook or Field Logsheet

10. REVISION HISTORY AND APPROVAL

Revision Level Revision Date	Revision Description	Responsible Manager
00 8/28/2003	Initial issue	N/A
01 09/11/2006	Updated template and numbering of procedure, Section 1- Purpose had minor edits.	Guy Gallello
02 08/25/2011	Modified format only to align with Governance Management framework.	Scott Logan

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1. PURPOSE

The purpose of this document is to provide the methods and procedure for sampling of soils and other solids using soil probes and core-type devices. These samplers can be used when matrices are composed of relatively soft and non-cemented formations. They are utilized to collect near-surface core samples and can also be placed into boreholes at specified depths. Soil probe/corer samplers provide an intact depth-specific sample for geotechnical, chemical, radiological, or biological analysis.

2. SCOPE

This procedure is applicable to all Shaw E & I projects where soil samples will be collected via hand-operated soil probe/corer methods and no project-specific procedure exists. This procedure is not applicable to drilling or direct push methods.

3. REFERENCES

- U.S. Army Corps of Engineers, 2001, *Requirements for the Preparation of Sampling and Analysis Plans*, EM-200-1-3.
- American Society for Testing and Materials, *Standard Practice for Soil Investigation and Sampling by Auger Borings*, D1452-80 (re-approved 2000).
- U.S. Environmental Protection Agency, 1994, *Soil Sampling*, EPA/ERT SOP 2012, November.

4. DEFINITIONS

- **Soil Corer**—A sample collection device consisting of extension rods, a T-handle, and a sampling head. The sampling head is a thin-walled two-piece metal tube, split lengthwise, into which a metal or plastic sleeve is placed. The tube halves are held together with screw-locked ends, the bottom one having a point. The sleeve fills with material as the sampler is forced downward, allowing for an undisturbed core to be collected.
- **Soil Probe**—A core sample collection device consisting of a thin-walled metal tube with a cutting edge on the bottom. The tube is cut-away from its tip to approximately one-third of the way to its top to allow material to enter. The top of a soil probe is removable, and a plastic or metal sleeve is inserted through the top and is held in place by the reduced diameter of the tube at the top of the cutout. Soil probes can be attached to extension rods and T-handles or may be of one-length construction. Samples collected from a soil probe are almost always submitted to the laboratory intact.

5. RESPONSIBILITIES

5.1 Procedure Responsibility

The Field Sampling Discipline Lead is responsible for maintenance, management, and revision of this procedure. Questions, comments, or suggestions regarding this technical SOP should be directed to the Field Sampling Discipline Lead.

5.2 Project Responsibility

Shaw employees performing this task, or any portion thereof, are responsible for meeting the requirements of this procedure. Shaw employees conducting technical review of task performance are also responsible for following appropriate portions of this SOP.

For those projects where the activities of this SOP are conducted, the Project Manager, or designee, is responsible for ensuring that those activities are conducted in accordance with this and other appropriate procedures. Project participants are responsible for documenting information in sufficient detail to provide objective documentation (checkprints, calculations, reports, etc.) that the requirements of this SOP have been met. Such documentation shall be retained as project records.

6. PROCEDURE

The sampling procedure is as follows:

1. Assemble the sampler by inserting the appropriate sample tube and close the ends. If using extension rods, attach the sampler by its top to the bottom rod. Attach the T-handle either to the extension rod or directly to the sampler head.

2. If desired, place plastic sheeting around the targeted location to keep sampled material in place. Use a knife to cut an access hole for the sample location.

3. Don a pair of clean sample gloves.

4. Remove any surficial debris (e.g. vegetation, rocks, twigs) from the sample location and surrounding area.

5. If the sample will be collected from a depth beyond the surface, use a hand-auger to remove the overburden and expose the “target” sample depth. Measure the depth of the hole with a rule or stiff tape to confirm that the target depth has been reached.

6. If the sampling depth is below where the sampling device can be seen while sampling, measure the distance from the tip to top of the sampler and mark the extension rod at this distance plus the depth of the hole with tape as a reference.

7. Change sample gloves just prior to collecting the sample, especially if an auger was used to expose the target depth

8. To collect the sample using a Soil Corer, place the point of the assembled corer directly on the ground or in the auger hole and, while holding it vertical, push straight down into the soil. Do not twist. A slide hammer may be required for hard or stiff materials.

9. A Soil Probe should be placed into the location and pushed downward with a twisting motion to allow the cutting edge to work. Do not drive or hammer the sampler as this will damage the cutting tip.

10. Continue to force the sampler downward until either the top joint is touching the ground or the reference mark is even with the top of the auger hole. This will ensure that the entire sleeve is filled with material.

11. Extract the sampler by pulling upward with a slight rocking or twisting motion until the head is fully out of the hole.

12. Wipe the sampler head with a cloth or towel and remove it from the T-handle or extension rod.

13. Disassemble the sampler and remove the sleeve. Also perform any field screening desired (e.g., PID screen).

14. For a Soil Probe sample, the sleeve will most likely be submitted intact. Wipe the outside of the sleeve and use a knife to cut off any material sticking from the end so that the ends are even. Place Teflon™ tape over the ends and cap both ends. Be sure to label the top and bottom of the sample interval.

15. A Soil Corer sample may be submitted intact, especially for geotechnical parameters. If this is the case, wipe the outside of the sleeve and use a knife to cut off any material sticking from the end so that the ends are even. Place Teflon™ tape over the ends and cap, labeling the sleeve and marking the top and bottom of the sample interval.

16. If the Soil Corer sample will be aliquotted into other containers, use a knife to split the sleeve lengthwise and remove the top section to expose the sample.

17. If sampling for Volatile Organic Compounds (VOCs), collect sample aliquots from the intact core first using an EnCore™ or other syringe-type device.

18. Place the remaining material directly into sample jars or into a mixing bowl for homogenization and containerization. Cap the sample container(s), label it/them, complete the documentation, and place the sample container(s) into the sample cooler.

19. Decontaminate the sampler.

7. ATTACHMENTS

None

8. FORMS

None

9. RECORDS

None

10. REVISION HISTORY AND APPROVAL

Revision Level / Revision Date	Revision Description	Responsible Manager
00 12/05/2003	Initial issue.	N/A
01 09/11/2006	Updated template and numbering of procedure, minor edits in Section 6-Procedure	Guy Gallello
02 08/25/2011	Modified format only to align with Governance Management framework.	Scott Logan

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1. PURPOSE

The purpose of this procedure is to provide general information about the procedure for using the syringe soil VOC samplers and laboratory-prepared, pre-weighed vial. This sampling system is used to obtain and ship soil and clay samples for volatile organic compound (VOC) analysis, including gasoline range organics (GRO), in accordance with SW-846 Method 5035A and other related protocols.

2. SCOPE

This procedure applies to all instances where soils require sampling and shipment for high, medium, or low VOC analysis using laboratory-prepared vials which are either empty or contain the appropriate extraction solvent.

This procedure should be used where state guidelines or client programs mandate closed-system sampling with pre-weighed vials. Refer to state or program work plans for closed-system sampling.

This procedure and these types of samplers are applicable to non-elastic soils and non-compactable materials, such as loose sand, rocky soils, and gravel. However, the sampler must consider the matrix compatibility to the extraction solvent.

3. REFERENCES

- Method 5035A "Closed-System Purge and Trap for Volatile Organics in Soil and Waste" *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods*, SW-846, Third Edition, Revised December, 1996, Update IV

4. DEFINITIONS

- **Syringe Sampler**—A single-use volumetric sampling device designed to collect and deliver a reproducible amount of soil to a sample vial for VOC methods that require storage in an extraction solvent. A plastic syringe with its bottom cut off works well.
- **Pre-weighed vial**—An amber or clear glass vial with a TEFLON®-lined screw cap that may contain a measured volume of extraction solvent. The weight of the vial with the screw cap and if present, the extraction solvent is recorded at the laboratory prior to collecting the sample in the field. The solvent volume is typically 5 mL and the solvent can be water, sodium bisulfate solution, or methanol.

5. RESPONSIBILITIES

5.1 Procedure Responsibility

The Field Sampling Discipline Lead is responsible for maintenance, management, and revision of this procedure. Questions, comments, or suggestions regarding this technical SOP should be directed to the Field Sampling Discipline Lead.

5.2 Project Responsibility

Shaw employees performing this task, or any portion thereof, are responsible for meeting the requirements of this procedure. Shaw employees conducting technical review of task performance are also responsible for following appropriate portions of this SOP.

For those projects where the activities of this SOP are conducted, the Project Manager or designee is responsible for ensuring that the activities are conducted in accordance with this and other appropriate procedures. Project participants are responsible for documenting information in sufficient detail to provide objective documentation (checkprints, calculations, reports, etc.) that the requirements of this SOP have been met. Such documentation shall be retained as project records.

6. PROCEDURE

1. For each sample collected and for each applicable field or laboratory QC sample, a separate container must be collected to allow for laboratory determination of percent moisture.

2. Prepare the surface by removing grass, sticks, and other matter to allow the sampler to penetrate the intended location.

   – For hard pan soils and clays or excavations, scrape away the top few inches of the material to expose virgin and penetrable soil/clay for sampling.

   – When sampling subsurface cores, split the core cover lengthwise or push the core from the coring tube to expose the core and sample from points along the core.

3. If using a cut-off syringe, TerraCore™ or similar system, push the plunger down until it is a few millimeters above the edge of the cylinder bottom.

4. Insert the cartridge device into the material being sampled with a downward twisting motion until full.

5. Withdraw the sampling device from the medium and use a fresh tissue to wipe off excess material from the outside of the cartridge body, especially the O-rings. If soil is protruding from the tube, carefully slice it off even with the open end using a clean knife or spatula.

6. Carefully open the cap on a pre-weighed vial and place the sample into it by inserting the syringe tube into the vial and slowly pushing down on the plunger to eject the core. If there is solvent do this without touching the liquid. Make sure the entire core is ejected and **do not allow the liquid to splash out of the vial.**

7. For a pre-weighed vial which is empty (no solvent) complete the sample label and immediately place the sample into the laboratory supplied rack or box in a cooler with ice.

8. If the vial contains solvent, cap the vial and swirl it to break up the core and wet it with the liquid. **Do not shake the vial.**

9. Repeat steps 9 and 10 for any additional required sample vials; e.g., if the laboratory supplied both medium-level (methanol) and low-level (water/bisulfate) vials.

10. Place all vials back into the laboratory-supplied rack or box.

11. Fill the additional jar provided by the laboratory to perform moisture analysis.

12. Complete all required documentation.

13. Package and prepare for shipment. The least difficult method is to use empty pre-weighed vials, which are allowed in Method 5035A. The samples must be delivered to the laboratory under ice and then either placed into solvent, analyzed or frozen within 48-hours of collection.

14. If necessary, methanol extracts can be shipped as an “Exempted Quantity” as long as no container has more than 30ml and the total volume is no more than 500 mL. See section 2.7 of the Dangerous Goods Regulations under IATA for details on proper labeling. In most

instances, the laboratory-supplied cooler containing the methanol pre-weighed vials should have been properly labeled and declared.

7. ATTACHMENTS

None

8. FORMS

None

9. RECORDS

- Shipping Documentation
- Chain of Custody Form
- Chain of Custody Continuation Page(s)
- Cooler Shipment Checklist

10. REVISION HISTORY AND APPROVAL

Revision Level Revision Date	Revision Description	Responsible Manager
00 08/28/2003	Initial issue	Guy Gallello
01 01/23/2012	Added text/instructions for using an empty VOC vial and removed all reference/instructions/attachments for use of the EnCore™ system. Modified format to align with Governance Management framework.	Scott Logan

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1. PURPOSE

The purpose of this procedure is to provide general information about the sampling of roll-off containers and preparatory requirements for completing the task safely. Roll-off containers are often used to store excavated/treated soil, trash, and other solid materials on project sites.

2. SCOPE

This procedure applies to all instances where roll-off containers require sampling for characterization and there is no project and/or regulatory agency specified procedure in force.

The procedure presents two sampling protocols with differing statistical designs and objectives for characterization of roll-offs depending upon the end use of the material or known disposition.

- Procedure A is designed to provide limited characterization information for those instances where the properties of the material are not in question from site/process knowledge; such as trash/debris from a non-hazardous site or hazardous wastes where the disposition method is pre-determined.
- Procedure B provides a more representative sampling design and should be used in those instances where the material properties are in question or the material is to be reused. Examples include characterization of staged overburden, confirmation that treated materials meet criteria, comparison of material constituent concentrations to differing disposition deciding regulatory concentrations (such as in listed waste situations), and determination of non-hazardous nature of trash/debris from known or suspect hazardous sites.

3. REFERENCES

- U.S. Environmental Protection Agency, 2002, *RCRA Waste Sampling Draft Technical Guidance, Planning, Implementation, Assessment*, EPA/530-D-02-002, August.

4. DEFINITIONS

- **Roll-off**—A metal container used to store and transport bulk materials such as soil and debris. The container has wheels on the bottom and can be loaded/unloaded from its transport vehicle by way of a track mechanism on the truck. Roll-offs are typically open-top containers and range from 10 to 20 cubic yards in volume. For purposes of this procedure, a roll-off is any container used to store bulk wastes such as soil or debris.
- **Composite Sample**—A sample created by the mixing of several discrete samples into one sample representative of the average characteristics of the entity sampled.

5. RESPONSIBILITIES

5.1 Procedure Responsibility

The Field Sampling Discipline Lead is responsible for maintenance, management, and revision of this procedure. Questions, comments, or suggestions regarding this technical SOP should be directed to the Field Sampling Discipline Lead.

5.2 Project Responsibility

Shaw employees performing this task, or any portion thereof, are responsible for meeting the requirements of this procedure. Shaw employees conducting technical review of task performance are also responsible for following appropriate portions of this SOP.

For those projects where the activities of this SOP are conducted, the Project Manager, or designee, is responsible for ensuring that those activities are conducted in accordance with this and other appropriate procedures. Project participants are responsible for documenting information in sufficient detail to provide objective documentation (checkprints, calculations, reports, etc.) that the requirements of this SOP have been met. Such documentation shall be retained as project records.

6. PROCEDURE

Safety Note: *Roll-off containers may contain shifting and physically hazardous loads and are considered to be a confined space. No personnel shall enter a roll-off container without first obtaining a confined-space permit. Personnel should not enter a roll-off containing soil or treatment residuals unless the site ECP deems it safe to do so. At* ***no time*** *shall personnel enter a roll-off containing debris. If a roll-off container cannot be entered, all sampling must be performed either by accessing with a trier or similar implement or by using the assistance of heavy equipment.*

6.1 Procedure A—For Limited Characterization Applications

This procedure uses a five-point composite design to collect a limited representation of the material in the roll-off. If sampling for VOCs, one additional location is randomly selected and sampled for VOCs only. *This procedure should not be used in applications where VOC concentrations are central to the decision.*

- Obtain the five grab samples from as close to the corners and the center of the container as possible.
  - If using a trier or collecting from within the container, collect each grab from the full depth below the first foot of material into the containerized material load. Place the entire length of material into the composite-creation container (bowl or other implement).
  - If heavy equipment is assisting in the sampling effort, instruct the operator to scoop material at differing depths for each of the grab locations. Each “grab” sample should consist of the material from three spots in the loader/backhoe bucket.
  - If collecting debris samples, place a piece of each type of waste at the selected sample location into the mixing bowl. Debris pieces should also be cut or reduced to a manageable size (1 to 2 inches square) before being mixed. Some debris may be light, and larger volumes may need to be sampled and submitted in order to provide adequate sample mass. This is especially true of PPE and other low-weight waste materials
  - If collecting a sample for VOCs, select one randomly determined additional location and collect a VOC sample at a particular depth, below one foot from the surface material. If heavy equipment is assisting, direct the operator to scoop from one location at a depth beyond one foot and fill the appropriate VOC sample containers directly from the material in the bucket.
- Mix and homogenize the material collected from the five locations prior to filling sample containers. If the sample is debris, be sure to fill each container with similar material types. Label and document all containers and prepare for shipment.

6.2 Procedure B—For Applications Requiring More Intense Characterization

This procedure uses a more involved composite design based upon the collection of four "quadrant composites" and VOC grabs. The quadrant composites can be further combined to reduce analytical costs and provide a gross-average representation of the material properties, or, if more data points are desired, the composites can be analyzed separately to provide data on each quadrant of the material load.

- Divide the roll-off container into quadrants using string and/or stakes. The divisions should be across the middle on both the long and short axis to result in four sections of equal size.
- Sample each quadrant in five randomly selected locations. In addition, collect one VOC grab from one of the five selected locations at a randomly selected depth.
  - If using a trier or collecting from within the container, collect each grab from the full depth below the first foot of material into the containerized material load. Place the entire length of material into the quadrant composite-creation container (bowl or other implement).
  - If heavy equipment is assisting in the sampling effort, instruct the operator to scoop material at differing depths for each of the grab locations. Each "grab" sample should consist of the material from three spots in the loader/backhoe bucket.
  - If collecting debris samples, place a piece of each type of waste at the selected sample location into the mixing bowl. Debris pieces should also be cut or reduced to a manageable size (1 to 2 inches square) before being mixed. Some debris may be light, and larger volumes may need to be sampled and submitted in order to provide adequate sample mass. This is especially true of PPE and other low-weight waste materials
  - If collecting a sample for VOCs, select one of the locations in each quadrant and collect a VOC sample at a particular depth, below one foot from the surface material. If heavy equipment is assisting, direct the operator to scoop from the location at a depth beyond one foot, and fill the appropriate VOC sample containers directly from the material in the bucket.
  - Mix and homogenize the quadrant composite, and place the material into appropriate labeled sample containers. The VOC sample should always remain discrete.
- Repeat the process for each of the other quadrants.
- If multiple data points are desired, package and submit each of the quadrant composites for analysis along with the four quadrant VOC samples.
- If a container average is needed, form a composite by mixing and homogenizing half of each quadrant composite into a single sample and submitting the VOC samples separately. In some cases the laboratory may be instructed to create a VOC-lab composite by combining medium/high level extracts or even combining 5g core sampler aliquots into a TCLP/VOC-(ZHE) test.
- Place the labeled composite and VOC samples into a cooler with the project-required coolant (ice or dry ice), complete all required documentation, and ship the cooler to the laboratory per the project plans.

7. ATTACHMENTS

None

8. FORMS

None

9. RECORDS

None

10. REVISION HISTORY AND APPROVAL

Revision Level Revision Date	Revision Description	Responsible Manager
00 12/08/2003	Initial issue	N/A
01 09/11/2006	Updated template and numbering of procedure, minor edit to Section 2-Scope, reference added, definition of Composite Sample added, minor edits to content in Sections 6.1and 6.2.	Guy Gallello
02 08/25/2011	Modified format only to align with Governance Management framework	Scott Logan

1. PURPOSE

The purpose of this procedure is to provide the methods and procedures for measurement of groundwater well water levels and for conducting LNAPL measurements. Well water levels can either be determined as part of the well purging/sampling effort or be independently determined to provide information on site hydrology.

2. SCOPE

This procedure is applicable to all Shaw E & I projects where groundwater level and/or LNAPL measurements are taken.

3. REFERENCES

- American Society of Testing and Materials, D4750-87 (Reapproved 2001), *Standard Test Method for Determining Subsurface Liquid Levels in a Borehole or Monitoring Well (Observation Well)*, West Conshohocken, PA.
- U.S. Department of the Interior, 1977 (updated 1984), *National Handbook of Recommended Methods for Water-Data Acquisition*, Chapter 2, Reston, VA.

4. DEFINITIONS

- **Measuring Tape**—Steel or plastic tape with graduations to 0.01 feet. The tape shall not stretch more than 0.05 feet under normal use.
- **Electronic Measuring Device**—Commercial probe and cable designed to register a signal when the probe contacts water. The cable must have graduations to 0.01 feet.
- **Oil/water Interface Probe**- a specialized electronic measuring device that detects organic liquids. It is used to determine the interface and physical extent of any oil within the well.

5. RESPONSIBILITIES

5.1 Procedure Responsibility

The Field Sampling Discipline Lead is responsible for maintenance, management, and revision of this procedure. Questions, comments, or suggestions regarding this technical SOP should be sent to the Field Sampling Discipline Lead.

5.2 Project Responsibility

Shaw E & I employees performing this task, or any portion thereof, are responsible for meeting the requirements of this procedure. Shaw E & I employees conducting technical review of task performance are also responsible for following appropriate portions of this SOP.

For those projects where the activities of this SOP are conducted, the Project Manager, or designee, is responsible for ensuring that those activities are conducted in accordance with this and other appropriate procedures. Project participants are responsible for documenting information in sufficient detail to provide objective documentation (checkprints, calculations, reports, etc.) that the requirements of this SOP have been met. Such documentation shall be retained as project records.

6. PROCEDURE

Two techniques are discussed below: the measuring-tape method and the electronic method.

6.1 Equipment

The following equipment should be used when measuring groundwater levels:

- Decontaminated, weighted tape with graduations to 0.01 feet. The weight should be sufficient to ensure plumbness of the tape, but slender enough so as not to raise the water level significantly when submerged in the water.
- Decontaminated, commercial electronic water-level measuring device.
- Engineer's rule, graduated to 0.01 feet.
- Oil/water interface probe and meter.

6.2 Weighted Steel Tape

The following procedure should be used when measuring groundwater levels with a measuring tape:

1. Unlock the well cover and remove the cap.
2. Locate the reference point on the riser pipe.
3. Don a pair of clean gloves.
4. Slowly lower the weighted tape down the well until the bottom is reached, indicated by a bump and sudden slack in the line.
5. Straighten the tape out, removing the slack, and measure the distance at the reference point.
6. Record the reading at the reference point as Depth to Bottom (DTB).
7. Withdraw the tape from the well and record the reading at the wet/dry interface as Depth to Water (DTW).
8. The difference between the two measurements is the depth of the water column (DWC).
9. Dry and decontaminate the wetted portion of the tape.

6.3 Electronic Measurement

The following procedure should be used when measuring groundwater levels with an electronic water-level measuring device:

1. Check for proper instrument response by inserting the probe in water. Fix or replace the instrument as needed.
2. Unlock the well cover and remove the cap.
3. Locate the reference point on the riser pipe.
4. Don a pair of clean gloves.
5. Slowly lower the probe down the well until the signal indicates that the water has been contacted.

6. Record the reading at the reference point as DTW.
7. Withdraw the probe and repeat steps 5 & 6. Duplicate measurements should agree within 0.02 feet. If not, continue with measurements until 0.02 feet precision is achieved.
8. Lower the probe until the bottom of the well is reached, as indicated by slack in the line.
9. Pull slightly to remove the slack, measure at the reference point, and record as DTB.
10. Determine the water column length as (DTB-DTW) and record as DWC.
11. Remove the probe from the well and decontaminate it.

6.4 Light Non-Aqueous Phase Liquids

Oil or other light non-aqueous phase liquids (LNAPL) may be floating on the water in selected wells. If so, measure the LNAPL level and the water level using an oil/water interface probe as follows:

1. Check for proper instrument response by inserting the probe in water. Instruments typically indicate LNAPL with a steady indicator light and tone, while water is indicated by an intermittent light and tone.
2. Unlock the well cover and remove the cap.
3. Locate the reference point on the riser pipe.
4. Don a pair of clean gloves.
5. Slowly lower the oil/water interface probe down the well until the signal indicates that LNAPL has been contacted (typically a steady indicator light and tone).
6. Record the reading at the reference point as DTNAPL.
7. Continue lowering the probe until the signal indicates that water has been contacted (typically an intermittent light and tone).
8. Record the reading at the reference point as DTW.
9. Determine the depth of LNAPL as (DTW-DTNAPL) and record it.
10. Withdraw the probe and repeat steps 5 & 6. Duplicate measurements should agree within 0.02 feet. If not, continue with measurements until 0.02 feet precision is achieved.
11. Lower the probe until the bottom of the well is reached, as indicated by slack in the line.
12. Pull slightly to remove the slack, measure at the reference point, and record as DTB.
13. Determine the water column length as (DTB-DTW) and record as DWC.
14. Remove the probe from the well and decontaminate it.

7. ATTACHMENTS

None

8. FORMS

None

9. RECORDS

- Measurements recorded in Field Logbook or Field Logsheet

10. REVISION HISTORY AND APPROVAL

Revision Level Revision Date	Revision Description	Responsible Manager
00 08/18/2003	Initial Issue.	N/A
01 9/11/2006	Updated template and numbering of procedure, minor edit to Section 2-Scope, added definition of Oil/Water Interface Probe.	Guy Gallello
02 08/25/2011	Modified format only to align with Governance Management framework.	Scott Logan

1. PURPOSE

The purpose of this procedure is to provide the methods and techniques to be utilized when sampling aqueous liquids using bailer methods. This procedure does not apply to the use of depth-integrated modified bailer systems such as the Kemmerer Sampler. Bailers should not be utilized when sampling for trace levels of VOCs in wells containing high solids loads or wells that have been purged using micro techniques.

2. SCOPE

This procedure is applicable to all Shaw E & I projects where samples will be collected using a bailer. These may include groundwater wells, water treatment pools, frac tanks, and other containers.

It is not applicable to direct push groundwater sampling. See Procedure EID-GS-009 for suggested direct push groundwater sampling methods.

3. REFERENCES

- U.S. Army Corps of Engineers, 2001, *Requirements for the Preparation of Sampling and Analysis Plans*, Appendix C, Section C.2, EM200-1-3, Washington, D.C.
- American Society of Testing and Materials, D6634-01, *Standard Guide for Selection of Purging and Sampling Devices for Ground-Water Monitoring Wells*, West Conshohocken, PA.
- American Society of Testing and Materials, D4448-01, *Standard Guide for Sampling Ground-Water Monitoring Wells*, West Conshohocken, PA.

4. DEFINITIONS

- **Bailer**—A device used to collect aqueous liquid samples typically consisting of a long tube with a check valve system attached to a rope or cable. The bailer is lowered into the liquid, and once the desired depth is reached, the check valve is set by causing an upward motion. Bailers are constructed of stainless steel, polyethylene plastic, or Teflon™. Those made of polyethylene and Teflon™ can be considered disposable and utilized for one-time use.
- **Single check valve bailer**—The most commonly used type of bailer; a tubular bailer with a bottom check valve that allows water to enter the bailer while it is lowered. The weight of the water in the bailer closes the check valve upon retrieval.
- **Top-filling bailer**—A tubular bailer that is only open on the top. The bailer is lowered beneath the water surface and water enters the top of the bailer. This type of bailer should **not** be used for environmental sampling. However, it is a very effective well purging device.
- **VOC sampling device/attachment**—A detachable spigot usually constructed of polyethylene or Teflon™ that can be attached to the bottom of a bailer to regulate the flow while emptying the device, preventing agitation of the liquid as it exits.

5. RESPONSIBILITIES

5.1 Procedure Responsibility

The Field Sampling Discipline Lead is responsible for maintenance, management, and revision of this procedure. Questions, comments, or suggestions regarding this technical SOP should be directed to the Field Sampling Discipline Lead.

5.2 Project Responsibility

Shaw E & I employees performing this task, or any portion thereof, are responsible for meeting the requirements of this procedure and utilizing materials of a construction specified in the project plans or applicable to the contaminants of concern and other aspects of the sampling effort. These may include well diameter, well construction materials, depth to water, and the presence of DNAPL or LNAPL contaminants. Shaw E & I employees conducting technical review of task performance are also responsible for following appropriate portions of this SOP.

For those projects where the activities of this SOP are conducted, the Project Manager or designee is responsible for ensuring that those activities are conducted in accordance with this and other appropriate procedures. Project participants are responsible for documenting information in sufficient detail to provide objective documentation (checkprints, calculations, reports, etc.) that the requirements of this SOP have been met. Such documentation shall be retained as project records.

6. PROCEDURE

6.1 Equipment

The following equipment should be used for sampling aqueous liquids using bailer methods:

- Dedicated bailer; construction depending upon contaminants of concern and intended data use per the project plan. Disposable bailers should be utilized for one sample location only.
- Dedicated polyethylene/Teflon™-coated string or Teflon™-coated steel cable for lowering and raising the bailer.
- Tripod with mechanical winch for lowering and raising the bailer (typically only for deep or large-diameter wells).
- Plastic sheeting.

6.2 Sampling

The following procedure should be used when sampling aqueous liquids using bailer methods:

1. Don a pair of clean gloves.
2. Securely attach the required amount of string or cable to the bailer.
3. Spread a new piece of plastic sheeting around the well so as to keep the bailer rope from contacting the ground. This step is not necessary if sampling treatment pools or storage tanks.
4. If required, unlock the well cover and remove the cap.
5. If sampling a well, measure the static water level and total well depth as described in Procedure EID-FS-108.

6. Purge the well as detailed in Procedure EID-FS-110 using a separate bailer or other device. **Do not purge and sample with the same bailer.** The project planning documents should specify a well purging endpoint, which may include either of the following:
   - A selected number of well volumes
   - Water property stabilization as indicated by pH, conductivity, turbidity, or temperature measurements, etc.
7. Collect the sample immediately after purging, if applicable, by slowly lowering the bailer to the desired sampling depth and stopping briefly.
8. Set the check valve by pulling upward on the string/cable and then slowly raise the bailer to the surface.
9. Wipe the bailer body with a paper towel or tissue to prevent liquid on the outside from entering the sample containers.
10. If using one, attach the VOC device to the bottom of the bailer.
11. Transfer the groundwater sample immediately to the sample bottles.
    - Fill VOA vials first by opening the VOC device spigot and allowing the liquid to slowly fill the container without agitation and to a meniscus slightly above the top of the vial.
    - Cap and check all VOA vials for entrained air by slowly tipping and observing for bubbles. If any are present, discard the sample and collect again as above.
    - If not using a VOC attachment, the liquid can be collected by pushing up on the check valve or pouring from the top of the bailer.
12. Continue lowering and retrieving the bailer as needed to fill all required sample bottles.
13. Add preservatives to the samples as needed, and place the sample bottles on ice.
14. Note that most sample bottles come with preservatives already added. If such is the case, do not overfill the bottles.
15. Replace the well cap, if required, and lock the cover.
16. Record the sampling information.
17. Dispose of or decontaminate the bailer and string/rope as required in the project plan.

7. ATTACHMENTS

None

8. FORMS

None

9. RECORDS

- Measurements recorded in Field Logbook or Field Logsheet
- Sampling information recorded in Field Logbook or Field Logsheet

10. REVISION HISTORY AND APPROVAL

Revision Level Revision Date	Revision Description	Responsible Manager
00 08/17/2003	Initial issue.	N/A
01 09/11/2006	Updated template and numbering of procedure.	Guy Gallello
02 08/25/2011	Modified format only to align with Governance Management framework.	Scott Logan

1. PURPOSE

This procedure is intended to provide the methods to be used for preparing groundwater wells for sampling. Preparation includes accessing the well, screening for VOCs (if required), measuring depth and water column height, determining the well volume, and purging the stagnant groundwater from the monitoring well. This procedure presents methods for purging using both bailer and pump techniques. This procedure does not address low-flow or micro-purging, which is covered in Procedure No. EID-FS-111.

2. SCOPE

This procedure is applicable to all Shaw E & I projects where groundwater samples will be collected from a monitoring well and where no project/program-specific procedure is in place. Unless specifically directed in project/program plans, well purging will be considered complete when 3 to 5 well volumes have been removed from the well and/or the well water quality parameters (pH, specific conductivity, temperature, dissolved oxygen) collected during purging have stabilized for three consecutive readings.

3. REFERENCES

- U.S. Army Corps of Engineers, 2001, *Requirements for the Preparation of Sampling and Analysis Plans*, Appendix C, Section C.2, EM200-1-3, Washington, D.C.
- American Society for Testing and Materials, D6634-01, *Standard Guide for Selection of Purging and Sampling Devices for Ground-Water Monitoring Wells*, West Conshohocken, PA.
- American Society for Testing and Materials, D4448-01, *Standard Guide for Sampling Ground-Water Monitoring Wells*, West Conshohocken, PA.

4. DEFINITIONS

- **Bailer**—A device used to collect water typically consisting of a long tube with a check valve system attached to a rope or cable. The bailer is lowered into the water, and once the desired depth is reached, the check valve is set by causing an upward motion on the bailer. Bailers are constructed of stainless steel, polyethylene plastic, or Teflon™. Bailers made of polyethylene and Teflon™ may be considered disposable.
- **Pump**—An electric, compressed air, or inert gas driven device that raises liquids by means of pressure or suction. The types of pumps used for well purging should be chosen based on the well size and depth, the type of contaminants, and the specific factors affecting the overall performance of the sampling effort. Pump types that may be used include centrifugal, peristaltic, centrifugal submersible, gas displacement, and bladder pumps.
- **Well Purging**—The action of removing stagnant groundwater using mechanical means from a monitoring well. Well purging is performed prior to collecting groundwater samples from a well for purposes of attaining representative samples from the groundwater zone where the monitoring well is screened.

5. RESPONSIBILITIES

5.1 Procedure Responsibility

The Field Sampling Discipline Lead is responsible for maintenance, management, and revision of this procedure. Questions, comments, or suggestions regarding this technical SOP should be directed to the Field Sampling Discipline Lead.

5.2 Project Responsibility

Shaw employees performing this task, or any portion thereof, are responsible for meeting the requirements of this procedure and utilizing materials of a construction specified in the project plans or applicable to the contaminants of concern and other aspects of the sampling effort. These aspects may include well diameter, well construction materials, depth to water, and the presence of DNAPL or LNAPL contaminants. Shaw employees conducting technical review of task performance are also responsible for following appropriate portions of this SOP.

For those projects where the activities of this SOP are conducted, the Project Manager, or designee, is responsible for ensuring that those activities are conducted in accordance with this and other appropriate procedures. Project participants are responsible for documenting information in sufficient detail to provide objective documentation (checkprints, calculations, reports, etc.) that the requirements of this SOP have been met. Such documentation shall be retained as project records.

6. PROCEDURE

6.1 Considerations

When planning for the well sampling task, the following variables should be reviewed to determine which well purging method to use:

- **Recharge capacity of each well:** The recharge capacity of a well will determine how fast the well should be purged. The purge rate should be the same as the recharge rate of the groundwater zone to prevent drawing the water table down and creating a cascading effect of groundwater entering the well along the well screen. If recharge rates are greater than 0.5 gallons per minute, bailers or pumps may be used to remove water from the well. Wells with slow recharge rates (<0.5 gpm) may need to be sampled using other methods such as low-flow or micro-purge techniques that do not agitate the well and therefore do not require full purging.

- **Well construction details, including well depth, diameter, screened interval, screen size, material of construction, and depth to water table:** The diameter and well depth will determine the size of the pump or bailer that will be required to remove water. The screen opening size will limit the rate at which water can be removed from the well due to high flow rates through the screen creating turbulent flow.

- **Groundwater quality, including type and concentration of chemical compounds present:** Choose a device that is constructed of materials compatible with the chemicals in the groundwater. Chemical contaminants can also dictate the rate at which the water can be removed from the well. Whenever possible, wells that contain VOCs should be purged using low-flow purging methods to prevent volatilization.

- **Presence of LNAPL or DNAPL:** If LNAPL or DNAPL are present, it is not recommended that the well be purged, due to the potential for creating a contaminated smear zone.

6.2 Equipment

The following equipment is recommended for use in conducting well purging:

- Bailers and line
- Pump and discharge hose/line
- Water level indicator
- Swabbing materials
- pH meter–if desired
- Specific conductance meter–if desired
- Temperature meter or gauge–if desired
- Nephelometer-turbidity–if desired
- Dissolved Oxygen meter–if desired
- Photoionization detector (PID)
- Drums or tanks to contain the purge water
- Field log book or sheets
- Calculator
- Plastic sheeting to spread around sampling area

6.3 Pre-Purging

To prevent cross contamination of other wells on site, upgradient and background wells should be sampled first. The procedure for pre-purging is as follows:

- Prepare the area surrounding the well by placing plastic sheeting on the ground surface to prevent potential cross-contamination of the purging and sampling implements.
- Place and secure the drum, tank, or suitable purge-water container in close proximity to the well for the collection and storage of purge water. *Purge water must be containerized and disposed of in the manner specified in the project/program plan or as the client directs.* ***Never*** *return purge water to the well.* If in doubt or where requirements are not specified, handle all purge water as waste and dispose of it accordingly.
- If screening for organics, measure and record the background organic vapors in the ambient air using a PID in accordance with manufacturer recommendations.
- Open the well casing, remove the well cap, and immediately measure and record the organic vapor levels from the head space within the well casing using a PID, if required, in accordance with manufacturer recommendations.
- Measure the depth to the static water level and the depth to the bottom of the well using the water level indicator in accordance with Procedure EI-FS108, *Water Level Measurements.*
- Calculate the volume of water within the well casing and screen as follows:

  $V = [\pi(di/2)^2 (TD-H)] (7.48)$

  Where:

  V = volume of groundwater in the casing, gallons

  di = inside diameter of casing, feet

TD = total well depth, feet

H = depth to the static water level, feet

Alternatively, for typical well casing diameters, the Volume can be determined as follows:

$V = CF \times (TD-H)$

Where:

V = volume of groundwater in casing, gallons

CF = Casing Factor, gallons per linear foot-from table below

Well Diameter (inches)	Casing Factor (CF) (gallons/foot)
2	0.16
4	0.65
6	1.47
8	2.61
10	4.08
12	5.88

6.4 Well Purging by Bailing

The well must not be bailed dry; water should be purged from the well at the same rate as it recharges to prevent loss of contaminants through degassing and to prevent agitation, which may release false levels of fine-grained particles or sediments to the groundwater zone. Water level measurements may be performed to verify that water levels remain constant during bailing.

The procedure for well purging by bailing is as follows:

- Attach new bailer line to a clean bailer or new disposable bailer. Attach the other end of the bailer line to the protective casing or your wrist allowing sufficient length to reach the well screen depth.
- Slowly lower the bailer down the well to avoid agitating the water and begin bailing groundwater by allowing water to pass through the bailer check valve into the bailer. Remove the filled bailer and empty the water into the purge-water container.
- If water quality parameters are not being used to determine stabilization, remove 5 well volumes from the well and then sample using a freshly decontaminated reusable or unused disposable bailer. **Do not sample with the same bailer used to purge.**
- If water quality parameters are being used to determine stabilization, two well volumes should be removed and the water quality parameters measured and recorded as the last bailer amount is removed from the well. This should be done by filling measurement containers with water directly from the bailer and taking readings.
- Continue purging until 3 to 5 well volumes have been removed from the well and three consecutive water quality parameter reading sets yield results within 10 percent of each other. For pH use +/- 0.3 units as the standard.

- Once stabilization has been achieved, collect the sample using a freshly decontaminated reusable or unused disposable bailer. **Do not sample with the same bailer used to purge.**

6.5 Well Purging Using a Pump

The well must not be pumped dry; water should be purged from the well at the same rate as it recharges to prevent loss of contaminants through degassing and to prevent agitation, which may release false levels of fine-grained particles or sediments to the groundwater zone. Water level measurements may be performed to verify that water levels remain constant during pumping.

The procedure for well purging using a pump is as follows:

- Review and understand the proper operating and maintenance instruction for each type of pump that is used prior to placing the pump in the well. Each pump type has specific procedures for operation.
- Assemble the pump and discharge line in accordance with manufacturer instructions. Ensure the pump discharge line is long enough so that the pump intake can be located within the well screen area and the discharge end can reach the purge water container.
- Lower the pump into the well until it is submerged and at the desired pumping depth.
- Start the pump and begin monitoring discharge rates and volume collected.
- If water quality parameters are not being used to determine stabilization, remove 5 well volumes from the well and then sample using the appropriate method.
- If water quality parameters are being used to determine stabilization, remove 2 well volumes and measure and record the water quality parameters at regular intervals as the purging continues. This can be accomplished either by using in-line direct-reading instruments or by collecting the pump discharge into appropriate measurement containers.
- Continue purging until 3 to 5 well volumes have been removed from the well and three consecutive water quality parameter reading sets yield results within 10 percent of each other. For pH use +/- 0.3 units as the standard.
- Once the stabilization has been achieved, collect the sample using a method applicable to the well and contaminants of concern.

7. ATTACHMENTS

None

8. FORMS

None

9. RECORDS

- Measurements recorded in Field Logbook or Field Logsheet
- Calculations recorded in Field Logbook or Field Logsheets

10. REVISION HISTORY AND APPROVAL

Revision Level / Revision Date	Revision Description	Responsible Manager
00	Initial issue.	N/A

Revision Level Revision Date	Revision Description	Responsible Manager
12/10/2003		
01 09/21/2006	Updated template and numbering of procedure, content was added to Section 1- Purpose	Guy Gallello
02 08/25/2011	Modified format only to align with Governance Management framework	Scott Logan

1. PURPOSE

This procedure is intended to provide methods for low-flow sampling of groundwater from monitoring wells. Low-flow or micro-purge sampling is a method of collecting samples from a well that does not require the removal of large volumes of water from the well and therefore does not overly agitate the water and suspended particles or potentially aspirate VOCs. The method entails the removal of water directly from the screened interval without disturbing any stagnant water above the screen by pumping the well at low enough flow rates to maintain minimal drawdown of the water column followed by in-line sample collection. Typical flow rates for low-flow sampling range from 0.1 L/min to 0.5 L/min depending on site characteristics.

2. SCOPE

This procedure is applicable to all Shaw E & I projects where groundwater samples will be collected from a monitoring well using low-flow or micro-purge methods and where no project/program specific procedure is in use.

3. REFERENCES

- U.S. Army Corps of Engineers, 2001, *Requirements for the Preparation of Sampling and Analysis Plans*, Appendix C, Section C.2, EM200-1-3, Washington, D.C.
- American Society for Testing and Materials, D6771-02, *Standard practice for Low-Flow Purging and Sampling for Wells and Devices Used for Ground-Water Quality Investigations*, West Conshohocken, PA.
- American Society for Testing and Materials, D4448-01, *Standard Guide for Sampling Ground-Water Monitoring Wells*, West Conshohocken, PA .
- U.S. Environmental Protection Agency Region 1, 1996, *Low Stress (Low Flow) Purging and Sampling Procedure for the Collection of Ground Water Samples from Monitoring Wells*, SOP GW0001, Revision 2, July 30.

4. DEFINITIONS

- **Low Flow**—Refers to the velocity that is imparted during pumping to the formation adjacent to the well screen, not necessarily the flow rate of the water discharged by the pump at the surface.
- **Micro-purge**—Another term for low-flow sampling referred to as such due to the fact that pre-sampling groundwater removal (purging) is performed at flow rates 2 to 3 orders of magnitude less than typical bailer or pump methods.
- **Pump**—An electric, compressed air, or inert gas driven device that raises liquids by means of pressure or suction. The types of pumps used for well purging should be chosen based on the well size and depth, the type of contaminants, and the specific factors affecting the overall performance of the sampling effort. Low flow/micro-purge sampling is performed using specially constructed pumps, usually of centrifugal, peristaltic, or centrifugal submersible design, with low draw rates (<1.0L/min).
- **Well Purging**—The action of removing groundwater using mechanical means from a monitoring well prior to collecting groundwater samples. Purging removes the stagnant

groundwater from the column allowing the groundwater surrounding the well screen to enter the collection zone.

5. RESPONSIBILITIES

5.1 Procedure Responsibility

The Field Sampling Discipline Lead is responsible for maintenance, management, and revision of this procedure. Questions, comments, or suggestions regarding this technical SOP should be directed to the Field Sampling Discipline Lead.

5.2 Project Responsibility

Shaw employees performing this task, or any portion thereof, are responsible for meeting the requirements of this procedure and utilizing materials of a construction specified in the project plans or applicable to the contaminants of concern and other aspects of the sampling effort. These aspects may include well diameter, well construction materials, depth to water, and the presence of DNAPL or LNAPL contaminants. Shaw employees conducting technical review of task performance are also responsible for following appropriate portions of this SOP.

For those projects where the activities of this SOP are conducted, the Project Manager, or designee, is responsible for ensuring that those activities are conducted in accordance with this and other appropriate procedures. Project participants are responsible for documenting information in sufficient detail to provide objective documentation (checkprints, calculations, reports, etc.) that the requirements of this SOP have been met. Such documentation shall be retained as project records.

6. PROCEDURE

Low-flow/micro-purge sampling involves removing water directly from the screened interval without disturbing any stagnant water above the screen or without lowering the water table. Since it is not based upon the removal of well volumes, it requires in-line monitoring of water quality parameters which may include pH, specific conductivity, temperature, dissolved oxygen, and redox potential to determine when the groundwater sample zone has stabilized. The sample is then collected using the same pump directly from the discharge tubing.

6.1 Considerations

The following variables should be reviewed in planning for low-flow purging and sampling:

- **Recharge capacity of each well:** The recharge capacity of a well will determine how fast the well should be purged. The purge rate should be no greater than the recharge rate of the groundwater zone to prevent water table drawdown.
- **Well construction details, including well depth, diameter, screened interval, screen size, material of construction, and depth to water table:** The diameter and well depth will determine the size of the pump and the location from which the pump will operate. Peristaltic and suction draw pumps are only viable at depths of less than 25 feet. The pump intake should be placed within the well screen.
- **Pump:** Low-flow purging and sampling can be used in any well that can be pumped at a constant rate of not more than 1.0 L/min. Continuous discharge and cycle discharge pumps with adjustable flow rate controls should be used to avoid causing continuous drawdown. Whenever possible, dedicated pumps should be installed to avoid disturbing the water column.
- **Groundwater quality, including type and concentration of chemical compounds present:** Low-flow methods can be used for all types of aqueous-phase contamination,

including VOCs, SVOCs, metals, pesticides, PCBs, radionuclides, and microbiological constituents. Pump parts and tubing should be made of materials that are compatible with the analytes of interest.

6.2 Equipment

The following equipment is recommended for use in conducting well purging:

- Pump capable of <1.0L/min draw rates
- Discharge line constructed of material compatible with the contaminants of interest. Enough for a fresh line to be used at each well
- Water level indicator
- Flow-through Water Quality Meter (pH, specific conductance, temperature, optional Dissolved Oxygen, Redox potential)–calibrated
- Nephelometer–for turbidity measurement-calibrated (if required)
- Photoionization Detector (PID)–calibrated (if screening for VOCs is required)
- Drums or tanks to contain the purge water
- Field log book
- Calculator
- Plastic sheeting
- Sample containers and preservatives
- Ice and Ziploc-type bags

6.3 Pre-Sampling

To prevent cross-contamination of other wells on-site, upgradient and background wells should be addressed first. It is also a good idea to use fresh discharge line for each well as the low-flows make it difficult to flush contaminants between samples. The procedure for pre-sampling is as follows:

- Prepare the area surrounding the well by placing plastic sheeting on the ground surface to prevent potential cross-contamination of the pump and discharge hose or sample equipment and materials.
- Place and secure the drum, tank, or suitable purge water container in close proximity to the well for the collection and storage of purge water. *Purge water must be containerized and disposed of in the manner specified in the project/program plan or as the client directs.* ***Never*** *return purge water to the well.* If in doubt or where requirements are not specified, handle all purge water as waste and dispose of it accordingly.
- If performing VOC screening, measure and record the background organic vapors in the ambient air using a PID, in accordance with manufacturer recommendations.
- Open the well casing, remove the well cap, and immediately measure and record the organic vapor levels from the head space within the well casing using a PID, in accordance with manufacturer recommendations.
- Measure the depth to the static water level using the water level indicator in accordance with Procedure EI-FS108, *Water Level Measurements*.

6.4 Well Purging

The procedure for well purging is as follows:

- Review and understand the proper operating and maintenance instruction for each type of pump that is used prior to placing the pump in the well. Each pump type has specific operating procedures.
- Some wells may include a dedicated pump that is already placed in the well along the well screen. If this is the case, review well construction data to verify the proper placement of the pump intake. Inspect the location where the discharge line and pump support cable exit the well to determine that they are in the proper position (markings should be present at the well head to show this).
- Assemble the pump and clean discharge line in accordance with manufacturer instructions. Ensure the pump discharge line is long enough so that the pump intake can be located within the well screen area and the discharge end can reach the purge water container.
- Slowly lower the pump into the well until it is submerged and at the desired pumping depth.
- Connect the pump discharge to the flow-through water quality meter system in accordance with the manufacturer's procedure.
- Start the pump and begin monitoring discharge rates and volume collected. Adjust flows if necessary to remain in a range of 0.1 to 0.5L/min without exceeding the well discharge rate.
- Monitor and record the pH, conductivity, temperature, dissolved oxygen, redox potential, and turbidity at set intervals (2 to 10 minutes).
- Collect the sample following the procedure below when all monitored water quality parameters are stable, as indicated by three consecutive readings differing by less than 10 percent. For pH use +/-0.3 units as the standard.

6.5 Sample Collection

The procedure for sample collection is as follows:

- Prepare the sample bottles and preservatives required for the sampling.
- Don a pair of clean gloves.
- Collect the sample immediately after purging through the pump discharge line.
  - Fill VOA vials first (reduce the flow rate of the pump discharge) allowing the liquid to slowly fill the container without agitation and obtain a meniscus slightly above the top of the vial.
  - Cap and check all VOA vials for entrained air by slowly tipping and observing for bubbles. If any are present, discard the sample and collect again as above.
- Continue filling all required sample bottles.
- Add preservatives to the samples as needed, and place the sample bottles on ice. Note that most sample bottles come with preservatives already added. If such is the case, do not overfill the bottles.
- Replace the well cap, if required, and lock the cover.
- Record the sampling information.

- For a dedicated down-hole pumping system, do not decontaminate the pump but rinse the water quality meter's flow-cell and probes with distilled water.
- If using a non-dedicated pump and meter system, decontaminate the pump and meter.
  - Retrieve the pump and remove and dispose of the discharge line, including the line leading to and from the water quality meter system.
  - Rinse the water quality meter system with distilled water.
  - Attach a few feet of clean line to the pump and water quality meter system with a discharge end into the purge waste container.
  - Place the pump into a container of distilled water, adjust the flow to its maximum, and allow the entire system to flush with distilled water for at least 5 minutes or longer if the waste does not appear to be clean.
- Secure the area by removing equipment and materials, properly dispose of plastic sheeting and other disposable sampling materials, and close the purge water container(s).
- Proceed to the next well and repeat the process using clean discharge tubing for each well sampled.

7. ATTACHMENTS

None

8. FORMS

None

9. RECORDS

- Measurements recorded in Field Logbook or Field Logsheet
- Sampling information recorded in Field Logbook or Field Logsheet

10. REVISION HISTORY AND APPROVAL

Revision Level / Revision Date	Revision Description	Responsible Manager
00 09/21/2006	Initial issue.	N/A
01 09/21/2006	Updated template and numbering of procedure, minor edits to Sections 6.0 Procedure, 6.2 Equipment, and 6.5 Sample Collection	Guy Gallello
02 08/25/2011	Modified format only to align with Governance Management framework.	Scott Logan

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1. PURPOSE

This procedure is intended to provide general guidance for sampling of tanks and storage vessels for all analyses including waste characterization or compatibility (HazCat) analysis. The procedure also presents safety requirements and reiterates Shaw policies with regards to safe container access and opening.

2. SCOPE

This procedure is applicable to all Shaw E & I activities where any type of tank or vessel with a capacity greater than 120 gallons requires sampling for either specific analysis or characterization purposes.

3. REFERENCES

- Cassis, Jo, et al., 1985, *Guidance Document for Cleanup of Surface Tank and Drum Sites*, prepared for Office of Emergency and Remedial Response, USEPA, Washington, D.C. under Contract No. 68-01-6930.
- U.S. Environmental Protection Agency, 2002, *RCRA Waste Sampling Draft Technical Guidance, Planning, Implementation, Assessment*, EPA/530-D-02-002, August.
- U.S. Environmental Protection Agency, 1994, *Tank Sampling*, EPA/ERT SOP 2010.
- U.S. Environmental Protection Agency, 1986, *Drum Handling Practices at Hazardous Waste Sites*, EPA/600/2-86/013.

4. DEFINITIONS

- **Tank**—A container designed to hold greater than 120 gallons of material constructed primarily of non-earthen materials that provide structural support. A tank may be open or closed at the top. For the purposes of this procedure, a tank also includes tank trucks, tanker cars, and other movable containers with volumes exceeding 120 gallons.
- **Nomex**—A flame-retardant fabric used to manufacture coveralls and other outer gear for use in potentially flammable environments. Most plants that handle, store, or manufacture flammable materials require Nomex outer garments during all work processes.

5. RESPONSIBILITIES

5.1 Procedure Responsibility

The Field Sampling Discipline Lead is responsible for maintenance, management, and revision of this procedure. Questions, comments, or suggestions regarding this technical SOP should be directed to the Field Sampling Discipline Lead.

5.2 Project Responsibility

Shaw employees performing this task, or any portion thereof, are responsible for meeting the requirements of this procedure. Shaw employees conducting technical review of task performance are also responsible for following appropriate portions of this SOP.

For projects where the activities of this SOP are conducted, the Project Manager, or designee, is responsible for ensuring that those activities are conducted in accordance with this and other appropriate procedures. Project participants are responsible for documenting information in sufficient detail to provide objective documentation (i.e. checkprints, calculations, reports, etc.) that the requirements of this SOP have been met. Such documentation shall be retained as project records.

6. PROCEDURES

Safety note: Tanks and other containers can pose a potential threat to employee health and the environment. It is extremely important that all safety precautions outlined in an approved project health and safety plan are understood and followed. All monitoring devices shall be intrinsically safe, and all tools shall be non-sparking. To protect against possible toxic gas/vapor exposure, all tank/vessels should be accessed and sampled in Level B PPE unless the site responsible person (SSHO or chemist) deems otherwise based upon clear and unquestionable information. All unknown containers where there is not assurance of the absence of toxic gas or vapors from cyanide, sulfide, or strongly corrosive acids must be remotely opened and sampled using Level B PPE.

6.1 Equipment

- **Dosimeter**—A portable, transistorized survey meter that can be used for radiation monitoring purposes and/or contamination measurements. *All tanks in landfills, in dump sites, or from sites where there is a potential that radioactive materials may have been used must be screened with a dosimeter.*
- **LEL (lower explosive limit) Meter**—An air-monitoring device that can test the surrounding air for sufficient oxygen content for life support and/or the presence of combustible gases or vapors, which may pose a potential flammability hazard. The lower explosive limit is defined as the minimum concentration of a particular combustible gas in the air which can be ignited. The upper explosive limit is defined as the maximum concentration that can be ignited.
- **Toxic gas meter**—A portable warning device used for detecting specific toxic gases found in the surrounding air (H_2S, HCl, Cl_2, HCN, and $COCl_2$).
- **Photo Ionization Detector (PID)**—A portable air-monitoring instrument used to detect organic vapors. The PID does not distinguish between different types of vapors or tell if more than one vapor is present.
- **Sample Equipment**—Specific sample equipment will be identified by the type of material in the tank/vessel. The equipment may include a bacon bomb sampler, a sludge judge, glass thieves, bailers, a COLIWASA, or subsurface grab samplers. The use of these is described in Section 6.5 of this SOP.
- **Weighted tape line, measuring stick, or equivalent**—This will be used to measure the depth of product in the tank.
- **High Volume Blower**—Used to exchange/purge the tank atmosphere for health & safety purposes, if necessary.

6.2 Special Types of Containers

- **Exotic Metal Tanks**—Very expensive tanks made of aluminum, nickel, stainless steel, or other unusual metals; these usually contain extremely dangerous materials.
- **Polyethylene or PVC-lined Tanks**—These often contain strong acids or bases. If the lining is punctured, the substance usually corrodes the steel, resulting in a significant leak or spill and possible explosive gas (hydrogen) generation.

- **Single-Walled Drums Used as a Pressure Vessel**—These tanks have fittings for both product filling and placement of an inert gas, such as nitrogen. Such tanks may contain reactive, flammable, or explosive substances.

6.3 General Cautions

Prior to performing any sampling of tanks, facility personnel shall be notified of planned activities if the facility is still active. Facilities will have specific minimum requirements regarding access to tanks, including a sign-in sheet, PPE selection, grounding, de-energizing and isolating tank systems, radio communications, and/or escort requirements.

Many projects require the sampling of some type of tanks and/or vessels at one time or another. These tanks/vessels can range from an underground storage tank to a vat inside a building. The following section describes specific details and associated hazards of tank sampling. NO SHAW EMPLOYEE OR SUBCONTRACTOR SHALL ENTER A TANK OR BREAK THE PLANE OF THE SAMPLE ACCESS POINT WITH THEIR HEAD TO COLLECT A SAMPLE. If a sample cannot be obtained without doing so, the situation must be re-evaluated with the SSO and site management.

- **Difficulties and Dangers**—Sampling of tanks, vats, process vessels, tank cars, and other types of containers presents unique problems. Generally, containers of this type are enclosed. Some tanks/vessels have small access ports, manways, hatches (on larger vessels), or taps and bungs (on smaller vessels). The physical size, shape, materials of construction, and locations of access will limit the types of equipment and methods of collection that can be used.

- **Toxic or Flammable Gas Hazards**—When liquids are contained in sealed vessels, gas vapor pressures build up, sludge settles out, and density layering develops. When containers are opened, the potential for explosive reactions or the release of noxious gases requires considerable safeguards. The vessels should be opened with extreme caution; preliminary sampling of any headspace gases is always warranted, and Level B protection is standard until the dangers are well understood.

- **Tank Physical Hazards**—Another source of danger is climbing on old rusty tanks, some of which may be over 70 feet tall, such as fuel oil storage tanks. Workers must not attempt to climb onto a rusty ladder, catwalk, or stairs. Instead, workers shall use OSHA-approved ladders or man-lifts to reach the top of the tank.

- **PPE-Associated Hazards**—Nomex is fire-retardant fabric; however, when soaked in flammable substances, the Nomex no longer retains the fire-retardant characteristics. Workers must be sure to don clean Nomex. Climbing on ladders while wearing PPE could create slippery and unstable conditions. PPE will limit mobility from carrying a SCBA unit; man-lifts should be used when the selected PPE severely limits mobility up and down ladders and/or stairs.

- **Weather Hazards**—Accessing tanks or vessel outdoors in below-freezing temperatures creates slippery conditions. High winds may be prevalent atop the tank that are not apparent from the ground level. Workers must wear lanyards and/or harnesses if sample access points are near edges of the tank.

6.4 Preliminary Inspection

The following process shall be used for the preliminary inspection:

- Verify that all screening instruments are operational and have been calibrated before proceeding.

- If the sampling is being performed for purposes of compatibility or HazCat analysis, obtain a blank Tank Sampling Data Sheet (TSDS) or, if using a touch-pad-based container logging system, advance to a blank entry. If the tank/vessel is to be sampled to determine characterization for investigation or disposal, use the standard project sample numbering convention. If a number is not already identified on the tank itself, assign a number to the tank/vessel *before* beginning the visual evaluation.

- If using a dosimeter, perform the radiation survey on the tank first. If the activity is above the limits of the health and safety plan, do not continue unless your PPE is sufficient to proceed.

- Proper tank inspection is necessary for safety and efficiency in sampling or working on the tank, and because the information generated may be input to a proposal. It is important that accurate tank dimensions and tank orientation be recorded on a TSDS. The location, size, type, and condition of valves are important. Tank condition should be detailed. The height and size of the dike surrounding the tank should be noted. Manways, vents, vacuum breakers, and pressure-relief valves should be noted.

- Tracing pipes connected to a tank will indicate whether it is connected to another reservoir of liquid. Bear in mind that any valve in the line may be open or broken. It is important to note whether tank jacketing or pipe insulation is asbestos. Tank liners, especially if constructed of glass, should also be noted.

6.5 Opening Tank/Vessel

- If the tank/vessel is not in direct contact with the ground surface, make sure it is grounded before proceeding. Static electricity could potentially ignite any flammable contents.

- Headspace gases are the accumulated gaseous components found above solid or liquid layers in closed vessels. These gases may be the result of volatilization, degradation, or chemical reaction. Poorly ventilated or partially sealed areas can also act to concentrate gas vapors.

- Component concentrations normally exceed those found in ambient measurements. Therefore, techniques used to monitor low-level hazardous gases must be modified for handling these higher concentrations and for the remote sensing of tank contents. The anticipated higher concentrations can be dealt with by altering the instrument detector range, reducing the sample gas flow rate into the instrument, or utilizing a sample dilution system. These techniques are necessary for preventing saturation, poisoning, and/or gross deterioration of the detector element. When using lengthy extensions, you must also take into account increased time-lags for instrument response.

- Most ambient measurement devices have sample intakes that are highly directional and localized. The use of an extension will allow the operator to maintain a safe position while obtaining samples from varying depths and distances within containers.

- Poorly ventilated vessels can usually be sampled for headspace gases through small hatches or openings. Fully sealed vessels must be approached more cautiously since breaching may result in the uncontrolled release of pressurized gases or the potential for violent reactions with the ambient atmosphere. Any decision to open a sealed vessel should be based on sound need. For on-site work, both the supervisor and the health and safety officer (HSO) need to be informed of this type of situation. Depending on specific circumstances, special permission to open sealed vessels may be required. The investigator must be cognizant of the inherent dangers and must take appropriate safety precautions. IF NO KNOWLEDGE OF THE TANK CONTENTS EXISTS AND THE TANK IS COMPLETELY SEALED, DO NOT OPEN BY HAND. Re-evaluate the situation with proper authorities.

- The parameters that must be checked are oxygen content, explosiveness, and toxicity. Oxygen content and explosiveness must be checked first, since the PID, which is used to

measure organic vapors, is not intrinsically safe. Toxicity may be assessed from PID or OVA readings and/or Drager tube readings. Because vapors with various densities will stratify, readings should be taken at the top, middle, and bottom of the tank. These readings should be recorded on the tank inspection sheet and in the field log note book.

- Flame ionization detectors, such as OVA and LEL, that utilize the sample gas stream as their combustion air may have insufficient oxygen for combustion and will likely require use of a dilution probe. The introduction of entrained droplets from the container contents should also be avoided. Careful handling of the extension tube to avoid close contact with the materials surface (and in some instances, the use of a glass wool filter plug) will prevent material build-up in the probe and detector.

Note: When a pressurized vessel is encountered, notify the site supervisor and/or the HSO. This vessel will require special handling and MUST NOT BE OPENED WHILE UNDER PRESSURE.

- If the tank is empty, note it on the TSDS. The determination of "empty" needs to be made prior to collection of tank samples. This determination can vary from project to project depending on what the project objectives are. For example, suppose a tank is empty except for rust scale on the insides of the tank. It may be necessary to scrape the rust scale for a sample if one of the concerns is to pressure-wash the tank. The information gathered from the rust scale sample may determine what waste stream the rust scale goes into when the tank is scraped out and what waste stream the rinsate (from pressure washing) goes into. Depending on the size/volume of the tank, an inch of product could mean a significant quantity. Consult the site supervisor and/or the project manager prior to sample collection.

- Determination and measurement of layering in tanks is essential to quantify each type of material in the tanks. A variety of methods can be used to accomplish this, such as:

  – Tank gauging tape/ORS interface probe—These probes are able to distinguish between liquids that conduct electricity and those that do not. This allows you to distinguish an aqueous layer from a light or heavy immiscible organic layer. The probe is lowered on a measuring tape. Consult the ORS manual for operating instructions. The standard probe must not be used with chlorinated organics. However, the units can be ordered with probes that are compatible with all solvents. Be certain the gauging tape and probe are properly grounded.

  – Sludge Judge™—The Sludge Judge™ is an acrylic tube, in 5-foot sections, which is marked off in feet and has a check valve at the bottom. While it is too difficult to decontaminate to make it useful for sampling, it can be used to observe layering. However, it is degraded quickly by exposure to most organic solvents.

  – A stick with waterfinder paste—If one is certain that there is only a light organic layer, an aqueous layer, and sludge in the tank, then the tank may be “stuck.” A stick is coated on one side with waterfinder paste. Then it is lowered slowly into the tank. When the liquid surface is reached, the stick is marked at hatch level. When resistance is felt, indicating the top of the dense sludge, the stick is again marked. When the bottom of the tank is reached, the stick is marked again. One must be careful because a dense immiscible solvent layer can cause a false bottom of sludge to be formed between it and the aqueous layer. This results from solids whose density is between that of water and of the dense solvent.

  – Depth Composite—A sample that reflects layering with depth. An accurate depth composite can give a good indication of layering. Measurements of layers in the sample can be scaled up to give rough measurements of the layers in the tank.

  – Frost Line—The band, visible on the tank exterior, that separates the organic liquids from the water. Organic liquids generally have lower heat capacities than water. As a result, on cool mornings or whenever the temperature drops below 32°F, one can sometimes

see frost on a tank with a band that is frost-free corresponding to the location of an aqueous layer.

- Unless available from plant information, obtain measurements of the diameter, D, and height, H (vertical), or length, L (horizontal), of the tank. Use the following equations to calculate the tank capacity in gallons:

Vertical Tanks

$$V = \Pi \times (D/2)^2 \times H \times 7.48$$

Where

V is the total volume in gallons

Π = 3.14 or approximately 22/7

D is the tank diameter in feet

H is the tank height in feet

7.48 is the constant conversion factor from cubic feet to gallons

Horizontal Tanks

$$V = \Pi \times (D/2)^2 \times L \times 7.48$$

Where

V is the total volume in gallons

Π = 3.14 or approximately 22/7

D is the tank diameter in feet

L is the tank length in feet

7.48 is the constant conversion factor from cubic feet to gallons

- Alternatively, consult the scales for Vertical and Horizontal cylindrical tanks on the Shaw TSDS. These can be used both to determine the tank capacity and to estimate product/layer volumes.

6.6 Sampling Tank/Vessel

- Review the sampling plan to determine the project sampling objectives prior to collecting the sample. The project data objectives and data use establish the appropriate sampling protocol. Waste characterization samples do not require stringent sampling efforts since the end result of the tank product is disposal. Particular attention is required to collect all phases of the tank for hazardous categorization. A periodic product test sample requires further requirements for collecting representative samples at various depths.
  - Waste/Disposal characterization—If the entire contents of a tank will be characterized and disposed of as one waste stream, simple sampling methods such as using a pond sampler or even a disposable plastic pitcher attached to a pole may suffice.
  - Hazard Categorization (HazCat)—If the intent is to determine the hazards of an unknown tank's contents, it is extremely important to collect all phases and layers of the tank contents. This can be accomplished using implements such as a drum thief, bailer, Sludge Judge™, or PVC Pipe sampler. Layer samples can also be collected using a

bacon bomb or similar depth-specific sampler and collecting a "sample" from within each defined layer.

– Quality Control/Process Sampling—If the intent is to determine whether the tank contents meet a specification or to ascertain whether a layer of unacceptable material (such as water) exists, a depth-specific sampling method such as bacon bomb should be used.

- Several sampling devices exist for sampling liquids in tanks: bacon bomb, pond sampler, PVC pipe sampler, sludge judge, and dip tube. All of these sampling devices will provide a depth-based composite of the liquid, with the exception of the pond sampling device. This device is utilized when there is minimal liquid at the bottom of a tank and a sample needs to be collected (note that 1 inch of material in the bottom of a tank can be a substantial amount, depending on the size of the tank). Refer to respective Shaw SOPs for procedures on using sampling equipment.

- Several types of sludge/solids sampling devices also exist for use in tanks: PVC pipe sampler, Sludge Judge™, pond sampler, floor scraper, and a shovel. The PVC pipe sampler and the Sludge Judge™ can provide a depth-based composite. A pond sampler or shovel is useful when minimal solid material is at the bottom of a tank. The floor scraper is useful when it is necessary to scrape scale from an otherwise empty tank, in order to collect a sample. Refer to Shaw SOPs for procedures on using specific sampling equipment.

- In some instances, a solid may form on top of a liquid. When the solid is broken up, this may reveal the liquid layer. The solid and liquid should be collected.

- Unless the intended sample is to target a specific depth/layer of contents, every effort must be made to collect all phases of the tank contents*. If a layer is not accessible or cannot be sampled, it* ***must*** *be noted on the TSDS*. Tanks may contain air- or water-reactive solids that are covered with inert materials such as phosphorous under water or metallic sodium under light hydrocarbon fuels. *Misclassification of such containers can and has resulted in serious repercussions during future handling efforts*.

- After sampling is complete, the tank should be resealed to prevent the escape of vapors and possible reactions from rainwater, air, etc. The resealing method that should be used will depend on the opening methods used and may include replacing the manway cover or other access point.

- Sample collection should be documented, and samples should be packaged and shipped in accordance with the project plans and Shaw SOPs. *Samples with known hazards evident from the field data must be shipped in accordance with Shaw Procedure No. EID-FS-013.* Remember to keep the total weight of samples, cooler, and ice below 60 pounds.

6.7 Tank Sampling Data Sheet Completion

For projects where samples are being collected for purposes of characterizing the container contents for segregation and/or disposal, the field data gathered during the sampling activities is imperative to the process and must be recorded on a TSDS (EID-FS-115.01).

The following is a list of the information needed for the TSDS form.

- Tank Number—Use either straight numeric or a site standard convention. Do **not** identify/number tanks by items such as date or locations. This information should be cross-reference to tank numbers elsewhere.

- Project Number--Assigned by Shaw E & I to each project.

- Project Location--Generally the client company's name and/or street address of the facility/site.

- Project Contact--The Shaw E & I employee responsible for overseeing the sampling operation. This person should be the individual to whom questions are to be directed or verbal results given for review (i.e., project chemist or site supervisor).
- Phone--Site phone or number of the supporting Shaw E & I office.
- Logger--Name of individual responsible for filling in the sampling portion of the TSDS.
- Sampler--Name of individual(s) responsible for obtaining the sample.
- Weather--Weather conditions during sampling (e.g., temperature and/or precipitation).
- Date--Date when sample is collected.
- Time--Time when sample is collected.
- Orientation--Place an "x" in the box identifying the tank as horizontally or vertically aligned.
- Location—Place an "x" in the box that describes the tank location relative to the ground surface (aboveground [AST] or underground [UST]).
- Condition--Place an "x" in the box indicating the integrity of the tank.
- Construction--Place an "x" in the box indicating the tank material (metal or fiberglass), and if it is lined.
- Shape--Place an "x" in the box indicating the shape of the tank.
- Type Cover—Place an "x" in the box indicating if the secondary containment is concrete or asphalt.
- Control Dike—Place an "x" in the box indicating the integrity of the secondary containment.
- Specialties—Indicate if the tank is/was heated, pressurized, or insulated.
- Layers—Designate the layer as top, middle, or bottom for a multi-layered sample. If only one layer exists, complete only the line associated with the top layer, "T."
- Physical State—Place an "x" in the box indicating the actual physical state of each layer.
- Color—Write in the standard color description for each layer of the sample. **The only acceptable color descriptions are as follows:**

blue (blu)	white (wht)	black (blk)
red (red)	cream (crm)	orange (org)
pink (pnk)	yellow (yel)	gray (gry)
colorless (cls)	purple (pup)	tan (tan)
green (grn)	brown (brn)	green-blue (g-bl)

- Clarity—Place an "x" in the box indicating the clarity of each layer of the sample.
- Layer Thickness—Record the thickness of each layer in inches.
- Estimated Volume—Using the Volume per Foot Calculation Table on the TSDS, enter the estimated volume of material in the tank (for each layer, if appropriate).

- Capacity—Enter the total capacity of the tank as calculated for the height, length, diameter and/or width, as appropriate, for the geometry of the tank.
- pH—Record pH measurement in standard units (SU): 0 to 14; or designate "N/A" if no measurement was obtained. Measurements should be made by pH test strips.
- PID—Record the results for vapor analysis by photoionization detector (PID), or designate “N/A” if no measurements were obtained. The PID scale reads in ppm (0 to 2,000).
- Dosimeter—Record the results of the field radiation survey in this space, or designate "N/A" if no measurement was obtained. The dosimeter’s scale units are in millirems per hour (mr/hr or mrem/hr).
- DOT Haz—Indicate the hazard category from placards or stencils on the tank. Example: Corrosive Liquid.
- UN/NA—Record any UN or NA numbers which are stenciled or written on the tank. These numbers are always prefixed by either UN or NA.
- NFPA—Enter NFPA information from the tank, if available.
- Chemical Name—Enter any chemical compound, key ingredient, trade name, and/or chemical name of the contents on the label or stenciled on the tank. Indicate whether the information was printed on a label or stenciled or handwritten. If the space provided is inadequate, indicate that the information continues on the back of the log, and use the space on the back as needed.
- Solvent and Lot Number used in Sampling—Enter this information for samples collected, if applicable.
- Diagram of Tank—Sketch the tank, including raw measurements, and the general layout of the tank area.
- Recommendations—Identify the preferred sampling device, if possible, along with other suggestions to increase safety and maximize representativeness of sample(s) collected.
- Access—Identify how the tank can be accessed for sampling.
- Comments—Provide additional information or comments for which no specific space is designated. This space can be used to document unusual comments or problems such as contents that are too hard to sample, tank color, or colored crystals that have formed on the tank. If the space provided is inadequate, indicate that the information continues on the back of the log, and use the space on the back as needed.
- The TSDS acts as its own Chain of Custody for projects where an on-site laboratory is being utilized. On these projects, the samples should be transferred along with the log, and the log should be signed and transferred to the on-site laboratory staff. This transfer is not necessary whenever the sampling personnel are also the on-site laboratory staff, which occurs on small projects.
- For projects where the samples will be shipped to an off-site laboratory for HazCat, copies of the TSDSs must be included with the Chain of Custody documentation. The samples should be transferred via Shaw’s standard Chain of Custody process.

7. ATTACHMENTS

None

8. FORMS

EID-FS-115.01_2 Tank Sampling Data Sheet

9. RECORDS

- Tank Sampling Data Sheet
- Field Logbook or Field Logsheet

10. REVISION HISTORY AND APPROVAL

Revision Level Revision Date	Revision Description	Responsible Manager
00 03/15/2004	Initial issue.	N/A
01 09/21/2006	Updated template and numbering of procedure, Section 3 References- Internal SOP references were removed, minor edits to Sections 6.5, 6.6 and 6.7.	Guy Gallello
02 08/25/2011	Modified format only to align with Governance Management framework.	Scott Logan

Tank Sampling Data Sheet

TANK SAMPLING DATA SHEET

PROJECT NUMBER: _____
PROJECT NAME: _____
TANK NUMBER: _____

PROJECT LOCATION	LOGGER	DATE
PROJECT CONTACT	SAMPLER	TIME
PHONE	WEATHER	

ORIENTATION ☐ VERTICAL ☐ HORIZONTAL
LOCATION ☐ AST ☐ UST
CONDITION ☐ EXCELLENT ☐ POOR ☐ GOOD ☐ LEAKING ☐ FAIR
CONSTRUCTION ☐ METAL ☐ FIBERGLASS ☐ LINED

SHAPE: ☐ SPHERICAL ☐ CYLINDRICAL ☐ RECTANGULAR
TYPE COVER: ☐ CONCRETE ☐ ASPHALT
CONTROL DYKE: ☐ EXCELLENT ☐ POOR ☐ GOOD ☐ LEAKING ☐ FAIR ☐ NONE
SPECIALTIES: ☐ HEATED ☐ PRESSURIZED ☐ INSULATED JACKET

LAYERS	PHYSICAL STATE				COLOR (USE STD COLORS)	CLARITY			LAYER THK. (IN)	ESTIMATED VOLUME (GALLONS)
	LIQUID	SOLID	GEL	SLUDGE		CLEAR	CLOUDY	OPAQUE		
TOP										
MIDDLE										
BOTTOM										

DOT HAZ:
UN/NA:
NFPA:
CHEMICAL NAME:
SOLVENT & LOT # USED IN SAMPLING

CAPACITY_____
HEIGHT_____
LENGTH_____
DIAMETER_____
WIDTH_____
pH_____
PID_____
DOSIMETER_____
_____MREM/HR

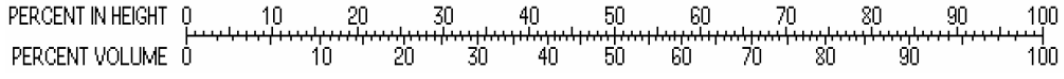
VOLUME PER FOOT, V, CALCULATIONS FOR VERTICAL CYLINDRICAL TANKS WITH DIAMETER, D

D, ft	V, gal/ft	D, ft	V, gal/ft	D, ft	V, gal/ft
2	23.5	11	711	20	2350
3	54	12	846	21	2591
4	94	13	993	22	2843
5	147	14	1151	23	3108
6	211	15	1322	24	3384
7	288	16	1504	25	3672
8	376	17	1698	30	5287
9	476	18	1903	35	7197
10	587	19	2121	40	9400

DIAGRAM OF TANK (INCLUDE RAW MEASUREMENTS)

RECOMMENDATIONS:_____
ACCESS:_____
COMMENTS:_____

PERCENT VOLUME CALCULATION OF A HORIZONTAL CYLINDRICAL TANK



CAPACITY OF A CYLINDRICAL TANK IN GALLONS

$$V_{gal} = L_{feet}\left(\tfrac{1}{2} \times D_{feet}\right)^2 \times \pi \times 7.48 \, {}^{gal}/_{ft^3}$$

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1. PURPOSE

This procedure is intended to provide general guidance for sampling of drums and other small containers for all analyses including characterization or compatibility (HazCat) analysis. The procedure also presents container handling and safety requirements and reiterates Shaw policies with regards to safe container handling.

2. SCOPE

This procedure is applicable to all Shaw E & I instances where drums or other containers of less than 120-gallon capacity require sampling for either specific analysis or characterization purposes. This procedure also presents important safety information and Shaw policies concerning the opening of drums/containers.

3. REFERENCES

- Cassis, Jo, et al., 1985, *Guidance Document for Cleanup of Surface Tank and Drum Sites*, Prepared for Office of Emergency and Remedial Response, USEPA, Washington, D.C. under Contract No. 68-01-6930.
- U.S. Environmental Protection Agency, 2002, *RCRA Waste Sampling Draft Technical Guidance, Planning, Implementation, Assessment*, EPA/530-D-02-002, August.
- U.S. Environmental Protection Agency, 1994, *Drum Sampling*; EPA/ERT SOP 2009.
- U.S. Environmental Protection Agency, 1986, *Drum Handling Practices at Hazardous Waste Sites*, EPA/600/2-86/013.

4. DEFINITIONS

- **Drum**—A container constructed of metal, plastic, glass, or fiber designed to hold material. The size of the container can be as small as an ampoule found on laboratories shelves to as large as 120-gallon capacity.
- **Drum Type A**—A drum or other container in which the contents are reasonably known and for which a qualified chemist or other hazardous material-experienced individual has determined that no hazard from shock sensitivity, air reactivity, or hazardous reactions is probable. These drums may be opened by hand unless damaged or visibly bulging. Determination may be made based upon visual inspection of drum/container condition, legible labeling, site information/records, or process/use knowledge that is supported by other information. Examples include staged IDW, waste oils, and other unused/waste products that do not degrade into shock-sensitive compounds. Type A Drums must also be constructed of typical materials and not of nickel, stainless steel, aluminum, center bung, or other special designs usually used to hold highly reactive materials. *All drums removed from legacy landfills or dump sites must be treated as Drum Type B containers and accessed remotely*.
- **Drum Type B**—A drum that poses a potential risk of injury to the sampler from shock sensitivity, air reactivity, flammability, toxicity, or rapid polymerization. Included in this category are drum/containers with visible crystals along the sides or tops, those constructed of non-typical materials or design (nickel, stainless steel, aluminum, or center bung), non-IDW drums that are bulging, containers with too much damage to allow for safe hand-opening, and **all** unknowns from sites where there is not assurance of non-hazardous

content. *In addition, it is Shaw policy that all drums removed from landfills or dump sites must be treated as Drum Type B containers and accessed remotely and in Level B PPE unless a clear determination can be made to handle them otherwise*.

Equipment

- **Dosimeter**—A portable, transistorized survey meter that can be used for radiation monitoring purposes and/or contamination measurements. *All drums in landfills, in dump sites, or from sites where a potential exists that radioactive materials may have been used must be screened with a dosimeter.*
- **Drum Thief**—A thin-walled borosilicate glass tube used to collect liquid samples from drums and containers.
- **LEL (Lower Explosive Limit) Meter**—An air monitoring device that can test the surrounding air for sufficient oxygen content for life support and/or the presence of combustible gases or vapors which may pose a potential flammability hazard. The lower explosive limit is defined as the minimum concentration of a particular combustible gas in the air that can be ignited. The upper explosive limit is defined as the maximum concentration that can be ignited.
- **Toxic Gas Meter**—A portable warning device used for detecting specific toxic gases found in the surrounding air (i.e., H_2S, HCl, Cl_2, HCN, and $COCl_2$).
- **PID (Photoionization Detector)**—A portable air-monitoring instrument used to detect organic vapors. The PID does not distinguish between different types of vapors or tell if more than one vapor is present.

Special Types of Containers

- **Laboratory Packs**—Such drums are commonly used for disposal of expired chemicals and process samples from laboratories, hospitals, and similar institutions. Bottles in the lab pack may contain incompatible materials and may not be packed in absorbent material. They may contain radioisotopes; shock-sensitive material; or highly volatile, highly corrosive, or very toxic exotic chemicals. Lab packs have been the primary ignition sources for fires at some hazardous waste sites.
- **Exotic Metal Drums**—Very expensive drums (aluminum, nickel, stainless steel, or other unusual metals) that usually contain an extremely dangerous material.
- **Polyethylene or PVC-lined Drums**—These drums often contain strong acids or bases. If the lining is punctured, the substance usually corrodes the steel, resulting in a significant leak or spill and possible explosive gas (hydrogen) generation.
- **Single-Walled Drums Used as a Pressure Vessel**—These drums have fittings for both product filling and placement of an inert gas, such as nitrogen. Such drums may contain reactive, flammable, or explosive substances.

5. RESPONSIBILITIES

5.1 Procedure Responsibility

The Field Sampling Discipline Lead is responsible for maintenance, management, and revision of this procedure. Questions, comments, or suggestions regarding this technical SOP should be directed to the Field Sampling Discipline Lead.

5.2 Project Responsibility

Shaw employees performing this task, or any portion thereof, are responsible for meeting the requirements of this procedure. Shaw employees conducting technical review of task performance are also responsible for following appropriate portions of this SOP.

For projects where the activities of this SOP are conducted, the Project Manager, or designee, is responsible for ensuring that those activities are conducted in accordance with this and other appropriate procedures. Project participants are responsible for documenting information in sufficient detail to provide objective documentation (i.e., checkprints, calculations, reports, etc.) that the requirements of this SOP have been met. Such documentation shall be retained as project records.

6. PROCEDURE

Safety note: Drums and other containers can pose a potential threat to the employee's health and the environment. It is extremely important that all safety precautions outlined in an approved project health and safety plan are understood and followed. **At no time shall Shaw E & I employees open an unknown and potentially hazardous or Type B drum/container by hand.** All monitoring devices shall be intrinsically safe and all tools shall be non-sparking. To protect against possible toxic gas/vapor exposure, all drums/containers should be accessed and sampled in Level B PPE unless the site responsible person (SSHO or chemist) deems otherwise based upon clear and unquestionable information. All unknowns where there is not assurance of the absence of toxic gas or vapors from cyanide, sulfide, or strongly corrosive acids **must** be opened and sampled using Level B PPE.

6.1 Evaluate and Log Drum/Container

- Verify that all screening instruments are operational and have been calibrated before proceeding.
- If the sampling is being performed for purposes of compatibility or HazCat analysis, obtain a blank Drum/Container log or, if using a touch pad-based drum logging system, advance to a blank entry.
- If the drum/container is being sampled for other purposes, use the standard project sampling logging convention.
- Assign a number to the drum/container *before* beginning the visual evaluation. This will ensure that all drums/containers are accounted for.
- Complete the header and visual observation sections of the Drum/Container log. Be sure to note any markings, the manufacturer trade names, the drum condition, and NFPA information on the drum/container. Do not complete the Volume section until after the drum has been opened. Also, if on a staging area, notate the location of the drum/container on the log; draw a map if necessary.
- If using a dosimeter, perform the radiation survey on the drum first. If the activity is above the limits of the health and safety plan, do not continue unless your PPE is sufficient to proceed.

6.2 Open and/or Sample Drum/Container

- Type B drums that have been remotely opened via a backhoe-attached brass punch will most likely be staged for sampling. Drums/containers may sometimes be logged, opened remotely, and sampled as they are unearthed from landfills and dump sites and then placed into over-packs with or without their lids in place. Type A drums/containers can be opened using a bung wrench, non-sparking crow-bar-type implement, or even a brass punch and hammer combination. Type B containers not opened via backhoe are usually opened using

drum/container-attachable remote punch apparatus or, in the case of small containers, drill-based cap removal or drilling systems.

- If the drum/container is not in direct contact with the ground surface, make sure it is grounded before proceeding. Static electricity could potentially ignite any flammable contents.
- If the drum/container was previously opened, remove the lid of the over-pack container or other covering from the top of the drum.
- If opening the drum manually or with a single-container remote-opening system, proceed to open the drum/container.
- Use a PID (if weather permits), LEL meter, and/or toxic gas meter to collect air monitoring readings from the drum/container. Record the results on the Drum/Container Log.
- If the drum is empty (<2 inches of content for a 55-gallon drum), note it on the Drum/Container Log and proceed to the next drum/container.
- Insert the drum thief almost to the bottom of the drum or until a solid layer is encountered. About 1 foot of tubing should extend above the drum. Allow the waste in the drum to reach its natural level in the tube. Cap the top of the sampling tube using a thumb or forefinger. Carefully remove the capped tube from the drum and insert the uncapped end in the sample container. Release thumb or forefinger from tube and allow the glass thief to drain completely into the sample container. Repeat as necessary until the required sample volume has been collected.
- Close the sample container cover tightly, wipe off with a paper towel, and place a label on the sample container. Replace the overpack lid or place a plastic cover over the drum/container.
- Place the used sampling tube, along with paper towels or waste rags (used to wipe up any spills), into an empty metal barrel marked “sampling waste” for subsequent disposal. Alternatively, break the drum thief in half inside the drum/container and leave it in the drum. *Make sure the top of the thief does not extend above the drum cover or serious eye/hand injury may occur to others.*
- Solids in drums are sampled by use of tongue depressors or disposable scoops. All reasonable efforts shall be made to obtain the sample to a depth of 12 inches or refusal. It is sometimes necessary to sample the material with the use of a trier. Nonexpendable sampling tools must be decontaminated between drums. Sometimes, the material must first be broken up with a non-sparking hammer or hammer and chisel, or, for rubber-like solids, a piece may need to be cut off with a knife.
- In some instances, a solid may form on top of a liquid. When the solid is broken up this may reveal the liquid layer. The solid and liquid should be collected.
- Every effort must be made to collect all phases of the drum contents. *If a layer is not accessible or cannot be sampled it **must** be noted on the Drum/Container Log*. Drums may contain air- or water-reactive solids that are covered with inert materials such as phosphorous under water or metallic sodium under light hydrocarbon fuels. *Misclassification of such drums can and has resulted in serious repercussions during subsequent handling efforts*.
- After sampling is complete, the container should be resealed to prevent the escape of vapors and possible reactions from rainwater, air, etc. The resealing method depends on the opening methods used and may include replacing the lid and retaining ring, placing the drum in an over-pack when it cannot be resealed by any other method, and/or placing polyethylene sheeting over the drum in a manner that prevents rainwater from entering the drum.

- Samples should be documented, packaged, and shipped in accordance with the project plans and Shaw SOPs. *Samples with known hazards evident from the field data must be shipped in accordance with Shaw Procedure No. EID-FS-013.* Remember to keep the total weight of samples, cooler, and ice below 60 pounds.

6.3 Drum/Container Log Completion–HazCat/Compatibility Projects

For projects where samples are being collected to characterize the container contents for segregation and/or disposal (HazCat or compatibility analysis), the field data gathered during the sampling activities is imperative to the process and must be recorded on a Drum/Container Sampling Log. The following information is needed for the form:

- Drum Number—Use either straight numeric or a site standard convention. Do **not** identify/number drums by items such as date or locations. This information should be cross-reference to drum numbers elsewhere.
- Project Number—Assigned by Shaw E & I to each project.
- Page x of y—If the drum log is accompanied by Material Safety Data Sheets (MSDSs) or other information, then the total number of pages is required. Commonly, will be page 1 of 1.
- Project Location—Generally the client company's name and/or street address of the facility or site.
- Project Contact—The Shaw E & I employee responsible for overseeing the sampling operation. This person should be the individual to whom questions are to be directed or verbal results given for review (i.e., project chemist or site supervisor).
- Phone—Site phone or number of the supporting Shaw E & I office.
- Logger—Name of the individual responsible for filling in the sampling portion of the Drum Inventory Log.
- Sampler—Name of individual(s) responsible for obtaining the sample.
- Weather—Weather conditions during sampling (e.g., temperature and/or precipitation).
- Date—Date when sample is collected.
- Time—Time when sample is collected.
- Drum Type—Place an "x" in the box or boxes that best describe the drum type and materials of construction.
- Lid Type—Place an "x" in the box that describes the type of closure on the container.
- Drum Condition—Place an "x" in the box indicating the integrity of the drum. "Meets DOT specifications" means the drum can be shipped according to U.S. Department of Transportation (DOT) regulations.
- Drum Size—Place an "x" in the box indicating the volume of the drum when full. If the drum is over-packed, the inner drum volume should be indicated, not the size of the over-pack.
- Drum Contents—Place an "x" in the box indicating the volume of waste contained in the drum.
- Overpacked—Place an "x" in the "yes" box if the container was overpacked, along with an "x" in the box that states the type of overpack utilized.

- Layers—Designate the layer as top, middle, or bottom for a multi-layered sample. If only one layer exists, complete only the line associated with the top layer, "T."
- Physical State—Place an "x" in the box indicating the actual physical state of each layer.
- Color—Write in the standard color description for each layer of the sample. **The only acceptable color descriptions are as follows:**

blue (blu)	white (wht)	black (blk)
red (red)	cream (crm)	orange (org)
pink (pnk)	yellow (yel)	gray (gry)
colorless (cls)	purple (pup)	tan (tan)
green (grn)	brown (brn)	green-blue (g-bl)

- Clarity—Add an "x" in the box indicating the clarity of each layer of the sample.
- Layer Thickness—Record the estimated thickness of each layer in inches.
- pH—Record the pH measurement in standard units (SU), 0 to 14, or designate "N/A" if no measurement was obtained. Measurements should be made by pH test strips.
- PID—Record the results for vapor analysis by photoionization detector (PID) or designate "N/A" if no measurement was obtained. The PID scale reads in ppm (0 to 2,000).
- Dosimeter—Record the results of the field radiation survey in this space or designate "N/A" if no measurement was obtained. The dosimeter's scale units are in millirems per hour (mr/hr or mrem/hr).
- Other—Use this space to record additional analysis that may take place or designate "N/A" if no other measurements were taken. The information should include the equipment used, the parameter being measured, and its concentration. Example: Drager tube - HCN - 5 ppm.
- DOT Haz—Hazard category from placards or stencils on drum. Example: Corrosive Liquid.
- UN/NA—Space for any UN or NA numbers that are stenciled or written on the drum. These numbers are always prefixed by either UN or NA.
- MFG Name—Record the name, address, and telephone number of the company producing or distributing the chemical/product. If the space provided is inadequate, indicate that the information continues on the back of the log, and use the back side as needed.
- Chemical Name—Record the chemical compound, key ingredient, trade name, and/or chemical name of the contents on the label or stenciled on the drum. Indicate whether the information was printed on a label or stenciled or handwritten on the drum. If the space provided is inadequate, indicate that the information continues on the back of the log, and use the back side as needed.
- Additional Information—This space is for additional information or comments for which no specific space is designated. Use it to provide unusual comments or indicate problems such as contents too hard to sample, drum color, or colored crystals formed on the drum. If the space provided is inadequate, indicate that the information continues on the back of the log.

The Drum/Container Log acts as its own Chain of Custody for projects where an on-site laboratory is being utilized. On these projects, the samples should be transferred along with the log, and the log should be signed and transferred to the on-site laboratory staff. This transfer is

not necessary whenever the sampling personnel are also the on-site laboratory staff, as occurs on small projects.

For projects where the samples will be shipped to an off-site laboratory for HazCat, copies of the Drum/Container Logs must be included with the Chain of Custody documentation. The samples should be transferred via Shaw's standard Chain of Custody form.

7. ATTACHMENTS

None

8. FORMS

Form EID-FS-116.01 Drum Container Sampling Log

9. RECORDS

- Drum/Container Log
- Field Logbook or Field Logsheet
- Chain of Custody Form
- Chain of Custody Continuation Page(s)

10. REVISION HISTORY AND APPROVAL

Revision Level Revision Date	Revision Description	Responsible Manager
00 01/05/2004	Initial issue.	N/A
01 09/21/2006	Updated template and numbering of procedure.	Guy Gallello
02 08/25/2011	Modified format only to align with Governance Management framework.	Scott Logan

Drum Container Sampling Log

(FS116.1_0)

	DRUM/CONTAINER SAMPLING LOG	DRUM NO. _____ PROJECT NO. _____ PAGE _____ OF _____

Project Location _____ Logger _____ Date _____
Project Contact _____ Sampler _____ Time _____
Phone _____ Weather _____

Drum Type: Fiber ☐ Poly Lined ☐ Steel ☐ Poly ☐ Stainless Steel ☐ Nickel ☐
Lid Type: Ringtop ☐ Closed Top ☐
Drum Condition: Meet DOT Spec. ☐ Good ☐ Fair ☐ Poor ☐
Drum Size: 110 ☐ 85 ☐ 55 ☐ 42 ☐ 30 ☐ 16 ☐ 10 ☐ 5 ☐ Other _____
Drum Contents: Volume Full ☐ 3/4 ☐ 1/2 ☐ 1/4 ☐ < 1/4 ☐ MT ☐
Overpacked: No ☐ Yes ☐ Overpack Type: Fiber ☐ Steel ☐ Poly ☐

	Phys. State				Color	Clarity			Layer Thickness	**Field Analysis**
	LIQUID	SOLID	GEL	SLUDGE	Use STD Colors	CLEAR	COLOUDY	OPAQUE	Inches	
T										pH _____ Su PID _____ ppm
M										Dosimeter _____
B										Other _____

Drum Labels / Markings

DOT Haz _____ UN / NA _____

MFG Name _____
Chemical Name _____
Additional Information _____

LABORATORY COMPATABILITY DATA

☐ Mark if physical state and color matches the above information. If not, stop analysis and notify Project Contact. Further work will not be paid for.

Drum Cat: _____
Analyst: _____
Date Performed: _____

Radiation Pos ☐ Neg ☐ _____ mRem / Hr

	Phys. State				Color	Clarity			Layer Thickness	Water Solubility	React	pH	Hex Sol	Per	Oxid	CN	Sul	Beil-stein	Flash Point	PCBs (25ppm)	Layer Class
	LIQUID	SOLID	GEL	SLUDGE	Use STD Colors	CLEAR	COLOUDY	OPAQUE	Inches	Solubility S, PS, I Density H or L	A= Air W= Water	Std. Units	S or I	+ or -	+ or -	+ or -	+ or -	+ or -	< 60 C 140 F + or -	+ or -	
T																					
M																					
B																					

Comments: _____

PCB Conc. _____ ppm Flash Point _____ C/F Compatability Composite Bulk No. _____
Data Reviewer: _____ Data Review Date: _____

Field Reviewer: _____ Field Review Date: _____

Transfer Number	Transfers Relinquished By	Transfers Accepted By	Date	Time
1				
2				
3				

1. PURPOSE

The purpose of this procedure is to provide the basic methods and guidance for volatile organic compound (VOC) screening of environmental samples using jar headspace techniques. Jar headspace analytical screening can be used to provide field data regarding the presence or absence of VOC vapors in environmental samples.

Field screening for VOC compounds can be useful for such environmental characterization purposes as discovery of site VOC contamination; selection of field samples to submit to a laboratory for analyses; selection of surface soil sampling locations; selection of boring locations; placement of groundwater monitoring wells; soil cutting (from drilling operations) screening for disposal characterization purposes; and purge water (from well purging/sampling tasks) screening for disposal characterization purposes.

2. SCOPE

This SOP is applicable to all Shaw E & I projects where VOC screening by the jar headspace method is employed. This procedure serves as general guidance on the proper methods for conducting jar headspace analytical screening. Users should always consult state-specific, program-specific, or project-specific requirements to ensure compliance with requirements when performing the activities of this SOP.

3. REFERENCES

- Massachusetts Department of Environmental Protection, *Interim Remediation Waste Management Policy for Petroleum Contaminated Soils*, #WCS-94-400.

4. DEFINITIONS

- **Flame Ionization Detector (FID)**—An organic compound detector based upon the ionization in a flame of compounds containing carbon-hydrogen bonds. The FID is a gross screening tool that detects the total organic content of the introduced sample. Its response is lower to halogenated compounds, and it will not respond to compounds lacking a carbon-hydrogen bond.
- **Ionization Potential (IP)**—The amount of energy required to remove an electron from the outer shell of a molecule or atom. The resultant molecule or atom will be a positively charged cation.
- **Photo Ionization Detector (PID)**—An organic compound detection system based upon the ionization of compounds via UV-radiation. A PID will respond only to those compounds with IP values less than or equal to the output of the UV-lamp. As such it is an indicator of aromatic and conjugated organic compounds. PID response is lower for halogenated compounds. PID systems are available with either a 10.2 or 11.7ev lamp.

5. RESPONSIBILITIES

5.1 Procedure Responsibility

The Field Sampling Discipline Lead is responsible for maintenance, management, and revision of this procedure. Questions, comments, or suggestions regarding this technical SOP should be directed to the Field Sampling Discipline Lead.

5.2 Project Responsibility

Shaw E & I employees performing this task, or any portion thereof, are responsible for meeting the requirements of this procedure. Shaw E & I employees conducting technical review of task performance are also responsible for following appropriate portions of this SOP.

For those projects where the activities of this SOP are conducted, the Project Manager, or designee, is responsible for ensuring that those activities are conducted in accordance with this and other appropriate procedures. Project participants are responsible for recording information in sufficient detail to provide objective documentation (i.e., checkprints, calculations, reports, etc.) that the requirements of this SOP have been met. Such documentation shall be retained as project records.

6. PROCEDURE

6.1 Equipment

The equipment to be used for jar headspace screening includes the following:

- Field logbook(s)
- Volatile organic compound vapor meter (PID or FID)
- Field Data Forms - See Section 8
- Indelible markers
- Wide-mouth glass jars (16-oz preferred, 8 oz minimum size)
- Stainless steel laboratory spoons
- Aluminum foil

6.2 Field Gas Chromatography

If field GC is being employed, the following additional equipment will be required:

- Gas Chromatograph system
- Calibration standards and materials
- Gas-tight syringes

6.3 Procedure Steps

- Calibrate field screening equipment in accordance with the manufacturer's instructions and/or project-specific requirements.
- Obtain a soil sample from the sampling device (split spoon, spatula, shovel, etc.) immediately after removal from the ground. Groundwater samples can be collected from the inside of auger flights using a disposable bailer. In order to reduce loss of the volatiles, take care to minimize handling of the sample and exposure to the air during transfer to the jar.
- Half-fill a clean glass jar with the sample to be analyzed. Quickly cover each open top with one or two sheets of clean aluminum foil and subsequently apply screw caps to tightly seal the jars. Sixteen-ounce (approximately 500 mL) soil or "mason" type jars are preferred. Do not use jars with less than 8 oz. (approximately 250 mL) total capacity.
- Allow sealed jar to sit for at least 10 minutes. Vigorously shake jars for 15 seconds at the beginning of the headspace development period. Where ambient temperatures are below

32°F (0°C), sample bottles should be placed within a heated vehicle or building for the prescribed period to allow the volatilization process to occur.

- Remove screw/lid and expose foil seal. Puncture foil seal with instrument sampling probe into the jar. Keep probe tip sufficiently above the media surface to avoid uptake of water droplets or soil particulates into the sample probe.
- As an alternative collection method or when using a field GC, use a gas-tight syringe to withdraw a measured volume of the headspace and inject into the probe inlet or calibrated GC.
- Following probe insertion through the foil seal and/or sample injection into the probe, the maximum (non-GC) instrument response should occur between 2 and 5 seconds. Record the highest meter response as the jar headspace concentration in the field log book or sheet. For GC analysis, determine and record the response/concentration of the target compound(s)
- Perform Duplicate QC and evaluate in accordance with the project plans
- Dispose of all wastes, including screened samples, in accordance with the project plans

7. ATTACHMENTS

- Attachment 1, Ionization Potentials for Common Volatile Contaminants

8. FORMS

- Form EID-FS-203.01, Jar Headspace Screening Results Log

9. RECORDS

- Field Logbook
- Field Data Forms
- Form EID-FS-203.01, Jar Headspace Screening Results Log

10. REVISION HISTORY AND APPROVAL

Revision Level Revision Date	Revision Description	Responsible Manager
00 09/18/2003	Initial Issue.	N/A
01 8/25/2011	Modified format only to align with Governance Management framework.	Scott Logan

Attachment 1
Ionization Potentials for Common Volatile Contaminants

Analyte	IP (eV)	Analyte type
Acetone	9.69	AAK
Acrolein	10.10	AAK
Allyl alcohol	9.67	SDO
Benzene	9.245	AC
Bromochloromethane (I.S.)	10.77	AH
Bromoform	10.51	AH
Bromomethane	10.53	AH
n-Butanol	10.04	AAETS
2-Butanone (MEK)	9.53	AAK
Carbon disulfide	10.08	AAETS
Carbon tetrachloride	11.47	AH
Chlorobenzene	9.07	AC
Chlorodibromomethane	10.59	AH
Chloroethane	10.98	AH
Chloroform	11.42	AH
Chloromethane	11.28	AH
1,2-Dibromoethane	10.19	AH
Dibromomethane	10.49	AH
1,2-Dichlorobenzene	9.07	AH
1,3-Dichlorobenzene	9.12	AH
1,4-Dichlorobenzene	8.94	AH
Dichlorodifluoromethane	12.31	AH
1,2-Dichloroethane	11.12	AH
trans-1,2-Dichloroethene	9.66	AH
1,2-Dichloropropane	10.87	AH
Diethyl ether	9.53	AAETS
Ethanol	10.48	AAETS
Ethyl acetate	10.11	AAE
Ethyl benzene	8.76	AC
Ethylene oxide	10.565	MM
2-Hexanone	9.34	AAK
Iodomethane	9.54	AH
Isopropylbenzene	8.69	AH
Methane	12.98	PC
Methanol	10.85	AAETS
Methylene chloride (DCM)	11.35	AH
4-Methyl-2-pentanone (MIBK)	9.30	AAK
Naphthalene	8.12	AC
Nitrobenzene	9.92	AC

Analyte	IP (eV)	Analyte type
Pyridine	9.32	HM
Styrene	8.47	AC
Tetrachloroethene	9.32	SDO
Toluene	8.82	AC
Trichloroethene	9.45	SDO
Trichlorofluoromethane	11.77	AH
Vinyl acetate	9.19	SDO
Vinyl chloride	9.995	SDO
o-Xylene	8.56	AC
m-Xylene	8.56	AC
p-Xylene	8.445	AC

PC = Paraffins and Cycloparaffins

AH = Alkyl Halides

AAETS = Aliphatic Alcohol, Ether, Thiol, and Sulfides

AAK = Aliphatic Aldehydes and Ketones

AAE = Aliphatic Acids and Esters

SDO = Some Derivatives of Olefins

HM = Heterocyclic Molecules

AC = Aromatic Compounds

MM = Miscellaneous Molecules

Jar Headspace Screening Results Log

Site: _____

Location: _____

Sample ID	Date	Headspace Reading	Comments

STANDARD OPERATING PROCEDURE

Subject: Standards for Conducting Subsurface Soil Sampling While Drilling

1. PURPOSE

This procedure provides the standard practice for subsurface soil sampling while drilling. The procedure includes the minimum recommended steps and quality checks that employees and subcontractors are to follow when performing the subject task.

This procedure may also contain guidance for other recommended or suggested practice that is based upon collective professional experience. Recommended practice goes beyond the minimum requirements of the procedure, and should be implemented when appropriate.

2. SCOPE

Geosciences Standard Operating Procedure (SOP) EI-GS001 describes standards for collecting subsurface soil samples while drilling, and defines how such sampling will be conducted and documented for projects executed by Shaw Environmental & Infrastructure Inc. (Shaw E & I). This standard is specific to sampling activities that are intended for the collection of soil samples for chemical analysis. Proper collection procedures are necessary to ensure the quality and integrity of all subsurface soil samples.

This SOP addresses technical requirements and required documentation. Responsibilities of individuals performing the work are also detailed. Additional project-specific requirements for subsurface soil sampling while drilling may be developed, as necessary, to supplement this procedure and to address project-specific conditions and/or objectives. This standard does not address subsurface soil sampling using direct-push techniques. Such sampling is covered under another SOP.

3. REFERENCES

Soil sampling should follow accepted industry practices while drilling. These are as defined by the latest version of the following ASTM Standards:

ASTM D 1586 Standard Method for Penetration Test and Split- Barrel Sampling of Soils.

ASTM D 1587 Standard Practice for Thin-Walled Tube Sampling of Soils.

ASTM D 3550 Standard Practice for Thick Wall Ring-Lined Split Barrel Sampling of Soils.

ASTM D 6169 Selection of Soil and Rock Sampling Devices Used with Drill Rigs for Environmental Investigations.

4. DEFINITIONS

The following definitions are applicable to the collection of subsurface soil samples while drilling, and are used in this SOP.

- **Borehole**—Any hole drilled into the subsurface for the purpose of identifying lithology, collecting soil samples, and/or installing monitoring wells.

- **Split-Spoon Sampler**—A steel tube, split in half lengthwise, with the halves held together by threaded collars at either end of the tube. This device can be driven into resistant (semiconsolidated) materials using a drive weight or drilling jars mounted to the drilling rig. A standard split-spoon sampler (used for performing standard penetration tests, ASTM D-1586) is 2 inches in outside diameter and 1⅜ inches in inside diameter. This standard spoon typically is available in two common lengths, providing either 20-inch or 26-inch internal longitudinal clearance for obtaining 18-inch or 24-inch long samples, respectively. Six-inch long sleeves (tubes) of brass, stainless steel, or plastic are commonly placed inside the sampler to collect and retain soil samples. A 5-foot long split-spoon sampler is available. A modified split-spoon sampler is also commonly used. The modified design is similar to the standard split-spoon, except the outside diameter varies from 2 to 3½ inches, and the inside diameter varies from 1½ to 3 inches (ASTM D 3550). The 2½-inch outside diameter sampler is referred to as the California Sampler.

- **Shelby Tube Sampler**—A thin-walled metal tube used to recover relatively undisturbed samples. These tubes are available in various sizes, ranging from 2 to 6 inches in outside diameter and from 18 to 54 inches in length (ASTM D 1587). A stationary piston device is included in the sampler to reduce sampling disturbance and to increase sample recovery. It has been found to be advantageous to collect Shelby tube samples from soft soil with the use of a hydraulically operated sampler (ASTM D 6519), often referred to as the Osterberg sampler. It has also been found to be advantageous to collect Shelby tube samples from hard soil with the use of a core barrel sampler, such as the Pitcher and Dennison samplers.

- **Drilling Jars**—A set pair of linked, heat-treated steel bars. The jars may be attached to a wireline sampling string incorporating a split spoon or other impact sampler. The jars are used to drive the sampler into the soil ahead of the bottom of the borehole, such as in cable tool drilling.

5. RESPONSIBILITIES

5.1 Procedure Responsibility

The Geosciences Discipline Lead is responsible for the development, maintenance, and revision of this procedure. Any questions, comments, or suggestions regarding this technical SOP should be directed to the Geosciences Discipline Lead. The Geosciences Discipline Lead's location and associated contact information can be found on the Shaw Group intranet site, ShawNet.

5.2 Project Responsibility

Employees conducting subsurface soil sampling while drilling, or any portion thereof, are responsible for meeting the requirements of this procedure. Employees conducting technical review or oversight of such efforts are also responsible for following appropriate portions of this SOP. Project participants are responsible for documenting information in sufficient detail to provide objective documentation (forms, calculations, reports, etc.) that the requirements of this SOP have been met. Such documentation shall be retained as project records.

6. PROCEDURES (TECHNICAL REQUIREMENTS AND STANDARDS)

This section addresses the process and procedures involved with subsurface soil sampling while drilling. Proper subsurface soil sampling procedures are necessary to ensure the quality and integrity of the samples.

The details within this SOP should be used in conjunction with project-specific work plans. The project work plans will generally provide the following information:

- Sample collection objectives

- Anticipated locations of soil borings and target horizons or depths of soil samples to be collected
- Numbers and volumes of samples to be collected
- Types of chemical analyses to be conducted for the samples
- Specific quality control (QC) procedures and sampling required
- Any additional subsurface soil boring sampling requirements or procedures beyond those covered in this SOP, as necessary

Many different methods may be used for subsurface soil sample collection during drilling. Refer to ASTM D 6169-98 for guidance for the selection of soil sampling devices used with drill rigs. This SOP focuses on the two most common methods of soil sample collection: split-spoon sampling and Shelby tube sampling. At a minimum, the basic procedures outlined below for these two subsurface soil sampling methods will be followed.

6.1 General Sampling Considerations

The two subsurface soil sampling methods covered in this SOP, split-spoon and Shelby tube, are commonly used in conjunction with hollow stem auger, air rotary, and dual tube percussion drilling methods. Split-spoon or Shelby tube sampling may also be conducted when drilling with mud rotary methods; however, when using this drilling method the samples are not generally used for chemical analyses. This is because the samples may become invaded or chemically altered when they are tripped through the drilling mud during sample retrieval. In addition, loose unconsolidated soils may also literally wash out of the samplers when they are tripped through the mud column.

The procedures described in this SOP should be used in conjunction with the SOP for the specific drilling method used at the site. The drilling method SOPs are listed on the Insider. Included in these drilling method SOPs are specific drilling requirements related to subsurface soil sampling. These also include, but are not limited to, site clearance, site preparation, and health and safety requirements. Consequently, this SOP, the SOP for the specific drilling method to be used at the site, and the project work plans should be reviewed together before the initiation of drilling and sampling.

6.2 Split-Spoon Sampling

Split-spoon samples for chemical analysis are usually obtained in brass, plastic, or stainless steel sleeves. The types, dimensions, and number of sleeves to be used, along with the length and type of sampler, should be stated in the project work plans. The split-spoon sampler, lined with the appropriate sleeves, is connected to the drill rod string or a wireline sampling string and is driven by a drive hammer (140 or 340 pound, depending on the size of the sampler) or drilling jars into the undisturbed soil ahead of the bottom of the borehole. The project-specific procedure for collecting and preserving samples from the split-spoon sampler should be outlined in the project work plans. The basic standard procedure for split-spoon sampling is as follows:

1. Calibrate all field analytical and health and safety monitoring equipment according to the instrument manufacturer's specifications. Calibration results must be recorded on the appropriate form(s) as specified by the project work plan or health and safety plan. Instruments that cannot be calibrated according to the manufacturer's specifications must be removed from service and tagged.

2. Wear the appropriate personal protective equipment as specified in the project work plan or health and safety plan. Personal protection will typically include the following, at a minimum: hard hat, safety glasses, gloves, steel-toed boots, hearing protection, and coveralls.

3. Between each sampling location and prior to each sampling run, decontaminate the sampler, sleeves, and other sampling equipment according to applicable Shaw- and/or project-specific procedures.

4. Drill or advance the borehole to the desired depth or target horizon where the sampling run is to begin. During drilling, monitor vapors in the breathing zone according to the project work plan and health and safety plan.

5. When the desired sampling depth or target horizon is reached, remove the drill bit or plug from inside the drive casing or augers. Check the bottom depth with a tape to measure for the presence of "flowing sands" or slough inside the auger, casing, or borehole.

6. Insert the sleeves into the split-spoon sampler, connect the halves, and screw together the rear threaded collar and front drive shoe. Attach the split-spoon sampler to the bottom end of the drill rod string or wireline sampling string. Set up and attach the specified-weight hammer, if used.

7. Drive the sampler into the soil at the bottom of the borehole. Record the type of sampler assembly and hammer weight on the appropriate form(s) (an example Visual Classification of Soil Form [i.e., field log] is included as an attachment to this SOP), as specified in the project work plans. To minimize off-gassing of the volatiles, the sampler should not be driven until the sampling team is ready to process the sample.

8. When conducting penetration testing, observe and record on the appropriate form the number of hammer blows as described in appropriate Shaw- and/or project-specific procedures.

9. Pull the drill rod or wireline sampling string up from the bottom of the borehole and remove the sampler.

10. Remove the drive shoe and rear collar from the sampler and open the split barrel.

11. Remove the sleeves one at a time, starting with the sleeve adjoining the drive shoe. Observe and record the amount of sample recovery on the appropriate form per applicable Shaw procedures. Any observed field problems associated with the sampling attempt (e.g., refusal) or lack of recovery should be noted on the appropriate form. Log the sample in accordance with applicable Shaw and/or project-specific requirements.

12. Select the sleeve(s) to be submitted for laboratory analysis. Sample sleeve selection should be based on five factors: (1) judgment that the sample represents relatively undisturbed intact material, not slough; (2) proximity to the drive shoe; (3) minimal exposure to air; (4) lithology; and (5) obvious evidence of contamination. The project work plans should specify which sample sleeves will be submitted for specific analyses and confirm the selection factor(s).

13. Place Teflon™ film over each end of sleeves to be submitted for chemical analysis, and seal each end with plastic end caps. Do not use any type of tape to seal the cap, because tape causes a toluene interference. All samples should be individually stored in resealable plastic bags. Note: Additional project-specific sample preparation steps or modifications may be required as stated in the project work plans.

14. Appropriately label and number each sleeve to be submitted for analysis. The label will be filled out using waterproof ink and may contain the following information:

    – Project number
    – Boring number
    – Sample number
    – Bottom depth of sleeve
    – Date and time of sample collection

- Parameters of analysis
- Sampler's initials

15. Document the sampling event on the appropriate form(s), as specified in the project work plans. The information listed on the form should, at a minimum, include the following:
    - Project name and number
    - Date and time of the sampling event
    - Drilling and sampling methods used – specify sample type
    - Sample number
    - Sample location
    - Boring number
    - Sample depth interval
    - Sample description (type of matrix)
    - Weather conditions
    - Unusual events
    - Signature or initials of the sampler
16. Appropriately preserve, package, handle, and ship the sample in accordance with applicable Shaw and/or project-specific procedures. The samples shall also be maintained under custody. Samples stored on site will be subject to the provisions of applicable Shaw procedures and/or project work plans. However, all reasonable attempts should be made to ship samples on the date they are collected.
17. One of the sample sleeves may also be utilized for lithologic logging. This sleeve may not then be retained for chemical analysis, as soil must be removed from the sleeve to effectively describe the soils/lithology and compile the lithologic log.
18. Where headspace organic vapor screening is required by the project work plans, remove the soil from one of the remaining sleeves and place in a seam-sealing, polyethylene bag. Place the bag in the sunlight (warm) for at least five minutes, then using an organic vapor probe (portable photoionization detector, flame ionization detector, or other appropriate instrument), monitor the soil headspace for organic vapors. Record the reading on the appropriate form(s) specified in the project work plans.
19. Repeat this sampling procedure at the intervals specified in the project work plans, and/or at suspected significant lithology changes until the bottom of the borehole is reached and/or the last sample is collected.

6.3 Thin-Walled or Shelby Tube Sampling

A thin-walled tube, or Shelby tube sampler may be used to collect relatively undisturbed soil samples. The project-specific procedure for collecting soil samples using a Shelby tube sampler should be outlined in the project work plans. The basic or standard procedure for Shelby tube sampling is described in the following text.

1. Calibrate all field analytical and health and safety monitoring equipment as discussed in Section 6.2, step 1.
2. Wear the appropriate personal protective equipment as described in Section 6.2, step 2.

3. Between each sampling location and prior to each sampling run, decontaminate the sampler and other sampling equipment according to applicable Shaw- and/or project-specific procedures.

4. Drill or advance the borehole to the desired depth or target horizon where the sampling run is to begin. While drilling, monitor the breathing zone according to the project work plans and health and safety plan.

5. Once the desired sampling depth or target horizon is reached, check the bottom depth with a tape to measure for the presence of "flowing sands" or slough inside the auger, casing, or borehole. Then connect the sampling tube to the drill rod string and advance the tube to the bottom of the boring. Then push the tube about 2 to 2.5 feet into the soil with a continuous, rapid motion without impact or twisting. If Osterberg, Pitcher, or Dennison samplers are used, follow the manufacturers' instructions for advancement of the sampler.

6. Pull the drill rod string up from the bottom of the borehole and remove the sampling tube from the string. Observe and record the amount of sample recovery and any associated problems as discussed in Section 6.2, step 11.

7. Place Teflon™ film over each end of the tube if it is to be submitted for chemical analysis and seal the ends with plastic end caps. With a waterproof marker, write a "T" for top on the leading end and a "B" for bottom on the trailing end of the tube. Note: Additional project-specific sample preparation steps or modifications may be required, as stated in the project work plans.

8. Appropriately label and number the tube as described in Section 6.2, step 14.

9. Document the sampling event on the appropriate form(s), as discussed in Section 6.2, step 15.

10. Appropriately preserve, package, handle, and ship the sample in accordance with applicable Shaw- and/or project-specific procedures. The samples shall also be maintained under custody. Samples stored on site will be subject to the provisions of applicable Shaw procedures and/or project work plans. However, all reasonable attempts should be made to ship samples on the date they are collected.

11. Repeat this sampling procedure at the intervals specified in the project work plans until the bottom of the borehole is reached and/or the last sample is collected.

Records generated as a result of this SOP will be controlled and maintained in the project record files.

7. ATTACHMENTS

None.

8. FORMS

Example Visual Classification of Soils Form (Field Log)

Shaw® Shaw E & I

Example
Visual Classification of Soils (Field Log)

PROJECT NUMBER:	PROJECT NAME:	
BORING NUMBER:	COORDINATES:	DATE:
ELEVATION:	GWL: Depth Date/Time	DATE STARTED:
ENGINEER/GEOLOGIST:	Depth Date/Time	DATE COMPLETED:
DRILLING METHODS:		PAGE: OF

DEPTH ( )	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER ( )	RECOVERY ( )	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	WELL CONSTRUCTION	REMARKS

NOTES:

Drilling Contractor: _____

Drilling Equipment: _____

Driller: _____

_____

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STANDARD OPERATING PROCEDURE

Subject: Standards for Direct Push Groundwater Sampling

1. PURPOSE

This procedure provides the standard practice for direct push groundwater sampling. The procedure provides the minimum required steps and quality checks that employees and subcontractors are to follow when performing the subject task.

This procedure may also contain guidance for recommended or suggested practice that is based upon collective professional experience. Recommended or suggested practice goes beyond the minimum requirements of the procedure and should be implemented when appropriate.

2. SCOPE AND RELATED STANDARDS

Geosciences Standard Operating Procedure (SOP) EI-GS009 describes standards for direct push groundwater sampling and discusses how such sampling will be conducted and documented for projects executed by Shaw Environmental & Infrastructure Inc. (Shaw E & I). Responsibilities of individuals performing the work are also detailed. Additional project-specific requirements for direct push groundwater sampling may be developed, as necessary, to supplement this procedure and to address project-specific conditions and/or objectives.

This SOP covers requirements for basic collection of groundwater samples from direct push temporary installations (such as the Hydropunch® system). It describes equipment, procedures, and aspects of quality control. The following are some manners of collecting groundwater samples that are not covered specifically in this SOP:

- The use of driven-point well systems that do not protect (enclose) the well screen during installation.
- The use of specialized closed-chamber devices such as the BAT® system (www.bat-gms.com) or SimulProbe® (www.besstinc.com).
- The use of driven devices that contain built-in pumping or testing systems.

Individuals needing assistance planning or conducting direct push groundwater sampling or these other types of sampling may consult internal Shaw E & I technical listings for experts or may contact the Geosciences Discipline Lead (see Section 5.1).

3. REFERENCES (STANDARD INDUSTRY PRACTICES)

The most current versions of the following references are useful for planning and implementing direct push groundwater sampling activities:

ASTM D 6001	Standard Guide for Direct-Push Water Sampling for Geoenvironmental Investigations
ASTM D 5730	Guide to Site Characterization for Environmental Purposes with Emphasis on Soil, Rock, the Vadose Zone, and Ground Water
ASTM D 4448	Guide for Sampling Groundwater Monitoring Wells

ASTM D 4750 Test Method for Determining Subsurface Liquid Levels in a Borehole or Monitoring Well (Observation Well)

QED Environmental Systems, Inc. http://www.qedenv.com/sales/hydropunch.html

Geoprobe Systems, Inc. http://www.geoprobe.com

USEPA Clu-in. http://fate.clu-in.org/direct_push/dpgroundwater.asp

4. DEFINITIONS

The following definitions are applicable to direct push groundwater sampling and this SOP:

- **Direct Push**—The creation of a boring by the displacement of soil without cutting or grinding, and without the production of mechanically altered soil (cuttings) at the ground surface. In direct push methods, soil is displaced, primarily laterally, as a pipe or rod is forced vertically downward, creating a cylindrical space (i.e., a boring). Energy to create the boring is generated by a "direct push rig" and may use constant pressure (e.g., hydraulically-powered), vibration, or other means.
- **Geoprobe**—Geoprobe® is a registered trademark of Geoprobe Systems, Inc. (www.geoprobe.com). The term *geoprobe* is informally used to refer to any small-diameter push-coring tool that is operated from a small vehicle and is used for site characterization (typically soils). Geoprobe Screen Point 15 and Screen Point 16 Systems are similar to the Hydropunch® II system (see below) and are considered suitable for use by this SOP.
- **Hydropunch**—Hydropunch® I and II are registered products of QED Environmental Systems, Inc. (www.qedenv.com). The term *hydropunch* is informally used to refer to any short to medium-length small-diameter, protected well screen system that is driven (pushed) to depth and then exposed to soil material and pore fluids by retraction of a protective sleeve, without regard to manufacturer, trademark, or registered name. The Hydropunch® I and Hydropunch® II systems are considered suitable for use by this SOP.
- **Well Screen**—A filtering device that is designed to retain soil, earthen material, or artificial sand pack on one side (outside) and permit the flow of water or other subsurface fluid into a void space on the other side (inside). A well screen is nearly always rigid and cylindrical.
- **Protected Screen**—A well screen that is encased within another material or system as it is emplaced and becomes exposed to soil materials and pore fluids only when a target depth has been reached and the protective device has been retracted or removed. The Hydropunch® and Geoprobe® Screen Point systems utilize protective covers, which are left in place until the target depth has been reached, and are then lifted upward, exposing the well screen to adjacent soil material and pore fluids.
- **Unprotected Screen**—A well screen that is in contact at all times during use with soil materials and pore fluids. The most common unprotected screen is a driven well point.

5. RESPONSIBILITIES

5.1 Procedure Responsibility

The Geosciences Discipline Lead is responsible for the development, maintenance, and revision of this procedure. Any questions, comments, or suggestions regarding this technical SOP should be directed to the Geosciences Discipline Lead. The Geosciences Discipline Lead's location and associated contact information can be found on the Shaw Group intranet site, ShawNet.

5.2 Project Responsibility

Employees planning or conducting direct push groundwater sampling are responsible for meeting the requirements of this procedure. Employees conducting technical review or oversight of direct push groundwater sampling are also responsible for appropriate portions of this SOP. Project participants are responsible for recording information in sufficient detail to provide objective documentation (i.e., field notes, forms, reports, etc.) that the requirements of this SOP have been met. Such documentation shall be retained as project records.

6. PROCEDURES (TECHNICAL REQUIREMENTS)

This section presents information on design issues, planning and preparation, basic procedures, documentation requirements, and technical review requirements for direct push groundwater sampling. Contract vendors generally conduct the pushing or driving of the sampling equipment to the desired sampling depth and associated collection of groundwater samples on Shaw E & I projects. A rig geologist is also present at each sampling event to oversee sampling activities and to ensure that samples are collected from the proper depths and placed in the correct containers following appropriate protocols. Contract vendors will require a detailed scope of work and adequate oversight.

6.1 Design Issues Likely to Affect Sample Quality or Collection

Sample quality is easily compromised by poorly selected or applied sampling techniques. Common and avoidable problems include the following:

- Use of Unprotected Screens. Use of an unprotected screen creates a likelihood that pore fluid and possibly soil particles that are not from the target depth (final depth) of the screen will pass through the well screen and into the well chamber and be included in the sample. This creates uncertainty as to how representative the sample is of the target horizon. This SOP recommends against the use of unprotected screens.

- Excessive Sediment or Particulate Matter within Well Screen. The presence of sediment within samples may bias analytical result, hamper laboratory quality control, or have other deleterious effects. The presence of sediment from an aquifer that is contaminated with an organic contaminant may positively bias (i.e., increase) the concentration results from analysis of organic chemicals, as organic chemicals are typically sorbed onto sediment. The presence of sediment or other particulate matter may also positively bias the concentration results from analysis of metals. This SOP recommends that entrainment of sediment into water within the well screen and the sample be avoided as much as reasonably possible.

- Collection of samples at a Uniform Depth Interval (e.g., every five feet or every ten feet of depth) Instead of Collection at Targeted Hydrostratigraphic Horizons. Many programs have been designed for sample collection at uniform pre-set depth intervals. Though this methodology may provide useful data, a more efficient and technically sound methodology involves targeting specific hydrostratigraphic units and boundaries (interfaces) between the units that may significantly affect the transport and distribution of contaminants. Such methodology involves constructing suitable cross-sections and interpreting the distribution of hydrostratigraphic units from boring logs, cone penetrometer test curves, and/or borehole geophysical logs, and then selecting sampling locations and depths appropriately.

Direct push groundwater sampling is commonly used in unconsolidated fine-grained and sandy soils. Problems are encountered when trying to push/drive the sampler through consolidated soils, cemented soils, coble or boulder beds, rubble fill, etc. In addition, some fine-grained beds may not yield water in sufficient volumes to allow sample collection in a timely manner. Evaluation of subsurface data (e.g., boring logs, cross-sections, reports, cone penetrometer tests, borehole geophysical logs, etc.) from the site or adjacent areas may provide information relative to potential problems with direct push sampling, including if the method is viable at the site. This should be done as part of the planning phase.

6.2 Planning and Preparation

Planning for direct push groundwater sampling activities involves the following:

- Reviewing and following Shaw Procedure HS316 "Drill Rig Operations."
- Identifying sample collection objectives and exact methodologies and equipment to be used for sample collection.
- Identifying specific locations, targeted depths, and specific identification numbers for groundwater samples to be collected.
- Identifying numbers and volumes of samples to be collected.
- Specifying types of chemical analyses to be conducted for the samples.
- Listing specific quality control (QC) procedures and sampling required.
- Describing any detailed project-specific sampling requirements or procedures beyond those covered in this SOP, as necessary.
- Listing expected soil types, hydrostratigraphy, and/or formations to be encountered.
- Identifying and listing all pertinent health and safety issues and requirements, including those contained in the project-specific health and safety plan(s), relative to work activities, including site utility clearance.
- Compiling main subcontractor requirements for direct push groundwater sampling and generating the statement of work to procure subcontractor services.

The specific sampling methods to be used and detailed procedures for collecting the groundwater samples should be developed to minimize disturbance or alteration of the samples. For example, the procedures for collecting groundwater samples for VOC analysis should prescribe a methodology that minimizes the contact of the sample with air. The methods and procedures should also allow appropriate or successful sample collection with respect to the expected depth to water, total depth, and inside diameter of the temporary screen system. For example, specified pumps should have sufficient power to lift water, and any downhole equipment should be narrow enough to operate without fouling or sticking in the direct push sample tubes.

All of the above information and items should be compiled as part of a sampling plan contained within the project-specific work plans. The work plans should include detailed, project-specific direct push groundwater sampling procedures beyond the basic procedures and requirements in this SOP.

Preparation for direct push groundwater sampling activities includes the following:

- Securing all necessary site access, permitting, and plan approvals.
- Procuring the appropriate direct push sampling subcontractor.
- Completing all necessary underground utility clearance activities at each of the sampling locations; each location should be cleared according to requirements of Shaw Procedure HS308 "Underground/Overhead Utility Contact Prevention" and the project work plans.
- Briefing the rig geologist and other site personnel on specific information necessary for effective implementation of the sampling effort (e.g., sampling objectives, locations, and depths; project-specific sampling requirements and procedures; pertinent health and safety requirements; etc.).
- Verifying that project personnel have proper health and safety training.

The project manager or designee is responsible for appropriately briefing field personnel, as described above.

6.3 Basic Procedure

The basic procedure for direct push groundwater sample collection is described below. More detailed project-specific procedures, based on sampling and quality control requirements and other aspects of the actual project, should be compiled to supplement this procedure and should be presented in the project work plans.

1. Decontaminate the direct push sampling rig and associated sampling equipment, in accordance with applicable Shaw E & I SOPs and/or project-specific requirements/procedures, before mobilizing to the first sample location.

2. The driller and rig geologist should inspect the direct push rig to verify that the equipment is properly maintained, adequately decontaminated, and capable of achieving the objectives for sampling equipment advancement, groundwater sample collection, and abandonment of the boring.

3. Calibrate all field analytical and health and safety monitoring equipment according to the instrument manufacturer's specifications and/or project work plans. Calibration results must be recorded on the appropriate form(s) as specified by the project work plans or health and safety plan.

4. Wear the appropriate personal protective equipment as specified in the project work plans or health and safety plan. Personal protection will typically include the following, at a minimum: hard hat, safety glasses, gloves, steel-toed boots, hearing protection, and coveralls.

5. Make sure the location is free of underground utilities in accordance with Shaw Procedure HS308 and the project work plans.

6. Between each sampling location and prior to each sampling run, decontaminate the sampling equipment according to applicable Shaw E & I SOPs and/or project-specific procedures.

7. Push or advance the sampling device until it is at the target depth or horizon where the sample is to be collected.

8. Retract the protective sleeve upward until the length of well screen is exposed, allowing water to flow into the sampler.

9. During advancement of the sampling device and collecting of the sample, conduct appropriate health and safety measurements/monitoring as required and specified in the project work plans or health and safety plan.

10. Evaluate for the presence and sufficiency of water within the well screen. This is usually done with a small-diameter electric water-level indicator.

11. If sufficient water is present, perform any purging that is part of the required sampling protocol.

12. Collect the water sample from inside the well screen and transfer into appropriate containers in accordance with appropriate Shaw E & I SOPs and project-specific requirements. Label and number each sample container according to applicable Shaw E & I SOPs and/or the project work plans.

13. Document the sampling event on the appropriate form(s), as specified in the project work plans. The information listed on the form(s) should, at a minimum, include the following:

    - Project name and number
    - Date and time of the sampling event
    - Sampling methods used – specify sample type
    - Sample number
    - Sample location
    - Sample depth interval
    - Sample description (type of matrix)
    - Weather conditions
    - Unusual events, including lack of water or insufficient water volume in sampler
    - Signature or initials of sampler

14. Appropriately preserve, package, handle, and ship the sample in accordance with applicable Shaw E & I technical SOPs and/or project-specific procedures. The samples shall also be maintained under custody. Samples stored on site will be subject to the provisions of applicable Shaw E & I procedures and/or project requirements. All reasonable attempts should be made to ship samples on the date they are collected.

15. Perform any other downhole operations that are required prior to abandoning the hole, including removing the direct push sampling equipment from the boring.

16. Fill the boring with grout in accordance with applicable Shaw E & I SOPs and/or project-specific requirements/procedures.

6.4 Documentation

Accurate documentation of the sampling event (e.g., emplacement of the temporary screen system, development of the temporary installation, sample collection, etc.) and the sample condition are important for interpreting the quality of the analyte concentrations found within the sample, and for ensuring that various project and quality control requirements are met. Such documentation should be compiled on the appropriate forms as specified in the project work plans. In addition, some regulatory agencies may require that any boring that penetrates the water table be reported in the same manner as a monitoring well. This may necessitate generation of a well construction diagram and/or boring log. Such documentation requirements should be specified in the project work plans.

6.5 Technical Review

Direct push groundwater sampling specifications, procedures, and results (e.g., reports, logs, etc.) should undergo technical review. It is recommended that the technical reviewer also provide review/oversight of the actual field implementation of the sampling activities. This may include aiding in troubleshooting sampling problems. The technical reviewer should be an experienced senior geologist or hydrogeologist. At a minimum, the technical reviewer should be a person capable of planning and supervising direct push groundwater sampling programs. Individuals needing assistance in finding qualified technical reviewers may consult internal Shaw technical listings for experts in direct push sampling.

Any issues raised during the technical review shall be resolved between the reviewer and staff planning, conducting, or preparing results of direct push groundwater sampling activities as follows:

- Comments/issues raised relative to planning and developing detailed procedures for sampling should be resolved before mobilization and sampling commences.
- Comments/issues raised relative to results of sampling activities should be resolved before external use or submission (i.e., outside of Shaw E & I) of the results.

The technical review comments and issues, and corresponding resolution, shall be documented and filed with the project records. The records should be maintained until project closeout.

7. ATTACHMENTS

None.

8. FORMS

None.

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STANDARD OPERATING PROCEDURE

Subject: Standards for Conducting Direct Push Drilling and Soil Sampling

1. PURPOSE

This procedure provides the standard practice for direct push drilling and soil sampling. The procedure provides the minimum required steps and quality checks that employees and subcontractors are to follow when performing the subject task.

This procedure may also contain guidance for recommended or suggested practice that is based upon collective professional experience. Recommended or suggested practice goes beyond the minimum requirements of the procedure and should be implemented when appropriate.

2. SCOPE AND RELATED STANDARDS

Geosciences Standard Operating Procedure (SOP) EI-GS021 describes standards for direct push drilling and soil sampling, and discusses how such drilling and sampling will be conducted and documented for projects executed by Shaw Environmental & Infrastrucure Inc. (Shaw E & I). Responsibilities of individuals performing the work are also detailed. Additional project-specific requirements for direct push drilling and soil sampling may be developed, as necessary, to supplement this procedure and to address project-specific conditions and/or objectives.

This SOP covers requirements for collection of soil and unconsolidated materials by direct push methods primarily for laboratory or other testing and for lithologic description or analysis (logging). It describes basic equipment and procedures and addresses aspects of the process where quality must be maintained. It does not address procedures for specific brands of equipment, or for uncommon purposes of boring or sampling. Other types of soil and rock sampling while drilling are addressed in other Shaw E & I technical SOPs.

3. REFERENCES (STANDARD INDUSTRY PRACTICES)

The methodology for direct push drilling and soil sampling should follow industry standard practices. The latest revision of the following references are relevant and useful for planning and conducting direct push drilling and soil sampling:

ASTM D 6282	Direct Push Soil Sampling for Environmental Site Characterizations
ASTM D 6286	Standard Guide for Selection of Drilling Methods for Environmental Site Characterization

4. DEFINITIONS

The following definitions are applicable to direct push drilling and soil sampling and this SOP.

- **Direct push drilling**—The creation of a boring by the displacement of soil without cutting or grinding and without the production of mechanically-altered soil (cuttings) at the ground surface. In direct push drilling, soil is displaced, primarily laterally, as a pipe or rod is forced vertically downward, creating a cylindrical space (i.e. a boring). Energy to create the boring may be generated from constant pressure (e.g., hydraulically-powered), vibration, or other means.

- **Slough**—Slough is soil or other earth material that has been dislodged from its original location within the boring and displaced elsewhere within the boring (usually to the bottom). The creation

and sampling of slough should be avoided, because slough has disturbed properties and is typically of uncertain origin with respect to depth. The presence of slough also impedes proper abandonment of borings.

- **Conductor Casing**—Conductor casing is drill pipe that is extended down into the ground as a boring is advanced, to prevent sidewall material from falling into the borehole and covering the in-place soil material that constitutes the bottom of the boring. Conductor casing is usually removed when a borehole is being abandoned.

- **Sample**—A mass of soil or earthen material that has been removed from the boring from a known depth, has had little internal disturbance, and may be considered representative of the in-situ earthen material from a known depth and representative with respect to the intended tests or properties of interest.

5. RESPONSIBILITIES

5.1 Procedure Responsibility

The Geosciences Discipline Lead is responsible for the development, maintenance, and revision of this procedure. Any questions, comments, or suggestions regarding this technical SOP should be directed to the Geosciences Discipline Lead. The Geosciences Discipline Lead's location and associated contact information can be found on the Shaw Group intranet site, ShawNet.

5.2 Project Responsibility

Employees planning or conducting direct push drilling and soil sampling, or any portion thereof, are responsible for meeting the requirements of this procedure. Employees conducting technical review or oversight of direct push drilling and soil sampling are also responsible for following appropriate portions of this SOP. Project participants are responsible for recording information in sufficient detail to provide objective documentation (field notes, logs, forms, reports, etc.) that the requirements of this SOP have been met. Such documentation shall be retained as project records.

6. PROCEDURES (TECHNICAL REQUIREMENTS)

This section addresses basic requirements and procedures involved with direct push drilling and soil sampling. This section includes information on selection of methods and equipment, planning and preparation requirements, health and safety requirements, drilling and sampling procedures, and key practices for ensuring quality.

Proper drilling and subsurface soil sampling procedures are necessary to ensure the quality and integrity of the samples. The details within this SOP should be used in conjunction with project-specific work plans. The project work plans should generally provide the following information:

- Specific direct push drilling and soil sampling methodologies and equipment to be employed
- Sample collection objectives
- Anticipated locations and total depths of soil borings and target horizons or depths of soil samples to be collected
- Numbers and volumes of samples to be collected
- Types of chemical analyses to be conducted for the samples
- Specific quality control (QC) procedures and sampling requirements

- Detailed direct push drilling and subsurface soil sampling requirements or procedures based upon site-specific conditions and project-specific objectives/requirements

6.1 Selection of Methods and Equipment

The practice of direct push drilling and soil sampling involves numerous variations in methodology and types of equipment. There are few industry-wide standards for direct push drilling and soil boring. Key aspects of the variations in direct push drilling and sampling are as follows:

- **The use of single-wall or dual-wall sampling systems**. Single-wall systems generally provide lower-quality sampling and higher rates of production than dual-wall systems. Single-wall systems can typically be advanced with lower energy sources (i.e., to greater depth) than dual-wall systems because they have smaller area and hence encounter less sidewall friction and tip resistance during advance.

- **Open-hole or cased boring**. *This SOP recommends that borings always be advanced through or with a conductor casing*.

- **Open-barrel or closed (sealed)-barrel sampler**. Open-barrel samplers are open at the bottom at all times, and may fill with slough, lose sample material as they are retrieved, or contribute to or be subject to cross-contamination. Closed-barrel samplers are closed at the bottom until being mechanically opened at a target depth. Closed-barrel samplers reduce the potential for sampling of slough or cross-contamination of the sample.

- **Liner or inner-barrel material**. Inner barrel/sampler tubes should be selected based on the need to see or access samples for lithologic evaluation and the need to perform chemical or other analytical testing. Use of lexan or other see-through materials can be beneficial in identifying soil type or visual indications of contamination (such as petroleum saturation). Some liners, such as lexan, can be quickly cut to select certain sample intervals for testing, and the sample may be retained, shipped, and stored directly in the liner. Liners or sample barrel material should generally not be made of materials that include any of the chemical species that are sought during analysis.

- **Energy source for making the boring**. Energy sources may be static or dynamic, and may include vibratory or sonic systems, hydraulic systems, percussion (hammer) systems, or even rotational systems.

- **Energy source for removing the sampler**. Energy sources may be static or dynamic, and are generally one of the following: hydraulically-lifted rod systems, winch and wire rope systems, or percussive systems (backpounding). This SOP recommends against backpounding as a means of removing samplers, as it tends to disturb samples.

- **Use of checkball or open-top tubes for collection of soil**. Checkball systems prevent fluids that are within the sampling barrel, above the sample, from flowing down into the barrel as the sampler is retrieved. Checkball systems are mostly used when sampling granular soils beneath the water table, to minimize the potential for water to dislodge or alter sample material as the barrel is retrieved.

- **Use of catchers or retainers**. Catchers are used to help retain loose soils within the sampling barrel as it is retrieved. Catchers are most commonly used when sampling granular soils beneath the water table, with variable success.

6.2 Planning and Preparation

Planning for direct push drilling and soil sampling activities involves the following:

- Identifying drilling and sample collection objectives and exact methodologies and equipment to be used for sample collection
- Identifying specific drilling and sampling locations, targeted depths, and specific identification numbers of soil samples to be collected
- Identifying numbers and volumes of samples to be collected
- Specifying types of chemical analyses to be conducted for the samples
- Listing specific quality control (QC) procedures and sampling requirements
- Describing any detailed project-specific sampling requirements or procedures beyond those covered in this SOP, as necessary
- Listing expected soil types, hydrostratigraphy, and/or formations to be encountered (if known)
- Identifying and listing all pertinent health and safety issues and requirements, including those contained in the project-specific health and safety plan(s), relative to work activities (including site utility clearance)
- Compiling main subcontractor requirements for direct push drilling and soil sampling and generating the statement of work to procure subcontractor services

All of the above information and items should be compiled as part of a sampling plan contained within the project work plans. This plan includes detailed, project-specific direct push drilling and soil sampling procedures beyond the basic procedures and requirements in this SOP.

Preparation for direct push drilling and soil sampling activities includes the following:

- Securing all necessary site access, permitting, and plan approvals
- Procuring the appropriate direct push drilling and sampling subcontractor
- Completing all necessary underground utility clearance activities at each of the sampling locations; each location should be cleared according to requirements in appropriate Shaw E & I technical SOPs and the project work plans.
- Briefing the rig geologist, subcontractor personnel, and other site personnel on specific information necessary for effective implementation of the sampling effort (e.g., sampling objectives, locations and depths, project-specific sampling requirements and procedures, pertinent health and safety requirements, etc.)
- Verifying that job personnel have proper health and safety training

The Project Manager, or designee, is responsible for appropriately briefing field personnel, as described above.

6.3 Health and Safety Requirements

Prior to initiating drilling and sampling activities, applicable Shaw E & I and project-specific safety requirements must be reviewed by Shaw E & I site personnel and subcontractors. This review is conducted to familiarize these individuals with specific hazards associated with the site and drilling activities, as well as with health and safety procedures associated with the operation and maintenance of drilling equipment. Such information may be found in the project health and safety

plan and other applicable Shaw E & I policies and procedures, such as HS316, *Drilling Operations*, and HS-308, *Underground/Overhead Utility Contact Prevention*. Additional health and safety requirements include the following:

- Tailgate Safety Meetings should be held in the manner and frequency stated in the project health and safety plan. All Shaw E & I and subcontractor personnel at the site should have appropriate training and qualifications as specified by the project health and safety plan. Documentation should be kept readily available in the project files on site.
- During drilling, all personnel within the exclusion zone should pay close attention to all rig operations. Pushed or driven drill tools can catch or snag loose clothing, causing serious injury.
- Clear communication signals must be established with the drilling crew, since verbal communication may not be heard during the drilling process.
- The entire crew should be made aware to inform the rig geologist when any unforeseen hazard arises or when anyone is approaching the exclusion zone.

6.4 Drilling and Sampling Requirements/Procedures

This SOP cannot present a single, detailed and specific procedure that is applicable to all methods and equipment that are available (Section 6.1) or to the specific sampling objectives of a specific project. An example procedure for direct push drilling and soil sample collection is shown in Attachment 1. The example procedure may be supplemented or customized to provide project-specific requirements and procedures.

Sample quality is easily compromised by poorly selected samples or haphazard drilling and sampling technique. Common problems and suggested solutions include the following:

- Generation of excess slough. Excess sloughing occurs when conductor casing is not used, when soil materials fall out of the sample barrel as it is retrieved, and when soil at or near the ground surface falls into the boring. Slough is excess when the amount that is present hinders the collection of sufficient representative sample volume or mass for the required testing or lithologic analysis.
- Collection of slough for testing or logging. This occurs when a large volume of slough is present in the boring bottom at the time the sampler is emplaced and driven into soil. Because slough is disturbed and from unknown depth, it is unsuitable for logging or testing.
- Disturbance (negatively-biasing) of samples for analysis of Volatile Organic Compounds (VOCs). The act of driving a sampling tube into soil causes compression and some heating of the soil, and can create macroscopic void space, i.e., a microannulus between the soil and sampling tube. Heating, compression of soil, and creation of void space contribute to the migration of gaseous fluids as well as the partitioning of VOCs, such as gasoline or solvent vapors. Although some heating, compression, and formation of microannular space are unavoidable, care should be taken to minimize these phenomena to the extent that is reasonably possible. Some sampling devices and methods are more suitable for analysis of samples for VOCs than others.
- Improper abandonment of borings. Excess slough or caving (the dislodgement and falling of a significant volume of sidewall material) hinders the proper abandonment of a boring. Where this occurs, the borehole should be cleaned out prior to grouting. A tremmie pipe should be used to conduct grout to the bottom of the borehole if a conductor casing is not in place prior to and during grouting.

Additional key practices that will ensure the quality of the samples collected and proper/efficient abandonment of the borings, include the following:

- Drill with a Conductor Casing. Various equipment, systems, and methods exist for direct push drilling and soil sampling. Some systems are open-hole (i.e., do not use conductor casing), hence borings made with these systems are at high risk for slough-related difficulties in logging, sampling, and abandonment. Most systems have provisions for driving down a conductor casing, to keep the boring open and relatively free of slough when the sampler or a plug or drive-point is not present at the bottom of the casing system. **This SOP recommends the use of a method of direct push drilling that integrally includes the advancement of conductor casing as the boring is made**, and further recommends that the conductor casing remain in place during sampling and into the abandonment process.

- Measure the Boring Depth. A weighted tape should be used to verify the depth of the boring within the conductor casing. Measurement should be made with reference to the ground surface. It is important to measure depth at the start of sampling intervals and at total depth (TD) of the boring.

- Clean-Out Excessive Slough. If slough is present, it should be removed by forcing a sampler into it and retrieving and emptying the sampler of slough.

- Identify Slough and Avoid Sampling it or Logging it as In Situ Material. Slough is generally easy to identify based on jumbled internal textures, lighter density, macroscopic and unmineralized void spaces, greater softness and malleability, and decreased cohesion, as compared to in situ material that has not been dislodged prior to the sampling process.

- Grout Through a Conductor Casing. Grouting through a conductor casing prevents any significant accumulation of slough in the boring and ensures that grout will be the predominant material in the borehole, thereby minimizing any potential for vertical migration of fluids in the filled borespace. This minimizes potential liability.

6.5 Documentation

Accurate documentation of the boring, sampling, and abandonment activities is important for interpreting sample results, interpreting boring conditions and lithologic information, and conceptually reconstructing events. Appropriate forms (including boring logs) should be completed in accordance with appropriate Shaw E & I technical SOPs and project-specific requirements/procedures.

6.6 Technical Review

All direct push drilling and soil sampling specifications, procedures, and results (e.g., reports, forms, etc.) should undergo technical review. It is recommended that the technical reviewer also provide review/oversight of the actual field implementation of direct push drilling and soil sampling activities. This should include aiding in troubleshooting for drilling and sampling problems. The technical reviewer should be an experienced senior geologist or hydrogeologist. At a minimum, the technical reviewer should be a person capable of planning and supervising direct push drilling and associated sampling and well installation programs. Individuals needing assistance in finding qualified technical reviewers may consult internal Shaw technical listings for experts in drilling or direct push drilling and sampling.

Any issues raised during the technical review shall be resolved between the reviewer and the staff planning, conducting, or preparing results of direct push drilling and soil sampling activities, as follows:

- Comments/issues that arise relative to planning and developing detailed procedures for direct push drilling and soil sampling should be resolved before mobilization and drilling commences.

- Comments/issues that arise relative to the results of drilling and sampling activities should be resolved before external (i.e., outside of Shaw E & I) use or submission of the results.

The technical review comments and issues, and corresponding resolution, shall be documented and filed with the project records. Such records should be maintained until project closeout.

7. ATTACHMENTS

- Attachment 1, Example Direct Push Drilling and Soil Sampling Procedure

8. FORMS

None.

Attachment 1
Example Direct Push Drilling and Soil Sampling Procedure

The following procedure is provided as an example. It should be customized based on project/site-specific equipment, methodology, and sampling and quality control requirements. This procedure is written for a direct push drilling rig that uses a small-diameter conductor casing with a 3-foot long inner wireline sample barrel (with a 3-foot long acrylic liner) connected to the bottom of the casing. The casing and associated sample barrel are driven, pushed, or vibrated into the ground in 3-foot increments. Soil samples are collected into the acrylic sample tubes as the conductor casing and sample barrel are advanced into the formation. The samples inside the liner and sample barrel are then retrieved with a wireline, leaving the conductor casing in place. Soil samples are thus continuously collected until the total depth of the boring is reached. The example procedure consists of the following:

1. Decontaminate the direct push sampling rig and associated sampling equipment before mobilizing to the first sample location, in accordance with applicable Shaw E & I technical SOPs and/or project-specific requirements/procedures.

2. Inspect the direct push rig to make sure the equipment is properly maintained, adequately decontaminated, and determined capable of achieving the objectives for drilling (equipment advancement), sample collection, and abandonment of the boring (to be done by the driller and rig geologist).

3. Calibrate all field analytical and health and safety monitoring equipment according to the instrument manufacturer's specifications and/or project work plans. Calibration results must be recorded on the appropriate form(s) as specified by the project work plans or health and safety plan.

4. Wear the appropriate personal protective equipment, as specified in the project work plans or health and safety plan. Personal protection will typically include, at a minimum, a hard hat, safety glasses, gloves, steel-toed boots, hearing protection, and coveralls.

5. Remove the surface cover (e.g., concrete, asphalt, etc.) at the drilling/sampling location according to the project work plans.

6. Once the direct push rig is sited at the sampling location, make sure the location is free of underground utilities, as per the project work plans and Shaw Policy and Procedure HS308, *Underground/Overhead Utility Contact Prevention*. Manually probe or excavate near-surface soils (as required) as an additional step to avoid underground utilities or structures.

7. Learn the drilling equipment heights and dimensions necessary to independently determine the boring or sampler depth while observing the work (to be done by the rig geologist). Such information includes lengths of rods, casing, barrels, and other in-ground equipment; the length of strokes or advances; and the height from ground surface to "full down" stroke of the direct push rig.

8. Between each sampling location and prior to each sampling run, decontaminate the sampling equipment according to applicable Shaw E & I technical SOPs and/or project-specific procedures.

9. Inform the driller of the expected total depth, the first and expected additional sampling depths, the likelihood of encountering groundwater or NAPL, and any contingency or opportunistic decisions that are anticipated (such as contingency-sampling or increased total depth).

10. Record the type of sampler assembly on the appropriate form(s) as specified in appropriate Shaw E & I technical SOPs or the project work plans. To minimize off-gassing of volatiles, the sampler should not be advanced/pushed until the sampling team is ready to process the sample.

11. Commence drilling and sample collection by advancing the conductor casing and associated sample barrel (with liner) for the first 3-foot increment.

12. Pull the wireline sampling string up from the bottom of the borehole and remove the sample barrel. Make sure that each sample barrel is retrieved as quickly and smoothly as possible. Record the depth interval for each sample drive as the sample barrel is being retrieved.

13. Remove the acrylic liner containing the soil sample from the sample barrel.

14. Observe and record the amount of sample recovery on the appropriate form(s), according to applicable Shaw E & I procedures and/or the project work plans. Any observed field problems associated with the sampling attempt (e.g., refusal) or lack of recovery should be noted on the appropriate form.

15. Select the appropriate portion of the liner containing the sample to be cut and be submitted for laboratory analysis. Such selection should be based on the following factors: (1) judgment that the sample represents relatively undisturbed intact material, not slough; (2) volume/length of sample required for analysis; (3) minimal exposure to air; (4) lithology; and (5) obvious evidence of contamination. The project work plans should specify the volume/length of sample to be submitted for specific analyses and confirm the selection factor(s).

16. Place Teflon™ film over each end of the liner containing the samples to be submitted for chemical analysis and seal each end with plastic end caps. Do not use any type of tape to seal the cap, because tape causes a toluene interference. All samples should be individually stored in resealable plastic bags. Note: Additional project-specific sample preparation steps or modifications may be required as stated in the project work plans.

17. Appropriately label and number each sample to be submitted for analysis according to applicable Shaw E & I technical SOPs and the project work plans. The label will be filled out using waterproof ink and may contain, at a minimum, the following information:

    – Project number
    – Boring number
    – Sample number
    – Bottom depth of sleeve
    – Date and time of sample collection
    – Parameters of analysis
    – Sampler's initials

18. Document the sampling event on the appropriate form(s), as specified in the project work plans. The information listed on the form(s) should, at a minimum, include the following:

    – Project name and number
    – Date and time of the sampling event
    – Sampling methods used – specify sample type
    – Sample number
    – Sample location
    – Sample depth interval
    – Sample description (type of matrix)
    – Weather conditions
    – Unusual events, including lack of water or insufficient water volume in sampler
    – Signature or initials of sampler

19. Appropriately preserve, package, handle, and ship the sample in accordance with applicable Shaw E & I technical SOPs and/or project-specific procedures. The samples shall also be maintained under custody. Samples stored on site will be subject to the provisions of applicable Shaw E & I procedures and/or project requirements. All reasonable attempts should be made to ship samples on the date they are collected.

20. Cut/split the remaining acrylic liner to expose the remaining soils for logging. The descriptions of the soil and preparation of a boring log should follow applicable Shaw E & I technical SOPs and project-specific requirements/procedures. The soil boring log should include the following information:

    – Borehole location
    – Name of the drilling company and driller
    – Dates and times when drilling began and when it was completed
    – Lithologic data and descriptions from soil samples
    – Sampling depths and recovery of soil samples

21. Continue to advance the borehole in 3-foot increments and collect soil samples to the total depth. As the borehole is advanced, the rig geologist will generally do the following:

    – Observe and monitor rig operations
    – Conduct all health and safety monitoring and sampling and supervise health and safety compliance
    – Prepare a boring log from cuttings or soil samples according to applicable Shaw E & I technical SOPs and project-specific requirements
    – Document drilling progress and other appropriate observations on appropriate forms
    – Supervise the collection and preparation of any soil, soil vapor, or groundwater samples

    The rig geologist should not leave the drill site while drilling operations are being conducted and the borehole is being advanced.

22. As drilling progresses, the rig geologist should observe and be in frequent communication with the driller regarding drilling operations. Conditions noted should include relative rates of penetration, flowing sands, drilling refusal, changes in equipment, etc. These conditions should be recorded on the appropriate logs and forms in accordance with applicable Shaw E & I technical SOPs and/or the project work plans. Drilling should not be allowed to progress faster than the rig geologist can adequately observe conditions, compile logs, and supervise safety and sampling activities.

23. The rig geologist should also observe the make-up and tightening of connections as additional conductor casing joints are added to the drill string. Any observed drilling problems and causes, including significant down time, should be recorded on the appropriate forms.

24. Cuttings (i.e., left over soil samples) and fluid containment during drilling should be observed and supervised by the rig geologist as per the project work plans.

25. Periodically measure the boring depth with a weighted tape to verify its depth. If it cannot be directly measured, then count rods or pipe lengths that have been inserted into the ground or take other action to verify depth (in a manner that is independent of asking the driller the boring depth).

26. If the borehole is to be abandoned once drilling and sampling is completed, follow procedures outlined in applicable Shaw E & I technical SOPs and the project work plans. The abandonment will be supervised by the rig geologist. If the borehole contains slough, the slough should be removed prior to abandonment.

27. If a monitoring well is to be installed in the borehole, follow appropriate Shaw E & I technical SOPs and project-specific requirements/procedures. The well installation will be supervised by the rig geologist.

28. After drilling, sampling, and well installation or borehole abandonment is completed, lay the conductor casing down and move the rig off of the location. The rig geologist or appropriate designee will supervise demobilization/site restoration. Additional demobilization requirements/ procedures are as follows:

    – All debris generated by the drilling operation should be removed and disposed of appropriately.

    – The site should be cleaned, the ground washed as necessary, and the site conditions restored according to the project work plans.

    – All abandoned borings should be topped off and completed as specified by the project work plans. All wells should also have their surface completions finished as specified by the project work plans.

    – Any hazards remaining as a result of drilling activities should be identified and appropriate barriers and markers put in place, as specified by the project health and safety plan.

    – All soil cuttings and fluids should be properly contained, clearly labeled, and maintained in compliance with the project work plans and/or other applicable requirements.

29. Complete all appropriate forms and documentation as required in the project work plans.

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STANDARD OPERATING PROCEDURE

Subject: Standards for Soils Logging

1. PURPOSE

This procedure provides the standard practice for soils logging (the description of soils). The procedure includes the minimum required steps and quality checks that employees and subcontractors are to follow when performing the subject task.

This procedure may also contain guidance for other recommended or suggested practice that is based upon collective professional experience. Recommended practice goes beyond the minimum requirements of the procedure, and should be implemented when appropriate.

2. SCOPE

Geosciences Standard Operating Procedure (SOP) EI-GS025 describes standards for the description and field classification of engineering soils by visual-manual methods for projects executed by Shaw Environmental & Infrastructure, Inc. (Shaw E & I). It applies to soils logging for generation of boring logs, trench logs, and any other type of descriptive soil log generated by visual observation and manual tests performed in the field. This procedure does not cover all of the requirements or standards for generation and completion of boring logs. (Standards for boring log generation can be found in Shaw Procedure No. EI-GS027.) This SOP does not include nor cover the use of laboratory or field geotechnical tests to identify/classify and describe soils, although descriptions may be augmented by data from such tests, when available.

The SOP addresses technical requirements and required documentation. Responsibilities of individuals performing the work are also detailed. Additional project-specific requirements for soils logging may be developed, as necessary, to supplement this procedure and address project-specific conditions and/or objectives.

3. REFERENCES

The description and classification of soil should follow accepted industry practices. These are presented in the latest version of the following American Society for Testing and Materials (ASTM) Standards:

ASTM D 653	Standard Terminology Relating to Soil, Rock, and Contained Fluids
ASTM D 2487	Standard Test Method for Classification of Soils for Engineering Purposes
ASTM D 2488	Standard Practice for Description and Identification of Soils (Visual-Manual Procedure)

Additional reference materials that are useful for planning and conducting soils logging include the following:

- United States Army, 1997, *Field Manual (FM) 5-410, Military Soils Engineering,* Revised, June 1997. Available on line at: http://www.adtdl.army.mil/cgi-bin/atdl.dll/fm/5-410/toc.htm
- United States Bureau of Reclamation (USBR), 1998, *Engineering Geology Field Manual, Second Edition*. Available on line at: http://www.usbr.gov/pmts/geology/fieldman.htm

- United Stated Department of Agriculture (USDA), 1993, *Soil Survey Manual, Soil Conservation Service*. Available on line at: http://soils.usda.gov/procedures/ssm/main.htm
- American Geological Institute, AGI Data Sheets
- US Army Corps of Engineers, 1953, *The Unified Soil Classification System; US Army Technical Memorandum, No.3-357*.
- Compton, Robert R., 1962, *Manual of Field Geology*, John Wiley and Sons Inc.
- US Department of the Interior, 1974, *Earth Manual*, a Water Resources Technical Publication.

4. DEFINITIONS

The following definitions are applicable to the logging of soils and this SOP.

- **Clay**—Soil passing a No. 200 (75µm) sieve that can be made to exhibit plasticity (putty-like properties) within a range of water contents, and that exhibits considerable strength when air-dry. For classification, a clay is a fine-grained soil, or fine-grained portion of a soil, with a plasticity index equal to or greater than 4.
- **Coarse Grained Soils**—Soils composed of greater than 50% sand and gravel or larger sized particles.
- **Fine Grained Soils**—Soils composed of 50% or more silt and clay-sized particles.
- **Gravel**—Particles of rock that will pass through a 3-inch (75mm) sieve and be retained on a No. 4 (4.75mm) sieve.
- **Sand**—Particles of rock that will pass a No. 4 (4.75mm) sieve and be retained on a No. 200 (75µm) sieve.
- **Silt**—Soil passing a No. 200 (75µm) sieve that is nonplastic or very slightly plastic and that exhibits little or no strength when air dry. For classification, a silt is a fine-grained soil, or the fine-grained portion of a soil, with a plasticity index less than 4.
- **Soil**—All unconsolidated materials above bedrock.
- **Standard Penetration Test**—ASTM D 1586 method for the collection of soil samples.
- **USCS**—Unified Soil Classification System.

5. RESPONSIBILITIES

5.1 Procedure Responsibility

The Geosciences Discipline Lead is responsible for the development, maintenance, and revision of this procedure. Any questions, comments, or suggestions regarding this technical SOP should be directed to the Geosciences Discipline Lead. The Geosciences Discipline Lead's location and associated contact information can be found on the Shaw Group intranet site, ShawNet.

5.2 Project Responsibility

Employees planning or conducting soils logging are responsible for meeting the requirements of this procedure. Employees conducting technical review or oversight of such efforts are also responsible for following appropriate portions of this SOP. Project participants are responsible for recording information in sufficient detail to provide objective documentation (logs, forms, reports, etc.) that the requirements of this SOP have been met. Such documentation shall be retained as project records.

6. PROCEDURES (TECHNICAL REQUIREMENTS)

This section addresses the process and procedures necessary for the preparation of soil descriptions based on the field classification of soils by visual-manual methods. Objective, quantitative and accurate observations are necessary to ensure the quality and scientific integrity of soil descriptions. The guidance contained within this SOP should be used in conjunction with project-specific work plans to prepare soil descriptions.

All personnel required to log soil for Shaw Technical Services should follow the guidelines presented in this SOP unless project, contract, or client requirements specify otherwise. The guidance provided in this SOP is based primarily on the procedures contained in the most recent version of American Society for Testing and Materials (ASTM) D 2488, *Standard Practice for Description and Identification of Soils (Visual-Manual Procedure)*. The logging/description of rock is discussed in Shaw Procedure No. EI-GS026, *Standards for Rock Logging*. Preparation of boring logs should follow Shaw Procedure EI-GS027, *Standards for Generation of Boring Logs* and/or the project work plans. Personnel involved in describing soil and preparing soil boring logs should be familiar with these documents.

Field soil descriptions prepared for soils collected from boreholes may be recorded on the Visual Classification of Soils Form (Section 8) unless project, contract, or client requirements specify otherwise. Descriptions will focus on making and recording objective, concise, quantitative, and accurate observations. The field geologist conducting the logging should refrain from providing subjective, interpretative, diagnostic, or genetic comments and observations until the soil is completely and accurately described following the guidance contained in this SOP.

6.1 Soils Description

The standard method for classification of soil is the Unified Soil Classification System (USCS). This system and classification method is presented in ASTM D 2488-00, *Standard Practice for Description and Identification of Soils (Visual Manual Procedure)*. When classifying soils using this method, a representative soil sample is obtained. The soil sample is then attributed to one of two broad groups: 1) fine-grained soils, or 2) coarse-grained soils. Fine-grained soils are composed of 50% or more silt and clay sized particles. Coarse-grained soils are composed of greater than 50% sands and gravels. Flow charts for determining the USCS symbol and associated name are provided on Figures 1a, 1b, and 2 in ASTM D 2488-00. A summary chart of the groups and USCS symbols is provided in Attachment 1. The soil description for each group should be prepared to contain the information and follow the sequence provided below.

6.1.1 *Fine Grained Soils* (Silts and Clays) Description Format

The standard description format for a fine-grained soil is as follows:

SOIL GROUP NAME; color; moisture state; consistency; plasticity; percentage of fines; percentage and size-range of coarse fraction; maximum particle size; evidence of contamination (visual evidence/odors); other terms (see below).

6.1.2 *Coarse Grained Soils* (Sands and Gravels) Description Format

The standard description format for a coarse-grained soil is as follows:

Grading term, **SOIL GROUP NAME;** color; moisture state; density; percentage and size-range of coarse fraction; maximum particle size; angularity; shape; percentage and plasticity of fines; evidence of contamination (visual evidence/odors); other terms (see below).

6.1.3 Other Terms to Include in Description

Additional information useful for describing the characteristics of a soil include the following:

- Hardness of coarse sand and larger particles
- Surface coating on coarse-grained particles
- Bedding and other soil structures
- Organic soil or presence of organic material
- Cement, caliche
- HCl reaction
- Mineralogy/petrology of grains/clasts
- Debris; metal, concrete, plastic, etc.
- Evidence of fill
- Evidence of disturbance

6.2 Descriptive Terms (Explanation and Use)

Brief explanations and use of the above descriptive terms are provided in the following text. Specific criteria and field methods used to assign the proper term in a soil sample description are provided in ASTM D 2488-00 and other references listed above. These terms should be included in the descriptions of the soil units.

- **Soil Group Name:** The primary criterion used to assign the soil group name is the percentage of each soil particle size fraction. The soil group name will be assigned based on the percentage and size-range distribution of soil particles using Figures 1a, 1b, and 2 in ASTM D 2488-00 and/or the classification chart in Attachment 1. Following determination of the soil group name, the USCS group symbol should be assigned to the soil unit. The group name and USCS group symbol for fine-grained soils will also need to be determined following the procedure in Section 14 of ASTM D 2488-00.

- **Grading term:** (Coarse-grained soils) Gradation is the proportion by mass of a soil distributed in a specified particle-size range. Coarse-grained soils are described as poorly graded or well graded. Note that grading is the opposite of sorting; a well-graded soil is poorly sorted and vice versa. Grading is described in Sections 15.3.1 and 15.3.2 of ASTM D 2488-00.

- **Color:** Color is an especially important property in identifying organic soils and is often important in identifying other types of soils. Within a given locality, color may also be useful in identifying materials of similar geologic units. Color should be described for moist samples. Note in the description if the color represents a dry condition. If the sample contains layers or patches of varying colors (i.e., mottled), this should be noted, and representative colors should be described.

  The Munsell Soil Color System should be used for consistent color descriptions and identification. This is because a given color will often be given different names by different people conducting the logging. A given color may also appear differently to people when next to other colors.

- **Moisture state:** Describe as dry, moist, or wet according to the following:
  - Dry Absence of moisture, dusty, dry to touch
  - Moist Damp but no visible water
  - Wet Visible free water, usually soil is below the water table
- **Density (coarse-grained soils):** Describe density (degree of firmness) for coarse-grained soils as very loose, loose, medium dense, dense, or very dense, as indicated by the criteria below. This observation is inappropriate for fine-grained soils. Terminology is as follows:

Density	Standard Penetration Resistance (SPT)
Very loose	0 – 4
Loose	5 – 10
Medium dense	11 – 30
Dense	31 – 50
Very dense	> 50

- **Consistency (fine-grained soils):** Describe consistency (degree of firmness) for intact fine-grained soils as very soft, soft, firm, hard, or very hard, as indicated by the criteria below. This characteristic should not be used for soils with significant amounts of gravel. Classification is as follows:

Consistency	Thumb/Thumbnail Test	Standard Penetration Resistance (SPT)
Very soft	Thumb penetration > 1in. (25 mm)	< 2
Soft	Thumb penetration ≈ 1 in. (25 mm)	2 – 4
Firm	Thumb penetration ≈ ¼ in. (5 mm)	5 – 15
Hard	Thumb will not indent, but thumbnail will	16 – 30
Very hard	Thumbnail will not indent.	> 30

- **Plasticity (fine-grained soils):** Describe as nonplastic, low, medium, or high. To determine plasticity, shape into an elongated thread about 1/8-inch in diameter. Describe plasticity based on the following:
  - **Nonplastic:** A 1/8-inch thread cannot be rolled at any water content.
  - **Low:** The thread can barely be rolled, and a lump cannot be formed when drier than the plastic limit.

  - **Medium:** The thread is easy to roll and little time is needed to reach the plastic limit. The thread cannot be re-rolled when the plastic limit is reached and the lump crumbles when drier than the plastic limit.
  - **High:** It takes a considerable amount of time to reach the plastic limit when rolling the sample. The thread can be re-rolled several times once the plastic limit is reached and the lump can be formed without crumbing when drier than the plastic limit.

- **Percentage of fines:** Estimate (to the nearest 5%) the percentage of silt and clay-sized particles combined, or the percentage of silt and clay individually to the nearest 10%.
- **Percentage of coarse fraction:** Estimate (to the nearest 5%) the percentage of sand and gravel-sized particles.
- **Size-range of coarse fraction:** Describe the size-range as fine sand, medium sand, coarse sand, fine gravel, coarse gravel, cobble-sized, or boulder-sized.
- **Maximum particle size or dimension:** Describe the maximum particle size of the course fraction.
- **Angularity:** Angularity is a description for coarse-grained materials only. The angularity of coarse sand, gravel, cobbles, and boulders is described as angular, subangular, subrounded, or rounded as indicated by the criteria below. A range of angularity may be stated, as such: sub-rounded to rounded. The criteria are as follows:
  - **Angular**—Particles have sharp edges and relatively planar sides with unpolished surfaces.
  - **Subangular**—Particles are similar to angular description but have rounded edges.
  - **Subrounded**—Particles have nearly planar sides but well-rounded corners and edges.
  - **Rounded**—Particles have smoothly curved sides and no edges.
- **Shape:** Describe the shape of the gravel, cobbles, and boulders as “flat”, “elongated,” or “flat and elongated” if they meet the criteria below. Indicate the fraction of the particles that have the shape, such as “one-third of gravel particles are flat”; note any unusually shaped particles.

  The particle shape is classified/described as follows, where length, width, and thickness refer to the greatest, intermediate, and least dimensions of a particle, respectively:

  - **Flat**—Particles with width/thickness ratio >3
  - **Elongated**—Particles with length/width ratio >3
  - **Flat and elongated**—Particles that meet criteria for both flat and elongated
- **Evidence of contamination (visual/olfactory):** Describe any visual signs (i.e., staining) or odors that may indicate that contamination is present.
- **Other Terms:** (see below).

6.3 Other Terms

Other geologic observations should be included to describe soils. These other observations and terms are just as important as the descriptive terms in Section 6.2. These other terms need to be carefully considered, observed, and included in the soil descriptions, as applicable. Such terms include the following:

- **Hardness:** Indicate the hardness of coarse sand or larger particles as hard, or state what happens when the particles are hit by a hammer; (e.g., “gravel-size particle fractures with considerable hammer blow,” “some gravel-size particles crumble with hammer blow”). Hard

particles are those that do not fracture or crumble when struck with a hammer. Remember that the larger the particle, the harder the blow required to fracture it. A good practice is to describe the particle size and the method that was used to determine the hardness.

- **Surface coating:** On coarse-grained particles.
- **Bedding**: Describe thickness, orientation, and/or grading.
- **Soil Structure:** Describe as stratified, laminated, fissured, slickensided, blocky, lenses, or homogeneous. The descriptors presented are for soils only; they are not synonymous with descriptions for rock.
  - **Stratified**—Alternating layers of varying material or color; note thickness.
  - **Laminated**[1]—Alternating layers of varying material or color with layers less than 6 mm thick; note thickness.
  - **Fissured**[1]—Breaks along definite planes with little resistance to fracturing.
  - **Slickensided**[1]—Fracture planes appear polished or glossy, sometimes striated.
  - **Blocky**[1]—Cohesive soil that can be broken down into small angular lumps which resist further breakdown.
  - **Lenses**—Inclusion of small pockets of different soils, such as small lenses of sand scattered through a mass of clay; note thicknesses.
  - **Homogeneous**—Same color and textural or structural appearance throughout.

  [1]Do not use for coarse-grained soils with the exception of fine sands, which can be laminated.
- **Organic soil:** Note the presence and type of organic particles; change in color upon exposure to air or odor.
- **Cementation:** Describe the cementation of intact soils as weak, moderate, or strong, as indicated by the criteria below:
  - **Weak**—Crumbles or breaks with handling or little finger pressure
  - **Moderate**—Crumbles or breaks with considerable finger pressure
  - **Strong**—Will not crumble or break with finger pressure.
- **HCl reaction:** Calcium carbonate is a common cementing agent in soils. The reaction with dilute hydrochloric acid is useful in determining the presence and abundance of calcium carbonate. Describe the reaction with HCl as none, weak, or strong, as indicated by the criteria below:
  - **None** – No visible reaction
  - **Weak**—Some reaction, with bubbles forming slowly
  - **Strong**—Violent reaction, with bubbles forming immediately
- **Mineralogy/petrology of grains/clasts:** Describe the specific minerals (e.g., mica, gypsum, etc.) and/or lithologies of clasts and relative percentages.
- **Evidence of fill:** Describe debris such as metal, concrete, plastic, etc.
- **Evidence of disturbance:** Describe visual evidence and degree of disturbance. Classify as natural (biological, tectonic, etc.) or manmade (e.g., construction).
- **Sedimentary structures:** Describe sedimentary structures or lack of structures in soil samples (includes root tubes).

6.4 Boring Log Preparation

Soil descriptions prepared following the guidance in this SOP should be recorded on a boring log according to the provisions and requirements of Shaw Procedure No. EI-GS027, *Standards for Generation of Boring Logs*. The soil descriptions should be recorded on the log in waterproof and smear-proof blue or black ink. Additional information may also be included on the log to supplement the soil descriptions as described in Procedure No. EI-GS027. An example Visual Classification of Soils field log form is included in this SOP (Section 8).

6.5 Technical Review

All soil descriptions (logging results) should undergo technical review and approval before internal or external distribution (i.e., outside of Shaw E & I). The technical reviewer should be an experienced senior geologist or hydrogeologist and capable of logging and describing soils following the requirements of this procedure. For logging/soil descriptions prepared for a site in a state that requires review and approval of such work products by a registered or licensed geologist, the individual conducting the technical review should hold appropriate registration or licensing in that state.

The technical reviewer should be given appropriate information on the geology of the site, the scope of associated site activities, any and all assumptions used in the logging and any other important information regarding site conditions or issues affecting soil descriptions. The technical reviewer must also be given sufficient time to conduct a sound and thorough review.

Certain states require the logging of soils and generation of boring logs under the supervision of a registered or licensed geologist. For sites and projects in such states, an appropriately registered or licensed geologist should be identified during the planning/preparation phase of the project. The registered/licensed geologist will meet with the field geologist(s) that will be conducting the soils logging. The registered/licensed geologist will brief the field geologist(s) regarding applicable requirements for soils logging and boring log generation, including the requirements in this SOP and Shaw Procedure No. EI-GS027, *Standards for Generation of Boring Logs.* The registered/licensed geologist may also observe/review the logging conducted by the field geologist(s) at the site during drilling and logging operations.

Any issues raised during the technical review should be resolved between the reviewer and employees generating the soil descriptions before internal distribution or external submission of the boring logs containing the descriptions. The technical review comments and issues and corresponding resolution should be documented and filed with the project records. Such records should be maintained until project closeout.

7. ATTACHMENTS

- Attachment 1, ASTM Soil Classification & USCS Group Symbols

8. FORMS

- Example Visual Classification of Soils Form

Attachment 1
ASTM Soil Classification & USCS Group Symbols

					Group Symbol				Group Name
>50% Sand & Gravel	GRAVEL % gravel > % sand	≤5% fines	Well-graded		GW	<15% sand			Well-graded GRAVEL
						≥15% sand			Well-graded GRAVEL with Sand
			Poorly-graded		GP	<15% sand			Poorly graded GRAVEL
						≥15% sand			Poorly graded GRAVEL with Sand
		10% fines	Well-graded	fines - ML or MH	GW-GM	<15% sand			Well-graded GRAVEL with Silt
						≥15% sand			Well-graded GRAVEL with Silt and Sand
				fines - CL or CH	GW-GC	<15% sand			Well-graded GRAVEL with Clay
						≥15% sand			Well-graded GRAVEL with Clay and Sand
			Poorly-graded	fines - ML or MH	GP-GM	<15% sand			Poorly graded GRAVEL with Silt
						≥15% sand			Poorly graded GRAVEL with Silt and Sand
				fines - CL or CH	GP-GC	<15% sand			Poorly graded GRAVEL with Clay
						≥15% sand			Poorly graded GRAVEL with Clay and Sand
		≥15% fines		fines - ML or MH	GM	<15% sand			Silty GRAVEL
						≥15% sand			Silty GRAVEL with Sand
				fines - CL or CH	GC	<15% sand			Clayey GRAVEL
						≥15% sand			Clayey GRAVEL with Sand
	SAND % sand > % gravel	≤5% fines	Well-graded		SW	<15% gravel			Well-graded SAND
						≥15% gravel			Well-graded SAND with Gravel
			Poorly-graded		SP	<15% gravel			Poorly graded SAND
						≥15% gravel			Poorly graded SAND with Gravel
		10% fines	Well-graded	fines - ML or MH	SW-SM	<15% gravel			Well-graded SAND with Silt
						≥15% gravel			Well-graded SAND with Silt and Gravel
				fines - CL or CH	SW-SC	<15% gravel			Well-graded SAND with Clay
						≥15% gravel			Well-graded SAND with Clay and Gravel
			Poorly-graded	fines - ML or MH	SP-SM	<15% gravel			Poorly graded SAND with Silt
						≥15% gravel			Poorly graded SAND with Silt and Gravel
				fines - CL or CH	SP-SC	<15% gravel			Poorly graded SAND with Clay
						≥15% gravel			Poorly graded SAND with Clay and Gravel
		≥15% fines		fines - ML or MH	SM	<15% gravel			Silty SAND
						≥15% gravel			Silty SAND with Gravel
				fines - CL or CH	SC	<15% gravel			Clayey SAND
						≥15% gravel			Clayey SAND with Gravel
50% or More Fines	Low-Plasticity Clay				CL	<30% sand & gravel	<15% Sand and Gravel		Lean CLAY
							15-25% sand & gravel	% sand ≥ % gravel	Lean CLAY with Sand
								% sand < % gravel	Lean CLAY with Gravel
						≥30% sand & gravel	% sand ≥ % of gravel	< 15% gravel	Sandy lean CLAY
								≥ 15% gravel	Sandy lean CLAY with Gravel
							% sand < % gravel	< 15% sand	Gravelly lean CLAY
								≥ 15% sand	Gravelly lean CLAY with Sand
	Low-Permeability Silt				ML	<30% sand & gravel	15% sand & gravel		SILT
							15-25% sand & gravel	% sand ≥ % gravel	SILT with Sand
								% sand < % gravel	SILT with Gravel
						≥30% sand & gravel	% sand ≥ % of gravel	< 15% gravel	Sandy SILT
								≥ 15% gravel	Sandy SILT with Gravel
							% sand < % gravel	< 15% sand	Gravelly Silt
								≥ 15% sand	Gravelly Silt with Sand
	Plastic Clay				CH	<30% sand & gravel	< 15% sand & gravel		Fat CLAY
							15-25% sand & gravel	% sand ≥ % gravel	Fat CLAY with Sand
								% sand < % gravel	Fat CLAY with Gravel
						≥30% sand & gravel	% sand ≥ % of gravel	< 15% gravel	Sandy fat CLAY
								≥ 15% gravel	Sandy fat CLAY with Gravel
							% sand < % gravel	< 15% sand	Gravelly fat CLAY
								≥ 15% sand	Gravelly fat CLAY with Sand
	Plastic Silt				MH	<30% sand & gravel	< 15% sand & gravel		Elastic SILT
							15-25% sand & gravel	% sand > % gravel	Elastic SILT with Sand
								% sand < % gravel	Elastic SILT with Gravel
						≥30% sand & gravel	% sand ≥ % of gravel	< 15% gravel	Sandy elastic SILT
								≥ 15% gravel	Sandy elastic SILT with Gravel
							% sand < % gravel	< 15% sand	Gravelly elastic SILT
								≥ 15% sand	Gravelly elastic SILT with Sand
	Organics (Peat or Bay Mud)				OL/OH	<30% sand & gravel	< 15% sand & gravel		Organic SOIL
							15-25% sand & gravel	% sand ≥ % gravel	Organic SOIL with Sand
								% sand < % gravel	Organic SOIL with Gravel
						≥30% sand & gravel	% sand ≥ % of gravel	< 15% gravel	Sandy Organic SOIL
								≥ 15% gravel	Sandy Organic SOIL with Gravel
							% sand < % gravel	< 15% sand	Gravelly Organic SOIL
								≥ 15% sand	Gravelly Organic SOIL with Sand

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Example
Visual Classification of Soils

PROJECT NUMBER:	PROJECT NAME:		
BORING NUMBER:	COORDINATES:		DATE:
ELEVATION:	GWL: Depth	Date/Time	DATE STARTED:
ENGINEER/GEOLOGIST:	Depth	Date/Time	DATE COMPLETED:
DRILLING METHODS:			PAGE: OF

DEPTH ( )	SAMPLE TYPE & NO.	BLOWS ON SAMPLER PER ( )	RECOVERY ( )	DESCRIPTION	USCS SYMBOL	MEASURED CONSISTENCY (TSF)	WELL CONSTRUCTION	REMARKS

NOTES:

Drilling Contractor: _____

Drilling Equipment: _____

Driller: _____

_____

1651-9-02

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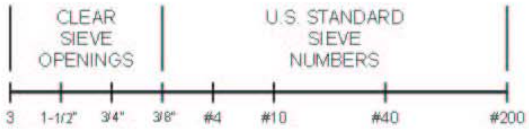
CONSISTENCY OF COHESIVE SOILS

CONSISTENCY	UNCONFINED COMPRESSIVE STRENGTH (TONS PER SQUARE FOOT)
VERY SOFT	LESS THAN 0.25
SOFT	0.25 to 0.50
FIRM	0.50 to 2.0
HARD	2.0 to 4.0
VERY HARD	MORE THAN 4.0

DENSITY OF GRANULAR SOILS

DENSITY	STANDARD PENETRATION RESISTANCE [1]
VERY LOOSE	0-4
LOOSE	5-10
MEDIUM DENSE	11-30
DENSE	31-50
VERY DENSE	OVER 50

[1] STANDARD PENETRATION RESISTANCE IS THE NUMBER OF BLOWS REQUIRED TO DRIVE A 2-INCH O.D. SPLIT BARREL SAMPLER 12 INCHES USING A 140-POUND HAMMER FALLING FREELY THROUGH 30 INCHES. THE SAMPLER IS DRIVEN 18 INCHES AND THE NUMBER OF BLOWS RECORDED FOR EACH 6-INCH INTERVAL. THE SUMMATION OF THE FINAL TWO INTERVALS IS THE STANDARD PENETRATION RESISTANCE.



GRAIN SIZE IN MM

COBBLES	GRAVEL		SAND			SILT AND CLAY
	COARSE	FINE	COARSE	MEDIUM	FINE	

USCS CLASSIFICATION FOR SOILS

COARSE-GRAINED SOILS

CLEAN GRAVELS (LITTLE OR NO FINES)	GW	WELL-GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES
	GP	POORLY GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES
GRAVELS WITH FINES (APPRECIABLE AMOUNT OF FINES)	GM	SILTY GRAVELS, GRAVEL-SAND-SILT MIXTURES
	GC	CLAYEY GRAVELS, GRAVEL-SAND-CLAY MIXTURES
CLEAN SANDS (LITTLE OR NO FINES)	SW	WELL-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
	SP	POORLY-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
SANDS WITH FINES (APPRECIABLE AMOUNT OF FINES)	SM	SILTY SANDS, SAND-SILT MIXTURES
	SC	CLAYEY SANDS, SAND-CLAY MIXTURES

FINE-GRAINED/HIGHLY ORGANIC SOILS

SILTS AND CLAYS LIQUID LIMIT (LESS THAN 50)	ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY
	CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS SILTY CLAYS, LEAN CLAYS
	OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
SILTS AND CLAYS LIQUID LIMIT (GREATER THAN 50)	MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SANDY OR SILTY SOILS
	CH	INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS
	OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
HIGHLY ORGANIC SOILS	PT	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS

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STANDARD OPERATING PROCEDURE

Subject: Standards for Trench Logging

1. PURPOSE

This procedure provides the standard practice for generation of trench logs. The procedure includes the minimum required steps and quality checks that employees and subcontractors are to follow when performing the subject task.

This procedure may also contain guidance for recommended or suggested practice that is based upon collective professional experience. Recommended practice goes beyond the minimum requirements of the procedure, and should be implemented when appropriate.

2. SCOPE

Geosciences Standard Operating Procedure No. EI-GS028 describes standards for generation of trench logs, and describes how such logs will be prepared for projects executed by Shaw Environmental & Infrastructure, Inc. (Shaw E & I). For the purpose of this SOP the term "trench logging" also refers to trench mapping, the logging of the walls of large excavations and logging of small exploratory excavations (sometimes called potholes). The SOP addresses technical requirements and required documentation. Responsibilities of individuals performing the work are also detailed. Additional project-specific requirements for trench logging may be developed, as necessary, to supplement this procedure and address project-specific conditions and/or objectives.

3. REFERENCES (STANDARD INDUSTRY PRACTICES)

Trench logging shall follow accepted industry practices. These industry practices are as presented in the latest version of the following ASTM standards:

ASTM D 4879	Standard Guide for Geotechnical Mapping of Large Underground Openings in Rock
ASTM D 5434	Standard Guide for Field Logging of Subsurface Explorations of Soil and Rock

The following reference materials are also useful for planning and conducting trench logging activities:

- Compton, R. R., 1985, *Geology in the Field*, John Wiley and Sons, Inc., New York, NY, 398 pp.
- Hathaway, A. W., and Leighton, F. B., 1979, Trenching as an exploratory tool: *in*, Hathaway, A. W., and McClure, C. R. Jr., editors, Geology in the siting of nuclear power plants: Geologic Society of America, Reviews in Engineering Geology, vol. IV, P. 169-195
- United States Bureau of Reclamation (USBR), 1998, *Engineering Geology Field Manual, Second Edition*. Available on line at: http://www.usbr.gov/pmts/geology/fieldman.htm
- United States Geological Survey, 1999, *Open-File Report 99-430, Digital Cartographic Standard for Geologic Map Symbolization*. Available on line at: http://geopubs.wr.usgs.gov/open-file/of99-430
- American Geological Institute, AGI Data Sheets

4. DEFINITIONS

The following definitions are applicable to trench logging and this SOP.

- **Backhoe Trench**—A trench excavated into the subsurface to expose rock or unconsolidated materials for the purpose of identifying lithology, characterizing subsurface conditions, and/or collecting samples. In most cases, trenches are 2 to 3 feet wide and 5 to 15 feet deep with at least one end sloped for easy access.
- **Contact**—The boundary between two geologic units (different soil or rock types); a surface in three dimensions, portrayed as a line on a map, cross-section or trench log.
- **Dozer Trench**—A cut to expose rock or unconsolidated materials. Normally excavated vertically, free of narrow benches and loose debris.
- **Formation**—A named stratigraphic unit or primary unit of formal mapping or description possessing certain distinctive lithic features.
- **Soil**—All unconsolidated materials above bedrock.
- **USCS**—Unified Soil Classification System

5. RESPONSIBILITIES

5.1 Procedure Responsibility

The Geosciences Discipline Lead is responsible for the development, maintenance, and revision of this procedure. Any questions, comments, or suggestions regarding this technical SOP should be directed to the Geosciences Discipline Lead. The Geosciences Discipline Lead's location and associated contact information can be found on the Shaw Group intranet site, ShawNet.

5.2 Project Responsibility

Employees supervising trench-logging activities are responsible for meeting the requirements of this procedure. Employees conducting technical review of trench logging activities are also responsible for following appropriate portions of this SOP. Project participants are responsible for recording information in sufficient detail to provide objective documentation (field notes, reports, etc.) that the requirements of this SOP have been met. Such documentation shall be retained as project records.

6. PROCEDURES (TECHNICAL REQUIREMENTS AND STANDARDS)

Exploratory trenches are cut to expose earth materials below the surface. Trench walls normally should be excavated vertically and be free of loose debris. Trench floors should be clean so that geologic structures such as contacts and shear zones are traceable from the wall into the floor for optimum determination of their nature and attitude. If trenches are to be left unattended, fencing or covering of the trench may be required.

6.1 Equipment Requirements and Considerations

The following equipment is useful and should be present for trench logging activities:

- Scraper, putty knife, square-nosed shovel, or rock pick to expose critical features
- Whisk broom or paint brush for cleaning trench exposures
- Flagging, nails, and wooden stakes to establish reference points used to measure critical features

- Surveyor's tape and Brunton compass to measure trench features (length depth, bearing, etc.)
- Grid paper and engineers scale for preparing base sheets
- Camera

6.2 Health and Safety Requirements

Prior to initiating trench logging activities, applicable Shaw E & I and project-specific safety requirements must be reviewed by Shaw E & I site personnel and subcontractors. This review is conducted to familiarize these individuals with specific hazards associated with the site and trench logging activities. Such information may be found in the project health and safety plan and other applicable Shaw E & I policies and procedures, including HS307, *Excavation and Trenching*.

Trench logging may be subject to OSHA excavation and confined space rules, and a "competent person" may be required to provide appropriate oversight during the project fieldwork. The competent person (most commonly a geologist or engineer) is responsible for evaluating the trench conditions, filing appropriate paperwork, and approving entrance. Trenches greater than 4 feet deep will not be entered without being shored to the satisfaction of the competent person. The competent person is responsible to ensure the dozer or backhoe operator produces a safe finished trench that meets OSHA safety standards.

Prior to working in a trench, the geologist conducting the logging and the competent person should inspect the ground surface near the trench and trench walls for fracturing, failure planes (obvious or incipient), and loose materials. If trenches are to be left unattended, fencing or covering of the trench may be required.

6.3 General Requirements for Trench Logs

The recorded information in a trench log will depend on the specific purpose of the site investigation. For example, a trench located to document the margins of a waste fill will not require the fine detail normally associated with a trench log documenting the evidence for a fault trace. However, trench logs should contain or include the following items:

- **Title** – including name of individual trench, project name, and site name
- **Trench bearing** – preferably located above sidewall sketch or north arrow on sketch of trench floor
- **Graphic or bar scale** – necessary for both horizontal and vertical scales
- **Sample locations** – if samples are collected
- **Soil or rock structure** – bedding (sedimentary), foliation (metamorphic), zonation (igneous), horizon (soil)
- **Legend or reference to legend location** – explaining **all** symbols, abbreviations, contacts, patterns, etc., depicted on the log
- **Unit labels** – Depending on the objectives of the trench logging, it may be appropriate to label the geologic/lithologic units with a USCS name, formation name, hydrogeologic unit name, or informal unit name. The units may be shown on the log as symbols or abbreviations that are explained in the legend.
- **Descriptions of lithologic units** – Depending on the objective of the trench logging, descriptions of the lithologic units may be provided. The descriptions may be presented in the legend next to the symbol for the lithologic unit. Procedure Nos. EI-GS025, *Standards for Soils Logging*, and

EI-GS026, *Standards for Rock Logging,* provide information on describing soils and rock, respectively.

- **Date prepared and name of individual who prepared the log** – should include first initial and last name of person who prepared the log and date of preparation for subsequent review and approval.
- **Dates of all observations** – if trench observation/logging is carried out over more than one day
- **Reference to base/location map used** – cited directly on the log
- **Appropriate sign-offs as "checked by" and "approved by"** – needs to be reviewed and signed as per text below and applicable Shaw standards and requirements. The professional signing the map as "approved by" should preferably be the individual who conducts the technical review of the map.

The specific objectives and requirements for the trench logs should be specified in the project-specific work plans.

6.4 Basic Construction of Trench Log

Basic construction of a trench log includes the following:

- Prepare base sheets to an appropriate scale. Typical dozer or backhoe trench log scales are between 1 inch (in) = 5 feet (ft) and 1 inch (in) = 10 feet (ft). However, scales could be smaller (1 inch (in) = 1 foot (ft)) if fine detail is required or larger (1 inch (in) = 50 feet (ft)) if required by structural and stratigraphic relationships. Base sheets should have a scaled grid (10 squares to the inch blue line paper is recommended).
- Mark stationing or surveyed control points on the trench walls at appropriate intervals immediately prior to logging. 10-foot mapping intervals are commonly used because this is a convenient distance for a single view with minimal visual distortion. In a backhoe trench, both walls should be spot cleaned and examined prior to major cleaning to determine which wall exposes the best geologic data.
- Sketch the walls and floors of the trench across the base sheet, locating the stationing at the proper scale.
- Determine the vertical heights of the trench walls at each station and between stations. It is often useful to place nails and string in a grid on the trench wall for ready reference of features during logging. At a minimum a horizontal baseline should be established by running a string between nails driven into the cleaned trench wall. A small string level (available in most hardware stores) is used to level the string.
- Enter names, symbols, and descriptions of lithologic units in the explanation on each base sheet prior to logging. Refer to Shaw Procedure Nos. EI-GS026, *Standards for Rock Logging,* and EI-GS025, *Standards for Soil Logging*, for logging terminology and descriptive information. It is recommended that written descriptions of soil and rock units and structural zones be restricted to the area below the sketch/log of the trench (see examples in Attachment 1).
- Use nails and flagging strips to mark obscure contacts or other features for ready reference.
- Accurately plot structural elements such as the position and attitude of contacts, bedding, foliation or cleavage, faults, shear zones, and joints using standard symbols. (Examples of standard symbols may be found in Compton [1985] and U.S. Geological Survey Open-File Report 99-430.)
- Accurately plot other features of concern such as degree of weathering, moisture content, soil formation, as needed.

- Photograph critical features and note the photo locations on the log.
- After the logging is completed, color the geologic units (optional) to complete the log and perform a field check.

6.5 Potential Errors to Avoid in Constructing Trench Logs

The following errors in technique have been observed on trench logs and should be avoided:

- Not mapping all excavated surfaces consistently. Avoid oversimplification. Inconsistencies or oversimplification can damage the credibility of the log. Review previous logging for consistency over the course of the project, if multiple trenches are logged.
- Not using an appropriate scale. Overly detailed logs use resources better used elsewhere. If simple plots document the critical features, do not spend time or resources acquiring additional detail. However, the purpose of the log must be considered. If small scale features will be needed (e.g., piercing points, slickensides, small scale folds for fault characterization), make sure the log scale will allow for collection and presentation of these details.

6.6 Technical Review

All trench logs should undergo technical review. The technical reviewer should be an experienced senior geologist or earth scientist. At a minimum, the technical reviewer should be a person capable of planning, constructing, and interpreting the specific types of trench logs prepared for the project. For trench logs prepared for a site in a state that requires preparation of such work products under the supervision, review, or approval of a registered or licensed geologist (or earth scientist), the individual conducting the technical review and sign-off as “approved by” should hold appropriate registration or licensing in that state.

The technical reviewer should consider the following items in conducting the review of trench logs:

- All bulleted required items in Section 6.3 should be effectively included and depicted, as appropriate.
- All items regarding basic log construction in Section 6.4 should be appropriately addressed and incorporated on the log(s).
- Potential errors listed in Section 6.5 should not be evident on the log(s).
- The logs should be complete and easy to read with all information legibly shown.

Any issues raised during the technical review should be resolved between the reviewer and staff preparing the logs before external submission of the logs (i.e., outside of Shaw E & I). The technical review comments and issues, and corresponding resolution, should be documented and filed with the project records. Such records should be maintained until project closeout.

7. ATTACHMENTS

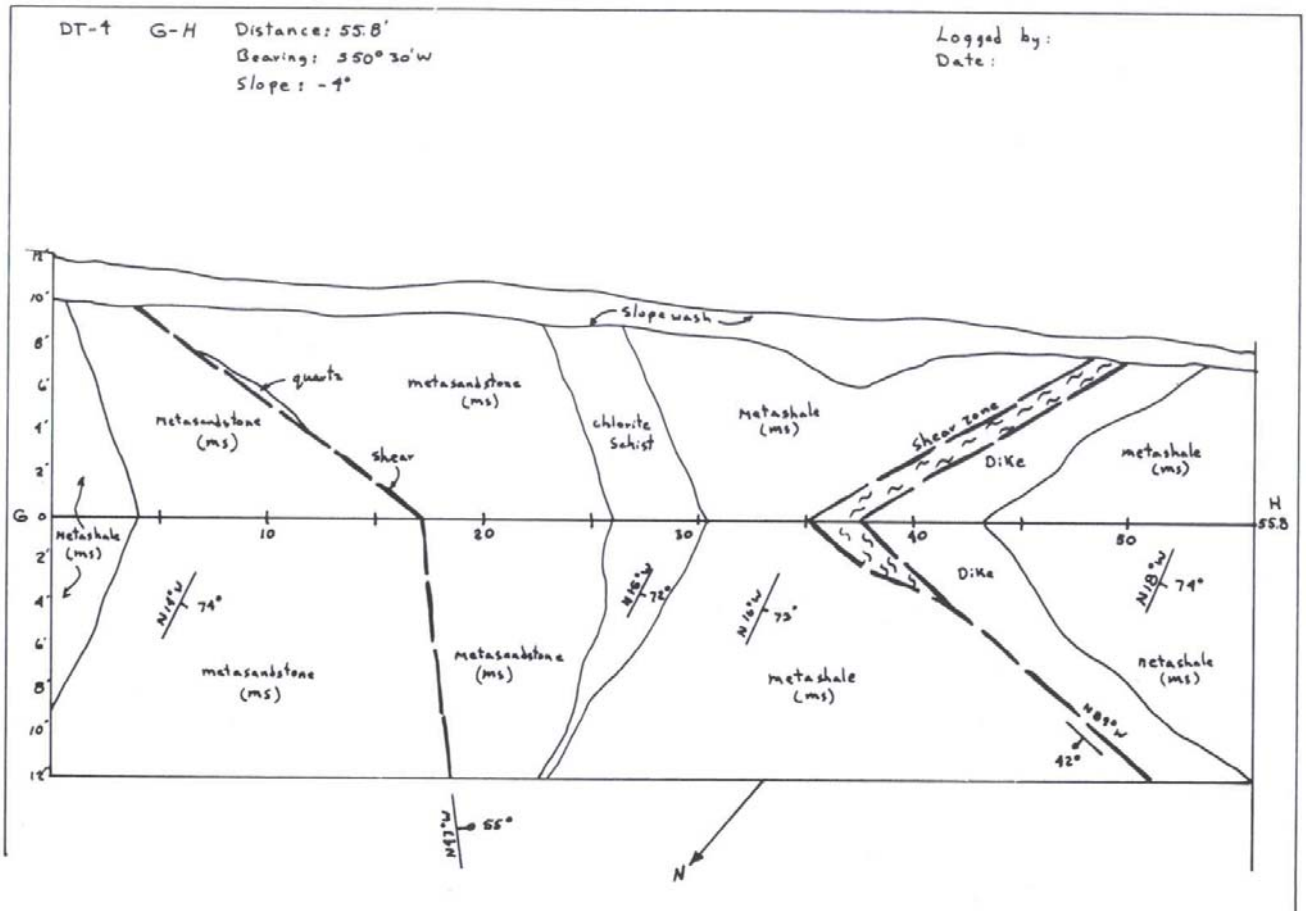
- Attachment 1, Trench Log Examples

8. FORMS

None.

Attachment 1
Trench Log Examples

(Examples are from the United States Bureau of Reclamation, Engineering Geology Field Manual, Second Edition, 1998)



7 1336 A (1-86) Bureau of Reclamation

LOG OF TEST PIT

HOLE NO. TP-4-TTDL

FEATURE
AREA DESIGNATION Sta. 203+27 on Centerline
COORDINATES N 439,409 E 767,405
APPROXIMATE DIMENSIONS 17'x4'x10'
DEPTH WATER ENCOUNTERED 1/ Not Encountered DATE

PROJECT
GROUND ELEVATION 2722.6
METHOD OF EXPLORATION MF-80 Backhoe
LOGGED BY
DATE(S) LOGGED 8/7/87

CLASSIFICATION GROUP SYMBOL (describe sample taken)	CLASSIFICATION AND DESCRIPTION OF MATERIAL SEE USBR 5000, 5005	% PLUS 3 in (BY VOLUME) 3 - 5 in	5 - 12 in	PLUS 12 in
SP-SM two 60-lb sacks 2.0 feet	o.0 to 2.0 ft. POORLY GRADED SAND WITH SILT, GRAVEL AND COBBLES: About 55% coarse to fine, angular to subangular sand; about 35% coarse to fine, angular to subangular, brittle to hard gravel with moderate surface coating; about 10% fines with low plasticity, rapid dilatancy, low toughness, low dry strength; strong reaction with HCl. TOTAL SAMPLE (BY VOLUME): About 5% 75 to 125 mm, brittle to hard, angular to subangular cobbles; trace of plus 125 mm brittle to hard, angular to subangular cobbles; remainder minus 75 mm; max. dimension, 250 mm. LAB TEST DATA: Sack samples taken from spoil pile. 46% gravel, 44% sand, 10% fines; LL=30, PI=10, Cu=88.5, Cc=1.8. Maximum and Minimum Relative Density: 127.3 lbf/ft^3, 99.2 lbf/ft^3; Lab max. density, opt.: 117.4 lbf/ft^3, 13.0%. Laboratory Classification is Well Graded Gravel With Clay and Sand (GW-GC)s. (Nondispersive). IN-PLACE CONDITION: Loose, homogeneous, root holes, moderate cementation, dry, brown. GEOLOGIC INTERPRETATION: Quaternary Slopewash (Qsw)	5	T	0
(SM)gc Andesite (Tsa) two 45-lb sacks	2.0 to 10.0 ft. SILTY SAND WITH GRAVEL WITH TRACE OF COBBLES: About 60% coarse to fine, angular to subangular sand; about 25% coarse to fine, angular to subangular, brittle to hard gravel with moderate surface coating; about 15% fines with low plasticity, rapid dilatancy, low toughness, low dry strength; max. dimension, 250 mm; strong reaction with HCl. LAB TEST DATA: Two sack samples taken from backhoe bucket at 7.0 to 7.5 depth. 54% sand, 29% gravel, 17% fines; LL=34, PI=8. Lab max. density, opt.: 112.2 lbf/ft^3, 15.1%. (Nondispersive).	T	T	0

REMARKS Moderate ground cover of mesquite and paloverde trees, greasewood bushed and maximum size cobble taken from excavation was 400x250x250 mm. Stopped test pit at 10.0 feet, unable to excavate further with backhoe.

1/ Report to nearest 0.1 foot

GPO 849-2[illegible]

7-1336-A (1-86) Bureau of Reclamation

LOG OF TEST PIT

HOLE NO. _____

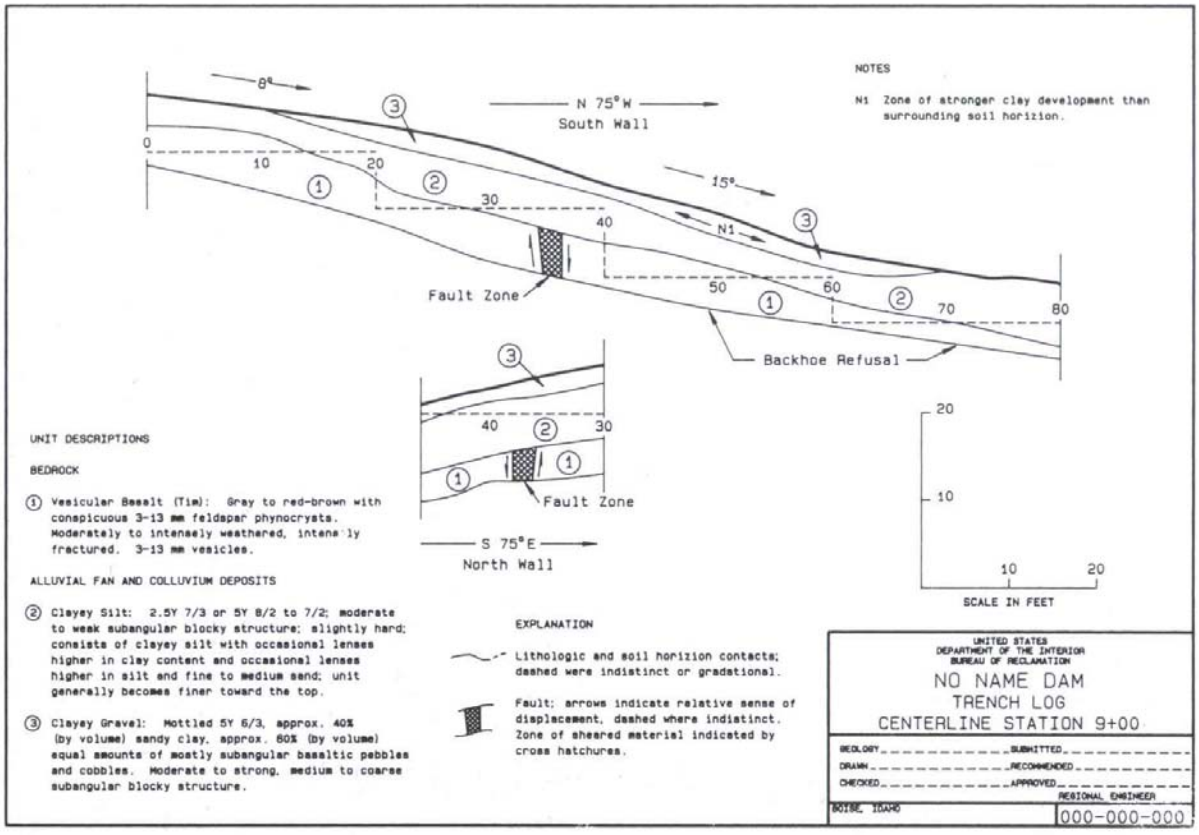
FEATURE _____ PROJECT _____
AREA DESIGNATION _____ GROUND ELEVATION _____
COORDINATES N _____ E _____ METHOD OF EXPLORATION _____
APPROXIMATE DIMENSIONS _____ LOGGED BY _____
DEPTH WATER ENCOUNTERED 1/ _____ DATE _____ DATE(S) LOGGED _____

CLASSIFICATION GROUP SYMBOL (describe sample taken)	CLASSIFICATION AND DESCRIPTION OF MATERIAL SEE USBR 5000, 5005	% PLUS 3 in (BY VOLUME) 3 - 6 in	6 - 12 in	PLUS 12 in
CL three sack samples 4.2 ft	0.0 to 4.2 ft LEAN CLAY: About 90% fines with medium plasticity, high dry strength, medium toughness; about 10% predominantly fine sand; maximum size, medium sand; strong reaction with HCl. IN-PLACE CONDITION: Soft, homogeneous, wet, brown. Three 50-lbm sack samples taken from 12-inch-wide sampling trench for entire interval on north side of test pit. Samples mixed and quartered.			
(SC)g block sample 9.8 ft	4.2 to 9.8 ft CLAYEY SAND WITH GRAVEL: About 50% coarse to fine, hard, subangular to subrounded sand; about 25% fine, hard, subangular to subrounded gravel; about 25% fines with medium plasticity, high dry strength, medium toughness; maximum size, 20 mm; weak reaction with HCl. IN-PLACE CONDITION: Firm, homogeneous except for occasional lenses of clean fine sand 1/4 inch to 1 inch thick, moist, reddish-brown. 12- by 12-inch block sample taken at 6.0 to 7.0 ft depth, at center of south side of test pit.			

REMARKS

1/ Report to nearest 0.1 foot

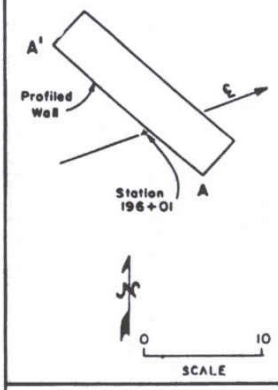
GPO 849-344


NOTES
N1 Zone of stronger clay development than surrounding soil horizion.
8°
N 75°W
South Wall
15°
N1
Fault Zone
Backhoe Refusal
0
10
20
30
40
50
60
70
80
S 75°E
North Wall
Fault Zone
UNIT DESCRIPTIONS
BEDROCK
① Vesicular Basalt (Tim): Gray to red-brown with conspicuous 3-13 mm feldspar phynocrysts. Moderately to intensely weathered, intensely fractured. 3-13 mm vesicles.
ALLUVIAL FAN AND COLLUVIUM DEPOSITS
② Clayey Silt: 2.5Y 7/3 or 5Y 8/2 to 7/2; moderate to weak subangular blocky structure; slightly hard; consists of clayey silt with occasional lenses higher in clay content and occasional lenses higher in silt and fine to medium sand; unit generally becomes finer toward the top.
③ Clayey Gravel: Mottled 5Y 6/3, approx. 40% (by volume) sandy clay, approx. 60% (by volume) equal amounts of mostly subangular basaltic pebbles and cobbles. Moderate to strong, medium to coarse subangular blocky structure.
EXPLANATION
Lithologic and soil horizion contacts; dashed were indistinct or gradational.
Fault; arrows indicate relative sense of displacement, dashed where indistinct. Zone of sheared material indicated by cross hatchures.
20
10
10
20
SCALE IN FEET
UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION
NO NAME DAM
TRENCH LOG
CENTERLINE STATION 9+00
GEOLOGY
DRAWN
CHECKED
SUBMITTED
RECOMMENDED
APPROVED
REGIONAL ENGINEER
BOISE, IDAHO
000-000-000

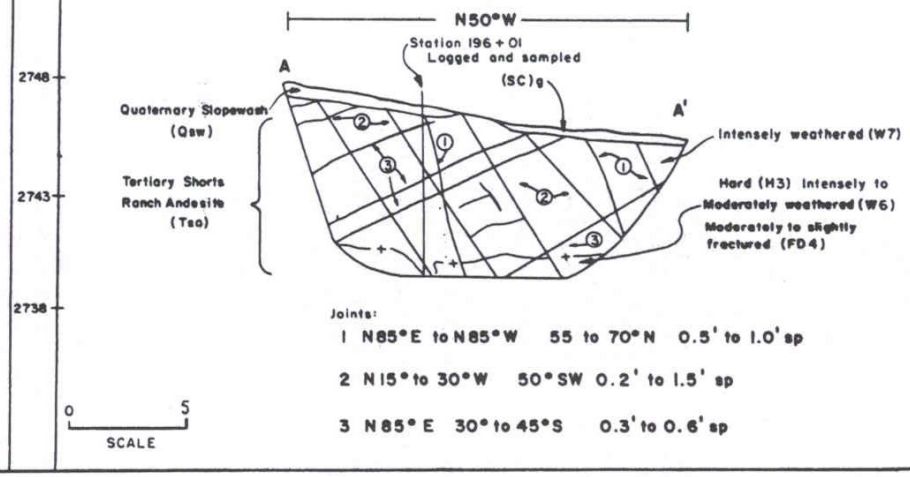
GEOLOGIC PROFILE OF TEST PIT NO. TP-2-TTDL

FEATURE OUTLET PIPELINE LOCATION STATION 196+01 ℄ PROJECT _____ STATE _____
COORDINATES N 439,095 E 766,624 GROUND ELEVATION 2746.8 BOTTOM ELEVATION 2739.3
METHOD OF EXCAVATION MF-80 Backhoe TOTAL DEPTH 7.5' SIZE 17' x 4' DEPTH TO WATER TABLE Not encountered
BEGUN 8/6/87 FINISHED 8/6/87 OPERATOR R. Gilmando GEOLOGIST Joe Geologist

PLAN



PROFILE OF EXCAVATION



Joints:

1 N85°E to N85°W 55 to 70°N 0.5' to 1.0' sp

2 N15° to 30°W 50°SW 0.2' to 1.5' sp

3 N85°E 30° to 45°S 0.3' to 0.6' sp

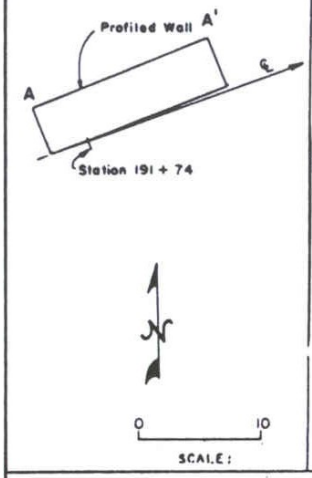
NOTES

TEST PIT NO. TP-2-TTDL

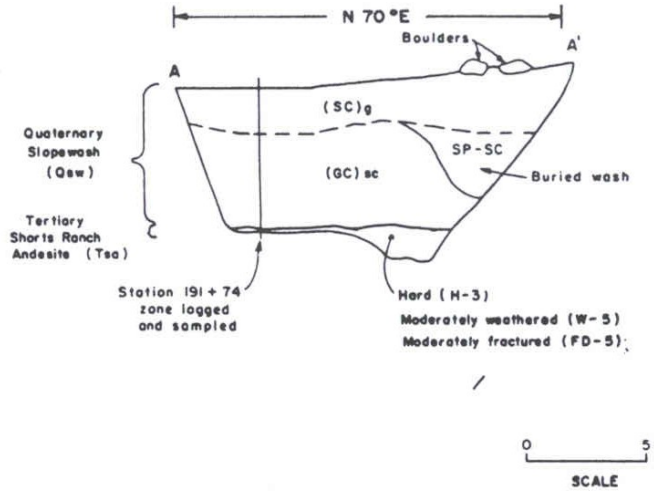
GEOLOGIC PROFILE OF TEST PIT NO. TP-1-TTDL

FEATURE OUTLET PIPELINE LOCATION STATION 191 + 74 ℄ PROJECT STATE
COORDINATES N 436,961 E 766,219 GROUND ELEVATION 2770.7 BOTTOM ELEVATION 2764.7
METHOD OF EXCAVATION MF-80 Backhoe TOTAL DEPTH 6' SIZE 16" x 4' DEPTH TO WATER TABLE Not encountered
BEGUN 8/6/87 FINISHED 8/6/87 OPERATOR R. Gilmondo GEOLOGIST Joe Geologist

PLAN



PROFILE OF EXCAVATION



NOTES

TEST PIT NO. TP-1-TTDL

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STANDARD OPERATING PROCEDURE

Subject: Standards for Design and Installation of Groundwater Monitoring Wells

1. PURPOSE

This procedure provides the standard practice for groundwater monitoring well design and installation. The procedure provides the minimum required steps and quality checks that employees and subcontractors are to follow when performing the subject task.

This procedure may also contain guidance for recommended or suggested practice that is based upon collective professional experience. Recommended or suggested practice goes beyond the minimum requirements of the procedure and should be implemented when appropriate.

2. SCOPE

Geosciences Standard Operating Procedure (SOP) EI-GS031 describes standards for the design and installation of groundwater monitoring wells, and how such design and installation will be conducted and documented for projects executed by Shaw Environmental & Infrastrucure Inc. (Shaw E & I). Responsibilities of individuals performing the work are also detailed. Additional project-specific requirements for monitoring well design and installation may be developed, as necessary, to supplement this procedure and address project-specific conditions and/or objectives.

This SOP covers requirements for basic monitoring well design and installation. The following types of well design and installations are not covered specifically in this SOP:

- Any well that is not primarily intended for groundwater monitoring.
- Wells with multiple screen interval completions.
- Multiple wells or casings within a single boring.
- Instrumented wells (e.g. wells with inclinometers).
- Driven wells.

Individuals needing assistance in the design and installation of monitoring wells and/or these other types of wells/completions may consult internal Shaw E & I technical listings for experts or may contact the Geoscience Discipline Lead (see Section 5.1).

3. REFERENCES (STANDARD INDUSTRY PRACTICES)

The design and installation of groundwater monitoring wells should follow industry standard practices. These are discussed in the latest version of the following ASTM Standards:

ASTM D 5092	Design and Installation of Groundwater Monitoring Wells in Aquifers
ASTM D 5787	Practice for Monitoring Well Protection

The following references are also useful for the planning, design, and installation of groundwater monitoring wells:

ASTM D 6286	Selection of Drilling Methods for Environmental Site Characterization
ASTM F 480	Standard Specification for Thermoplastic Well Casing Pipe and Couplings Made in Standard Dimension Ratios (SDRs), SCH 40 and SCH 80.

Smith, S. A., 1995, *Monitoring and Remediation Wells: Problem Prevention, Maintenance and Rehabilitation*, CRC Press.

U. S. Army Corps of Engineers, 1998, *Monitoring Well Design, Installation and Documentation at Hazardous, Toxic and Radioactive Waste Sites, Engineer Manual EM 1110-1-4000*, November 1. http://www.usace.army.mil/inet/usace-docs/eng-manuals/em1110-1-4000/.

4. DEFINITIONS

The following definitions are applicable to monitoring well design and installation and this SOP.

- **Monitoring Well**—An engineered structure made for the purposes of accurately recording the depth to free water within the ground and for the repeated collection of liquid samples that are representative of the conditions of the groundwater within the vicinity of the screened portion of the well.
- **Installation**—The construction of a groundwater monitoring well within the ground.
- **Water Table**—The surface or level in the saturated zone at which the hydraulic pressure is equal to atmospheric pressure.
- **Well Casing String (System)**—Monitoring well components consisting of blank casing (riser), well screen, well sump (optional), and top and bottom caps that are connected together and placed in the well boring for construction of the well.

5. RESPONSIBILITIES

5.1 Procedure Responsibility

The Geosciences Discipline Lead is responsible for the development, maintenance, and revision of this procedure. Any questions, comments, or suggestions regarding this technical SOP should be directed to the Geosciences Discipline Lead. The Geosciences Discipline Lead's location and associated contact information can be found on the Shaw Group intranet site, ShawNet.

5.2 Project Responsibility

Employees designing or installing groundwater monitoring wells, or any portion thereof, are responsible for meeting the requirements of this procedure. Employees conducting technical review or oversight of monitoring well design or installation are also responsible for following appropriate portions of this SOP. Project participants are responsible for recording information in sufficient detail to provide objective documentation (e.g., field notes, completion diagrams, reports, etc.) that the requirements of this SOP have been met. Such documentation shall be retained as project records.

6. PROCEDURES

Groundwater monitoring wells are constructed to facilitate reliable, repeatable, representative, and cost-effective sampling of groundwater with minimal disturbance of the aquifer. The degree of

representativeness of samples depends upon both the well installation and the sampling procedures. Poor well design or construction may result in samples that are unrepresentative of the groundwater quality for the strata or formation in which the wells are screened. Well sampling procedures are addressed in other Shaw E & I technical SOPs.

This SOP presents procedures for monitoring well design and installation that will facilitate collection of representative samples and be protective of the environment, in manners consistent with accepted practice and with most regulatory requirements.

6.1 Planning

The planning phase for monitoring well design and installation is an important function and includes the following:

- Identifying and addressing conceptual design issues/parameters (see Section 6.1.1)
- Selecting the drilling and well construction methods to be used (see Section 6.1.2)
- Identifying key approvals necessary for site access and installation of monitoring wells (see Section 6.1.3)
- Listing key Health and Safety requirements (see Section 6.1.4)
- Identifying and listing key requirements of subcontractor(s) used for well installation (see Section 6.1.6)

All planning, design, and installation of monitoring wells shall meet applicable federal, state, or local agency regulations/requirements. Additional program/project-specific requirements may also need to be addressed. Design elements and specifications, drilling methods, health and safety requirements, and detailed site- or project-specific installation procedures should be described in the project-specific work plans.

6.1.1 Conceptual Design

The expected stratigraphic interval for completion, the approximate total depth of the well, and the expected drilling conditions need to be known/developed. This information is necessary in order to complete the design for the well(s) (see Section 6.2), select methods for the drilling and construction of a well, and determine appropriate site-specific installation procedures.

The following are critical issues that must be identified and addressed during conceptual design:

- Monitoring and sampling objectives for the well(s) (e.g., collect groundwater samples, monitor position of the water table, measure thickness of non-aqueous phase liquid (NAPL), collect NAPL samples, etc.)
- Specific hydrostratographic interval or zone targeted for monitoring (e.g., base of unconfined unit A, top of confined aquifer B, first water-bearing fractured interval in unit X, water table in unconfined unit C, etc.)
- Any expectations for other future uses of the well(s) (e.g., groundwater extraction, NAPL [product] recovery, fluid injection for remediation, etc.).
- Expected top and bottom depths of the targeted zone (screen interval) of monitoring and total depth of the well(s).
- The type(s) of sampling that are to be performed in the well.
- Contaminant and groundwater chemistry and relation to composition of well materials.

- Current and expected use of the drill site area during the lifetime of the well.
- Expected long-term range or fluctuation in the position of the water table, or water level in the well(s).
- Expected grain size gradations of the zone that is to be filter-packed.
- Expectations for the presence of light or dense NAPL.
- Rough diameter of well casing and screen to be installed.
- "Drillability" of the geologic formations and/or type of drilling method(s) appropriate for penetrating formations to be encountered and installing the well(s) (see Section 6.1.2).
- Need for telescoped casing, including shallow permanent casing.
- Requirements for collecting formation fluid, cuttings, or intact formation samples as the well boring is advanced (drilled).
- Requirements for geophysical logging of the wellbore or completed well.

Additional project-specific critical issues may also need to be identified and addressed, and should be described in the project work plans.

6.1.2 Selection of Drilling and Well Construction Methods

The drilling method(s) to be used for constructing the monitoring well will need to be identified. Primary criteria for selecting a drilling method are a follows:

- Ability to drill and maintain a stable wellbore of the desired diameter and depth in the geologic formations at the site and effectively construct the well, as anticipated.
- Ability to avoid more complex constructions such as telescoped casings (deep wells) and shallow permanent casings to prevent communication between water-bearing zones.
- Minimizing formation damage or introduction of drilling fluids into the formation.
- Cost and time factors (budget) for the drilling method and site conditions.
- Flexibility of a drilling method to adapt to unexpected but possible different subsurface conditions or lithology, such as a perched aquifer or bedrock where only alluvium was anticipated.
- Surface access requirements, impacts, and limitations for drilling and sampling equipment (e.g., wildlife areas, archaeology site, buildings, etc.).
- Minimizing and controlling the generation of cutting or fluid wastes produced during the drilling.
- Ability to efficiently and reliably collect samples and data during the drilling process.

The selected drilling method(s) should be specified in the project work plans.

6.1.3 Approvals

Specific approvals for well installation need to be identified and can include notifications, permits, legal access and right-of-entry, and contacting and cooperating with inspection authorities.

Typical or basic pre-work approvals include some or all of the following:

- Permit for Drilling and/or Well Construction. A permit for drilling and/or installation of the well(s) may be required from a government agency (and sometimes also from a client agency) that has appropriate jurisdiction. Fees or accounts for payments of fees for oversite are often required by

many jurisdictions. Local, State, and Federal agencies may have specific well construction requirements that need to be identified and followed.

- Project work plans. Review and approval of various work plans (containing design specifications and procedures for installing monitoring wells) by a regulatory agency and the client are often required.
- Request/notification for underground utilities. Additionally, Shaw Procedure HS308, *Underground/ Overhead Utility Contact Prevention,* shall be followed. Additionally, in nearly every state it is a legal requirement to notify a third-party consortium for the identification and marking of known underground utility structures and features. There may also be client-specific requirements for underground utility identification and clearance.
- Legal Authority to Enter/Construct. Rights of entry and rights to construct must be in hand for any property that is not owned by the Client and under contract.
- Requirements for inspections before, during, or after well installation may exist. Regulatory agencies in urbanized areas and on more sophisticated or larger projects commonly retain and exercise the right to inspect work.

The approvals need to be appropriately planned for and executed in order to effect timely and efficient installation of the monitoring wells.

6.1.4 Health & Safety

All applicable Shaw E & I and project-specific health and safety requirements for drilling and well installation shall be identified and adhered to at a minimum. The Client, regulatory agencies, property owner, or site operator may have additional requirements that must be identified and addressed. All requirements must be listed and described in the project health and safety plan.

6.1.5 Subcontractors & Personnel

Requirements for the subcontractor that is drilling and installing the monitoring well(s) must be identified. The requirements are compiled into a statement of work to procure subcontractor services once the design of the monitoring well(s) is completed.

The drilling subcontractor typically must possess one or more licenses pertaining to its qualifications to perform the type of work, and authority to work in the city or state. This can include a contractor's license, issued by the state, and other specialized licenses, such as for drilling and installation of water wells, to demonstrate expertise and responsibility. Such license requirement should be listed in the project work plans.

6.2 Design Process and Considerations

Monitoring wells may be designed after the approximate completion interval and total depth, drilling conditions, method of drilling, sampling requirements, and relevant understanding of contaminant and groundwater chemistry are known. Additional site- or project-specific conditions may also need to be known. Certain special design or installation conditions require additional evaluation and consideration. Some conditions potentially requiring special design or installation considerations are listed in Attachment 1. The following text discusses the components that need to be evaluated and specified for the monitoring well design. The specific design components and parameters for the well(s) should be described in the project work plans.

6.2.1 Borehole and Casing Diameters

The borehole diameter must be sufficiently wide to construct the well, and the well casing string must be sufficiently wide for use after completion. The borehole diameter should be at least 4 inches greater than the nominal casing diameter. For deep borings it may be prudent for the boring diameter

to be 6 inches greater than the nominal casing diameter. For drilling methods that involve constructing the well within temporary casing (i.e., hollow-stem auger or temporarily driven drill casing), it is common for the boring diameter to be 6 to 7 inches greater than the nominal well casing diameter (i.e., 10 to 12–inch diameter boreholes). The borehole diameter needs to be sufficiently wide such that all the well construction materials may be placed without obstruction.

The well casing should have an interior diameter sufficient to allow passage of all equipment that might plausibly be used within the casing during the lifetime of the well. Monitoring wells are commonly 2- or 4-inch nominal diameter for depths to about 200 feet, and often 6-inch diameter for greater depths.

It is common to select an inside casing diameter that is 1 inch greater than the diameter of any equipment expected to be used within the well casing for shallower wells, and 2 inches greater for deeper wells.

Many monitoring wells are installed in boreholes made by direct push drilling methods. For these wells the casing strings are relatively small diameter, generally <2 inches. The borehole diameters using direct push methods are also relatively small, generally <3 inches. Viable monitoring wells can be constructed using these methods; however, due to the relatively narrow annular space, a pre-pack may be used for the filter pack (see Section 6.2.8).

6.2.2 Length and Position of Well Screen

Only factory-manufactured well screen should be used. Screens are commonly available in lengths of 5, 10, and 20 feet, and sometimes 2.5 feet. Pieces may be joined for greater lengths.

Most monitoring well screens are designed to be 5 or 10 feet long, and many regulatory agencies specify these lengths in their guidance or regulations. The reason for short screen lengths is that well screens and associated filter packs are analogous to elevator shafts within buildings: contaminants and other materials may migrate up and down within them with ease. In addition, there may be stratification of dissolved phase contaminants in the formation that may be diluted during purging and sampling across a long screen interval.

There are a few site-specific situations where well screens of 20 feet or more may be suitable or necessary. Such situations could include wells where the expected range in water levels is 20 feet or more, and the well needs to screen across the water table; or where the target formation is more than 20 feet thick, the contaminant plume is believed to be of great thickness, there is little or no vertical groundwater gradient within the target formation and no potential for a NAPL. In general, the length of screen (and associated length of filter pack) selected for the well should be based upon site-specific objectives, requirements, and conditions, should be designed to meet monitoring/sampling objectives, and should not contribute to enhanced vertical transport of contaminants.

The position or depth of the well screen relative to the water table, or specific target horizon or fracture/stratigraphic interval must be clearly known. Such information should be specified in the project work plans.

6.2.3 Length of Filter Pack

The filter pack should not extend more than 2 to 3 feet above the top of the well screen and no more than 1 to 2 feet below the bottom cap or sump. This is because filter packs typically have much higher vertical permeability than the adjoining native formation, and hence will facilitate the preferential vertical flow of groundwater or contaminants. Excess length of filter packs facilitates the vertical spread of contamination as well as the collection of samples that “average” (i.e., dilute) across a greater thickness of aquifer than anticipated.

A transition (or secondary) pack may be placed over the primary filter pack. The transition pack is a finer gradation material than the primary pack, and is designed to retard the infiltration of the overlying

bentonite and/or cement seal into the primary filter pack. It is appropriately used where the primary filter pack is a coarse gradation with a high potential for the infiltration of the overlying seal material.

6.2.4 Lengths of Seals

A bentonite seal should be placed directly over the uppermost filter pack. It should be 2 to 3 feet thick. A cement annular seal should extend from the top of the bentonite seal to the surface. In deeper wells, the seal may be over 100 feet thick.

The lengths and positions of the bentonite and cement seals may have to be adjusted if the water table is shallow (i.e., <6 feet deep). At times, a thicker bentonite seal may also be prudent when there are uncertainties in the borehole condition. Information on the composition of the seals is provided in Sections 6.2.10 and 6.2.11.

6.2.5 Shallow Permanent Casing

A permanent (larger diameter) shallow casing may be necessary to isolate the wellbore and well casing string (Section 6.2.6) and prevent communication between water-bearing zones. Such casings are commonly steel pipe of large diameter. The inside diameter of such casing should be at least 4 inches more than the exterior well casing diameter, to provide an adequate width for filling with a cement seal. This may require a very large initial boring for the shallow casing, and may necessitate a different drilling method. The use of a shallow casing in well construction will typically double the total cost of well construction.

Permanent shallow casings may be appropriate under the following conditions:

- The shallow or overlying aquifer or zone is highly contaminated and the deeper aquifer or zone of completion may have much lower or no contamination.
- The monitoring well will be screened/filter packed in a zone that has contaminant or natural chemistry distinct from that of an overlying zone of saturation.
- The monitoring well will be screened/filter packed in a zone that has different total head from an overlying zone of saturation, indicating that advection would occur between the two zones via the wellbore.
- Either the screened/filter pack zone or an overlying zone of saturation is an important resource for drinking water supply.
- A NAPL is suspected to exist above the zone that is to be screened/filter packed.

At times, a temporary drive casing may be used in drilling and constructing a well in place of a permanent shallow casing. The use of a permanent shallow casing or temporary drive casing in the installation of the well should be based upon site-specific objectives and conditions or regulatory requirements, and specified in the project work plans.

6.2.6 Well Casing String

This section discusses each component of the well casing string. The components include blank casing (riser), well screen, sump (optional), and top and bottom caps.

Blank Casing or Riser

Blank well casing (or riser) is attached to the top of the well screen and extends from the screen up to, or just above, the ground surface. Blank casing is made from the following materials:

- PVC. Any PVC well pipe/screen should be manufactured to ASTM F-480 standards. Schedule (SCH) 40 or SCH 80 are typically used; SCH 80 is typically used for total depths greater than

roughly 100 feet. Use of SCH 40 PVC at depths roughly greater than 100 to 150 feet; or in environments rich in ketones, esters, or certain aromatic hydrocarbons, may be problematic.

- Stainless Steel. Stainless steel (SS) is commonly used for wells with high concentrations of solvents or other organic compounds. Type 304 is the most commonly used grade and 316 is less commonly used, but more resistant to corrosion/chemical reaction. Use in saline or reducing waters may cause corrosion or leaching of metals.

- PTFE (Teflon). PTFE is very expensive. Its surface is slippery, and it may slip during installation, and it may be difficult for seal material to bond to it. It has higher chemical resistance and lower leachability than PVC or SS.

- Reinforced Fiberglass. The outside surface of reinforced fiberglass casing is slippery, brittle, and easy to crack if not handled with care. It is usually used for monitoring specific remediation applications/techniques.

ABS plastic, high density polyethylene (HDPE), and low carbon steel pipe are other materials that are sometimes used for blank well casing.

Well casing material should be selected based upon the following factors:

- The expected total well depth and expected depth of water during construction. For wells deeper than roughly 100 feet, the selection of casing material must consider the potential for the casing to collapse or tear apart as it is being hung in the well bore.

- The natural and contaminant groundwater chemistry. Saline waters and pH<7 are conditions which will likely degrade stainless steel or other metal well casings. Certain chemical products, or high dissolved concentrations, of non-polarizing organic compounds may cause swelling or even dissolution of PVC, or dissolution of some plasticizers.

- The cost of the well casing material. Well casing materials vary in cost as follows: least expensive – PVC; moderately expensive – stainless steel; most expensive – PTFE (Teflon).

Casing connections should be flush treaded. O-rings of known chemistry and compatible with the water chemistry and sampling objectives may be used to ensure a tight seal. Glued or solvent welded connections are not acceptable as the glues or solvents can alter the chemistry of the groundwater samples. Connections held together with slip couplings and sheet metal screws are also not acceptable. The screws can easily fail and can also damage sampling equipment.

Well Screen

Well screens are composed of the same materials as the blank casing and should be factory-manufactured. For monitoring wells, the dominant criterion for selection of the screen should be sizing to exclude approximately 90% of the filter or sand pack particles. Sizing and selection of well screen and filter pack is covered in Shaw E & I technical SOP EI-GS033, *Standards for Filter Pack and Well Screen Selection*.

Common screen types are slotted (milled) or wire-wrap. Slotted (milled) screen has the least open area (typically 2-6%) and is the least expensive. The most common widths of the cut slots used are 0.010 and 0.020-inch. Wire-wrap screen typically has 5-15% open area and comes in various grades of spacing between the wraps. Teflon and fiberglass screens are usually only available as slotted screen.

Well screens do not have to be of the same material as the blank casing. For example, a well could be constructed of SCH 80 PVC blank casing and 304 stainless well screen. If different materials are used, care should be taken to ensure that the screen and blank casing can be securely connected, and that the use of dissimilar metals does not create problems with corrosion/cathodic reaction at the connection. Individuals needing help in designing well casing string configurations should find a senior geologist/hydrogeologist with monitoring well design and installation experience.

Well Sump (Foot)

A well sump consists of a short piece (i.e., 1 to 3 feet) of blank well casing with a bottom cap that is attached to the bottom of the screen section. A sump is used when dense non-aqueous phase liquid (DNAPL) is expected to enter the well (and is to be sampled and/or removed from the well), or a significant amount of sediment may enter the well over time.

The use of a foot or sump results in the expenditure of more resources during installation, development, and well purging. It is a practice that carried over from the installation of water supply wells, and is generally of little benefit for monitoring wells. The use of a sump may not be practical where the bottom of the well screen is to be set at the top of a lower confining unit. Consequently, the current trend is to avoid the use of sumps in monitoring wells.

Top and Bottom Caps

The well screen or sump should have a firmly attached bottom cap to prevent formation material from entering the well during installation and after completion. The top cap is usually either a slip cap that is placed over the top of the blank casing, or a rubber (expansion) gasket cap that is used to seal the top of the casing. The purpose of the top cap is to prevent entry of surface water into the well casing.

6.2.7 Centralizers

Centralizers are concentric devices that are designed to keep the well casing centered within the borehole, and to build a well that has an adequate annular space around the sides of the well casing. Centralizers are generally not used for wells less than 20 feet total depth and are typically not used when constructing a well through hollow stem augers or when using direct push drilling methods. The augers maintain space between the well casing string and borehole wall as the well is constructed.

Drillers generally have to use extra care in installing wells with centralizers. This is because the centralizers may become dislodged during installation of the casing string, hinder emplacement of filter pack or seal material with a tremie pipe, or hinder measuring the depths of filter pack or seal material. Any installation of centralizers should be closely supervised.

Centralizers, if used, are typically placed at intervals of every 20 feet for SCH 40 PVC casings. They may be placed at intervals of every 40 feet for steel or other more rigid casings. Centralizers are also placed just above the top of the well screen and, for certain wells, at the bottom of the screen or sump. The exact spacing to be used should be based on well- and site-specific conditions and specified in the project work plans. Metal centralizers will interface with electrical geophysical logs run inside PVC well casing.

6.2.8 Filter Pack

Filter packs may either be artificial (emplaced engineered material, including pre-packs) or natural (in-place geologic formation). Artificial packs are used most commonly and should be considered the default approach. Natural sand packs are not recommended and should generally only be used when installation of an artificial pack is not feasible (due to subsurface conditions).

Engineered (Artificial) Filter Pack. Engineered filter packs should consist of chemically inert rounded particles of a defined size distribution. Clean-washed and bagged graded silica sands are usually used for this purpose. Selection of filter pack size should follow appropriate Shaw E & I technical SOPs and/or project-specific requirements. Filter packs are best placed (especially with deeper borings) with a small diameter pipe (tremie) extended to the bottom of the borehole. The tremie is slowly withdrawn as the sand is pumped into the boring.

Pre-Pack. Pre-pack and channel-pack are integral systems of interior casing, filter pack, centralizers, and exterior casing. They are commonly used for small diameter (i.e., 1-inch casing diameter) wells and may be preferable for larger diameters wells where heaving or caving formation is prevalent.

Filter pack gradations and screen opening sizes can be designed or selected from several off-the-shelf products.

Natural Sand Pack. Use of a natural pack may be appropriate if the following criteria are met: an engineered filter pack cannot be installed and the natural formation in the vicinity of the proposed well screen is well characterized, homogeneous, composed predominantly of grains that will not enter the well screen, sufficiently permeable, and loose enough that it will collapse around the well screen. The use of a natural sand pack will usually require prior regulatory agency and client approval. Such approval should be documented, as required for the project, and the documentation maintained as project records.

6.2.9 Transition (Secondary) Filter Pack

A transition (or secondary) sand pack may be placed above the primary filter pack. This transition pack may be used where the filter pack is sufficiently coarse-grained and graded such that there is potential for the bentonite seal to migrate significantly into it. Such migration may result in bentonite entering the well screen. An optional upper transition filter pack may also be placed between the bentonite seal and the cement seal. Transition sand packs are typically 2 to 3 feet thick and composed of a graded, engineered silica sand with smaller grain size than the primary filter pack.

6.2.10 Bentonite Seal

The bentonite seal serves to separate the sanitary seal from the filter pack and provides extra protection against any migration of fluid up or down the wellbore from the screen/filter pack interval. It is typically 2 to 3 feet thick and may be composed of bentonite chips or pellets that are emplaced and then hydrated in-place, or it may be composed of a mechanically-mixed bentonite powder-water slurry that is tremied into place.

6.2.11 Cement Annular Seal

The cement seal constitutes the bulk of the annular fill in a deep well. Its primary purpose is to prevent fluids from migrating up or down the wellbore above the filter pack. To do this it must have low permeability, fill the entire annular space, and not shrink.

The seal is composed of a grout mixture of Portland cement and water, with or without a bentonite additive. An admixture of about 5% bentonite powder, added to a cement-water slurry, is used to minimize shrinkage of the seal after it has been emplaced and is setting. Some regulatory agencies have guidance, requirements, or specifications for using or not using bentonite in the grout. Such guidance and/or requirements need to be known and incorporated into the well design.

The use of quick-setting or other additives is not recommended as they can affect the chemistry of the groundwater samples. At times such additives may be necessary in highly permeable formation, but should only be used after appropriate regulatory approval. Such approval should be documented in the project files. Proper mixing and installation are important. The seal material should be mechanically mixed. It should be emplaced into the borehole in a way that prevents contact with the boring sidewall until it is in place, so that it does not pull sidewall material with it as it falls. The use of a tremie pipe, as with the sand pack placement, will facilitate completing the annular seal, especially in deeper borings. This helps to prevent voids or bridging of the cement. Additional information on the composition and mixing of the cement seal is presented in ASTM D 5787.

Cement generates heat as it sets. It is possible for deformation or failure of thermoplastic (i.e., PVC or ABS) well casing to occur from the heat generated during setting of the cement seal. This problem is exacerbated by more-rapidly-setting cements and thicker annular spaces. At times, the thickness of the annular space is greater than designed, for example if the formation washes out during drilling or cleaning of the wellbore. In such cases the potential for softening and sagging of the well casing is great as the cement sets. If this occurs, the well must be abandoned and replaced. Changing the design of the well may also be necessary.

6.2.12 Above-Grade or Flush-Mount Surface Completion

Selection of an above-grade or flush-mount surface completion is largely determined by the likelihood of vehicle traffic at the site surface, or other client/property owner requirements (e.g., visual aesthetics, etc.). Flush-mount completions are default practice where there is vehicle traffic, the ground surface is stable, and flooding is not anticipated. Above-grade completions are commonly used in areas of little or no vehicle traffic, where the ground surface is unstable (loose or muddy), where high grasses are present, or where a likelihood of standing water exists. There may be strict regulatory requirements for the design and construction of surface completions. Such requirements must be identified and incorporated into the well design.

The following are the primary design criteria for every surface completion:

- Preventing hazard to/from vehicles.
- Preventing damage to the well.
- Preventing inflow of surface waters.
- Preventing unauthorized access and/or tampering. (requires some form of locking or securing the wellhead)
- Ease of use.
- Client/property owner requirements.

The exact type and components of the surface completion to be used should be described in the project work plans.

Above-Grade Completions

The primary components of an above-grade completion are the surface pad, protective casing, locking lid, drain hole, and bollards. Information on each of these components is provided in the following text.

Surface Pad. The surface pad is a concrete pad that stabilizes the protective casing, provides a firm surface for workers, and directs surface waters away from the well casing. The protective pad should be at least 2 feet by 2 feet and at least 4 inches thick; however, it is recommended that it be somewhat larger and at least 6 inches thick. The surface pad should have a slight slope away from the protective casing to drain water away from the well.

Protective Casing. The protective casing should be weather- and tamper-resistant, capable of keeping rainfall from reaching the well casing, and resistant to opening without use of significant force. It is set around and over the well casing, extending from at least 6 inches above the well casing to at least 2 feet below grade (~30 inches below top of surface pad). There should be cement all the way around the protective casing, to its full depth.

Lid. The protective casing should have a locking, hinged lid that will protect the wellhead from rain, tampering, animals, and ultraviolet damage.

Drain hole. A small hole should be drilled through the protective casing, a short distance above the top of the surface pad (higher if flooding is anticipated).

Bollards. Bollards (a.k.a. bumpers, traffic guards) are emplaced around the protective casing to hinder the destruction of the well from vehicles. Bollards are often made of six-foot long, 4- to 6-inch diameter iron (black) pipe, filled with concrete. Bollards should be painted in a weather-resistant and highly-visible color paint.

Bollards should be set to a depth of at least 30 inches. They should be placed in an oversized, slough-free borehole or excavation that is filled with concrete. The borehole or excavation for the bollard should be at least 6 inches greater diameter than the bollard. Bollards are typically placed 3 to 6 feet from a well, usually 4 per well. At times, the bollards are embedded in the surface pad.

Bollards are easily knocked over when the momentum (speed and/or weight) of an impacting vehicle is great. For wells that are deeper or otherwise significantly expensive to replace, more robust bollards may be made as follows:

- Use a wider-diameter, thicker walled pipe for the bollard.
- Use a longer pipe. Bury it more deeply yet maintain enough height that any portion of a vehicle will strike the bollard before striking the protective well casing.
- Bury the pipe in a wider excavation. A wider and heavier concrete base is more difficult to dislodge than a narrow, shallow and light base.
- Space the bollards further out from the well. This may require use of 6 or more bollards.

Bollards should not be placed as to completely prevent a development, workover, or sampling rig from accessing the well.

Flush-Mount Completions

Flush-mount completions are constructed for monitoring wells that need to be secured from damage when driven over by vehicles, constructed in locations that have very low likelihood of flooding, and need to be resistant to entry of rainfall or sheetflow. A locking protective street box or vault is the main component of the flush-mount completion. The box needs to have the following characteristics:

- Sufficient strength to not break, crack, significantly sag, or permanently deform when the greatest expectable vehicle wheel weight is upon it
- A lid that is snuggly fitting and securely bolted to the frame
- Minimal potential for rainfall or sheetflow to enter it

The box should be set slightly above surface grade and placed in concrete. The concrete should completely surround the box and be sloped from the top edge of the box to surface grade. The top of the blank well casing should be positioned inside the box to provide sufficient clearance to install a top cap on the casing.

6.3 Monitoring Well Installation

The basic process for monitoring well installation consists of drilling and preparing the well boring or borehole (includes setting permanent shallow protective casing [if required] and drilling borehole to total depth [TD]); decontaminating the well material (as necessary); connecting the components of the well casing string; carefully placing the well casing string in the borehole; placing/setting the annular materials (filter pack, transition pack [optional], bentonite seal, and cement seal); and constructing the surface completion. The procedures for installation (construction) of a monitoring well depend upon a variety of site-specific conditions and factors discussed in Sections 6.1 and 6.2.

Detailed site-specific procedures for monitoring well installation should be developed and described in the project work plans and be based on the site-specific conditions and factors. Drilling of the borehole for the well should also follow applicable Shaw E & I technical SOPs and project-specific requirements/procedures. An example of a basic monitoring well installation procedure is included as Attachment 2. It is not possible for this SOP to present a detailed, specific procedure that would be applicable to the wide range of well designs, drilling methods, and installation methods available or applicable to specific conditions for a particular project. The example procedure may be customized

and supplemented to address site- or project-specific conditions and requirements. Monitoring well installation should be supervised by the rig geologist.

6.4 Documentation

Accurate documentation is important to demonstrate that the monitoring well was installed appropriately and to help ensure the usability of monitoring and sampling results from the well. Appropriate forms should be completed as per applicable Shaw E & I technical SOPs and project-specific requirements/procedures. Such forms can consist of a well construction form and a boring log. An example well construction form is included with this SOP (see Section 8). Basic requirements for generation of boring logs are presented in Shaw E & I technical SOP EI-GS027, *Standards for Generation of Boring Logs*.

Additional aspects of work may be addressed on separate appropriate forms. Such items to be entered on the appropriate forms include the following:

- Observations or measurements pertaining to health and safety
- Times of starting and completion of tasks and any significant down time
- Any problems or issues related to installing a particular well
- Exact counts (footages, weights, bags, piece numbers, etc.) of materials, as required for payment purposes.

In addition, the regulatory agencies may have specific documentation requirements for monitoring well installations. These requirements should be known and planned for in advance to ensure timely and effective compliance.

6.5 Acceptance

Shaw E & I or client QC programs may have specific requirements for the acceptance of a monitoring well. These requirements may include submittals of documentation (see above discussion) and/or field tests. The following are examples of field QC tests.

Straightness of Well Casing

A well casing must be sufficiently straight that any instrument/equipment used within the casing can freely pass through it. As many instruments/equipment have lengths of 3 feet, 10 feet, or even more, a casing that is not straight can cause an instrument or equipment to become stuck or prevent it from passing the area of constriction. Methods to help ensure a straight casing are to drill a straight boring (if possible) and, once the boring is complete, to hang or suspend the casing (using slips, etc.) while constructing the well.

Sediment Content or Turbidity

A client or oversight agency may have a maximum measured turbidity allowed for water samples produced from a monitoring well. They may refuse to accept a well that does not adequately clean up of sediment and turbidity during development. Careful design and construction of the well help ensure that the initial sedimentation rate and turbidity within the well can be reduced to acceptable limits during subsequent development of the well.

At times, monitoring wells are required to be designed and installed in fine-grained non-aquifer units. In such cases, the required maximum turbidity standards may not be achieved even with careful design and well installation practices.

6.6 Technical Review

All monitoring well design and installation specifications, procedures, and results (e.g., reports, forms, etc.) should undergo technical review. It is recommended that the technical reviewer also provide review/oversight of the actual field implementation of monitoring well installation activities. This should include aid in troubleshooting drilling and installation problems. The technical reviewer should be an experienced senior geologist or hydrogeologist. At a minimum, the technical reviewer should be a person capable of planning and supervising monitoring well installation programs. Individuals needing assistance in finding qualified technical reviewers may consult internal Shaw E & I technical listings for experts in well design and installation.

Any issues raised during the technical review shall be resolved between the reviewer and staff planning, conducting, or preparing results of monitoring well installation activities as follows:

- Comments/issues raised relative to planning, designing, and developing detailed procedures for monitoring installation should be resolved before mobilization and drilling/well installation commences.
- Comments/issues raised relative to results of well installation activities should be resolved before external (i.e., outside of Shaw E & I) use or submission of the results.

The technical review comments and issues, and corresponding resolution should be documented and filed with the project records. Such records should be maintained until project closeout.

7. ATTACHMENTS

- Attachment 1, Conditions Potentially Requiring Special Design or Installation Considerations
- Attachment 2, Example Monitoring Well Installation Procedure

8. FORMS

- Example Monitoring Well Construction Form

Attachment 1
Conditions Potentially Requiring Special Design or Installation

Installation over 100 feet total depth – potential for casing failure during installation of well. Careful selection of casing materials and drilling techniques; careful handling of well materials during installation recommended.

Installation in waters with polar organic chemicals at concentrations > approximately 25% of solubility limit – potential for damage to PVC casing, screen, and components. Literature research and possibly using material other than PVC is recommended.

Installation in reducing waters or low pH waters with hydrogen sulfide – potential for corrosion of steel casing components and leaching of metals such as Ni and Cr into well waters. Use of non-metal casing may be recommended.

Drilling through a confining zone between two saturated zones – high potential for advective flow of contaminated water through borehole. Use of a conductor casing or temporary drive casing may be required.

Extremely unstable formation/flowing sands – necessitates careful consideration and implementation of drilling and installation techniques, including use of mud rotary drilling methods and/or temporary drive casing. Use of water to flood hollow stem augers to construct wells in flowing sands is another technique. However, issues may arise with possible chemicals in the water supply used. May also require prior regulatory acceptance/concurrence; some agencies may not allow use of this technique.

Installation at the water table – careful review of range in depth to water is recommended. Recommend for well screen that is high enough and low enough to capture all expected depths of water.

Installation through uncased borehole – a high potential exists for dislodging of loose sidewall materials during installation, and of bridging of sand or seal materials, or entrainment of sloughed sidewall materials. Use of a tremie pipe is recommended for installing filter pack and seals.

Expected use includes active recovery of liquids – the well screen and filter pack should be more carefully designed to ensure adequate flow of liquids into the well casing.

Monitoring for radionuclides – certain well construction materials (such as bentonite) contain naturally-occurring radioactive components. Discussion of construction materials with geoscience leads at Shaw's U.S. Dept. of Energy Project Offices is recommended.

Attachment 2
Example Monitoring Well Installation Procedure

The following monitoring well installation procedure is provided as an example or basic procedure. It should be customized based on project/site-specific conditions, equipment, methodologies, and quality control requirements. This procedure is written for a generic shallow 2- or 4- inch diameter monitoring well installed inside a mud rotary boring or inside hollow stem augers or temporary drive casing. The rig geologist should supervise drilling of the well boring and installation of the monitoring well. The example procedure consists of the following:

1. The well boring should be drilled to the desired total depth using the methods and procedures specified in applicable Shaw E & I technical SOPs and the project work plans. This includes generation of a boring log by the rig geologist during the advancement of the boring.

2. After the borehole has been successfully drilled to the target total depth, remove all drill cuttings prior to constructing the well. Additional conditioning of the borehole may be required depending upon observed conditions. Review logs and notes with the driller for any zones or depths exhibiting drilling problems that may affect the well installation. Make sure the proposed screen depths will be placed in the proper stratigraphic interval. Identify and plan any other necessary actions mutually agreed upon by the rig geologist, project geologist, and the driller to ensure or aid in effective installation of the well.

3. Remove the drill pipe and bit if using rotary techniques, or remove the center stem, bit, and plug if using the hollow-stem auger technique. The well construction materials will then be installed inside the open borehole or through the center of the drive casing or augers.

4. Measure the total depth of the completed boring using a weighted sounding line. Check the borehole depth to ensure that formation material has not heaved to fill the borehole. If heaving has taken place, options for cleaning, redrilling, or installation in the open section of the boring should be discussed with the project geologist and driller.

5. In the event that the hole was drilled beyond the desired depth, sealant (usually bentonite or as specified in the project work plans) may be added to the bottom of the boring to raise the bottom of the hole to the desired depth. The bentonite should be added gradually to prevent bridging. Bentonite addition should stop when its level has reached approximately 6 inches to 1 foot below the desired base of the well casing string. The bentonite plug should be allowed to hydrate for at least 1 hour before installation of a filter pack or other well materials.

6. Calculate volumes of filter pack, bentonite pellets/slurry, and cement grout required, based on borehole and well casing dimensions.

7. Place a layer of filter pack (6 inches to 1 foot, or as specified in the project work plans) at the bottom of the borehole. The filter pack will be installed through the center of the drive casing/augers. Filter pack will be added slowly while withdrawing the drive casing/augers. Measure and record the depth to the top of the layer.

8. Thoroughly decontaminate the blank casing, well screen, sump (optional), and top and bottom caps to be installed in the well according to applicable Shaw E & I technical SOPs and/or the project work plans.

9. Inspect the blank casing, well screen, sump, top and bottom caps, and any other well construction materials prior to installation to ensure that no damage has occurred during shipment and decontamination activities.

10. Connect the well casing string together. Make sure the top cap is securely positioned on the blank casing to prevent unwanted material from entering the well during construction activities. Carefully lower the well string through the open borehole, drive casing, or inside of the augers until the well string is at the desired depth. The well string should be suspended by the installation rig and should not rest on the bottom of the boring. The casing string should be vertical and centrally positioned in the borehole. Stainless steel centralizers should be used if necessary and feasible. In the event that the well string was dropped,

lowered abruptly, or suspected of being damaged during placement, the string should be removed from the boring and inspected.

In certain instances, the well string may rise after being placed in the borehole due to heaving sands. If this occurs, the driller must not place any drilling equipment (drill pipe, hammers, etc.) to prevent the casing from rising. The rig geologist should note the amount of rise. The rig geologist should then consult with the project geologist for an appropriate course of action.

11. Record the following information on the appropriate forms according to this SOP and/or the project work plans: length of well screen, total depth of well boring, depth from ground surface to top of grout or bentonite plug in bottom of borehole (if present), depth to base of well string and depth to top and bottom of well screen.

12. When using the mud rotary drilling technique, tremie the filter pack into the annular space around the screen. Clean, potable water may be used to assist with the filter pack tremie operation. For all other drilling techniques, the filter pack may be allowed to free-fall or be tremied (deeper boring) according to the project work plans. If using drive casing or augers, the drive casing or augers should be pulled slowly during filter pack installation in increments of roughly 0.5 to 1 foot so that the filter pack can fill the annular space between the well screen and borehole wall.

13. Monitor filter pack settlement by initially measuring the sand level (before beginning to withdraw the drive casing/augers). In addition, repeatedly take depth soundings using a weighted tape to continually monitor the level of the sand. The top of the well casing should also be monitored to detect any movement due to settlement or upward lifting from drive casing/auger removal. If the top of the well casing moves upwards at any time during the well installation process, the driller should not be allowed to set drilling equipment (downhole hammers, drill pipe, etc.) on the top of the casing to prevent further movement.

14. Add filter pack until its height is approximately 2 to 3 feet above the top of the screen (unless otherwise specified in the project work plans), and verify its placement (by sounding). The filter pack may then be gently surged or swabbed in order to settle the pack material and reduce the possibility of bridging.

15. The height of the filter pack should then be re-sounded and additional filter pack placed as necessary. Once the placement of the filter pack is completed, the depth to the top of the pack is measured and recorded on the appropriate forms according to the project work plans. The total volume of filter pack used should be recorded and compared to the pre-installation calculated volume. If the actual volume used is less than the calculated volume, the project geologist should be consulted to help determine if bridging of the sand pack occurred.

16. Install a bentonite seal measuring 2 to 3 feet thick (unless otherwise specified in the project work plans) on top of the filter pack. If pellets or chips are used, they should be added gradually to avoid bridging. Take repeated depth soundings using a weighted tape to ascertain the top of the bentonite seal. The seal should be allowed to hydrate for at least one hour, or as specified in the project work plans, before proceeding with the grouting operation.

17. After hydration of the bentonite seal, place cement grout in the annular space. The grout may be pumped through a tremie pipe and filled from the top of the bentonite seal upward. The bottom of the tremie pipe should be maintained below the top of the grout to prevent free fall and bridging. When using drive casing or hollow-stem auger techniques, the drive casing/augers should be raised in incremental intervals, keeping the bottom of the drive casing/augers below the top of the grout. Grouting will cease when the grout level has risen to within approximately 1 to 2 feet of the ground surface, depending on the surface completion type (flush-mount versus aboveground). The grout levels should be checked for settlement after a time period specified in the project work plans. If settling has occurred, the grout should be topped off to the original level.

18. For above-grade completions, the protective steel casing should be centered over the well casing (riser) and inserted into the grouted annulus. The bottom of the protective casing should be set at a depth of 2 feet below grade. Prior to installation, a 2-inch deep temporary spacer shall be placed between the PVC

well cap and the bottom of the protective casing cover to keep the protective casing from settling onto the well cap.

19. Allow a minimum of 24 hours to elapse after final grouting before installing the concrete pad and steel guard posts for above-grade completions, or street boxes or vaults for flush-mount completions.

20. After the protective casing has set, construct a concrete surface pad (2 feet by 2 feet by 4 inches thick) at ground surface around the protective steel casing. The concrete is sloped away from the protective casing to promote surface drainage from the well.

21. Embed four steel bollards to a depth of approximately 30 inches below surface grade. Install the posts in concrete-filled postholes spaced equally around the well at a distance of approximately 3 feet from the protective steel casing.

22. After the surface pad has set, a drainage hole may be drilled into the protective casing if required by the project work plans. The drainage hole is positioned approximately two inches above ground surface, just above the top of the surface pad.

23. For flush-mount completions, set a street box or vault and cement it in position. The street box or vault will be centered over the well casing (riser). The top of the street box or vault will be positioned slightly above grade and the cement sloped to grade to promote surface drainage away from the well

24. Label the wellhead to identify, at a minimum, the well number, depth, and date of installation. A reference or measuring point for measuring water levels may also be placed or marked at the wellhead.

25. Following well completion and demobilization of the rig, the well site should be cleared of all debris and trash and restored to a neat and clean appearance according to the project work plans. All investigation-derived waste generated at the well site should be appropriately contained and managed according to the project work plans.

26. All measurements should be recorded and all appropriate documentation completed according to this SOP and/or project-specific requirements.

27. The wellhead may be surveyed for location and elevation after completion according to applicable Shaw E & I technical SOPs and/or project-specific requirements.

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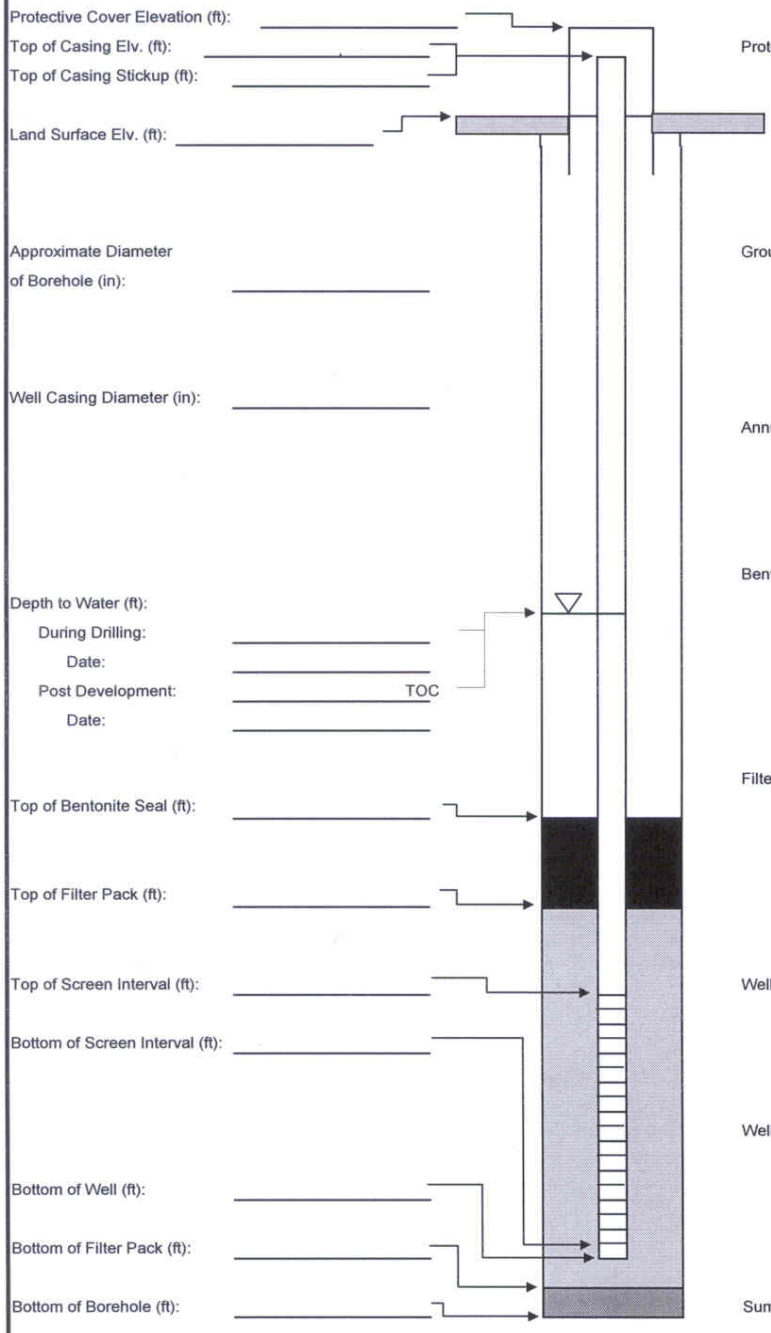
Example Monitoring Well Construction Form

Monitoring Well Construction Form

Project: _____ Well Number: _____
Location: _____ Site Location: _____
Client: _____ Installation Date _____
Subcontractor: _____ Northing: _____
Driller: _____ Easting: _____
IT Field Representative: _____ NAD: _____ NGVD: _____



Protective Cover Elevation (ft): _____
Top of Casing Elv. (ft): _____
Top of Casing Stickup (ft): _____
Land Surface Elv. (ft): _____

Approximate Diameter of Borehole (in): _____

Well Casing Diameter (in): _____

Depth to Water (ft):
During Drilling: _____
Date: _____
Post Development: _____ TOC
Date: _____

Top of Bentonite Seal (ft): _____

Top of Filter Pack (ft): _____

Top of Screen Interval (ft): _____

Bottom of Screen Interval (ft): _____

Bottom of Well (ft): _____

Bottom of Filter Pack (ft): _____

Bottom of Borehole (ft): _____

Protective Casing:
Type: _____
Dimensions (in): _____
Length (ft): _____
Guard Post: _____

Ground Seal (Surface Pad)
Dimensions: _____
Type: Concrete

Annular Space Seal:
Type: Bentonite-Cement Grout
Installation: Gravity Tremie Pumped

Bentonite Seal:
Manufacturer: _____
Type: Pellets Slurry
Installation: 6-in lifts One Section
Gravity Tremie Pumped
Hydration time (hrs): _____

Filter Pack Material:
Manufacturer: _____
Product Name: _____
Size: _____
Volume Added (ft^3): _____
Installation: Gravity Tremie

Well Casing:
Manufacturer: _____
Type: _____
Diameter (in): _____

Well Screen Casing:
Manufacturer: _____
Type: _____
Slot Size (in): _____ %Open
Slot Type: Continuous wrap Factory slot

Sump/End Cap: _____

Backfill Material: _____

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STANDARD OPERATING PROCEDURE

Subject: Standards for Conducting Well Development

1. PURPOSE

This procedure provides the standard practice for development of monitoring, extraction, and injection wells completed primarily in granular formations. The procedure includes the minimum required steps and quality checks that all employees and subcontractors are to follow when performing the subject task.

This procedure may also contain guidance for recommended or suggested practice that is based upon collective professional experience. Recommended practice goes beyond the minimum requirements of the procedure and should be implemented when appropriate.

2. SCOPE

Geosciences Standard Operating Procedure (SOP) EI-GS037 describes standards for well development and outlines how such development activities will be conducted for projects executed by Shaw Environmental & Infrastructure, Inc. (Shaw E & I). The SOP addresses technical requirements and required documentation. Responsibilities of individuals performing the work are also detailed. Additional project-specific requirements for well development may be prepared, as necessary, to supplement this procedure and address project-specific conditions and/or objectives.

3. REFERENCES (STANDARD INDUSTRY PRACTICES)

Well development should follow accepted industry practices. These industry practices are presented in the latest version of the following ASTM Standards:

ASTM D 5521	Standard Guide for Development of Ground-Water Monitoring Wells in Granular Aquifers
ASTM D 5092	Standard Practice for Design and Installation of Ground Water Monitoring Wells in Aquifers.
ASTM D 6724	Standard Guide for Installation of Direct Push Ground Water Monitoring Wells
ASTM D 6725	Standard Guide for Installation of Direct Push Ground Water Monitoring Wells

Additional reference materials, which will be useful for planning and conducting well development, include the following:

- Aller, Linda, B.W. Truman, G. Hackett, R.J. Petty, J.H. Lehr, H. Sedoris, D.M. Nelson, J.E. Denne, 1989, *Handbook of Suggested Practices for the Design and Installation of Ground-Water Monitoring Wells*, National Water Well Association, Dublin, Ohio.
- Driscoll, Fletcher G. 1995, *Groundwater and Wells*, Johnson Division, St. Paul, Minnesota.

- Izraell, Ruth, D. Yeskis, M. Collins, K. Davies, B. Zavala, 1992, *Monitoring Well Development Guidelines for Superfund Project Managers*, U.S. EPA Groundwater Forum, Office of Solid Waste and Emergency Response, April 1992.
- U.S. Environmental Protection Agency, 1986, RCRA Ground-Water Monitoring Technical Enforcement Guidance Document, OSWER-9950.1.

Additional reference materials on well development may be found in regulatory or other governmental links on the Internet.

4. DEFINITIONS

The following definitions are applicable to well development and this SOP.

- **Airlift Pumping**—A method of well development for groundwater production wells. It utilizes an airlift pump consisting of two pipes, with one (the air line) inside the other (the eductor pipe) used to withdraw water from a well. The lower ends of the pipes are submerged, and compressed air is delivered through the inner pipe to form a mixture of air and water. This mixture rises in the outer (eductor) pipe to the surface because the specific gravity of this mixture is less than that of the water column. This method of pumping is not usually recommended by regulatory agencies for development of monitoring wells, since volatile organics may be stripped from the groundwater and since the introduction of air can change formation and groundwater chemistry.
- **Backwashing**—The reversal of water flow (due to the addition of water to a well) that causes water to move through the well screen, through the sand pack, and into the formation to loosen bridges and facilitate the removal of fine-grained materials. Only formation water and a pump without a check valve are used for this process. Water is first discharged from the well and then the pump is shut down. The corresponding water column in the eductor line then flows back down through the pump and into the well, causing the flow reversal.
- **Bailer**—A cylindrical steel, stainless steel, Polyvinyl Chloride (PVC), or Teflon container with a valve at the bottom, and sometimes open at the top, for admission of fluid and sediment. The bailer is attached to a wire line or string and used in recovering and removing water, cuttings, mud, sand, or debris from the bottom of a well.
- **Bailing**—A technique whereby a bailer is lowered to the bottom of a well and then raised to recover and remove water, cuttings, mud, sand, or debris from the well.
- **Eductor Pipe**—The pipe used to transport water discharged to the surface from a pump (during pumping or air lifting).
- **Hydraulic Jetting**—A well development method that employs a jetting tool with nozzles and a high-pressure pump to force water outwardly through the well screen, through the filter pack, and into the adjacent formation to dislodge fine sediment and sand bridges and rehabilitate formation damage from drilling.
- **Overpumping**—Pumping at rates generally greater than those used during sampling, well purging, or general groundwater extraction. Commonly combined with backwashing or surging of the well as part of development.
- **Suction Bailer (Also referred to as a Double Bailer or Moran Bailer or Sand Pump)**—A suction bailer is a specially built bailer that can remove sediment or other foreign objects from the bottom of a monitoring or extraction well. The upward and downward movement of the bailer may also help to surge the well. A suction bailer is one of the tools used by a well development subcontractor.

- **Surge Block**—A plunger-like tool consisting of leather or rubber discs sandwiched between steel or wooden discs that may be solid or valved (vented surge block) that is used in well development. (See "Surging" below.)

- **Surging**—A well development technique using a number of different types of equipment or methods to create a strong inward and outward movement of water through the well screen, through the sand pack, and into the formation.

- **Turbidity**—The state, condition, or quality of opaqueness or reduced clarity of a fluid due to the presence of suspended matter. Also, a measure of the ability of suspended material to disturb or diminish the penetration of light through a fluid; commonly measured as nephelometric turbidity units (NTUs).

- **Washing**—The addition of water to a well to conduct development. This is usually done for wells with the water level in the middle of the well screen interval. That is, part of the sand pack and formation is not saturated. The water is added to develop the unsaturated portion of the well screen, sand pack, and adjoining formation. Potable water from a domestic water supply is commonly used; however, most regulatory agencies do not like the use of this technique for monitoring wells. Any water added to the well must be of known and acceptable chemistry. The effects of the wash water on the formation groundwater chemistry must also be ascertained.

  Well water may also be used to wash the well cap and inside of the casing (above the static water level) of sediment from the development process. This application of washing is usually acceptable to the regulatory community.

- **Well Development**—The use of any number of mechanical techniques to remove fine-grained materials, drilling fluids, and sand bridges from the well screen, sand pack, and adjacent formation to provide sediment-free representative groundwater samples, enhance well yields, and help restore natural hydraulic conditions in the formation.

5. RESPONSIBILITIES

5.1 Procedure Responsibility

The Geosciences Discipline Lead is responsible for the development, maintenance, and revision of this procedure. Any questions, comments, or suggestions regarding this technical SOP should be directed to the Geosciences Discipline Lead. The Geosciences Discipline Lead's location and associated contact information can be found on the Shaw Group intranet site, ShawNet.

5.2 Project Responsibility

Employees conducting well development are responsible for meeting the requirements of this procedure. Employees conducting field technical review of well development activities are also responsible for following appropriate portions of this SOP. Project participants are responsible for recording information in sufficient detail to provide objective documentation (field notes, reports, etc.) that the requirements of this SOP have been met. Such documentation shall be retained as project records.

6. PROCEDURES (TECHNICAL REQUIREMENTS AND STANDARDS)

This section presents information on basic considerations and methods, planning and preparation, basic procedures and requirements, and technical review requirements for well development.

6.1 Basic Considerations and Methods

Well development is conducted to help restore natural hydraulic conditions in the formation, enhance well yields, and provide sediment-free water samples from the wells that are representative of groundwater in the formation. The development process involves use of one or a combination of mechanical methods to 1) recover fluids introduced into the formation and sand pack during drilling; 2) remove fine-grained materials and sand bridges from the sand pack and adjacent formation; 3) remove the "skin" from the borehole wall; and 4) help repair damage to the formation from drilling.

Well development should be conducted on all newly installed wells, after a specified period of time (e.g., a minimum of 48 hours and not more than 7 days after sealing the annular space of the well). State or local regulatory agencies may specify the time period; individuals planning well development activities should be aware of such requirements relative to their specific site(s). Monitoring wells may also be redeveloped after they have not been used for a period of time, when they show evidence of sediment buildup in the bottom of the well, or when they start yielding turbid water samples. Extraction/injection wells may also be redeveloped to restore or improve yield and specific capacity, and after rehabilitation efforts.

Many well development methods are currently in use within the industry. These include surging, bailing, pumping, overpumping, airlifting, washing, backwashing, and jetting. Descriptions and information on these methods are provided in Driscoll (1986) and ASTM D 5521. Some combination of methods are specifically planned and implemented for development of wells relative to specific construction parameters and subsurface conditions at a particular site. For instance, monitoring wells can be developed by surging and pumping; surging and bailing; bailing, pumping, and backwashing; etc. The focus of developing monitoring wells is generally towards cleaning the filter pack to provide representative groundwater samples, though some monitoring wells are used for slug and specific capacity testing and may require more aggressive development. Development methods should be selected to reflect the main objective.

The focus of extraction/injection well development is generally towards restoring the natural hydraulic conditions in the formation and enhancing well yields. Many extraction/injection wells are installed using mud rotary methods. Consequently, development of such wells tends to commonly be a multi-staged process utilizing several different and "aggressive" methods. These methods and operations are utilized to clean the filter pack, breakdown the mud cake, and repair the formation at the filter pack/formation interface. Polyphosphates and/or surfactants may be used to remove drilling mud from the well. Example combinations of methods for extraction/injection well development include airlifting, jetting, and mechanical surging; jetting, pumping, and overpumping; bailing, mechanical surging, and pumping; etc.

The specific combination used should include a method that imparts a surge or flow of water from the well out thorough the sand pack, into the formation, and back through the sand pack into the well. This surge or flow is necessary to remove fine-grained materials and drilling fluids, and to break up sand bridges in the sand pack and formation.

The exact combination of development methods to be used for wells at a site depends on a variety of project- or site-specific factors that include, but are not limited to, the following:

- Development objectives
- Intended use and type of the well
- Well construction parameters
- Drilling methods used, including type of drilling fluids and volume of fluid loss
- Regulatory requirements

- Type(s) of contaminants present, or potentially present, including non-aqueous phase liquids (NAPLs)
- Type and composition of formation at the well completion interval
- Water level position inside the well
- Other previous well development issues or problems occurring at the site
- Types and relative costs of methods available by local subcontractors

Certain special well construction and site conditions may require additional evaluation and consideration for the planning and implementation of well development activities. Some conditions potentially requiring special planning and implementation considerations are listed in Attachment 1.

Individuals planning and selecting appropriate development methods/combinations for their particular wells should consider and evaluate the above information. They should look at methods and techniques used for previous similar wells (completed in the same formations) on site or near the site area. They may also seek the aid of an experienced senior geologist or hydrogeologist. Individuals needing assistance in finding qualified technical assistance may consult internal Shaw technical listings for experts in well development.

6.2 Planning and Preparation

Planning and preparation for well development activities involves the following:

- Identifying specific well development objectives and development methods to be used (including possible limitations to the development methodologies)
- Determining specific well(s) to be developed, locations of the wells, and specific identification numbers for the wells
- Securing construction details and information on the expected condition of each of the wells to be developed
- Listing known or assumed hydrogeologic conditions for each well, e.g., high yield, low yield, potential for presence of non-aqueous phase liquid (NAPL)
- Identifying and listing exact equipment to be used (simple or complex)
- Determining type, duration, and frequency of field parameter measurements to be made during development
- Identifying and listing exact criteria to be used to determine when a well has been sufficiently developed
- Describing the estimated duration(s) of the development effort per well
- Specifying water and sediment handling and disposal requirements
- Identifying site access and restrictions on equipment layout
- Determining and listing expected hardcopy and electronic work products to be generated from the development activities
- Listing all pertinent Health and Safety issues and requirements, including those contained in the project-specific Health and Safety Plan(s), relative to work activities
- Identifying applicable requirements of this and other SOPs and pertinent project-specific requirements for the well development effort

- Determining and describing detailed project-specific procedures for the well development effort
- Identifying all main subcontractor requirements for well development to be compiled into subsequent Statement of Work to procure subcontractor services
- Procuring the appropriate well development subcontractor

The above information is necessary for effective implementation of the well development effort and should be presented in the project work plans, especially the detailed project-specific development procedures.

Prior to initiating well development activities in the field, site personnel and subcontractors should be briefed on the above information and any additional information contained in the project work plans, along with project or corporate health and safety requirements. This is done to familiarize personnel with specific objectives, requirements, procedures, and hazards associated with the site as well as health and safety procedures associated with the field operation. The Project Manager or designee is responsible for ensuring that the briefing is conducted.

6.3 Basic Procedures and Requirements

This text describes the basic method or process for conducting well development. It is not possible to write a single specific procedure for well development applicable to the wide range of sites encountered and methods available. Attachments 2 and 3 provide example general procedures for monitoring well and extraction/injection well development, respectively. These example procedures should be modified or customized, as appropriate, to address specific site conditions and requirements. These detailed project-specific procedures should be presented in the project work plans.

The basic process for monitoring well development is as follows.

- Decontaminate the development rig and all development equipment, including pumps, bailers, riser pipes, etc., in accordance with appropriate Shaw E & I technical SOPs and/or project-specific requirements/procedures.
- Calibrate all field measuring and testing equipment (e.g., pH, temperature, conductivity, turbidity, dissolved oxygen meters, etc.) according to the instrument manufacturer's specifications, and appropriate Shaw E & I technical SOPs and/or project-specific requirements.
- Access the wellhead according to the project work plans; visually inspect the well to ensure that it is undamaged, properly labeled, and secured (locked). Any observed problems with the wellhead should be noted on the appropriate forms and reported to the Site Superintendent.
- Unlock the well and obtain a depth to water level measurement according to applicable Shaw E & I technical SOPs or project-specific procedures/requirements. Sound the total well depth and compare that value with the value shown on the well completion diagram or form. In addition, observe and record any unusual conditions such as possible obstructions or tight-spots as the well tape is lowered or removed from the well. (Do not insert bailers, pumps, or surge blocks into the well if obstructions, parting of the casing, or other damage to the well are suspected. Instead, report the conditions to the Site Superintendent and Project Manager and obtain approval to continue or cease well development activities, as appropriate.)
- Calculate the volume of water in the well (well volume). The equation for the calculation is shown on the Example Well Development Record (Section 8).
- Collect an initial sample of the well water and measure and record field parameters on the appropriate forms according to the project work plans.

- Compare the measured total well depth to the well construction diagram. If sand or sediment is present inside the well, it should be first removed. This is usually done by bailing; however, airlifting may also be used for extraction/injection wells. (Note: during the initial lowering of the bailer into the well, direct the subcontractor to lower the bailer slowly, and not drop the bailer to the bottom of the well. Failure to do this may cause the bailer to stick, break, or dislodge the well bottom cap or sump, resulting in costly repair/replacement of the well).

- Periodically measure the depth to water and check to see that the well recovers sufficiently during and immediately after sediment removal.

- Begin developing by applying the development method or combination of methods as specified in the project work plans. Begin gently at first and then progress as appropriate and specified.

- While development progresses, take periodic water level measurements (as specified in the project work plans) (at least one every 5 to 10 minutes) to determine if drawdown is occurring, and record the measurements on the appropriate forms.

- While development progresses, measure the water discharge and calculate the rate at which water is being removed from the well. Record the volume, time, and rate on the appropriate forms. Record any observations made regarding general well yield and/or recovery.

- While developing, periodically collect water directly from the pump, eductor pipe, or bailer discharge and measure for specified parameters. The time intervals for collection and measurement (e.g., every 15 minutes, etc.) should be listed in the project work plans. The parameters measured usually include temperature, pH, conductivity, and turbidity. Dissolved oxygen (DO) and oxidation/reduction potential (ORP) are optional parameters that may also be measured. All measurements and associated times should be recorded on the appropriate form(s).

- Development should continue until a predetermined set of conditions are met. The exact conditions and criteria should be specified in the project work plans. These can include the following:

  – The well water appears clear and sediment-free to the unaided eye

  – The sediment thickness remaining in the well is less than 1 percent of the screen length

  – A predetermined number of well volumes (previously calculated) of water, usually from three to five, have been removed from the well

  – The final turbidity goal (usually 5 or 10 NTUs) has been attained

  – The measured indicator parameters have stabilized. Stabilization is defined where three or more readings are within tolerances specified in the project work plans. Example tolerances and indicator parameters include 0.1 units for pH; 1 degree F or less for temperature; and 10 percent or less for conductivity.

  – Drilling fluids have been sufficiently removed from the formation, as determined by a review of measured parameters

  – Sand production during pumping is less than or equal to a specified value (e.g., 3 parts per million [ppm])

Terminating development prior to attaining the required water removal and stabilized parameters will require the concurrence of the Project Geologist/Hydrogeologist. The Project Geologist/ Hydrogeologist is responsible for ensuring that development activities are appropriately planned and implemented. The individual selected as the Project Geologist/Hydorgeologist should be a senior professional with experience in planning, implementing, and evaluating well development programs.

- Once development is considered complete, obtain a final water level and turbidity measurement and record on the appropriate form(s). Collect a 1-pint sample of the well water for storage and photographing.
- Remove all equipment from the well and decontaminate appropriately for storage or development of another well according to the project work plans.
- Complete documentation of the well development event on the appropriate form(s). At a minimum, the following information should be recorded:
  - Project name/client name
  - Project number
  - Well I.D. number
  - Location
  - Start and end dates
  - Developer/subcontractor
  - Well diameter
  - Total depth of well as installed and at end of development
  - Top and bottom depth of screen/sand pack
  - Static water level
  - Development method(s) used
  - Equipment used; decontamination method and calibration method
  - Record of water levels, volumes removed, measured parameters, measurement times, and any observations
- Collect and appropriately transport and dispose of water removed from the well in accordance with the project work plans and regulatory requirements.
- Allow the well to recover for a time period specified in the project work plans prior to sampling (generally 24 to 48 hours - check for local and/or regulatory requirements).

6.4 Technical Review

All well development procedures, data analysis, and results (e.g., reports, etc.) should undergo technical review. It is recommended that the technical reviewer also provide review/oversight of the actual field implementation of well development activities. The technical reviewer should be an experienced senior geologist or hydrogeologist. At a minimum, the technical reviewer should be a person capable of planning, conducting, and evaluating well development activities and results. Individuals needing assistance in finding qualified technical reviewers may consult internal Shaw technical listings for experts in well development.

Any issues raised during the technical review should be resolved between the reviewer and staff conducting the well development activities before external (i.e., outside of Shaw) use or submission of the results. The technical review comments and issues, and corresponding resolution, shall be documented and filed with the project records. Such records should be maintained until project closeout.

7. ATTACHMENTS

- Attachment 1, Conditions Potentially Requiring Special Well Development Considerations
- Attachment 2, Example Monitoring Well Development Procedure
- Attachment 3, Example Extraction/Injection Well Development Procedure

8. FORMS

- Example Well Development Record

Attachment 1
Conditions Potentially Requiring Special Well Development Considerations

Wells completed in fine-grain-dominated formation materials (i.e., in units dominated by clay, silt, or fine sand); not in an aquifer – For some of these formations, no well design or development technique can reduce the turbidity of the water or improve the well efficiency or hydraulic conductivity of the formation. Aggressive development of such wells can actually damage the wells or substantially increase the turbidity of the water. Suitable objectives and methods will need to be compiled for the development effort and possibly discussed with the client and regulatory agencies beforehand. Development of such wells should be conducted and progress carefully.

Wells with a minimal height of water column (e.g., less than 2 feet) inside the well screen – Such wells should not be surged, but can be developed with bailing and pumping, and may need to be developed again in stages; that is, come back in the wet season when the water level may be higher. These wells may be developed by bailing (to remove sediment) and pumping, and could also be developed by washing; however, any water added to the well must be of acceptable and known chemistry. The effect of such water on the formation groundwater chemistry must also be ascertained. Such use will also likely require prior regulatory approval. All water added to the well should be removed; this is not always possible.

Damaged wells – Damaged or obstructed wells should never be developed or redeveloped. Such wells first need to be repaired or replaced.

Use of surge blocks in PVC wells/well screens – The use of surge blocks in such wells has a high potential to collapse or damage the PVC well screens. A vented surge block may help. The development subcontractor should use the surge block carefully in a slow and gentle manner when starting to surge a well. When sediment is first removed from the well by bailing, pumping, or airlifting it is important to monitor the water level to see if the well recharges sufficiently. A well that does not recharge sufficiently has a sediment-blocked screen or sand pack; this will result in collapsing of the screen during surging if the blockage isn't removed first.

Small diameter wells (i.e. < 2 inches in diameter) – Such wells are commonly installed using direct-push methods and usually cannot be developed with a surge block. They are commonly developed by bailing and pumping. Because many of these wells are installed in fine-grain-dominated formations, development should be conducted carefully and initially at low discharge rates.

Use of long or heavy bailers with power winch systems – Long stainless steel bailers are commonly used by development subcontractors with power winch systems. At times, the subcontractor lowers the bailer too quickly and the bailer hits and dislodges the bottom cap or well sump. The subcontractor must be instructed to first carefully lower the bailer to the bottom of the well and mark the cable appropriately. Thereafter the subcontractor must lower the bailer carefully, noting when the bailer is approaching the bottom of the well and slowing the winch down appropriately.

Attachment 2
Example Monitoring Well Development Procedure

This text provides an example monitoring well development procedure by bailing, pumping, and back-washing. Other projects and sites may have different conditions and requirements and use different development methods. This example procedure may therefore be modified or customized, as appropriate, to address specific site conditions, requirements, and methods.

The example procedure is as follows:

1. Develop the well no less than 2 days and not more than 7 days after well installation is complete.

2. Decontaminate the development rig and all downhole equipment (e.g., pumps, bailers, discharge pipes, etc.) in accordance with the project work plans and Shaw E & I SOPs. This includes steam cleaning with unchlorinated water from an approved source followed by thorough rinsing with 100-PPM unchlorinated, organic-free water.

3. Inspect the equipment to ensure that it is in good working order. Repair or replace damaged or malfunctioning equipment and decontaminate appropriately.

4. Calibrate and test all measuring and testing equipment prior to use according to manufacturer's specifications and appropriate project-specific requirements and procedures.

5. Access the wellhead according to the project work plans; visually inspect the well to ensure that it is undamaged, properly labeled, and secured (locked). Any observed problems with the wellhead should be noted on the appropriate forms and reported to the Site Superintendent.

6. Unlock the well and obtain a depth-to-water level measurement according to applicable Shaw E & I technical SOPs or project-specific procedures/requirements. Then sound the total well depth and record the measurements on the appropriate forms specified in the project work plans. (If LNAPL or DNAPL is expected, use an interface probe for monitoring according to applicable Shaw E & I technical SOPs.)

   In addition, observe and record any unusual conditions such as possible obstructions or tight-spots as the well tape is lowered or removed from the well. (Do not insert bailers or pumps into the well if obstructions, parting of the casing, or other damage to the well are suspected. Instead, report the conditions to the Site Superintendent and obtain approval to continue or cease well development activities, as appropriate.)

7. Calculate the volume of water in the well (well volume). (The equation for the calculation is shown on the Example Well Development Record [Section 8].)

8. Slowly lower a bailer into the well to mid-screen and collect a water sample. Empty the sample into a vessel and measure and record field parameters on the appropriate forms according to the project work plans and as discussed below.

9. Compare the measured total well depth to the well construction diagram. If sand or sediment is present inside the well, it should be first removed by bailing. After the bailer is initially placed on the bottom of the well, check to make sure that the subcontractor marks the wire line as to the total depth of the well. Bail the sediment from the bottom of the well.

10. Periodically measure the depth to water and check to see that the well recovers sufficiently during and immediately after sediment removal via bailing.

11. Once sediment removal is complete, measure the water level. Allow sufficient equalization of the water level to commence pumping.

12. Lower a decontaminated electric-powered submersible pump (without check valve) into the well and pump the well.

13. Periodically during pumping, the well will be backwashed by turning the power of the pump off and allowing the water in the pump pipe to flow back into the well. (This creates a surging action of water into the screen, sandpack, and formation.) Additionally, the pump will be periodically lifted up and down inside the well screen while the pump is operating. Water will not be added to the well to aid in development, nor will any type of airlift techniques be used.

14. While developing, periodically collect water directly from the pump eductor pipe or bailer discharge every 15 minutes and measure for the following parameters: temperature, pH, conductivity, turbidity, and possibly dissolved oxygen (DO) and oxidation/reduction potential (ORP). Record all measurements and associated times on the appropriate form(s).

15. Rinse the cap and all internal components of the well casing above the water table with well water to remove all traces of soil/sediment/cuttings. Washing will be conducted before and/or during development.

16. Development will proceed until the following conditions are met:

    - The well water appears clear to the unaided eye.
    - The measured turbidity is $\leq$ 5 NTU.
    - The sediment thickness remaining in the well is less than 1 percent of the screen length (the depth to the water/sediment interface will be measured with a weighted tape and the percentage of sediment height to screen length will be calculated).
    - At least three well volumes (including the saturated filter material in the annulus), plus the volume of water/drilling fluid lost during the drilling process has been removed from the well.
    - The pH, temperature, and conductivity of the development water have stabilized. Stabilization is defined as successive readings in which the pH has changed $\leq$ 0.1 pH units, temperature has changed $\leq$ 1 degree F, and conductivity has changed by less than 10%.

17. Once development is considered complete, obtain a final water level and turbidity measurement and record the measurement on the appropriate form(s). Collect a 1-pint sample of the well water; label the jar with the well number and development date. Agitate the sample and immediately photograph with a 35-millimeter camera in a backlit setting so that the clarity of the water is visible. Prepare the sample for storage according to the project work plans.

18. Remove all equipment from the well; if the equipment is to be stored, decontaminate appropriately according to the project work plans.

19. Cap and secure the wellhead.

20. Complete documentation of the well development event on the appropriate form(s). At a minimum, the following information should be recorded:

    - Project name/client name
    - Project number
    - Well I.D. number
    - Location
    - Date of well installation.
    - Start and end dates of development
    - Developer/subcontractor
    - Well diameter

- Height of well casing above ground surface
- Quantity of water lost during drilling
- Total depth of well as installed and at end of development
- Top and bottom depth of screen/sand pack
- Static water Level
- Development method(s); description of pumping technique
- Type and size/capacity of pump used
- Equipment used, decontamination method, and calibration method
- Record of water levels, volumes removed, measured parameters, and measurement times
- Any observations including physical character of removed water and changes in clarity, color, particulates, and odor during development

21. Collect and appropriately transport and dispose of water removed from the well in accordance with the project work plans and regulatory requirements.
22. Allow the well to recover for at least 48 hours prior to sampling.

Attachment 3
Example Extraction/Injection Well Development Procedure

This text provides an example extraction/injection well development procedure by airlifting, jetting, surging, pumping, and overpumping. Other projects and sites may have different conditions and requirements and use different development methods. This example procedure may therefore be modified or customized, as appropriate, to address specific site conditions, requirements, and methods. Extraction and injection well development is a multi-staged process whereby different operations and techniques are utilized to clean the filter pack, breakdown the mud cake, and repair the formation at the filter pack/formation interface.

During extraction/injection well development, chemical additives may need to be used, with prior regulatory agency approval, to assist in breaking down mud cake built up during mud rotary drilling. Drilling mud can be a polymer mud (e.g. Polygel), a bentonite-based mud, or a combination of both (e.g. Quikgel). An example of an additive for the dispersal of polymer drill mud is sodium hypochlorite (which will release free chlorine into the well). An example of using an additive to disperse bentonite mud or other clays is the addition of polyphosphates. Polyphosphates should be added in accordance with the manufacturer's specifications. Whenever using chemical additives, care must be used to remove all chemical additives. Over-pumping of the well is recommended to remove the chemical additives.

The example procedure is as follows:

1. Develop the well no less than 2 days and not more than 7 days after well installation is complete.

2. Decontaminate the development rig and all downhole equipment (e.g., pumps, bailers, surge blocks, jetting tools, discharge pipes, etc.) in accordance with applicable Shaw E & I technical SOPs and project-specific requirements/procedures. This includes steam cleaning with unchlorinated water from an approved source followed by thorough rinsing with 100-ppm unchlorinated, organic-free water.

3. Inspect the equipment to ensure that it is in good working order. Repair or replace any damaged or malfunctioning equipment and decontaminate appropriately.

4. Calibrate and test all measuring and testing equipment prior to use according to manufacturer's specifications and appropriate project-specific requirements and procedures.

5. Access the wellhead according to the project work plans; visually inspect the well to ensure that it is undamaged, properly labeled, and secured (locked). Any observed problems with the wellhead should be noted on the appropriate forms and reported to the Site Superintendent.

6. Unlock the well and obtain a depth-to-water level measurement according to applicable Shaw E & I technical SOPs or project-specific procedures/requirements. Then sound the total well depth and compare that value with the value shown on the well completion diagram or form. In addition, observe and record any unusual conditions such as possible obstructions or tight-spots as the well tape is lowered or removed from the well. (Do not insert bailers, pumps, jetting tools, or surge blocks into the well if obstructions, parting of the casing, or other damage to the well is suspected. Instead, report the conditions to the Site Superintendent and obtain approval to continue or cease well development activities, as appropriate.)

7. Obtain a water level depth measurement and sound the bottom of the well. (If LNAPL or DNAPL is expected, use an interface probe for monitoring according to applicable Shaw E & I technical SOPs.)

8. Calculate the volume of water in the well (well volume). (The equation for the calculation is shown on the Example Well Development Record [Section 8].)

9. Collect an initial sample of the well water and measure and record field parameters on the appropriate forms according to the project work plans and as discussed below.

10. Compare the measured total well depth to the well construction diagram. If sand or sediment is present inside the well, they should be first removed by airlifting. (Note: if the air supply is from an air compressor

and the well will be sampled for petroleum hydrocarbons, an appropriate filter will need to be placed between the airline and the compressor.) Periodically measure the depth to water and check to see that the well recovers sufficiently during and immediately after sediment removal via airlifting.

11. Periodically measure the depth to water and check to see that the well recovers sufficiently during and immediately after sediment removal.

12. Once sediment removal is complete, the entire screen shall be jetted with water using a jetting tool (see page 516 of Driscoll [1995]). The jetting velocity shall be between 150 and 300 feet per second, or using a pressure not to exceed screen manufacturer's recommendations. The Sediment should then be removed from the bottom of the well via airlifting. Two cycles of jetting should be required.

13. Mechanically surge the entire length of the well screen with an approved appropriate-sized surge block to remove sediment from the filter pack. The surging should start slowly at first in the blank casing just above the screen, then get progressively stronger to be effective.

14. The surging shall proceed in 10-foot intervals from just above the top of the screen and working down. Each 10-foot section should be surged for 10 minutes. The rate of ascent and descent of the surge block within the 10-foot section should be increased to about 3 feet per second, or as directed. The section of screen should then be isolated with a shell-catcher, or other device, and pumped at a predetermined rate (the rate will be increased up to the maximum allowable rate) until the return water is clear. The surging shall be repeated until the working section pumps clear after surging. This process shall be continued down the entire length of the well's screened interval. Depending upon the amount of material pulled through the screen into the well, airlifting should be incorporated at any point in this stage of well development to remove sediment and prevent the surge block from becoming sand-locked.

15. Following jetting and surging, a submersible pump will be installed approximately 10 feet below the expected maximum drawdown. The well will be pumped at progressively higher rates until the discharge water is visually clear and sediment free. The pumping rate will be stepped up from the design flow rate to a maximum flow rate of approximately 2 to 5 times higher.

16. While developing, periodically collect water directly from the pump eductor pipe discharge every 15 minutes and measure for the following parameters: temperature, pH, conductivity, turbidity, and possibly dissolved oxygen (DO) and oxidation/reduction potential (ORP). Record all measurements and associated times on the appropriate form(s).

17. Rinse the cap and all internal components of the well casing above the water table with well water to remove all traces of soil/sediment/cuttings. Washing will be conducted before and/or during development.

18. Development will proceed until the following conditions are met:

    - The well water appears clear to the unaided eye.
    - The sediment thickness remaining in the well is less than 1 percent of the screen length (the depth to the water/sediment interface will be measured with a weighted tape and the percentage of sediment height to screen length will be calculated).
    - At least five well volumes (including the saturated filter material in the annulus), plus the volume of water/drilling fluid lost during the drilling process, has been removed from the well.
    - The measured turbidity is $\leq$ 10 NTU.
    - The pH, temperature, and conductivity of the development water have stabilized. Stabilization is defined as successive readings in which the pH has changed $\leq$ 0.1 pH units, temperature has changed $\leq$ 1 degree F, and conductivity has changed by less than 10%.
    - Sand production during pumping is less than 3 parts per million (ppm).

19. Once development is considered complete, obtain a final water level and turbidity measurement and record on the appropriate form(s). Collect a 1-pint sample of the well water; label the jar with the number and development date. Agitate the sample and immediately photograph with a 35-millimeter camera in a backlit setting so that the clarity of the water is visible. Prepare the sample for storage according to the project work plans.

20. Remove all equipment from the well and decontaminate appropriately for storage according to the project work plans.

21. Cap and secure the wellhead.

22. Complete documentation of the well development event on the appropriate form(s). At a minimum, the following information should be recorded:

    - Project name/client name
    - Project number
    - Well I.D. number
    - Location
    - Date of well installation
    - Start and end dates of development
    - Developer/subcontractor
    - Well diameter
    - Height of well casing above ground surface
    - Quantity of water lost during drilling and fluid purging
    - Total depth of well as installed and at the time of development
    - Top and bottom depth of screen/sand pack
    - Static water level
    - Development method(s); description of surging, jetting, and pumping technique
    - Type and size/capacity of pump used
    - Equipment, decontamination method, and calibration methods used
    - Record of water levels, volumes removed, measured parameters, and measurement times
    - Any observations including physical character of removed water and changes in clarity, color, particulates, and odor during development

23. Collect and appropriately transport and dispose of water removed from the well in accordance with the project work plans and regulatory requirements.

24. Allow the well to recover for at least 24 hours prior to sampling.

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EXAMPLE
WELL DEVELOPMENT RECORD

Project Name: _____

Location: _____ Well/Piez. No.: _____

Personnel: _____ Date Installed: _____

Date (Start/End): _____ Csg. Diameter (I.D.): _____

Method of Development: _____ Total Depth (ft. TOC): _____

❑ Surging ❑ Bailing ❑ Pumping ❑ Other (State Method) _____

❑ Original Development ❑ Redevelopment Development Date: _____

Depth to water before developing well: _____

		Volume (V)	Purge Factor	Volume To Purge
Height of Water Column:	_____ feet	_____ =	_____ gal.*	_____ = _____

$$V = (B * r_c^2 * L_c * 7.48)+(B*(r_w-r_c)^2*L_s*ø_s*7.48)=$$ _____ gallons (See Notes below)

Depth purging from: _____ feet Time purging begins: _____

Weather: _____ Screened Interval (ft. BGL): _____

Equipment Nos.: pH Meter _____ EC Meter _____ Turbidity Meter _____

Equipment decontaminated prior to development Y _____ N _____

Describe _____

Date	Time	Water Level (ft. below TOC)	Volume Removed (gal.)	Temp (C or F)	pH	EC	Turbidity	D.O.	Comments

Notes:

- Water levels – Reported to the nearest 0.01 foot.
- pH – Reading rounded to 0.1 pH units
- Electrical conductivity (EC) – Reported to the nearest 10% mhos/cm or
- µmho/cm @25 C or in mS/cm of instrument set range
- Water temperature – Reported to the nearest 0.1 C or F feet
- Dissolved oxygen (D.O.) report in 0.1 mg/L
- Turbidity report in NTV nearest whole #

Where:

B=3.14

$ø_s$=porosity of the sand pack

r_c =radius of the well casing and screen in feet

L_c=length of water column inside the casing and screen in feet

r_w =radius of the well bore in feet

L_s =length of saturated portion of the sand pack in feet

7.48 gallons/cubic foot=conversion from cubic feet to gallons

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1. PURPOSE

This procedure prescribes the steps to be followed in order to prevent accidents involving the contact with or damage of underground/overhead utilities. The company provides the operational and training practices required to safely execute work where underground/overhead utility hazards may exist.

2. SCOPE

This procedure applies to all excavation and trenching activities.

2.1 Exception Provisions

Anytime a minimum of a 5-foot clearance cannot be obtained by either hand digging, vacuum excavation, or by using geophysical means, the Field Team Leader (FTL) must obtain a variance from the Regional Vice President (or equivalent level such as Operations Director for Federal Business Line) or designee to proceed with drilling operations in that area. This would include an initial verbal variance documented in the field log followed up by a written (email) approval from either the Regional Vice President (or equivalent level or title) or designee. The record of communication will be noted in the field log for the project, and a record of the approval or denial will be placed in the project file. The Health and Safety Department will only serve as a consultant to this procedure and is not required to sign the variance.

A variance form can be obtained in Form EIG-HS-308.1, “Variance Request Form.” A flowchart to assist one in determining how and when a variance should be obtained can be found as Attachment 1, “Flowchart to Obtain a Variance.”

3. REFERENCES

- Shaw Environmental & Infrastructure, Inc. (Shaw E&I) Procedure No. EIG-HS-013, “Health and Safety Procedure Variances”
- Shaw E&I Procedure No. EIG-HS-020, “Accident Prevention Program: Reporting, Investigation, and Review”
- Shaw E&I Procedure No. EIG-HS-050, “Training Requirements”
- Shaw E&I Procedure No. EIG-HS-307, “Excavation and Trenching”
- Shaw E&I Form EIG-HS-308.01, “Variance Request Form”

4. DEFINITIONS

- **Boring Activities**—Any mechanical or manual penetration of the earth’s surface below 5 feet using drilling, Geoprobes, hand auguring equipment, or similar type of equipment. Boring activities also include the installation of stakes or fence posts to a depth of 5 feet or greater.
- **Company**—All wholly-owned subsidiaries of Shaw E&I.
- **Competent Person – Drilling Oversight (CPDO) Training**—When drilling activity is to take place the Shaw FTL must have successfully completed Shaw’s in-house training pertinent to competent person drilling oversight (CPDO Training). The FTL is required not only to have successfully completed CPDO training but to have an appropriate educational background,

coupled with field experience and the authority to make changes to correct deficiencies, or to stop the job if need be.

- **Competent Person – Excavation and Trenching—A person** who is capable of identifying existing and predictable hazards in the excavation/trenching work area and who has the authority to take prompt corrective measures to eliminate them. NOTE: Excavation/Trenching training is required when trenching/excavation hazards are present/anticipated (i.e., spoil piles, use of 3-foot or larger diameter augers, or other circumstances) but only recommended when trenching/excavation hazards are not present/anticipated.
- **Excavation Activities**—Any mechanical or manual penetration of the earth's surface below 5 feet using heavy equipment such as excavators, backhoes, dozers, etc. Excavation activities also include manual use of hand shovels, pick-axes, etc. to a depth of 5 feet or greater. The use of 3-foot or larger diameter augers is also included.
- **Excavation**—Any manmade cut, cavity, trench, or depression in an earth surface formed by earth removal.
- **Underground Utility**—Any active or inactive subsurface or buried structure that is or was designed to service a public or private facility. These may include, but are not limited, to the following:
  - Electric power lines
  - Natural gas lines
  - Telephone lines
  - Telephone cables and fiber optic lines
  - Water lines
  - Steam and pneumatic lines
  - Sewer lines
  - Drain lines
  - Underground storage tanks
  - Septic tanks
  - Process or product lines
- **Overhead Utility**—Any active or inactive overhead structure that is or was designed to service a public or private facility. These may include, but are not limited, to the following:
  - Overhead power lines
  - Overhead telephone lines
  - Overhead fiber optic lines
  - Overhead cables
  - Overhead supports
  - Overhead piping
  - Traffic lights
  - Utility bridges

- **One Call Center**—Each state has a One Call, Dig Safe, Miss Dig, etc. dial-in number for requesting mark-out of buried public utilities, such as gas lines, electrical lines, telephone/cable lines, sewer lines, and water lines. This number is typically called a minimum of 72 hours prior to subsurface activities depending on the particular state in which the work will be conducted. The One Call Center will notify the local public utilities for a line location mark-out for the particular location. The individual public utilities must locate and mark-out the utilities upon request. In most cases, the markouts will not be performed on private property. A confirmation number is established and confirmation report generated and submitted to the requester.

- **As-Built Drawings**—As-built drawings are blueprints that are usually obtained from the facility owner or client. They show original buried utilities and any modifications that have been made.

- **Private Utility Locating Service**—A private utility locating service is a firm established to locate underground utilities using specialized locating equipment, such as ground penetrating radar location devices or radio transmitter type utility locating equipment.

- **Fiber Optic Service Lines**—Fiber optic service lines are communication lines that are buried underground. When damaged, these lines are very expensive to replace. Fiber optic companies routinely provide on-site supervision, if requested. The company encourages this practice.

- **Field Team Leader**—The FTL is the person with whom the responsibility of the execution of the field work resides. This person may be the Project Manager, Senior Geologist, Staff Geologist, etc. This individual must have the sufficient experience, training, and field knowledge to ensure all site configuration information is collected and analyzed.

- **Site Survey**—A site survey is an inspection of the work site to look for signs of other buried utilities that may not be indicated through as-built drawings or through utility locating services. The survey typically involves inspection of overhead electrical services, inspection of basements, utility rooms, garages, etc., for signs of old electrical conduits or fuel/water/septic lines. The FTL must contact the appropriate site representative to provide any additional information that may be marked on the as-builts.

- **Vacuum Excavator**—Equipment that excavates underground utilities with a combination of alternating water-and-air or air-and air pulsations (e.g., Air knife, water knife, etc.)

5. RESPONSIBILITY

5.1 Procedure Responsibility

The Executive Director of Health and Safety is responsible for the issuance, revision, and maintenance of this procedure. Also, see Attachment 2, “Underground/Overhead Utility Contact Prevention Responsibility Matrix,” for matrix of responsibilities.

5.2 Action/Approval Responsibilities

The Responsibility Matrix is Attachment 2.

6. PROCEDURE

Underground/overhead utilities may be encountered at any job site. The guidelines established in this procedure were developed to help identify and mitigate the potential hazards associated with this type of work.

Any subsurface activity is subject to the underground utility locating regulations for the state where the work will be conducted. This procedure authorizes the use of state, local, or other required practices, but requires that the practice, which most limits the liability to Shaw for damaged utilities, is utilized. No variance is required under these circumstances, but the project-specific Health and Safety Plan (HASP) or Work Plan shall fully document these more protective procedures.

6.1 Boring Activity Requirements

6.1.1 Preliminary Requirements

The Project Manager or designee must visit the site to mark the boring locations so they can be clearly identified and then contact the One Call Center for the state in which the work is to be performed in to formally request a utility mark out at the particular work location(s).

Prior to assignment of work the FTL will assure that all affected employees receive an overview of the hazards of encountering underground/overhead utilities. The FTL is responsible to review this procedure, the work practices to control these hazards, and the roles and responsibilities of each worker with the work crew. This procedure and other requirements that may be contained in the site specific HASP shall be reinforced during daily Tailgate Safety Meetings.

6.1.2 Operating Requirements

Prior to conducting any project site activities, the FTL must ensure that all existing underground/overhead utilities in the work area are located per the state or local mark-out protocols. The Pre-Boring/Excavation Checklist (Form EIG-HS-308.02) will assist the FTL with this assessment. Documentation of utility mark-out must be completed using the Utility Mark-out Documentation form (EIG-HS-308.03). No boring work is to be performed until all utility mark-outs are verified.

While on site, the FTL must conduct a site survey to search for signs of other buried or overhead utilities. This will include areas such as garages, basements, etc. The results of such surveys must be documented on the Utility Mark-out Documentation form (EIG-HS-308.03). The property owner, client, or facility operator must be consulted on the issue of underground utilities. All knowledge of past and present utilities must be evaluated prior to conducting work.

After all mark outs have been completed, and the boring locations have been accepted by the FTL prior to drilling, each borehole location must be hand dug or vacuum excavated to a minimum of 5 feet bgs.

If the investigation requires boreholes in an area not covered by a municipal one call system (on private property), then the FTL must utilize appropriate geophysical techniques, hand held utility locating devices, a private utility locating firm, or other approved method to determine the locations of underground utilities. The current accepted geophysical methods for the investigation and location of buried utilities include: Ground Penetrating Radar (GPR), Time Domain and/or Frequency Domain Electromagnetic methods, Magnetometer, and Inductive/Conductive Radio-Magnetic methods. The geophysical methods can be very useful for locating buried utility lines in areas where hand digging is not possible or practical. However, it must be noted that these methods do have limitations that are a function of soil conditions, depth of investigation, imaging resolution, or other factors.

If it is determined that a noninvasive geophysical investigation may be needed, assistance with selecting the appropriate method(s) can be obtained from the Shaw E&I Science and Technology Division, Geophysics & Mapping Group, and a variance request must be submitted and approved prior to the inception of intrusive field activity.

Should the local geology be prone to refusal or should there be any other reason the boring location cannot be cleared to a minimum of 5 feet bgs then the appropriate aforementioned alternative methods should be utilized to ensure the boring location is clear of utilities 5 feet bgs, and a variance request must be submitted for review.

6.2 Excavation Activity Requirements

6.2.1 Preliminary Requirements

The Project Manager or designee must visit the site to mark the excavation locations so they can be clearly identified and then contact the One Call Center for the state in which the work is to be performed in to formally request a utility mark out at the particular work location(s).

Prior to assignment of work the FTL will assure that all affected employees receive an overview of the hazards of encountering underground/overhead utilities. The FTL is responsible for reviewing this procedure, the work practices to control these hazards, and the roles and responsibilities of each worker with the work crew. This procedure and other requirements that may be contained in the site specific HASP shall be reinforced during daily Tailgate Safety Meetings.

6.2.2 Operating Requirements

Prior to conducting any project site activities, the FTL must ensure that all existing underground/overhead utilities in the work area are located per the state or local mark-out protocols. Documentation of utility mark-out must be completed using the Utility Mark-out Documentation form (EIG-HS-308.03). No boring work is to be performed until all utility mark-outs are verified.

While on site, the FTL must conduct a site survey to search for signs of other buried or overhead utilities. This will include areas such as garages, basements, etc. The results of such surveys must be documented on the Utility Mark-out Documentation form (EIG-HS-308.03). The property owner, client, or facility operator must be consulted on the issue of underground utilities. All knowledge of past and present utilities must be evaluated prior to conducting work.

After all mark outs have been completed, and the excavation locations have been accepted by the FTL prior to excavation, each utility identified inside the excavation location must be hand dug (see restrictions under Section 5.3) or vacuum excavated to a verify the utility location. The utility locations must be exposed in enough locations to verify its path of travel. If possible, the excavation location should be moved away from any utilities.

If the investigation requires excavation activities in an area not covered by a municipal one call system (on private property), then the FTL must utilize appropriate geophysical techniques, hand held utility locating devices, a private utility locating firm, or other approved method to determine the locations of underground utilities. The current accepted geophysical methods for the investigation and location of buried utilities include: GPR, Time Domain and/or Frequency Domain Electromagnetic methods, Magnetometer, and Inductive/Conductive Radio-Magnetic methods. The geophysical methods can be very useful for locating buried utility lines in areas where hand digging is not possible or practical. However, it must be noted that these methods do have limitations that are a function of soil conditions, depth of investigation, imaging resolution, or other factors.

If it is determined that a noninvasive geophysical investigation may be needed, assistance with selecting the appropriate method(s) can be obtained from the Shaw E&I Science and Technology Division, Geophysics & Mapping Group, and a variance request must be submitted and approved prior to the inception of intrusive field activity.

6.3 Other Requirements

Only hand digging is permitted within 3 feet of underground high voltage, product, or gas lines. Once the line is exposed heavy equipment can be used, but must remain at least 3 feet from the exposed line.

Only experienced, demonstrably proficient equipment operators, as determined by the Project Manager, will be used to operate such heavy equipment as drill rigs, backhoes, front-end loaders, cranes, etc.

Due to the sensitivity and costs associated with damage to fiber optic cables, the FTL must have documented verbal contact and an agreement with the fiber optic company for all work within 50 feet of the fiber optic cables. Subsurface investigations near fiber optic cables are more fully discussed in site specific HASPs.

6.4 Overhead Utilities Requirements

The FTL is responsible for marking (warning tape, flags, etc.) overhead utility locations where heavy equipment, or other equipment, has the potential for contacting overhead utilities. Conduct a site inspection on a daily basis to determine where activities will take place and the location of overhead utilities and overhead obstructions. Once they have been identified, place warning tape on poles and/or guy wires and attempt to plan the work so that no contact will be made with the overhead utilities or obstructions. Share the information with all site personnel during the tailgate safety meeting.

When working around overhead utilities, one or more of the following conditions shall be met:

- The Project Manager shall confirm with the utility company that the power is de-energized (preferably in writing).
- The minimal clearance distances shall be established and maintained according to Attachment 3, “Minimum Clearance Distances.”
- Insulating blankets shall be used to isolate the power line and the utility company shall provide the minimum safe operating distance in writing to the Project Manager. Insulating blankets must be placed by the utility company.

Maintain at least 10 feet from overhead power lines, up to 50 kilovolts (kV). For voltages over 50 kV, add 0.4 inches per kV to obtain the safe distance between equipment and power lines. If voltage is unknown, remain at least 20 feet from overhead power lines. See Attachment 3 for the Minimum Clearance Distance table. As a precaution, a spotter must be used at all times when it is possible to violate the minimum distance requirements for overhead utilities. If contact is deemed unavoidable, consult with the client and the respective health and safety representative to evaluate the area to determine if the particular overhead utility can be removed prior to engaging in the activity.

6.5 Training Requirements

6.5.1 Competent Person Drilling Oversight Training

The FTL (at least one on-site Shaw person will be performing the drilling oversight) will be required to have successfully completed the approved internal CPDO training. It is the Project Manager’s responsibility to ensure that the FTL has completed the CPDO training prior to overseeing boring activities.

Prior to assignment of work the FTL will assure that all affected employees receive an overview of the hazards of encountering underground/overhead utilities. The FTL is responsible for reviewing

this procedure, the work practices to control these hazards, and the roles and responsibilities of each worker with the work crew. This procedure and other requirements that may be contained in the site specific HASP shall be reinforced during daily tailgate safety meetings. A list of Frequently Asked Questions is provided as Attachment 4, "Frequently Asked Questions."

6.5.2 Trenching/Excavation Training

The FTL or at least one on-site Shaw employee will be required to have successfully completed Trenching/Excavation training prior to the inception of site work activity when excavation activities (i.e., excavations, test pits, use of 3-foot diameter augers, or anytime similar hazards are present) are present/anticipated. NOTE: This training is now recommended rather than required when trenching/excavation hazards are NOT anticipated/required.

6.6 Incident Reporting Requirements

Employees are required to immediately report to their direct supervisor any overhead or underground utility contact incident, or near miss incidents. Any supervisor (but preferably the supervisor directly responsible for the involved employees) with first-hand knowledge of an incident is required to investigate the incident. The Project Manager and respective Health and Safety Manager or Representative shall be informed of the incident immediately.

At a minimum, the incident investigation will require completion of the incident investigation report and General Liability Property Damage and Loss Report form found in Shaw E&I Procedure No. HS020.

In addition, Attachment 5, "Underground Utility Hits – Tip Sheet for Incident Investigations," provides a "Tip Sheet" to help properly assess and investigate the incident causes and recommendations or requirements.

6.7 Local Jurisdiction Requirements

Where local jurisdictions or clients have established requirements different from those in this procedure, the practice which most limits the liability to Shaw for damaged utilities shall be utilized. No variance is required under these circumstances but the project-specific HASP or Work Plan shall fully document the alternate procedures.

7. ATTACHMENTS

- Attachment 1, Flowchart to Obtain a Variance
- Attachment 2, Underground/Overhead Utility Contact Prevention Responsibility Matrix
- Attachment 3, Minimum Clearance Distances
- Attachment 4, Frequently Asked Questions
- Attachment 5, Underground Utility Hits – Tip Sheet for Incident Investigations

8. FORMS

- EIG-HS-308.01, Variance Request Form
- EIG-HS-308.02, Pre-Boring Checklist
- EIG-HS-308.03, Utility Mark-Out Documentation

9. RECORDS

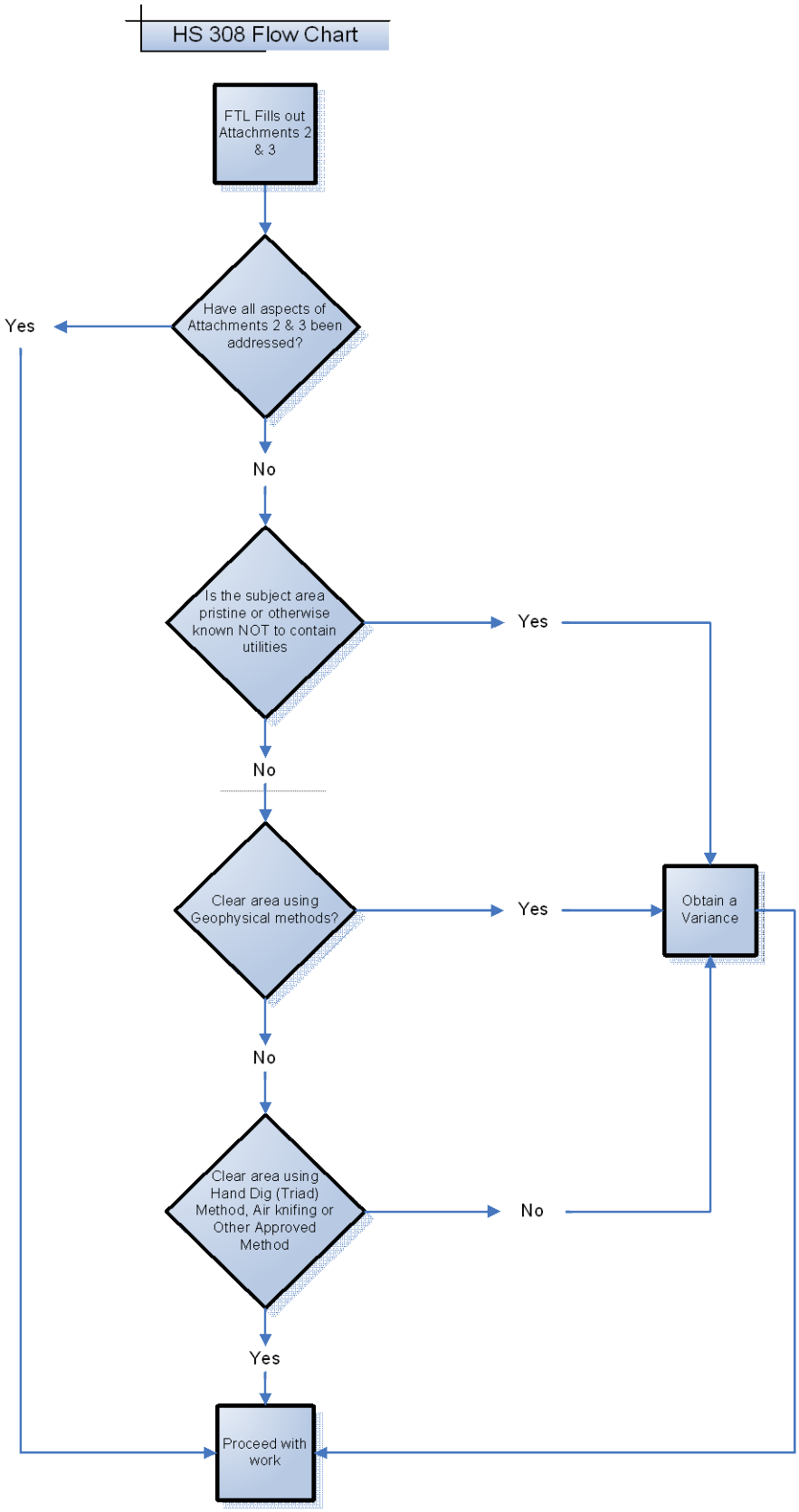
- EIG-HS-308.01, Variance Request Form

- EIG-HS-308.02, Pre-Boring Checklist
- EIG-HS-308.03, Utility Mark-Out Documentation

10. REVISION HISTORY AND APPROVAL

Revision Level Revision Date	Revision Description	Responsible Manager
00 N/A	Initial issue information is unavailable.	N/A
01 2/20/2006	Revision 1 information is unavailable.	Troy Allen
02 9/28/2010	Revised procedure format. Added “boring activities, “excavation activities,” and “vacuum excavator” to definitions section. Provided separate section for “boring activities” and “excavation activities.” After Revision 1 posting and individual found an error that was corrected regarding Competent Person- Drilling Oversight (CPDO) training. The Note that said: “The CPDO training requirement will become effective September 1, 2006> This means that every FTL will have successfully completed CPDO Training prior to August 31, 2006.” Was removed as it was not relevant anymore.	Troy Allen
03 8/25/2011	Modified format only to align with Governance Management framework.	Andrew Johnson

Attachment 1
Flowchart to Obtain a Variance



Attachment 2
Underground/Overhead Utility Contact Prevention Responsibility Matrix

Action	Procedure Section	Vice President	Project Manager	Field Team Leader	Supervisor	HS Representative
Project-specific HASP or Work Plan shall document the practices to be used at a particular site.	6.0		X	X		X
Contact the One Call Center for mark out of utilities at the site	6.1.2		X			
Complete Utility Mark-out Documentation Form	6.1.2		X	X		
Only experienced demonstrably proficient equipment operators will be used to operate such heavy equipment as backhoes, front-end loaders, cranes, etc.	6.3			X		
Provide training*	6.5					
Incident Investigation and Reporting	6.6		X		X	
Exceptions to Procedure	2.1	X	X	X		

*Provided by Shaw's Training Department.

Attachment 3
Minimum Clearance Distances

When work is undertaken near electrical lines, the distance maintained from those lines shall also meet the minimum distances for electrical hazards as defined below:

NOTE: This procedure primarily focuses on electrical overhead utilities; however, all other hazards shall be taken into consideration when performing work.

Normal System Voltage	Required Minimum Clearance Distances
0-50kV	10'
51-100kV	11.6'
101-200kV	15'
201-300kV	18.3'
301-500kV	25'
501-750kV	33.3'
751-1000kV	41.7'

***For those locations where utility companies specify more stringent safe distances, those distances shall be observed.**

Attachment 4
Frequently Asked Questions (FAQ)

During the roll-out of this revision of EIG-HS-308 a variety of questions/comments/concerns arose. These concerns have been put in the form of most frequently asked questions (FAQs) and their respective responses. These FAQs will clear up misunderstanding pertaining to this procedure, and provide valuable information that will help our workforce have a better understanding of how this procedure should be implemented. Please review the FAQs below:

1. *No other competitor of Shaw has felt the need to do anything as extreme as this procedure to ensure minimization of utility hits. Instituting this procedure will put us out of business.*

Response: After thorough review of claims and incidents involving drilling activities and underground utilities, the committee believes that our business/client needs are best served by adopting this policy. And that the likelihood of being put out of business is much greater from continuing to do business the way we currently do it than by adopting this improved policy. The committee realized that 100% adherence to this procedure at all work sites is likely not possible. For those cases where legitimate reasons exist for non-compliance, the committee realized that an effective responsive (variance) system must be in place. The committee believes that the variance procedure, as stated in the policy, should address the exceptions as they occur.

The Committee is not aware of any specific ASTM or true "industry standard". However, the committee is aware that best practices can vary tremendously and many times are client dependent. For example one extremely large Shaw client requires that we continuously probe. On the other end of the spectrum some clients look completely to Shaw for guidance in these matters.

2. *Our clients want us to do the work but do not wish to pay the additional fees involved with this new procedure. Could we offer them a two tiered pricing, one to do it the old way, and one to do it the new way?*

Response: The committee believes that contacting an underground utility of any type, no matter who is at fault or who ultimately pays for fixing, the outcome is a "black eye" for all involved. When these events occur, even if Shaw is not at fault, the committee believes that continued good client relations, and the potential for obtaining future business lessens as utility hits/incidents occur. This procedure is designed to minimize health and safety risks to our workers AND to mitigate liability to Shaw. Receiving the necessary compensation for the precautionary measures outlined in the procedure would be expected, and should be itemized in the initial proposal including a statement as to what will specifically be done in the field to mitigate risks relative to underground utilities and WHY Shaw believes these steps are necessary. However, if the client is willing to assume the entire liability resulting from "hitting" an underground utility, the contract should be written to reflect this and a variance would be in order. Keep in mind that Shaw cannot allow a client's desires to take on liability to affect the health and safety of workers. No matter what the client desires might be, Shaw would still expect the basic procedures to be followed for health and safety purposes. The training though yet to be

finalized will provide project manager's examples of wording to be used in proposals and contracts.

3. *Hand digging to 5' is impossible during frost conditions in Minnesota, Wisconsin and many northern areas. How should this be addressed?*

Response: When conditions present themselves that do not allow for hand digging each borehole, other methods must be used for clearance and a variance must be obtained. The alternative methods include a range of non-invasive geophysical survey techniques designed specifically for locating buried utilities, pipelines, tank (UST), and other buried objects that can interfere with drilling. These non-invasive geophysical methods are suggested and mentioned in the procedure.

4. *What if the field crew runs into refusal during hand dig clearance?*

Response: If refusal occurs and moving to an alternate spot presents the same problem, hand digging may not be possible as mentioned in #2 above. When conditions present themselves that do not allow for hand digging each borehole, other methods must be used for clearance and/or a variance must be obtained. Of course, we expect that the dig safe folks to be contacted, and that a private locating service be utilized if available. Should a private locating service not be available, we can use trained internal sources.

The alternative methods include a range of non-invasive geophysical survey techniques designed specifically for locating buried utilities, pipelines, tank (UST), and other buried objects that can interfere with drilling. The current accepted geophysical methods for the investigation and location of buried utilities include: Ground Penetrating Radar (GPR), Time Domain and/or Frequency Domain Electromagnetic methods, Magnetometer, and Inductive/Conductive Radio-Magnetic methods. These non-invasive geophysical methods are suggested and discussed in the procedures. The geophysical methods can be very useful for locating buried utility lines in areas where drilling and digging are not possible or practical, but these methods do have some limitations that are a function of soil conditions, depth of investigation, and imaging resolution.

If it is determined that a non-invasive geophysical investigation may be needed, assistance with selecting the appropriate method(s) can be obtained from the Shaw E&I Science and Technology Division, Geophysics & Mapping Group. Of course, it is expected that the "dig safe" folks will be contacted, and that a private utility locating service be utilized when appropriate (utility location method is known to be feasible), and if available. Should a private locating service not be available, we can use trained internal Shaw E&I personnel resources to perform utility line location work. Finally, if the Project Manager has determined that a variance to the procedure is justified, a variance request should be submitted for review.

5. *Why is trenching/excavation training required for putting in Geoprobe® boreholes? This seems like tremendous overkill.*

Response: The committee believes that, in general, trenching/excavation training is a good educational tool that promotes overall health and safety awareness and provides important information/techniques for our field staff. Trenching/excavation training provides insights into

fall hazards, spoil pile placement, and many other related safety issues. Many of our drilling jobs have involved oversized auger bits (3' in diameter) where a large deep borehole is created. The committee agrees that when the diameter of the borehole lessens (i.e. use of a Geoprobe®), the impact of trenching/excavation training decreases. Trenching excavation training is now a requirement only when large boreholes are created or other hazards as mentioned above are present, but only recommended training when Geoprobe ® or similar equipment is being used and the result is trenching excavation type hazards do NOT exist. NOTE: Specific training pertinent to drilling/ Geoprobing ®/boring (CPDO training) will be provided and will be mandatory. Additionally, CPDO and trenching / excavation training are both required on projects where 3' or larger diameter boreholes are to be drilled.

6. *Are there any training requirements besides trenching/excavation training?*

Response: The committee evaluated a need for training specific to the HS 308 policy (drilling) and solicited the assistance of the training department and certain operations employees to develop CPDO training. This CPDO training includes basic steps needed to be taken from call the dig-safe number, private utility searches, geo-physical capabilities, probing, hand augering, air knifing, water pumping/knifing, hand digging, and others.

7. *Hand diggings create heat stress, tripping hazards, back injuries, and other hazards and are unnecessary.*

Response: The committee did not envision using a spade and a strong back to dig various 5' holes at the field site. The committee does envision using an air knife, water knife, probe, or other method rather than a hand shovel. The committee understands that not all methods may be acceptable in all states, municipalities or to all clients. The committee was also aware that when all else fails one could consider using a l" diameter stainless steel auger placing 5' bgs hand borings in a triangular pattern where the auger bit could be placed in between these small hand borings. The committee envisions this theme and methodology to be expanded within the upcoming training. Additional information on augering techniques will be provided in the specific training (CPDO) mentioned above.

8. *I need to put borings in pristine farmland next door to a contamination zone. There are no and have never been any utilities in this area. What should I do?*

Response: Once you go through the proper utility locate procedure and are confident that no utilities exist in the subject area, you need to obtain a variance. This would also hold true for pristine forest preserves, wildlife refuges, or other areas not affected by utilities.

9. *Who needs to sign off on a variance?*

Response: Variances are signed by the Area Vice President (or designee, which may be delegated to the BLM for each office) along with the Project/Program Manager/Director. When we know in advance that EIG-HS-308 cannot be adhered to, one should make plans to get a formal variance approval and appropriate paperwork developed two weeks prior to field activity. Variances can also be obtained when field conditions arise that make adherence to EIG-HS-308

impossible. The variance can be obtained via cell phone in the field with the PM and appropriate management with the outcome noted in the field logbook followed up by an appropriate e-mail. This e-mail should be kept in the project file as proof of variance approval. It is recommended that variances be obtained as soon as it is known that they will be required.

10. What constitutes a "probe"? I assume a Geoprobe® is not valid?

Response: A Geoprobe® is NOT a valid probe in that Geoprobes® have caused damage to sewer lines and other utilities. Probes are typically made of a fiberglass-like material that have a pointed end but will not damage subsurface utilities and allows for the field staff to sense if underground items are encountered.

11. Under 5.1, is a subcontractor a designee?

Response: Although a subcontractor can make arrangements to contact dig safe and more, Shaw must ensure that the sub has, in fact, done what they had agreed to do. It should be remembered that typically on drilling projects, from many of our customer's perspective, the liability remains with Shaw, and they will look to Shaw, not our subs, for resolution of any events that occur. Hence, it is incumbent on Shaw to insure that our procedures are followed by Shaw and Shaw subs.

12. Does ground surface include concrete, asphalt or other man-made coverings?

Response: A simple NO. Some of our projects include drilling through airport runways or tarmacs which can be up to 15" in depth. Manmade surfaces do NOT count in the 5' hand dig clearance specification. If we are attempting to advance boreholes below existing concrete surfaces, the geology below the concrete will be exposed by cutting the concrete and removal of the concrete. After the concrete is removed and the geology is exposed, a hand auger can then be used.

Hopefully, the twelve concerns above and the responses to these comments will have helped users understand the implementation of this EIG-HS-308 policy. More importantly the committee realizes that information on this subject will be provided during the training mentioned above. It is the committee's belief that once this program has been completely rolled out the need for variances will be minimal and the interactions of the safety department with operations management with this entire process will make ensure success.

Attachment 5
Underground Utility Hits
Tip Sheet for Incident Investigations

1. Location of the incident.
2. The time of day the incident occurred.
3. What type of utility was hit?
4. How deep was the line hit (in feet)?
5. Who called Designated Locator Service?
6. Note the “One Call” number on the Incident Investigation Follow-up report.
7. Attach the “One Call” record keeping documentation.
8. Were mark-outs completed by the utilities? If so, please identify.
9. Were mark-outs legible at the site?
10. Was the mark-out of the line that was hit accurate?
11. Was the mark-out misinterpreted?
12. Is there a utility damage sheet attached to the Incident Investigation Follow-up Report?
13. Have there been any faults or oversights by any 3rd party? If so, is it documented on the Incident Investigation Follow-up Report?
14. Did the FTL interview the property owner/manager prior to the incident?
15. Was pre-screened by hand digging 5 feet?
16. Were any supplemental utility locator devices used? If so, did we obtain them? If so, were they used on site?
17. Were there blueprints/as built plans available? If so, did we obtain them? If so, were they used on site?
18. Who is paying for the repairs?
19. Please define the total hours and cost estimate/impact to address the utility damage incident:

_____ Site time in hours (not billed to the job)

_____ PM time hours (not billed to the job)

_____ H&S time in hours (not billed to the job)

_____ BLM Time in hours (not billed to the job)

_____ Rework/non-billable time (estimate)

_____ Subcontractor rework/non-billable costs (estimate)

_____ Repair costs to company (estimate)

_____ Repair cost to customer (estimate)

20. Has the FTL completed Shaw's in-house CPDO training?
21. Has the FTL completed trenching/excavation training?
22. Is he/she current with the OSHA 40 hour and 8 hour refresher? If so, what are the dates of the training?
23. Who was the Site Safety Officer on the job site?
24. Does he/she have OSHA 8 hour supervisor training? If so, what are the dates of the training?
25. What was the name of the drilling subcontractor that was on site?
26. Have we researched the training background for this vendor?
27. Was a JSA performed at least once during the day that covered utility contacts and associated hazards?
28. Does this vendor have approved status?
29. Was there a tailgate safety meeting that took place?
30. Were utility mark-outs addressed at the tailgate safety meeting?
31. Were there any markings nearby the "hit" area?

Variance Request Form

Variance Request for Company Procedure: EIG-HS-308-Underground/Overhead Utility Clearance procedure	Date of Request:
Requestor:	Location:
Reason for the variance:	
Alternate Procedure(s) that will be implemented:	
APPROVED	**REJECTED**
Regional VP or Designee	

Pre-Boring Checklist

Purpose: This form is designed to help the FTL make decisions during boring/excavation around underground/overhead utilities.

DATE _____ PROJECT NAME/NUMBER _____

Field Team Leader Name: _____

DURATION/SUMMARY OF WORK TO BE PERFORMED: _____

_____

Consideration	Check	Check	Explanation	Initial
Has the state one-call been contacted?	☐ Yes	☐ No		
Are any as-built drawings available? If so, do they show any utilities?	☐ Yes	☐ No		
Has a visual inspection of the work area(s) been completed?	☐ Yes	☐ No		
If one-call not available has a private locating service or Shaw S&T group been contacted?	☐ Yes	☐ No		
Were any utilities identified through private locating service? If so, indicate on site drawings.	☐ Yes	☐ No		
Are there any fiber optic cables within 50 feet of hole locations?	☐ Yes	☐ No		
If fiber optic cables are within 50 feet has an agreement with the fiber optic company been established?	☐ Yes	☐ No		
Can a test borehole be advanced by hand digging, probing, post hole digging, and/or air knifed to 5 feet bgs?	☐ Yes	☐ No		
If hand digging, probing, post hole digging, and or air knifing to 5 feet bgs is not possible, can a non-invasive geophysical investigation be conducted? If not, why?	☐ Yes	☐ No		
Are you comfortable with approving this authorization?	☐ Yes	☐ No		
Other considerations:				

Utility Mark-Out Documentation

Project Name: _____ **Location:** _____
FTL Name: _____ **Date:** _____
Utility Called: _____ **Confirmation #:** _____
Subcontractor: _____ **Task/Activity:** _____
County of work: _____ **Municipality of work:** _____

Before work is done on any site, contact the appropriate local utility locating service (One Call, Miss Dig, Uloco, etc.) or a local utility contractor to have sub grade utilities marked. NOTE: Boring locations to be placed not in the public right of way are typically not marked out by the public utility mark out, and a private utility locate service must be engaged. Indicate to the utility locator the nearest intersecting street for the site: _____
_____ **Confirmation No:** _____.

List utility firms (public and private) and the utility they will mark.

Utility Marker Emergency Telephone Numbers Major Utilities Marked by Color Code			
Name of Utility Company	Utility	Color Code	Emergency Telephone Number
	Water	**Blue**	
	Gas	**Yellow**	
	Electric	**Red**	
	Telephone/ Cable/ Communication	**Orange**	
	Sewer	**Green**	

"ALL UNDERGROUND UTILITIES MAY NOT BE LOCATED BY THE LOCAL UTILITY SERVICE". Accordingly, you must list other known utilities in the area that the "One Call" service will not contact:

Attach photos of the area prior to placing boreholes.
Take photos of the area indicating minimum 5' hand dig, post hole dig, probe, GPR or other:
NOTE: For any borehole, should 5' minimum clearance not be obtained, you must contact Business Line Vice President or equivalent (Operations Director or other on the Federal Business Line) and obtain a variance.

Completed by: _____
_____

_____ _____ _____
Name **Signature** **Date**

1. PURPOSE

The purpose of this procedure is to provide guidelines to assist Shaw Environmental & Infrastructure Group's (Shaw E&I) Procurement Specialists/Subcontract Administrators (PS/SCA) with pre-award considerations of sourcing, including matters to be considered in securing information from subcontractors/vendors to establish the foundation for qualification, evaluation, and selection to perform work or supply materials to or for Shaw E&I.

Purchases shall be made from, and subcontracts shall be awarded to, responsible firms only. No awards shall be made unless the PS/SCA makes an affirmative determination of responsibility. The PS/SCA signature on the agreement constitutes a determination that the prospective subcontractor or supplier is responsible with respect to that agreement.

2. SCOPE

This procedure applies to procurement and subcontract activities of Shaw E&I as further described below.

3. REFERENCES

3.1 Internal References

- EIG-HS-011 Health and Safety Rules for Contractors
- EIG-PS-203 Terms and Conditions
- EIG-PS-204 Solicitation and Evaluation Criteria
- EIG-PS-211 Cost and Price Analysis
- EIG-PS-213 Acquisition of Commercial Items and Services
- EIG-PS-302 Vendor Performance Evaluation
- SG-AF-SPR-1002 Credit Assessment

3.2 External References

- FAR 9.4, Debarment, Suspension, and Ineligibility
- FAR 22.805 - Procedures
- FAR 52.222-35 Equal Opportunity for Veterans
- FAR 52.225-1 Buy American Act – Supplies
- FAR 52.225-4 Buy American Act – Free Trade Agreements – Israeli Trade Act Certificate
- FAR 52.225-5 Trade Agreements
- FAR 52.225-9 Buy American Act – Construction Materials
- FAR 52.225-11 Buy American Act – Construction Materials under Trade Agreements
- FAR 52.230-1 Cost Accounting Standards Notices and Certifications

- Excluded Parties List System (EPLS)

4. DEFINITIONS

- **Federally Qualified**—A business concern that
  - Has completed and submitted Representations and Certifications
  - Is not on the Excluded Parties Lists System
- **Financially Stable**—A Business Concern that
  - Has a Dun & Bradstreet "Composite Credit Appraisal" of 1, 2 or 3
  - Has acceptable levels of insurance coverage or has granted an insurance waiver
- **Fully-Qualified**—A Business Concern that
  - Is Financially Stable
  - Has an acceptable Quality Control Program
  - Has an approved Heath and Safety Program with the following
    - 40-hour training including 8-hour annual refresher and 3 days on site
    - 8-hour supervisor training
    - Medical Surveillance Program
    - Active drug and alcohol screening and awareness program
    - A written safety program and job-specific safety plan
    - Experience Modification Rate < or = 1 *
    - Written acknowledgment of contractor safety rules
  - Has acceptable Past Performance
  - Has no identifiable Conflicts of Interest
- **Limited-Qualified**—A Business Concern that
  - Is Financially Stable
  - Has an acceptable Quality Control Program
  - Meets Health and Safety Minimum Requirements
    - Provide basic safety training to employees
    - Experience Modification Rate < or = 1 *
    - Written acknowledgment of contractor safety rules
  - Has no identifiable Conflicts of Interest

  NOTE: A Business Concern can be determined less than acceptable in one of these areas: Quality Control Program, Heath and Safety Program, and Past Performance. The project manager can develop with the vendor/subcontractor a mitigation program, providing the project manager has agreed to accept responsibility for implementing and completing the

mitigation program with review and interaction of the appropriate department that did not provide the acceptable rating, and the mitigation program is approved by the business line manager. Once approved, the subcontractor can be receive a Limited-Qualification Ranking for that project only.

- **Low Risk Services**—Defined as follows:
  - That have a low risk of resulting in property damage or bodily injury, and
  - Do not pose a risk to Shaw's ability to perform its scope of work, such as, by way of example, services that are not included as a material element of Shaw's work scope; or services that Shaw will not depend upon in order to fulfill its material contract obligations.

  Examples of such services are:

  1. Simple collection; delivery or drop shipment services (e.g., Federal Express, bottled water suppliers, trash collection, office supply and material deliveries; and any deliveries that would not involve entrance into areas requiring special accesses. This could include areas requiring government security clearances, or contractor restricted areas,)
  2. Utility hookup and service providers for office facilities, such as telephone, electricity, water, etc.
  3. Landscaping/sprinkler installation in areas isolated or removed from other work in progress
  4. On-site repair technicians for equipment that is not part of a process unit, manufacturing line or the like
  5. Unarmed security guards
  6. Miscellaneous painting & striping that does not impact or effect any facility or equipment operations, and which will be conducted in areas removed or isolated from other work in progress
  7. Training for Shaw employees conducted in ordinary course as opposed to, by way of example, project specific training necessary for Shaw's service or operation of project facilities
  8. Plumbing or electrical work inside a building or structure that is not critical to Shaw's ability to fulfill its contract obligations (this does not, in any event, include any outside below grade work, work in an industrial facility or work that ties into a process unit or manufacturing operation)
  9. Janitorial services
  10. Licensed exterminators
  11. Fence installation or repair where location of installation and repair is removed or isolated from work in progress
  12. Paving repair services in an isolated area or otherwise in an area having no third-party access while repair work is being performed

- **Micro-purchase threshold**—An acquisition of supplies or services, generally consisting of COTS or Commercial Items, where the aggregate amount does not exceed $3,000.00. Exceptions to this threshold are noted below.
  - Micro-purchases for construction subject to the Davis Bacon Act are limited to $2,000.00.

- Micro-purchases for services subject to the Service Contract Act are limited to $2,500.00.
- Micro-purchases under commercial prime contracts not subject to funding from federal, state or local governmental entities are $10,000.

- **Qualified**—A Business Concern that
  - Is Financially Stable
  - Has an acceptable Quality Control Program
  - Has an acceptable Heath and Safety Program
    - 24-hour training including 8-hour annual refresher and 3 days on site On-The-Job Training
    - 8-hour supervisor training
    - Medical Surveillance Program
    - Active drug and alcohol screening and awareness program
    - A written safety program and job-specific safety plan
    - Experience Modification Rate < or = 1 *
    - Written acknowledgment of contractor safety rules.
  - Has acceptable Past Performance
  - Has no identifiable Conflicts of Interest
- **Qualified for Engineering Design Work**—A Business Concern that
  - Is Financially Stable.
  - Has an acceptable Quality Control Program.
  - Does not meet the minimum Health and Safety Requirements. All work is accomplished in the office. The Subcontractor is not qualified for any field work and cannot be used for any field applications.
  - Has acceptable Past Performance.
  - Has no identifiable Conflicts of Interest
- **Qualified Suppliers**—A business concern experienced in equipment fabrication that
  - Is Financially Stable
  - Has an acceptable Quality Control Program
  - Has an acceptable Heath and Safety Program
    - Provides basic safety training to employees
    - Experience Modification Rate < or = 1 *
  - Has an acceptable Past Performance
  - Has no identifiable Conflicts of Interest

- **Unacceptable**—A business concern that does not meet one or more the following criteria
  - Is Financially Stable
  - Has an acceptable Quality Control Program
  - Has an acceptable Heath and Safety Program
  - Has an acceptable Past Performance
  - Has no apparent Conflicts of Interest
- **Vendor –** A person or organization selling or leasing commercial or commercial, off-the-shelf items. (See EIG-PS-213 for definitions of commercial and commercial, off-the-shelf items.)

5. RESPONSIBILITIES

5.1 Procurement Specialist/Subcontract Administrator

PS/SCAs have the overall responsibility for implementing this procedure and for determining whether prospective subcontractors are responsible and qualified to be eligible for award of a subcontract.

The PS/SCA shall request clearance from the appropriate Office of Federal Contract Compliance Programs (OFCCP) regional office for first-tier subcontracts if the estimated amount of the subcontract is $10 million or more (excluding construction.) This clearance shall be requested at least 30 days before the proposed award date of any subcontract, including any indefinite delivery subcontract or letter subcontract, or modification of an existing subcontract for new effort that would constitute a subcontract award.

5.2 Project Manager

The Project Manager, or qualified technical designee, is responsible for providing the PS/SCA with the period of performance, estimated value, and all technical requirements, specifications and/or Statement of Work to include any performance qualification criteria with the procurement requisition. The Project Manager, or qualified technical designee, shall assist the PS/SCA in developing evaluation criteria for the particular resource opportunity. The Project Manager may suggest bidders. Once bids are submitted, the Project Manager will assist in determining if a prospective firm's final offer is technically acceptable. The Project Manager, or personnel with the proper authority to approve the requisition, must provide written rationale for the use of a vendor/supplier with a composite rating less than 3.0 in Shaw's supplier performance database.

5.3 Regional Health & Safety Manager

The Regional Health & Safety Manager is responsible for reviewing the Health & Safety portion of the Qualification Questionnaire as required herein; making a determination of the qualifications of the supplier/subcontractor; and documenting their determination and any limitations on the type of work that the supplier/subcontractor can perform or any additional Shaw oversight requirements necessary.

5.4 Regional Quality Assurance Manager

The Regional Quality Assurance Manager is responsible for reviewing the QA portion of the Qualification Questionnaire as required herein; making a determination of the qualifications of the supplier/subcontractor; and documenting their determination and any limitations on the type of work that the supplier/subcontractor can perform or any additional Shaw oversight requirements necessary.

5.5 Corporate Compliance Officer

The Corporate Compliance Officer will make a determination as to whether or not a potential supplier/subcontractor who has answered "yes" on Form EIG-PS-104.01 Qualification Questionnaire (Short Form) Question 2 or Form EIG-PS-104.02 Qualification Questionnaire (Long Form) Question 7 will be eligible to do business with Shaw.

5.6 Regional Procurement Manager

The Regional Procurement Manager shall review the written rationale of the Project Manager and approve use of a supplier/vendor who has a composite rating less than 3.0 in Shaw's supplier performance database. The Regional Procurement Manager shall also notify the Vice President, Subcontracts and Procurement prior to adding the name of any prospective supplier/subcontractor who is found to have failed the determination of responsibility criteria, to Shaw's Supplier Alert List.

5.7 Credit Assessment Group

The Credit Assessment Group is responsible for conducting a credit assessment of existing and potential subcontractors and suppliers where purchase orders/subcontracts, change orders, purchase commitments or other transactions will result in a total outstanding commitment in excess of $5M in accordance with SG-AF-SPR-1002.

6. PROCEDURE

6.1 Qualification Process

The PS/SCA is responsible for assembling and maintaining a potential list of bidders for services, taking into account the selection criteria, recommendations, and restrictions identified in this procedure. Assistance will be solicited from Project Managers, Technical Associates, QA/QC associates, Health and Safety, and other pertinent personnel, where appropriate.

Selection of bidders is determined as each requirement is identified in conjunction with the assembly of a bid list. Development of bid lists and preparation of solicitations is addressed in EIG-PS-204 – Solicitation and Evaluation Criteria.

6.2 Qualification Package

A potential new supplier/subcontractor will be issued a qualification package either in advance of, or with, the solicitation documents. The PS/SCA is responsible for coordinating the review and evaluation process with other evaluation team members. The authorized PS/SCA may adjust the package to a particular procurement. As noted below, there are two different qualification packages – one for low risk services (as defined above) with an award greater than the micro-purchase threshold (as defined above) and one for all other subcontractors or suppliers that will be fabricating equipment or materials.

All packages shall include a cover letter instructing the supplier/subcontractor to complete and execute the forms and to return them along with a Certificate of Insurance which complies with the insurance requirements of the applicable agreement (including all types and amounts of insurance and all required endorsements).

NOTE: In those instances when Shaw is buying or leasing a commercial or commercial, off-the-shelf item, it is not necessary for the vendor to complete a qualification questionnaire, be approved by H&S or QA/QC or supply a Certificate of Insurance. On a federal program where the purchase orders/subcontract is above the micro-purchase threshold the vendor shall complete the applicable Representations & Certifications. This includes instances when Shaw is renting equipment only without an operator. The rental company will request a Certificate of Insurance

from Shaw with limits covering the replacement value of the equipment. The CA shall be consulted to provide this insurance certificate to the PS/SCA.

13. The qualification package for low risk services with an award greater than the micro-purchase threshold shall include:

    - EIG-PS-104.01 Qualification Questionnaire Short Form
    - W-9
    - The appropriate Shaw standard agreement (per EIG-PS-203 Terms and Conditions), if applicable – it is acceptable to utilize PO terms and conditions for low risk services
    - EIG-HS-011 Attachment 2 General Safety Rules for Contractors
    - Federal Programs require the following be added:
        – Representations and Certifications Forms, if applicable (EIG-PS-104.03 Annual Representations and Certifications – General Requirements for United States Owned Entities, EIG-PS-104.04 Cost Accounting Standards Notices and Certification, EIG-PS-104.06 Annual Representations and Certifications – General Requirements for Foreign Owned Entities and EIG-PS-104.07 Buy American Act Supplement to Representations and Certifications if required by the prime contract.)

    NOTE: In those instances when Shaw is buying or leasing a commercial or commercial, off-the-shelf item on a federal program where the purchase orders/subcontract is above the micro-purchase threshold the vendor shall complete the applicable Representations & Certifications. This includes instances when Shaw is renting equipment only without an operator.

14. The qualification package for all other subcontractors or suppliers that will be fabricating equipment or materials shall include all of the above documents, except EIG-PS-104.01 Qualification Questionnaire Short Form shall be replaced with:

    - EIG-PS-104.02 Qualification Questionnaire Long Form

15. Annual Updates of the qualification package for all subcontractors and suppliers shall include

    - Either EIG-PS-104.01 Qualification Questionnaire Short Form or EIG-PS-104.02 Qualification Questionnaire Long Form. The same form completed initially shall be completed for each annual renewal.
    - Federal Programs require the following added:
        – Representations and Certifications Forms, if applicable (EIG-PS-104.03 Annual Representations and Certifications – General Requirements for United States Owned Entities, EIG-PS-104.04 Cost Accounting Standards Notices and Certification, EIG-PS-104.06 Annual Representations and Certifications – General Requirements for Foreign Owned Entities and EI-PS-104.07 Buy American Act Supplement to Representations and Certifications if required by prime contract).

    NOTE: In those instances when Shaw is buying or leasing a commercial or commercial, off-the-shelf item on a federal program where the purchase orders/subcontract is above the micro-purchase threshold the vendor shall complete the applicable Representations & Certifications. This includes instances when Shaw is renting equipment only without an operator.

Any company issues identified during the review process shall be communicated by the PS/SCA to the prospective subcontractor or supplier for action.

Go Kahuna Certification: Special Requirement for Construction Subcontracts greater than $1M - Go Kahuna Certification is required for domestic site subcontractors to be awarded a subcontract on or after September 1, 2007 in the amount of $1 million or greater and are subcontractors performing one of the following types of services: move dirt, drill caissons, drill test holes, place underground utilities, licensed mechanical subcontractors, licensed electrical subcontractors, building construction subcontractors, major equipment installation subcontractors, piping subcontractors, concrete construction contractors, roofing contractors, and any other subcontractor that performs construction site work. To find out more about the Go Kahuna certification program and how to become Go Kahuna certified, please visit www.gokahuna.com."

6.3 Qualification of Subcontractors/Suppliers

Before work is awarded to a prospective subcontractor/supplier, the PS/SCA must determine the firm to be technically and commercially responsible and to have the relevant experience and sufficient resources necessary to complete the awarded requirement within schedule constraints.

The factors to be considered in the qualification process must be determined based on the specific circumstances of a given purchase. Factors such as long-lead engineered goods, critical path schedule or safety related requirements, or high-risk activities increase the importance of the qualification process. A responsible subcontractor/supplier has adequate financial resources necessary to support all financial responsibilities during the performance of the work.

Financial Adequacy: Information can be obtained from a Dun & Bradstreet report, a recognized financial advisory service, a written statement from a recognized source, such as a bank, or a financial report issued by the supplier and certified by an independent accountant. Depending on the value of the award, confirmation of prompt payments of supplier's debts to its creditors may satisfy this requirement. A Dun & Bradstreet report is required for subcontractors or suppliers with an award greater than $1 Million. In addition to a Dun & Bradstreet report, a financial analysis by the Credit Assessment Group is required for subcontractors or suppliers with a total outstanding commitment greater than $5 Million. A Dun & Bradstreet report may be utilized to review the financial adequacy of a subcontractor or vendor with an award less than $1 Million depending on the technicalities or complexity.

6.3.1 A satisfactory record of past performance

Prospective bidders may be excluded for any of the following reasons.

1. Repeated failure to comply with required submittal or delivery schedules
2. Unsatisfactory performance on previous purchase orders

Insight into record of past performance can be obtained from internal Shaw resources, from historical experience, or from references provided by the Subcontractor for representative projects. A formal record shall be created to document any deficiencies noted during discussions with past customers. Recent unsatisfactory performance regarding timeliness of delivery, or quality issues, must be resolved as to its potential impact on the contemplated subcontract prior to making a determination qualifying the bidder for award.

The following types of information are considered vital in evaluating the seriousness of any deficiencies and its potential impact on the contemplated procurement.

1. The nature of the deficiency including its perceived seriousness
2. The quantity involved in relationship to the total produced
3. The cause, if known, and a determination if the circumstances were within or outside the control of the Subcontractor/Supplier

4. Any remedial action taken by the Subcontractor to preclude a repeated occurrence
5. The ability to comply with required performance schedules, taking into consideration all existing business commitments
6. Systems and Capabilities

6.3.2 Technical Capabilities and Experience

To be determined responsible, a subcontractor/supplier must have the necessary experience and technical capabilities required to successfully undertake the specifications or project requirements. Past performance data obtained either from internal or external sources should be an important element in evaluating a Subcontractor's/Supplier's responsibility. Performance of similar work in the past can be used as a qualifying determination. A marginal rating, assigned to a subcontractor/supplier on a previous job or project, may be unsatisfactory for future projects, depending on complexity, cost factors, equipment availability or other criteria.

As part of the qualification process, the PS/SCA shall check the supplier performance database on the Contracts/Procurement department's portal in order to evaluate a firm's past performance. The database should be checked for all subcontractors/suppliers greater than the micro-purchase threshold regardless of the type of award.. The PS/SCA shall document the date he/she checked the database and the composite rating. This information will be annotated in the Remarks/Comments section on EIG-PS-205.05 Award Justification Form or in section IX Technical Evaluation of form EIG-PS-205.06 Procurement Summary. If the subcontractor/supplier has more than one evaluation in the supplier performance database, the PS/SCA shall calculate an average composite rating using the composite rating from each evaluation completed within the last 12 months. If the subcontractor/supplier is not in the supplier performance database then the PS/SCA needs to document the database was checked but no information was available.

For qualification purposes, a vendor must have a composite rating or a summary composite rating of at least 3.0 in order to be awarded a purchase order/subcontract. If a vendor has a composite rating less than 3.0 and the project team still wants to award a purchase order/subcontract to them, the Regional Procurement Manager and the Project Manager or personnel with the proper authority to approve the requisition, must approve this action.

Shaw will rely on the subcontractor's/supplier's existing quality assurance systems as a substitute for Company inspection and testing, unless the customary industry practices for commercially available goods require in-process inspection. The Subcontractor/Supplier shall provide proof of an acceptable quality assurance system. Product literature available in the industry will normally be adequate in evaluating the technical acceptability of the product.

6.3.3 Related Party Status

- EIG-PS-104.01 Qualification Questionnaire Short Form Question 2 – should a potential subcontractor/supplier answer "yes" to this question they will not be eligible to do business with Shaw unless reviewed and approved by the Shaw Corporate Compliance Officer.
- EIG-PS-104.02 Qualification Questionnaire Long Form Question 7 – should a potential subcontractor/supplier answer "yes" to this question they will not be eligible to do business with Shaw unless reviewed and approved by the Shaw Corporate Compliance Officer.

6.3.4 Necessary facilities and technical equipment

Special qualification criteria may be required when experience has demonstrated that expertise or specialized facilities are needed to assure satisfactory performance for the contemplated scope of work. When special qualification criteria are required, the criteria shall be set forth in the

solicitation and shall apply to all subcontractors/suppliers. These must be provided by QA/QC or Project Management, or whichever functional group is identifying the requirement.

6.4 Representations and Certifications

The PS/SCA shall obtain annual Representations and Certifications for each firm doing business with Shaw on Government funded projects. Sources should not be asked to complete EIG-PS-104.04 Cost Accounting Standards Notices and Certification unless award is anticipated to be in excess of the threshold as stated in FAR 52.230-1 Cost Accounting Standards Notices and Certification.

Prior to each award in excessive of the micro-purchase threshold, the PS/SCA shall confirm, by written representation of the offeror, that the Representations and Certifications are current, complete and accurate. **Representations and Certifications should be renewed every year.**

The following basic requirements apply to Representations and Certifications:

- EIG-PS-104.03 Annual Representations and Certifications - General Requirements for United States Owned Entities is required for all firms performing work pursuant to a federal government prime contract. The instructions on the form indicate the level of completion required.
- EIG-PS-104.04 Cost Accounting Standards Notices and Certification must be completed by all firms where there is no competition, the procurement is not for a commercial item, and award will be in excess of the threshold as stated in FAR 52.230-1 Cost Accounting Standards Notices and Certification. The CAS Certification will be specific to a particular procurement and shall be documented in the purchase order/subcontract file.
- EIG-PS-104.06 Annual Representations and Certifications – General Requirements for Foreign Owned Entities must be completed by any firm indicating that it has foreign ownership.
- EIG-PS-104.07 Buy American Act Supplement to Representations and Certifications must be completed by all firms if the prime contract contains FAR 52.225-1 – Buy American Act – Supplies; FAR 52.225-4 – Buy American Act – Free Trade Agreements – Israeli Trade Act; FAR 52.225-5 – Trade Agreements; FAR 52.225-9 – Buy American Act – Construction Materials; OR FAR 52.225-11 – Buy American Act – Construction Materials under Trade Agreements include

NOTE: The Contract Administrator must be consulted to ensure that Representations and Certifications included with solicitations are appropriate under the prime contract.

6.5 Subcontracting With Parties Excluded From Federal Programs:

The Government suspends or debars Contractors to protect the Government's interests. Shaw shall not enter into any subcontract pursuant to a federal prime contract in excess of $30,000 with a Contractor that is debarred, suspended, or proposed for debarment unless there is a compelling reason to do so.

The PS/SCA shall require each proposed first-tier subcontractor to disclose, in writing, whether as of the time of award of the subcontract, the subcontractor, or its principals, is or is not debarred, suspended, or proposed for debarment by the Federal Government. In addition, the PS/SCA shall check the Excluded Parties List System (EPLS), print out the search results, and place them in the purchase order/subcontract file.

In accordance with FAR 9.405(d)(1) and (4), the EPLS shall be checked a minimum of two times throughout the acquisition process to ensure the subcontractor is not excluded from federal programs:

- After the opening of bids or receipt of proposals
- Immediately prior to award

The Contract Administrator shall notify the Contracting Officer, in writing, before entering into a subcontract with a party that is debarred, suspended, or proposed for debarment. The notice must include the following:

- The name of the subcontractor.
- Shaw's knowledge of the reasons for the subcontractor being in the Excluded Parties List System.
- The compelling reason(s) for doing business with the subcontractor notwithstanding its inclusion in the Excluded Parties List System.
- The systems and procedures the Contractor has established to ensure that it is fully protecting the Government's interests when dealing with such subcontractor in view of the specific basis for the party's debarment, suspension, or proposed debarment.

EIG-PS-104.03, Annual Representations and Certifications - General Requirements for United States Owned Entities, includes the subcontractor's written disclosure which states whether it is or is not suspended or proposed for debarment by the Federal Government. This disclosure is required before entering into a purchasing agreement that exceeds $30,000 and is issued in support of a Government Prime Contract.

6.6 Federal Contractor Veterans' Employment Report VETS-100

If the prime contract includes FAR 52.222-35 "Equal Opportunity for Veterans" and the anticipated award is greater than $100,000, then the PS/SCA must verify that the subcontractor has filed with the Department of Labor a VETS-100 form by emailing verify@vets100.com.

Award cannot be made until verification with the Department of Labor is completed.

6.7 Preaward Clearances

In accordance with the requirements of FAR 22.805 – Procedures, the PS/SCA shall request clearance from the appropriate Office of Federal Contract Compliance Programs (OFCCP) regional office for first-tier subcontracts if the estimated amount of the subcontract is $10 million or more (excluding construction.) This clearance shall be requested at least 30 days before the proposed award date of any subcontract, including any indefinite delivery subcontract or letter subcontract, or modification of an existing subcontract for new effort that would constitute a subcontract award. The PS/SCA shall include the following information in the preaward clearance request:

- Name, address, and telephone number of each proposed first-tier subcontractor with a proposed subcontract estimated at $10 million or more.
- Anticipated date of award.
- Information as to whether the first-tier subcontractor(s) have previously held any Government contracts or subcontracts.
- Place or places of performance of the first-tier subcontracts estimated at $10 million or more.
- The estimated dollar amount of each first-tier subcontract.

6.8 Health and Safety

For those subcontractors/suppliers who are required to complete the Health and Safety portion of EIG-PS-104.01 Qualification Questionnaire Short Form or EIG-PS-104.02 Qualification Questionnaire Long Form, the Regional Health & Safety Manager shall review the Health & Safety portion of the questionnaire and make a determination of the qualifications in accordance with Attachment 1, Heath and Safety Rating Instructions Their determination and any limitations on the type of work that the subcontractor/supplier can perform or any additional Shaw oversight requirements necessary shall be documented on EIG-PS-104.09 Qualification Routing and Approval Sheet.

6.9 Quality Assurance

The Regional Quality Assurance representative shall review the QA portion of the subcontractor questionnaire and make a determination of the subcontractor/supplier's qualifications. Their determination and any limitations on type of work that the subcontractor can perform or any additional Shaw oversight requirements necessary will be documented on EIG-PS104.09 Qualification Routing and Approval Sheet.

6.10 Disqualification

A subcontractor/supplier may be disqualified from providing resources or services to Shaw for failure to conform to any of the requirements of this procedure or failure to perform satisfactorily on a project.

When an offer on which an award would otherwise be made is rejected because the prospective vendor/subcontractor is found to have failed the determination of responsibility criteria, the PS/SCA shall document the basis for the determination in the specific file and shall notify the Regional Procurement Manager. The Regional Procurement Manager shall be responsible for first notifying the Vice President, Subcontracts and Procurement prior to adding the name of the subcontractor/supplier to Shaw's Supplier Alert List.

7. ATTACHMENTS

- Attachment 1, Health and Safety Rating Instructions
- Attachment 2, Required Qualification Documents

8. FORMS

- EIG-PS104.01 Qualification Questionnaire Short Form
- EIG-PS104.02 Qualification Questionnaire Long Form
- EIG-PS104.03 Annual Representations and Certifications – General Requirements for United States Owned Entities
- EIG-PS104.04 Cost Accounting Standards Notices and Certification
- *EI-PS104.05 Representations and Certifications Supplement for Department of Defense (ARCHIVED)*
- EIG-PS104.06 Annual Representations and Certifications – General Requirements for Foreign Owned Entities
- EI-PS104.07 Buy American Act Supplement to Representations and Certifications
- *EI-PS104.08 General Safety Rules for Contractors (ARCHIVED)*

- EIG-PS104.09 Qualification Routing and Approval Sheet

9. RECORDS

- EIG-HS-011 Health and Safety Rules for Contractors
- EIG-PS-104.01 Qualification Questionnaire Short Form
- EIG-PS-104.02 Qualification Questionnaire Long Form
- EIG-PS-104.03 Annual Representations and Certifications – General Requirements for United States Owned Entities
- EIG-PS-104.04 Cost Accounting Standards Notices and Certification
- EIG-PS-104.06 Annual Representations and Certifications – General Requirements for Foreign Owned Entities
- EIG-PS-104.07 Buy American Act Supplement to Representations and Certifications
- EIG-PS-104.09 Qualification Routing and Approval Sheet

10. REVISION HISTORY AND APPROVAL

Revision Level / Revision Date	Revision Description	Responsible Manager
00 11/07/2011	Initial Issue.	Jim Pointer
01 04/09/2008	Added Section 6.6 for VETS-100 verification	Jim Pointer
02 11/12/2011	Modified format to align with Governance Management framework, Section 3.1 added two external references; removed the requirement for subcontractors to register in CCR throughout; Section 5 added three departments; Section 6.6 corrected the procedure for verifying VETS-100; various formatting corrections to SOPS and Forms throughout. Added requirement to check EPLS and supplier performance database as part of qualification process. Added paragraph for preaward clearances. Removed references to using ORCA. Revised definition of Low Risk Services. Revised Reps&Certs documents. Updated reference to Health&Safety Rules for Contractors. Added Attachment 2.	Jim Pointer
03 01/11/2012	No changes to procedure; ONLY 3 of the forms. Form EIG-PS-104.02 was updated to include (Rev 3): Fixed #6 section where the "6" was in the last bullet after the letter "e"; Added the #10 to the section between #9 and #11, added check box options before Yes, No and N/A in #19, changed the item after #20 from #17 to #21. Form EIG-PS-104.03 was updated to include (Rev 4): Corrected the spelling error of "Representations" in the title of section 1, removed the various signature blocks at the end of sections 1, 2, and 3. There is now one signature block after section 3 and the end of the form. Made Cage Code. Form EIG-PS-104.06 was updated to include (Rev 4): Deleted the various signature blocks after sections 1, 2, and 3. There is now one signature block after section 3 at the end of the form. Made Duns number and Firm number fillable fields.	Cassie Volpe

Attachment 1

Health and Safety Rating Instructions

All qualification for Health and Safety work must be approved by an assigned Health and Safety Professional. A rating system will be assigned to all contractors regardless of work conditions. The rating system is based on OSHA 1910.120 and is documented as follows:

A FULLY QUALIFIED

Subcontractors may be used for all hazardous waste activities if they meet the following requirements:

- 40-hour training including 8-hour annual refresher and 3 days on site
- 8-hour supervisor training
- Medical Surveillance Program
- Active drug and alcohol screening and awareness program
- A written safety program and job-specific safety plan
- Experience Modification Rate < or = 1 *
- Written acknowledgment of contractor safety rules.
- Insurance

B QUALIFIED

Subcontractor may perform limited site (e.g. non-routine task such as surveying, waste removal, etc.) but may not work in exclusion/contamination reduction zones for extended periods if they meet the following requirements:

- 24-hour training including 8-hour annual refresher and 3 days on site On-The-Job Training
- 8-hour supervisor training
- Medical Surveillance Program
- Active drug and alcohol screening and awareness program
- A written safety program and job-specific safety plan
- Experience Modification Rate, or = 1 *
- Written acknowledgment of contractor safety rules.
- Insurance

C LIMITED QUALIFICATION

Subcontractor may be used in support zone or non-hazardous site activities. For limited activities at a hazardous waste site, the Scope of Work must be reviewed with the Health and Safety Professional before work is started. (Examples: Hydro seeder, landscape service, electricians, software development, training, etc.). The subcontractor must meet the following minimum requirements:

- Provide basic safety training to employees

- Experience Modification Rate, or = 1 *
- Written acknowledgment of contractor safety rules.
- Insurance

D QUALIFIED FOR ENGINEERING DESIGN WORK.

Subcontractor does not meet the minimum requirements. All work is accomplished in the office. Contractor is not qualified for any field work and cannot be used for any field applications unless the minimum requirements outlined in A, B, or C is met.

E UNACCEPTABLE

Subcontractor does not meet the minimum requirement necessary to perform work for SHAW and will not be used for any jobs.

NOTE: Contractors unable to meet SHAW requirements for accident rates or experience modification rates may submit a written safety enhancement program designed to bring project performance in line with SHAW requirements that will be implemented for all work done for SHAW. If approved by the SHAW Health and Safety Professional, the safety enhancement plan will become part of the contractor's job-specific safety plan and the contractor may be approved.

Attachment 2

Required Qualification Documents

Type of Vendor/Subcontractor											
		< or = Micro Purchase Threshold				> Micro Purchase Threshold					
	Form No.	Vendors	Low Risk Services	Other than Low Risk Services & Suppliers	Equipment Rental (without Operator)	Equipment Rental (without Operator)	Vendors	Low Risk Services	Other than Low Risk Services & Suppliers
Short Form Qualification Form	EIG-PS-104.01							X	
Long Form Qualification Form	EIG-PS-104.02			X					X
Applicable Representation & Certification	EIG-PS-104.03, .04, .06, .07					X	X	X	X
W-9		X*	X*	X*	X*	X*	X*	X*	X*
Shaw Standard Terms and Conditions	EIG-PS-203.01, .02, .04, .05	X	X	X	X	X	X	X	X
General Safety Rules for Contractors	EIG-HS-011 Attachment 2			X					X
Certificate of Insurance			X	X				X	X
EPLS						X	X	X	X

*As Applicable

Note: commercial PO/subcontracts issued under a commercial prime contract shall follow the above table with the exception of Reps&Certs. Reps&Certs are not required for PO/Subcontracts issued under a commercial prime contract.
Supplier: a business concern experience in equipment fabrication
Vendor: a person or organization selling or leasing commercial or commercial, off-the-shelf items

Purpose: To obtain information regarding a Supplier/Subcontractor.

Instructions: Complete all sections of this form and return to the Shaw Environmental & Infrastructure, Inc. Shaw representative referenced on the cover letter. Mark sections which are not applicable "NA." Any information which does not fit in the spaces provided or that you feel will be helpful in determining Supplier capability to meet Shaw's needs should be placed in the Supplementary Information Section.

SECTION A: To be completed by all firms.

Company Name:

Company Address:

City/State/Zip Code:

Contact Names & Titles:

Telephone Number:

Emergency (After Hours Contact): Name: Phone No.

Fax Number:

Email Address:

Web Site:

Type of Company: ☐ **Material Supplier** ☐ **Rental Supplier** ☐ **Other** _____

City(ies) and State(s) Business/Occupational Licenses:

Applicable North American Industry Classification System Codes (NAICS):

Description of Supplies/Equipment (i.e. office supplies, excavator):

Catalog or Line Card available upon request: ☐ **Yes** ☐ **No**

Taxpayer ID Number:

Organization Type: **Check appropriate box:**
☐**Individual** ☐**Sole proprietor** ☐**Corporation** ☐**Partnership** ☐ **Other**_____

Duns. Number:

CCR Registered: ☐Yes. Date_____; ☐ No

Business Classification: (Check appropriate boxes)

- ☐ **Large,**
  - ☐ **Women-Owned**
- ☐ **Non-Profit,**
- ☐ **Foreign,**
- ☐ **Small (Check All Subclassifications That Apply),**
  - ☐ **Woman-Owned,**
  - ☐ **Veteran-Owned,**
  - ☐ **Service Disabled Veteran,**
  - ☐ **HUBZone (Copy of SBA Certification Letter Required),**
  - ☐ **Qualified Non-Profit,**
  - ☐ **Disadvantaged (Copy of SBA Certification Letter Required),**
    - ☐ Black American.
    - ☐ Hispanic American.
    - ☐ Native American (American Indians, Eskimos, Aleuts, or Native Hawaiians)
      - ☐ Alaska Native Corporation
      - ☐ Indian Tribe
    - ☐ Asian-Pacific American (persons with origins from Burma, Thailand, Malaysia, Indonesia, Singapore, Brunei, Japan, China, Taiwan, Laos, Cambodia, (Kampuchea), Vietnam, Korea, The Philippines, U.S. Trust Territory of the Pacific Islands (Republic of Palau), Republic of the Marshall Islands, Federated States of Micronesia, the Commonwealth of the Northern Mariana Islands, Guam, Samoa, Macao, Hong Kong, Fiji, Tonga, Kiribati, Tuvalu, or Nauru).
    - ☐ Subcontinent Asian (Asian-Indian) American (persons with origins from India, Pakistan, Bangladesh, Sri Lanka, Bhutan, the Maldives Islands, or Nepal).
    - ☐ Individual/concern, other than one of the preceding

COMMERCIAL SOCIO-ECONOMIC CERTIFICATIONS: Check appropriate box and enter name of State in the field provided

☐ MBE Minority Business Enterprise State(s):_____; _____; Organization:_____;
☐ WBE Women Business Enterprise State(s): _____; _____; Organization: _____;
☐ DBE Disadvantage Business Enterprise State(s): _____; _____; Organization:_____;

1. Does any company officer, partner, owner or their spouse have an ownership and /or management interest in another company? This would include being an officer, partner or owner of another company. **Yes** ☐ **No** ☐

If so, please list:

Name of Officer and Title [Owner, Director, Partner, Spouse] Company Name

_____

_____

2. Are any current company officers, partners, owner or their spouses a relative of any current Shaw employee (including Shaw subsidiaries). **Yes** ☐ **No**☐

If yes, then list the officer and Shaw employee name.

Name of Officer and Title [Owner, Director, Partner, Spouse] Shaw Employee

_____

_____

3.	**How many years in business under your current legal name?**	
4.	**How many employees are currently on your payroll?**	
5.	**Are you privately owned or a publicly traded company"?**	
6.	**Are you union or non-union? ☐ Union ☐Non-union If union, identify union affiliation."**	
7.	**Does your firm accept Master Card for purchases less than $3,000?**	

SECTION B. ANALYTICAL SUPPLIERS: This section only needs to be complete by firms providing analytical analysis.

ANALYTICAL CERTIFICATIONS:

☐ NELAP Certified:
Accrediting State:_____ (*Attach Copy)*
☐ USACE Self Declared (*Attach Copy)*
☐ NFESC Approval Letter (*Attach Copy)*
☐ US Department of Agriculture (Foreign Soils Permit) (*Attach Copy)*
Other Certifications(can attach as a list):
_____; _____; _____

Additional Laboratory Services:

Yes ☐ **No** ☐ Ability to Produce Full Data Deliverable in PDF Format
Yes ☐ **No** ☐ Ability to Produce Reduced Data Deliverable in PDF Format (Format to be provided a project start up)
Yes ☐ **No** ☐ Ability to Produce Standard Electronic Data Deliverables
Yes ☐ **No** ☐ Ability to Produce Custom Electronic Data Deliverables
Yes ☐ **No** ☐ Laboratory Information Management System (LIMs)
Yes ☐ **No** ☐ On-Line Data Retrieval
Yes ☐ **No** ☐ Courier Service, if yes radius from laboratory:_____
Yes ☐ **No** ☐ Field Services
Yes ☐ **No** ☐ Mobile Laboratory Services
Yes ☐ **No** ☐ Service Centers, if yes list locations:_____
Yes ☐ **No** ☐ UFP QAPP Preparation Support

Can you support the following matrices, check all that are applicable:
☐ Soil ☐ Sediment ☐ Water ☐ Tissue ☐ Air

Specialty Analysis:
☐ Mold ☐ Asbestos ☐ Indoor Air Quality ☐ Industrial Hygiene

Can you support the following groups of methodology, it is understood that the laboratory may not support every method, check all that are applicable:
☐ SW-846 ☐ ASTM ☐ Current CLP SOW ☐ Standard Methods ☐ EPA

Standard Laboratory Turnaround time:_____
Can you support the following accelerated turnarounds with prior notification, it is understood that the laboratory may not support these turnarounds for every method :
24 hour ☐ 3 days☐ 5 days☐ 7 days☐

PLEASE INCLUDE COPIES OF THE FOLLOWING:

- Laboratory Statement of Qualifications
- Locations of all Laboratories
- List of all Method Capabilities
- List of all Instrumentation
- Organizational Chart/s
- Resumes of Key Personnel
- Brief Paragraph on Sample Handling which includes sample disposal policies
- List of Project Experience (include a variety of projects past and present and in support of multiple programs)
- Name of one Shaw contact that you are currently performing analytical services for: _____

SECTION C: Health and Safety Information *(to be complete only if personnel will be on a Shaw project site for other than delivery of Supplies or Materials).*

1. Are you willing to comply with the Shaw Environmental & Infrastructure, Inc Health and Safety Program if so directed by contract documents? ☐ Yes ☐ No If no, please explain.

2. Do you have a Health & Safety Orientation Program for new hires and newly hired or promoted supervisors? ☐ Yes ☐ No

3. Do you hold site Health & Safety meeting for:

a. Tailgate/Toolbox Safety Meetings	☐ Yes **If yes box checked, please provide sample copy(s)**	☐ No	Frequency _____
b. Field Supervisors	☐ Yes	☐ No	Frequency _____
c. Employees	☐ Yes	☐ No	Frequency _____
d. Subcontractors	☐ Yes	☐ No	Frequency _____

d. Are the safety meetings documented? ☐ Yes ☐ No

4. Personal Protection Equipment (PPE) Program:
   a. Is applicable PPE provided for employees? ☐ Yes ☐ No
   b. Do you have a program to assure that PPE is inspected and maintained? ☐ Yes ☐ No
   c. What method do you use to prescribe PPE for each task? _____
   d. How are task-specific PPE requirements communicated to workers? _____

5. Employee Safety Program:
   a. Do you use a safety observer program or behavior based safety program? ☐ Yes ☐ No
   b. Do you have a corrective action process for addressing individual health and safety performance deficiencies? ☐ Yes ☐ No
   c. Do you have procedure for injury/illness reporting and investigation? ☐ Yes ☐ No

Inspections and audits:
   a. Do you conduct and document Health and Safety inspections? ☐ Yes ☐ No
   b. Do you conduct and document Health and Safety Program audits? ☐ Yes ☐ No
   c. Are corrections of deficiencies documented? ☐ Yes ☐ No
   d. What method do you use to ensure that identified deficiencies have been corrected? _____

6. Use your OSHA 200/300 logs to record the number of injuries and illnesses for the last three years. Please note that SHAW requires all subcontractors to provide incident statistics, even though certain companies may not be statutorily required to keep OSHA 200/300 logs.

YEAR	_____	_____	_____
a. Number of Fatalities	_____	_____	_____
b. Lost Work Day Incident Rate[1]	_____	_____	_____
c. OSHA Recordable Incident Rate[2]	_____	_____	_____
d. Number of Hours Worked	_____	_____	_____
e. Total Number of Employees on Your Payroll	_____	_____	_____

f. Attach a copy of your OSHA 300 logs for the last three years.

[1] The following formula is used for calculating the **Lost Work Day Incident Rate:**_____ = $\frac{\text{Number of Lost Work Day Cases x 200,000}}{\text{Number of Hours Worked}}$

[2] The following formula is used for calculating the **OSHA Recordable Incident Rate:** _____ = $\frac{\text{Number of OSHA Recordable Cases x 200,000}}{\text{Number of Hours Worked}}$

7. List your company's Worker's Compensation (WC) Experience Modification Rate **(EMR)** for the three (3) most recent years:

	Year	Interstate	Intrastate
a.	_____	_____	_____
b.	_____	_____	_____
c.	_____	_____	_____

d. **Provide a letter from your WC insurance carrier certifying the above EMRs.**

e. **If your WC carrier has not issued your company an EMR because you have not accrued enough WC costs, provide a copy of your WC Loss Run (available from your WC carrier).**

f. **If your current EMR is greater than 1.0, provide a written explanation of the safety methods that are being implemented by your company to reduce this rate.**

8. List activities your company will be performing on SHAW projects and the anticipated hazardous work operations (for example: excavation work, fall protection, ladders, scaffolding, confined space work, heavy equipment etc.)

Activities: _____

HazOps: _____

a. Will you subcontract work to other subcontractors? ☐Yes ☐ No

If yes, **please detail what portion of work:** _____

b. Do you prequalify subcontractors? ☐Yes ☐ No **If yes box checked, please attach method used to qualify subcontractors**

9. Has your company received an OSHA (or State OSHA) citation within the last five (5) years? ☐Yes ☐ No

If yes, provide the following information below: **If yes box checked, please attach copies of the citation(s).**

a. The number and type of violations?_____
b. The penalties assessed by OSHA? _____
c. Were the citations contested/vacated? _____
d. What specific corrective actions were taken to prevent further penalties/injuries? _____

10. Does your company have a written occupational safety and health program? ☐ Yes ☐ No

If yes box checked, please provide a copy of your health & safety program.

11. Does your company conduct field safety inspections to determine compliance with applicable regulations and procedures?

a. ☐Yes ☐No **If yes box checked, please provide sample copy of inspection form.**

b. Who conducts these inspections? (Please provide position/title) _____

c. How often are safety inspections conducted? _____

12. Does your company have the following on your staff or on retainer?

	Yes	No	How Many	Staff	Retainer	**Please give certification number(s)**
Occupational Physician	☐	☐	_____	_____	_____	_____
Certified Industrial Hygienist	☐	☐	_____	_____	_____	_____
Certified Safety Professional	☐	☐	_____	_____	_____	_____
Certified Health Physicist	☐	☐	_____	_____	_____	_____

13. Does your company have an orientation program for new hires? ☐ Yes ☐No

If yes box checked, please provide an outline of the orientation and the topics covered

14. Has your company implemented any of the following training programs?

If yes box checked, please provide the last date this training was provided.

Yes	No	Date		Yes	No	Date	
☐	☐	_____	Asbestos	☐	☐	_____	Hazardous Waste (40-hour)
☐	☐	_____	Blasting/Explosives	☐	☐	_____	Hearing Conservation
☐	☐	_____	Bloodborne Pathogens	☐	☐	_____	Heavy Equipment operation
☐	☐	_____	Confined Space Entry	☐	☐	_____	Laboratory Safety
☐	☐	_____	Construction (OSHA Certified 10 Hours)	☐	☐	_____	Ladder/Scaffolding
☐	☐	_____	Construction (OSHA Certified 30 Hours)	☐	☐	_____	Lead
☐	☐	_____	Cranes Operations	☐	☐	_____	Lockout/Tagout
☐	☐	_____	Electrical Safety	☐	☐	_____	Personal Protective Equipment
☐	☐	_____	Excavation Competent Person	☐	☐	_____	Powder-actuated Tools
☐	☐	_____	Fall Protection	☐	☐	_____	Process Safety Management
☐	☐	_____	Fire Extinguishers	☐	☐	_____	Radiation Protection
☐	☐	_____	First Aid/CPR	☐	☐	_____	Respiratory Protection
☐	☐	_____	Forklift Operations	☐	☐	_____	Welding/Cutting

Who conducts training for your company (name, title)? _____

15. Does your company have a program in place to discipline workers that perform unsafe work practices? ☐Yes ☐ No
If yes box checked, please provide as attachment

16. Does your company have written Accident Investigation Procedures? ☐Yes ☐ No
If yes box checked, please provide as attachment

17. Does your company currently maintain a program in compliance with applicable state "Right to Know" laws and the OSHA Hazard Communication Standard? ☐Yes ☐No **If yes box checked, please provide as attachment**

18. Does your company currently maintain an Accident Prevention Program in compliance with applicable state OSHA regulations? (Required for AlasSCA, California, Minnesota, Nevada and North Carolina) ☐Yes ☐ No ☐ N/A
☒ **If yes box checked, please provide as attachment**

19. Does your company implement a medical surveillance program for employees that work on hazardous waste sites or with hazardous chemicals (i.e., lead, asbestos, benzene, arsenic, formaldehyde, etc.)? Yes ___ No ___ N/A ___
☒ **If yes box checked, please provide as attachment**

20. Does your company have a written Alcohol and Substance Abuse Program? ☐Yes ☐No **If yes box checked, please provide program as attachment.**

If yes, does it include the following?

a. 10-panel substance testing? ☐Yes ☐No

b. Pre-employment/pre-job assignment testing (within 30 days of pre-job assignment)? ☐Yes ☐No

c. Post-accident drug and alcohol testing? ☐Yes ☐No

d. Random testing (10 percent per month)? ☐Yes ☐No

e. Reasonable suspicion drug and alcohol testing? ☐Yes ☐No

17. Has your company worked for SHAW in the past three years? ☐Yes ☐No

If so, what year and what project manager were you working for? Year: _____

Project Manager: _____

SECTION D: Quality Assurance

Does your company have a documented Quality Assurance program applicable to the goods or services to be provided? **Yes** ☐ **No** ☐

If yes, on what industry standard(s) is it based? _____

Will you provide your QA/QC Plan/Manual if requested? **Yes** ☐ **No** ☐

If work is to be performed in your facilities, will you make your facilities and processes available for Shaw Quality audits? **Yes** ☐ **No** ☐

SUPPLEMENTARY INFORMATION (additional pages maybe added)

SIGNATURE/CERTIFICATION

By signing below, the offeror certifies, under penalty of law, that the representations and certifications are accurate, current and complete. The offeror further certifies that it will notify the SHAW E&I Procurement Representative of any changes to these representations and certifications. The representations and certifications made by the offeror, as contained herein, concern matters within the jurisdiction of an agency of the United States and the making of a false, fictitious, or fraudulent representation or certification may render the maker subject to prosecution under Title 18, United States Code, Section 1001.

_____ _____

Signature of Offeror Responsible for Offer *Date*

_____

Typed Name of Person Responsible for the Offer

_____

Title of Person Responsible for the Offer

*NOTE: PENALTIES FOR FALSE MISREPRESENTATION. 1) FAR 52-219(e)(4) – Misrepresentations of business status as a small, small disadvantaged, women-owned small, veteran-owned small (including service disabled), and HUBZone small business concern for the purpose of obtaining a subcontract that is to be included as part or all of a goal contained in the Contractor's subcontracting plan, without remedy, can result in severe penalties. Additionally, 2) Under 15 U.S.C. 645(d), any person who misrepresents a firm's status as a small, small disadvantaged, women-owned small, veteran-owned small (including service disabled), and HUBZone small business concern in order to obtain a contract to be awarded under the preference programs established pursuant to section 8(a), 8(d), 9 or 15 of the Small Business Act or any other provision of Federal law that specifically references section 8(d) for a definition of program eligibility, shall: (i) Be punished by imposition of fine, imprisonment, or both; (ii) Be subject to administrative remedies, including suspension and debarment; and (iii) Be ineligible for participation in programs conducted under the authority of the Act.

Purpose: To obtain information regarding a Supplier/Subcontractor.

Instructions: Complete all sections of this form and return to the Shaw Environmental & Infrastructure, Inc. Shaw representative referenced on the cover letter. Mark sections which are not applicable "NA." Any information which does not fit in the spaces provided or that you feel will be helpful in determining Supplier capability to meet Shaw's needs should be placed in the Supplementary Information Section.

SECTION A: To be completed by all firms.

Company Name: _____

Company Address: _____

City/State/Zip Code: _____

Contact Names & Titles: _____

_____

Telephone Number: _____

Emergency (After Hours Contact): **Name:** _____ **Phone No.** _____

Fax Number: _____

Email Address: _____

Web Site: _____

Type of Company: ☐ Material Supplier ☐ Rental Supplier ☐ Other _____

City(ies) and State(s) Business/Occupational Licenses: _____

Applicable North American Industry Classification System Codes (NAICS):

_____

Description of Services/ Supplies/Equipment (i.e. office supplies, excavator):

_____

Catalog or Line Card available upon request: ☐ Yes ☐ No

Taxpayer ID Number: _____

Organization Type: Check appropriate box:

☐ Individual ☐ Sole proprietor ☐ Corporation ☐ Partnership ☐ Other _____

Duns. Number: _____

CCR Registered: ☐ Yes. Date_____; ☐ No

Business Classification: (Check appropriate boxes)

- ☐ **Large,**
  - ☐ **Women-Owned**
- ☐ **Non-Profit,**
- ☐ **Foreign,**
- ☐ **Small (Check All Subclassifications That Apply),**
  - ☐ **Woman-Owned,**
  - ☐ **Veteran-Owned,**
  - ☐ **Service Disabled Veteran,**
  - ☐ **HUBZone (Copy of SBA Certification Letter Required),**
  - ☐ **Qualified Non-Profit,**
  - ☐ **Disadvantaged (Copy of SBA Certification Letter Required),**
    - ☐ Black American.
    - ☐ Hispanic American.
    - ☐ Native American (American Indians, Eskimos, Aleuts, or Native Hawaiians)
      - ☐ Alaskan Native Corporation
      - ☐ Indian Tribe
    - ☐ Asian-Pacific American (persons with origins from Burma, Thailand, Malaysia, Indonesia, Singapore, Brunei, Japan, China, Taiwan, Laos, Cambodia, (Kampuchea), Vietnam, Korea, The Philippines, U.S. Trust Territory of the Pacific Islands (Republic of Palau), Republic of the Marshall Islands, Federated States of Micronesia, the Commonwealth of the Northern Mariana Islands, Guam, Samoa, Macao, Hong Kong, Fiji, Tonga, Kiribati, Tuvalu, or Nauru).
    - ☐ Subcontinent Asian (Asian-Indian) American (persons with origins from India, Pakistan, Bangladesh, Sri Lanka, Bhutan, the Maldives Islands, or Nepal).
    - ☐ Individual/concern, other than one of the preceding

COMMERCIAL SOCIO-ECONOMIC CERTIFICATIONS: Check appropriate box and enter name of State in the field provided

☐ MBE Minority Business Enterprise State(s):_____; _____; Organization:_____;
☐ WBE Women Business Enterprise State(s): _____; _____; Organization: _____;
☐ DBE Disadvantage Business Enterprise State(s): _____; _____; Organization:_____;

1. Does any company officer, partner, owner or their spouse have an ownership and /or management interest in another company? This would include being an officer, partner or owner of another company. **Yes** ☐ **No** ☐

   If so, please list:

   Name of Officer and Title [Owner, Director, Partner, Spouse] Company Name

   _____

   _____

2. Are any current company officers, partners, owner or their spouses a relative of any current Shaw employee (including Shaw subsidiaries). **Yes** ☐ **No** ☐

   If yes, then list the officer and Shaw employee name.

   Name of Officer and Title [Owner, Director, Partner, Spouse] Shaw Employee

   _____

   _____

3. How many years in business under your current legal name? _____
4. How many employees are currently on your payroll? _____
5. Are you privately owned or a publicly traded company"? _____
6. Are you union or non-union? ☐ Union ☐ Non-union
   If union, identify union affiliation." _____
7. Does your firm accept Master Card for purchases less than $3,000? _____

SECTION B PAST PERFORMANCE:

1. MAJOR CONTRACTS. List five largest contracts completed during that past four years, with special emphasis on hazardous waste/remediation work.

Contract Title/Scope	Client	$ Amount	Year Completed

2. MAJOR CURRENT CONTRACTS. List major contracts now on hand or in progress, with special emphasis on hazardous waste or remediation projects.

Contract Title/Scope	Client	Location	$ Amount

3. PROJECT PERFORMED FOR SHAW ENVIRONMENTAL & INFRASTRUCTURE, INC. (Shaw)
☐ Check this box if no previous experience working for Shaw. Otherwise complete the table below.

Contract Title/Scope	Shaw Project Manager	Location	Period of Performance

4. REFERENCE: List client/agencies, its representative, title and telephone number.

Client/Agency	Representative	Telephone Number

5. CRAFT INFORMATION: Lists crafts regularly employed in the field by your company. Identify any related trade agreements to which you are signatory (if none, check Merit Shop Contractor)

Craft	Trade Agreement	Craft	Trade Agreement
	☐Yes, _____ ☐Merit Shop Contractor		☐Yes, ☐Merit Shop Contractor
	☐Yes, _____ ☐Merit Shop Contractor		☐Yes, _____ ☐Merit Shop Contractor
	☐Yes, _____ ☐Merit Shop Contractor		☐Yes, _____ ☐Merit Shop Contractor
	☐Yes, _____ ☐Merit Shop Contractor		☐Yes, _____ ☐Merit Shop Contractor
	☐Yes, _____ ☐Merit Shop Contractor		☐Yes, _____ ☐Merit Shop Contractor
	☐Yes, _____ ☐Merit Shop Contractor		☐Yes, _____ ☐Merit Shop Contractor
	☐Yes, _____ ☐Merit Shop Contractor		☐Yes, _____ ☐Merit Shop Contractor
	☐Yes, _____ ☐Merit Shop Contractor		☐Yes, _____ ☐Merit Shop Contractor
	☐Yes, _____ ☐Merit Shop Contractor		☐Yes, _____ ☐Merit Shop Contractor

SECTION C. FINANCIAL

1. Provide Banking and Bonding information.

Banking Institute:	Bonding Company:
Contact:	Contact:
Phone:	Phone:
	Bonding Capacity:
	Available Bonding Capacity:
D&B Rating: Date:	

2. Is your firm able to supply the limits of coverage in Column A? In Column B indicate if there is an additional cost for the levels of coverage in Column A. In Column C, state your standard coverage levels.

Insurance	Column A		Column B	Column C
Workers' Compensation – Per Occurrence	$1,000,000	☐Yes ☐No	☐Yes ☐No	_____
Employers Liability – Per Occurrence	$1,000,000	☐Yes ☐No	☐Yes ☐No	_____
Comprehensive General Liablity- combined single limit per occurrence and annual aggregate of not less	$5,000,000	☐Yes ☐No	☐Yes ☐No	_____
Automobile Liability –per accident for bodily injury and property damage	$1,000,000	☐Yes ☐No	☐Yes ☐No	_____
Pollution Liability – per loss for bodily injury, property damage, clean-up cost and defense (for work including drilling, excavating or other obtrusive activities, and environmental remediation work.	**$1,000,000**	☐Yes ☐No	☐Yes ☐No	_____

3. Will your firm be able to satisfy the mandatory requirement that Shaw Environmental & Infrastructure, Inc. be named an additional insured on your Comprehensive General Liability Insurance Policy?
   ☐Yes ☐No.
4. Has your firm completed the "Go Kahuna" Certification program in the last 12 months? ☐Yes ☐No. If yes, please provide copy of certification.
5. STATE LICENSES AND REGISTRATION. Complete the following.

State	Classification/Type (Contractor, Engineer, etc.)	License Number(s)	Expiration Date

SECTION D ANALYTICAL SERVICES: This section only needs to be complete by firms providing analytical analysis. ☐ **Check this box if this section is not applicable.**

ANALYTICAL CERTIFICATIONS:

☐ NELAP Certified:
Accrediting State:_____ *(Attach Copy)*
☐ USACE Self Declared *(Attach Copy)*
☐ NFESC Approval Letter *(Attach Copy)*
☐ US Department of Agriculture (Foreign Soils Permit) *(Attach Copy)*
Other Certifications(can attach as a list):
_____; _____; _____

Additional Laboratory Services:

Yes ☐ **No** ☐ Ability to Produce Full Data Deliverable in PDF Format
Yes ☐ **No** ☐ Ability to Produce Reduced Data Deliverable in PDF Format (Format to be provided a project start up)
Yes ☐ **No** ☐ Ability to Produce Standard Electronic Data Deliverables
Yes ☐ **No** ☐ Ability to Produce Custom Electronic Data Deliverables
Yes ☐ **No** ☐ Laboratory Information Management System (LIMs)
Yes ☐ **No** ☐ On-Line Data Retrieval
Yes ☐ **No** ☐ Courier Service, if yes radius from laboratory:_____
Yes ☐ **No** ☐ Field Services
Yes ☐ **No** ☐ Mobile Laboratory Services
Yes ☐ **No** ☐ Service Centers, if yes list locations:_____
Yes ☐ **No** ☐ UFP QAPP Preparation Support

Can you support the following matrices, check all that are applicable:
☐ Soil ☐ Sediment ☐ Water ☐ Tissue ☐ Air

Specialty Analysis:
☐ Mold ☐ Asbestos ☐ Indoor Air Quality ☐ Industrial Hygiene

Can you support the following groups of methodology, it is understood that the laboratory may not support every method, check all that are applicable:
☐ SW-846 ☐ ASTM ☐ Current CLP SOW ☐ Standard Methods ☐ EPA

Standard Laboratory Turnaround time:_____
Can you support the following accelerated turnarounds with prior notification, it is understood that the laboratory may not support these turnarounds for every method :
24 hour ☐ 3 days☐ 5 days☐ 7 days☐

PLEASE INCLUDE COPIES OF THE FOLLOWING:

1. Laboratory Statement of Qualifications
2. Locations of all Laboratories
3. List of all Method Capabilities
4. List of all Instrumentation
5. Organizational Chart/s
6. Resumes of Key Personnel
7. Brief Paragraph on Sample Handling which includes sample disposal policies
8. List of Project Experience (include a variety of projects past and present and in support of multiple programs)
9. Name of one Shaw contact that you are currently performing analytical services for: _____

SECTION E: Training Practices

1. Do your employees receive training required by 29CFR1910.120 (HAZWOPER)?
   ☐Yes ☐No. If no, go to Section F
2. How many hours of initial HAZWOPER training do your employees receive? _____ Hours
3. Do your employees receive annual 8-hour refresher training? ☐Yes ☐No
4. Do your supervisors have the 8-hour HAZWOPER supervisory training? ☐Yes ☐No
5. Is there any other specific training your employees receive? ☐Yes ☐No
   If yes, what kind of training:_____

SECTION F: Medical Practices

1. Do you conduct initial and annual update medical exams in accordance with 29CFR1910.120(f)? ☐Yes ☐No
   If no, please explain: _____
2. Shaw Environmental & Infrastructure, Inc. requires pre-employment drug screening for all employees and subcontractors performing in work in exclusion zones. Do you currently conduct pre-employment drug screenings? ☐Yes ☐No
   If no, are you willing to conduct drug screening if so directed by contract documents?
   ☐Yes ☐No

SECTION G: Health and Safety Information ***(to be complete only if personnel will be on a Shaw project site for other than delivery of Supplies or Materials).***

1. Are you willing to comply with the Shaw Environmental & Infrastructure, Inc Health and Safety Program if so directed by contract documents? ☐ Yes ☐No If no, please explain.			
2. Do you have a Health & Safety Orientation Program for new hires and newly hired or promoted supervisors? ☐ Yes ☐No			
3. Do you hold site Health & Safety meeting for:			
a. Tailgate/Toolbox Safety Meetings	☐ Yes **If yes box checked, please provide sample copy(s)**	☐ No	Frequency _____
b. Field Supervisors	☐ Yes	☐ No	Frequency _____
c. Employees	☐ Yes	☐ No	Frequency _____
d. Subcontractors	☐ Yes	☐ No	Frequency _____
e. Are the safety meetings documented? ☐ Yes ☐No			
4. Personal Protection Equipment (PPE) Program: a. Is applicable PPE provided for employees? ☐Yes ☐ No b. Do you have a program to assure that PPE is inspected and maintained? ☐Yes ☐No c. What method do you use to prescribe PPE for each task? _____ d. How are task-specific PPE requirements communicated to workers? _____			
5. Employee Safety Program: a. Do you use a safety observer program or behavior based safety program? ☐Yes ☐No b. Do you have a corrective action process for addressing individual health and safety performance deficiencies? ☐Yes ☐No c. Do you have procedure for injury/illness reporting and investigation? ☐Yes ☐No			
6. Inspections and audits: a. Do you conduct and document Health and Safety inspections? ☐Yes ☐No b. Do you conduct and document Health and Safety Program audits? ☐Yes ☐No c. Are corrections of deficiencies documented? ☐Yes ☐No d. What method do you use to ensure that identified deficiencies have been corrected? _____			

e. Use your OSHA 200/300 logs to record the number of injuries and illnesses for the last three years. Please note that SHAW requires all subcontractors to provide incident statistics, even though certain companies may not be statutorily required to keep OSHA 200/300 logs.

YEAR	_____	_____	_____
a. Number of Fatalities	_____	_____	_____
b. Lost Work Day Incident Rate[1]	_____	_____	_____
c. OSHA Recordable Incident Rate[2]	_____	_____	_____
d. Number of Hours Worked	_____	_____	_____
e. Total Number of Employees on Your Payroll	_____	_____	_____

f. Attach a copy of your OSHA 300 logs for the last three years.

[1] The following formula is used for calculating the **Lost Work Day Incident Rate:**_____ = Number of Lost Work Day Cases x 200,000 / Number of Hours Worked

[2] The following formula is used for calculating the **OSHA Recordable Incident Rate:** _____ = Number of OSHA Recordable Cases x 200,000 / Number of Hours Worked

7. List your company's Worker's Compensation (WC) Experience Modification Rate **(EMR)** for the three (3) most recent years:

Year	Interstate	Intrastate
a. _____	_____	_____
b. _____	_____	_____
c. _____	_____	_____

d. **Provide a letter from your WC insurance carrier certifying the above EMRs.**
e. **If your WC carrier has not issued your company an EMR because you have not accrued enough WC costs, provide a copy of your WC Loss Run (available from your WC carrier).**
f. **If your current EMR is greater than 1.0, provide a written explanation of the safety methods that are being implemented by your company to reduce this rate.**

8. List activities your company will be performing on SHAW projects and the anticipated hazardous work operations (for example: excavation work, fall protection, ladders, scaffolding, confined space work, heavy equipment etc.)
Activities: _____
HazOps: _____
a. Will you subcontract work to other subcontractors? ☐ Yes ☐ No
If yes, **please detail what portion of work:** _____
b. Do you prequalify subcontractors? ☐ Yes ☐ No **If yes box checked, please attach method used to qualify subcontractors**

9. Has your company received an OSHA (or State OSHA) citation within the last five (5) years? ☐ Yes ☐ No
If yes, provide the following information below: **If yes box checked, please attach copies of the citation(s).**
a. The number and type of violations?_____
b. The penalties assessed by OSHA? _____
c. Were the citations contested/vacated? _____
d. What specific corrective actions were taken to prevent further penalties/injuries? _____

10. Does your company have a written occupational safety and health program? ☐ Yes ☐ No
If yes box checked, please provide a copy of your health & safety program.

11. Does your company conduct field safety inspections to determine compliance with applicable regulations and procedures?

a. ☐Yes ☐No **If yes box checked, please provide sample copy of inspection form.**

b. Who conducts these inspections? (Please provide position/title) _____

c. How often are safety inspections conducted? _____

12. Does your company have the following on your staff or on retainer?

	Yes	No	How Many	Staff	Retainer	**Please give certification number(s)**
Occupational Physician	☐	☐	_____	_____	_____	_____
Certified Industrial Hygienist	☐	☐	_____	_____	_____	_____
Certified Safety Professional	☐	☐	_____	_____	_____	_____
Certified Health Physicist	☐	☐	_____	_____	_____	_____

13. Does your company have an orientation program for new hires? ☐ Yes ☐No
If yes box checked, please provide an outline of the orientation and the topics covered

14. Has your company implemented any of the following training programs?
If yes box checked, please provide the last date this training was provided.

Yes	No	Date		Yes	No	Date	
☐	☐	_____	Asbestos	☐	☐	_____	Hazardous Waste (40-hour)
☐	☐	_____	Blasting/Explosives	☐	☐	_____	Hearing Conservation
☐	☐	_____	Bloodborne Pathogens	☐	☐	_____	Heavy Equipment operation
☐	☐	_____	Confined Space Entry	☐	☐	_____	Laboratory Safety
☐	☐	_____	Construction (OSHA Certified 10 Hours)	☐	☐	_____	Ladder/Scaffolding
☐	☐	_____	Construction (OSHA Certified 30 Hours)	☐	☐	_____	Lead
☐	☐	_____	Cranes Operations	☐	☐	_____	Lockout/Tagout
☐	☐	_____	Electrical Safety	☐	☐	_____	Personal Protective Equipment
☐	☐	_____	Excavation Competent Person	☐	☐	_____	Powder-actuated Tools
☐	☐	_____	Fall Protection	☐	☐	_____	Process Safety Management
☐	☐	_____	Fire Extinguishers	☐	☐	_____	Radiation Protection
☐	☐	_____	First Aid/CPR	☐	☐	_____	Respiratory Protection
☐	☐	_____	Forklift Operations	☐	☐	_____	Welding/Cutting

Who conducts training for your company (name, title)? _____

15. Does your company have a program in place to discipline workers that perform unsafe work practices? ☐Yes ☐ No
If yes box checked, please provide as attachment

16. Does your company have written Accident Investigation Procedures? ☐Yes ☐ No
If yes box checked, please provide as attachment

17. Does your company currently maintain a program in compliance with applicable state "Right to Know" laws and the OSHA Hazard Communication Standard? ☐Yes ☐No **If yes box checked, please provide as attachment**

18. Does your company currently maintain an Accident Prevention Program in compliance with applicable state OSHA regulations? (Required for AlasSCA, California, Minnesota, Nevada and North Carolina) ☐ Yes ☐ No ☐ N/A
☒ **If yes box checked, please provide as attachment**

19. Does your company implement a medical surveillance program for employees that work on hazardous waste sites or with hazardous chemicals (i.e., lead, asbestos, benzene, arsenic, formaldehyde, etc.)? ☐ Yes ☐ No ☐ N/A
☒ **If yes box checked, please provide as attachment**

20. Does your company have a written Alcohol and Substance Abuse Program? ☐Yes ☐No **If yes box checked, please provide program as attachment.**
If yes, does it include the following?
a. 10-panel substance testing? ☐Yes ☐No
b. Pre-employment/pre-job assignment testing (within 30 days of pre-job assignment)? ☐Yes ☐No
c. Post-accident drug and alcohol testing? ☐Yes ☐No
d. Random testing (10 percent per month)? ☐Yes ☐No
e. Reasonable suspicion drug and alcohol testing? ☐Yes ☐No

21. Has your company worked for SHAW in the past three years? ☐Yes ☐No
If so, what year and what project manager were you working for? Year: _____
Project Manager: _____

SECTION H: Quality Assurance

1. Does your company have a documented Quality Assurance program applicable to the goods, services or work activity to be provided? Yes ☐ No☐
If yes, on what industry standard(s) is it based? _____

2. Will you provide your QA/QC Plan/Manual if requested? Yes ☐ No☐
3. If work is to be performed in your facilities, will you make your facilities and processes available for Shaw Quality audits? Yes ☐ No☐
4. Have you previously been required by contract to have and implement a Quality Assurance Program or work under a client's Quality Assurance Programs? Yes ☐ No☐
If yes, describe participation including when and with whom._____
5. Are you willing to comply with the SE&I QA/QC Program or include specific Shaw Environmental & Infrastructure, Inc. quality requirements in your Quality Assurance Program, if so directed by the contract documents? Yes ☐ No☐
If no, please explain_____
6. Will you provide Shaw Environmental & Infrastructure, Inc. personnel with access to your facilities/operations for the purpose of qualification and in-process quality audits? Yes ☐ No☐
If no, please explain_____
7. Which of the following QA practices do you normally perform?
   a. Design Review(such as checking, data review, peer review) Yes ☐ No☐
   b. Calibration Yes ☐ No☐
   c. Preventive Maintenance Yes ☐ No☐
   d. In-process Inspection Yes ☐ No☐
   e. In-process Testing Yes ☐ No☐
   f. Formal Training Yes ☐ No☐
   g. Personnel Certification Yes ☐ No☐
   h. Corrective Action(identification, reporting, resolution) Yes ☐ No☐
   i. Record Maintenance Yes ☐ No☐
   j. Audits Yes ☐ No☐

SECTION I: MOTOR VEHICLE OPERATION GENERAL REQUIREMENTS

Attached is the Motor Vehicle Operations: General Requirements Procedure H800 (if required). You are required to review this document. Attachments two(2) through six(6) are to be signed and returned with this Qualification Form. Your signature acknowledges your firms acceptance of the requirements.

SECTION J: SUPPLEMENTARY INFORMATION any information related to your company that Shaw Environmental & Infrastructure, Inc. should know that was not asked. (additional pages maybe added)

As they specifically relate to our projects, will you provide applicable safety and quality-related records, IF REQUIRED, by Contract Documents such as certifications and test results, fabrication drawings, as-built drawings, calibration records operation logs, QA sample results, training records, medical examination protocols, injury and illness records? Yes ☐ No☐ If no, please explain:_____

SECTION K SIGNATURE/CERTIFICATION

By signing below, the offeror certifies, under penalty of law, that the representations and certifications are accurate, current and complete. The offeror further certifies that it will notify the SHAW E&I Procurement Representative of any changes to these representations and certifications. The representations and certifications made by the offeror, as contained herein, concern matters within the jurisdiction of an agency of the United States and the making of a false, fictitious, or fraudulent representation or certification may render the maker subject to prosecution under Title 18, United States Code, Section 1001.

_____ _____
Signature of Offeror Responsible for Offer *Date*

_____
Typed Name of Person Responsible for the Offer

_____
Title of Person Responsible for the Offer

*NOTE: PENALTIES FOR FALSE MISREPRESENTATION. 1) FAR 52-219(e)(4) – Misrepresentations of business status as a small, small disadvantaged, women-owned small, veteran-owned small (including service disabled), and HUBZone small business concern for the purpose of obtaining a subcontract that is to be included as part or all of a goal contained in the Contractor's subcontracting plan, without remedy, can result in severe penalties. Additionally, 2) Under 15 U.S.C. 645(d), any person who misrepresents a firm's status as a small, small disadvantaged, women-owned small, veteran-owned small (including service disabled), and HUBZone small business concern in order to obtain a contract to be awarded under the preference programs established pursuant to section 8(a), 8(d), 9 or 15 of the Small Business Act or any other provision of Federal law that specifically references section 8(d) for a definition of program eligibility, shall: (i) Be punished by imposition of fine, imprisonment, or both; (ii) Be subject to administrative remedies, including suspension and debarment; and (iii) Be ineligible for participation in programs conducted under the authority of the Act.

Annual Representations and Certifications—General Requirements for United States–Owned Entities

SHAW E&I is performing work under various U.S. Federal Government prime contracts as well as many state and local government prime contracts. These prime contracts require SHAW E&I to obtain certain information and certifications from your organization. The information requested is in accordance with the Federal Acquisition Regulation (FAR), available at http://www.acquisition.gov/far/, and the related sections of the FAR are cited for your reference. You are required to fully complete the appropriate sections of this form and signed it prior to submission of any proposal to SHAW E&I. The Representations and Certifications must be executed by an individual capable to commit your company. An award to your company cannot be made until this document is completed, executed and received/acknowledged within our GSIS system. Your cooperation is greatly appreciated.

EFFECTIVE PERIOD

This Annual Representation and Certification Document is valid for all orders issued to your company for one year from the date of execution.

Instructions:

The Representations and Certifications contain three parts.

Part I—General Representations and Certifications

Part II—Reporting Executive Compensation and First-Tier Subcontract Awards

Part III—Limitations On Pass Through Charges Certification

Supplementary Representations and Certification information may be requested in addition based upon prime contract requirements. This form and any supplemental forms will be provided to you prior to award of a specific order by the Procurement Function and will have an effective period which will be the same as the period of performance of the order. These forms could include, but are not limited to:

Cost Accounting Standards Notices and Certification

PART I—GENERAL REPRESENTATIONS AND CERTIFICATIONS

North American Industry Classification System (NAICS)		
The small business size status is derived from the receipts, number of employees, assets, barrels of oil, and/or megawatt hours		
NAICS Code	Description	Small Business (Yes or No)

.

OFFEROR HEREBY AFFIRMS THAT THE REPRESENTATIONS AND CERTIFICATIONS MADE HEREIN ARE TRUE AND CORRECT AND AGREES THAT SUCH REPRESENTATIONS AND CERTIFICATIONS SHALL FORM A PART OF ALL CONTRACTS AWARDED.

***CAUTION**: Federal law prescribes penalties and remedies for misrepresentations of business status as small business or small disadvantaged business for the purpose of obtaining a subcontract.*

Company Name: _____

Address: _____

_____

Telephone: _____

Facsimile: _____

Point of Contact: _____

Email Address: _____

Website: _____

** Cage Code: _____

** This is the number assigned by the government to the company address listed—applies only if prime government work has been performed by the company / individual shown above.

DUNS Number: _____

Bureau of Indian Affairs Reporting:

☐ Alaska Native Corporation

☐ Indian Tribe

☐ Written designation is attached.

☐ MBE Certifying State(s): _____

State Supplier Diversity Registration:

Identify state socio-economic business classifications

☐ WBE Certifying State(s):_____

☐ DBE Certifying State(s):_____

1. Taxpayer Identification (FAR 52.204-3) (Oct 1998)

All offerors must submit the information required in paragraphs (a) through (c) of this provision to comply with debt

(a) *Definitions.*

"Common parent," as used in this provision, means that corporate entity that owns or controls an affiliated group of corporations that files its Federal income tax returns on a consolidated basis, and of which the offeror is a member.

"Taxpayer Identification Number (TIN)," as used in this provision, means the number required by the Internal Revenue Service (IRS) to be used by the offeror in reporting income tax and other returns. The TIN may be either a Social Security Number or an Employer Identification Number.

(b) All offerors must submit the information required in paragraphs (d) through (f) of this provision to comply with debt collection requirements of 31 U.S.C. 7701(c) and 3325(d), reporting requirements of 26 U.S.C. 6041, 6041A, and 6050M and implementing regulations issued by the IRS. If the resulting contract is subject to the reporting requirements described in Federal Acquisition Regulation (FAR) 4.904, the failure or refusal by the offeror to furnish the information may result in a 31 percent reduction of payments otherwise due under the contract.

(c) The TIN may be used by the Government to collect and report on any delinquent amounts arising out of the offeror's relationship with the government (31 U.S.C. 7701(c)(3)). If the resulting contract is subject to the payment reporting requirements described in FAR 4.904, the TIN provided hereunder may be matched with IRS records to verify the accuracy of the offeror's TIN.

(d) *Taxpayer Identification Number (TIN)*.

☐TIN:_ _____.

☐TIN has been applied for.

☐TIN is not required because:

☐ Offeror is a nonresident alien, foreign corporation, or foreign partnership that does not have income effectively connected with the conduct of a trade or business in the United States and does not have an office or place of business or a fiscal paying agent in the United States;

☐ Offeror is an agency or instrumentality of a foreign government;

☐ Offeror is an agency or instrumentality of a Federal Government;

(e) *Type of organization.*

☐ Sole proprietorship
☐ Partnership
☐ Corporate entity (not tax-exempt)
☐ Corporate entity (tax-exempt)
☐ Government entity (Federal, State, or local)
☐ Foreign government
☐ International organization per 26 CFR 1.6049-4
☐ Other _____

(f) *Common Parent.*

☐ Offeror is not owned or controlled by a common parent as defined in paragraph (a) of this provision.

☐ Name and TIN of common parent:

Name _____

TIN _____

2. Small Business Program Representations (FAR 52.219-1) (APR 2011)

(a) (1) The North American Industry Classification System (NAICS) code for this acquisition is See Note.*

(2) The small business size standard is See Note.

(3) The small business size standard for a concern which submits an offer in its own name, other than on a construction or service contract, but which proposes to furnish a product which it did not itself manufacture, is 500 employees.

**If you are responding to a Government solicitation for supplies or services under a NAICS code not listed in the table above of this certification, you must provide this certification directly to the Shaw Procurement associate.*

(b) *Representations*.

(1) The offeror represents as part of its offer that it ☐is, ☐ is not a small business concern (see table above).

(2) [*Complete only if the offeror represented itself as a small business concern in paragraph (b)(1) of this provision.*] The offeror represents, for general statistical purposes, that it ☐ is, ☐is not, a small disadvantaged business concern as defined in 13 CFR 124.1002.

(3) [*Complete only if the offeror represented itself as a small business concern in paragraph (b)(1) of this provision.*] The offeror represents as part of its offer that it ☐ is, ☐ is not a women-owned small business concern.

(4) Women-owned small business (WOSB) concern eligible under the WOSB Program. [Complete only if the offeror represented itself as a women-owned small business concern in paragraph (b)(3) of this provision.] The offeror represents as part of its offer that

(i) It ☐ is, ☐ is not a WOSB concern eligible under the WOSB Program, has provided all the required documents to the WOSB Repository, and no change in circumstances or adverse decisions have been issued that affects its eligibility; and

(ii) It ☐ is, ☐ is not a joint venture that complies with the requirements of 13 CFR part 127, and the representation in paragraph (b)(4)(i) of this provision is accurate in reference to the WOSB concern or concerns that are participating in the joint venture. [The offeror shall enter the name or names of the WOSB concern or concerns that are participating in the joint venture: .] Each WOSB

concern participating in the joint venture shall submit a separate signed copy of the WOSB representation.

(5) Economically disadvantaged women-owned small business (EDWOSB) concern. [Complete only if the offeror represented itself as a women-owned small business concern eligible under the WOSB Program in (b)(4) of this provision.] The offeror represents as part of its offer that

(i) It ☐ is, ☐ is not an EDWOSB concern eligible under the WOSB Program, has provided all the required documents to the WOSB Repository, and no change in circumstances or adverse decisions have been issued that affects its eligibility; and

(ii) It ☐ is, ☐ is not a joint venture that complies with the requirements of 13 CFR part 127, and the representation in paragraph (b)(5)(i) of this provision is accurate in reference to the EDWOSB concern or concerns that are participating in the joint venture. [The offeror shall enter the name or names of the EDWOSB concern or concerns that are participating in the joint venture: .] Each EDWOSB concern participating in the joint venture shall submit a separate signed copy of the EDWOSB representation.

(6) [*Complete only if the offeror represented itself as a small business concern in paragraph (b)(1) of this provision.*] The offeror represents as part of its offer that it ☐ is, ☐ is not a veteran-owned small business concern.

(7) [*Complete only if the offeror represented itself as a veteran-owned small business concern in paragraph (b)(6) of this provision.*] The offeror represents as part of its offer that is ☐ is, ☐ is not a service-disabled veteran-owned small business concern.

(8) [*Complete only if the offeror represented itself as a small business concern in paragraph (b)(1) of this provision*.] The offeror represents, as part of its offer, that—

(i) It ☐ is, ☐ is not a HUBZone small business concern listed, on the date of this representation, on the List of Qualified HUBZone Small Business Concerns maintained by the Small Business Administration, and no material change in ownership and control, principal office, or HUBZone employee percentage has occurred since it was certified by the Small Business Administration in accordance with 13 CFR part 126; and

(ii) It ☐ is, ☐ is not a HUBZone joint venture that complies with the requirements of 13 CFR part 126, and the representation in paragraph (b)(8)(i) of this provision is accurate of the HUBZone small business concern participating in the HUBZonejoint venture. [*The offeror shall enter the names of the HUBZone small business concerns participating in the joint venture:* _____.] Each HUBZone small business concern participating in the HUBZone joint venture shall submit a separate signed copy of the HUBZone representation.

(c) *Definitions*. As used in this provision—

"Economically disadvantaged women-owned small business (EDWOSB) concern" means a small business concern that is at least 51 percent directly and unconditionally owned by, and the management and daily business operations of which are controlled by, one or more women who are citizens of the United States and who are economically disadvantaged in accordance with 13 CFR part 127. It automatically qualifies as a women-owned small business concern eligible under the WOSB Program."Service-disabled veteran-owned small business concern"—

(1) Means a small business concern—

(i) Not less than 51 percent of which is owned by one or more service-disabled veterans or, in the case of any publicly owned business, not less than 51 percent of the stock of which is owned by one or more service-disabled veterans; and

(ii) The management and daily business operations of which are controlled by one or more service-disabled veterans or, in the case of a service-disabled veteran with permanent and severe disability, the spouse or permanent caregiver of such veteran.

(2) Service-disabled veteran means a veteran, as defined in 38 U.S.C. 101(2), with a disability that is service-connected, as defined in 38 U.S.C. 101(16).

"Small business concern," means a concern, including its affiliates, that is independently owned and operated, not dominant in the field of operation in which it is bidding on Government contracts, and qualified as a small business under the criteria in 13 CFR Part 121 and the size standard in paragraph (a) of this provision.

"Veteran-owned small business concern" means a small business concern—

(1) Not less than 51 percent of which is owned by one or more veterans (as defined at 38 U.S.C. 101(2)) or, in the case of any publicly owned business, not less than 51 percent of the stock of which is owned by one or more veterans; and

(2) The management and daily business operations of which are controlled by one or more veterans.

"Women-owned small business concern," means a small business concern—

(1) That is at least 51 percent owned by one or more women; or, in the case of any publicly owned business, at least 51 percent of the stock of which is owned by one or more women; and

(2) Whose management and daily business operations are controlled by one or more women."Women-owned small business (WOSB) concern eligible under the WOSB Program (in accordance with 13 CFR part 127)," means a small business concern that is at least 51 percent directly and unconditionally owned by, and the management and daily business operations of which are controlled by, one or more women who are citizens of the United States.

(d) *Notice*.

(1) If this solicitation is for supplies and has been set aside, in whole or in part, for small business concerns, then the clause in this solicitation providing notice of the set-aside contains restrictions on the source of the end items to be furnished.

(2) Under 15 U.S.C. 645(d), any person who misrepresents a firm's status as a business concern that is small, HUBZone small, small disadvantaged, service-disabled veteran-owned small, economically disadvantaged women-owned small, or women-owned small eligible under the WOSB Program in order to obtain a contract to be awarded under the preference programs established pursuant to section 8, 9, 15, 31 and 36 of the Small Business Act or any other provision of Federal law that specifically references section 8(d) for a definition of program eligibility, shall—

(i) Be punished by imposition of fine, imprisonment, or both;
(ii) Be subject to administrative remedies, including suspension and debarment; and
(iii) Be ineligible for participation in programs conducted under the authority of the Act.

3 Historically Black College Or University And Minority Institution Representation (FAR 52.226-2) (OCT 2008)

(a) Definitions. As used in this provision—

Historically black college or university means an institution determined by the Secretary of Education to meet the requirements of 34 CFR 608.2. For the Department of Defense, the National Aeronautics and Space Administration, and the Coast Guard, the term also includes any nonprofit research institution that was an integral part of such a college or university before November 14, 1986.

Minority institution means an institution of higher education meeting the requirements of Section 365(3) of the Higher Education Act of 1965 [20 U.S.C. 1067k including a Hispanic-serving institution of higher education, as defined in Section 502(a) of the Act (20 U.S.C. 1101a)]

(b) Representation. The offeror represents that it—

☐ is ☐ is not a historically black college or university;
☐ is ☐ is not a minority institution.

4. Previous Contracts and Compliance Reports (FAR 52.222-22) (Feb 1999)

The offeror represents that:

(a) ☐ It has, ☐ has not, participated in a previous contract or subcontract subject to the Equal Opportunity clause of this solicitation;

(b) ☐ It has, ☐ has not, filed all required compliance reports (*note that if no reports were required, mark "has" filed all reports*); and

(c) Representations indicating submission of required compliance reports, signed by proposed subcontractors, will be obtained before subcontract awards.

5. Affirmative Action Compliance (FAR 52.222-25) (Apr 1984)

The offeror represents that it: *(Complete either item (a) or (b) only)*

(a) ☐ Has developed and has on file, or ☐ has not developed and does not have on file, at each establishment, affirmative action programs required by the rules and regulations of the Secretary of Labor (41 CFR 60-1 and 60-2), or

(b) ☐ Has not previously had contracts subject to the written affirmative action programs requirement of the rules and regulations of the Secretary of Labor.

6. Certification Regarding Responsibility Matters (FAR 52.209-5) (APR 2010) (Applicable to Subcontracts expected to exceed $30,000)

(a) (1) The offeror certifies, to the best of its knowledge and belief, that:

(i) The offeror and/or any of its Principals:

(A) ☐ Are, ☐ are, not presently debarred, suspended, proposed for debarment, or declared ineligible for the award of contracts by any Federal agency;

(B) ☐ Have, ☐ have not, within a three-year period preceding this offer, been convicted of or had a civil judgment rendered against them for: commission of fraud or a criminal offense in connection with obtaining, attempting to obtain, or performing a public (Federal, state or local) contract or subcontract; violation of Federal or state antitrust statutes relating to the submission of offers; or commission of embezzlement, theft, forgery, bribery, falsification or destruction of records, making false statements, tax evasion, or receiving stolen property (if offeror checks “have”, the offeror shall also see 52.209-7, if included in this solicitation); and

(C) ☐ Are, ☐ are not, presently indicted for, or otherwise criminally or civilly charged by a governmental entity with, commission of any of the offenses enumerated in subdivision (a)(1)(i)(B) of this provision.

(D) Have ☐ have not ☐, within a three year period preceding this offer, been notified of any delinquent Federal taxes in an amount that exceeds $3,000 for which the liability remains unsatisfied.

(1) Federal taxes are considered delinquent if both of the following criteria apply:

(i) The tax liability is finally determined. The liability is finally determined if it has been assessed. A liability is not finally determined if there is a pending administrative or judicial challenge. In the case of a judicial challenge to the liability, the liability is not finally determined until all judicial appeal rights have been exhausted.

(ii) The taxpayer is delinquent in making payment. A taxpayer is delinquent if the taxpayer has failed to pay the tax liability when full payment was due and required. A taxpayer is not delinquent in cases where enforced collection action is precluded.

(2) Examples.

(i) The taxpayer has received a statutory notice of deficiency, under I.R.C. §6212, which entitles the taxpayer to seek Tax Court review of a proposed tax deficiency. This is not a delinquent tax because it is not a final tax liability. Should the taxpayer seek Tax Court review, this will not be a final tax liability until the taxpayer has exercised all judicial appeal rights.

(ii) The IRS has filed a notice of Federal tax lien with respect to an assessed tax liability, and the taxpayer has been issued a notice under I.R.C. §6320 entitling the taxpayer to request a hearing with the IRS Office of Appeals contesting the lien filing, and to further appeal to the Tax Court if the IRS determines to sustain the lien filing. In the course of the hearing, the taxpayer is entitled to contest the underlying tax liability because the taxpayer has had no prior opportunity to contest the liability. This is not a delinquent tax because it is not a final tax liability. Should the taxpayer seek tax court review, this will not be a final tax liability until the taxpayer has exercised all judicial appeal rights.

(iii) The taxpayer has entered into an installment agreement pursuant to I.R.C. §6159. The taxpayer is making timely payments and is in full compliance with the agreement terms. The taxpayer is not delinquent because the taxpayer is not currently required to make full payment.

(iv) The taxpayer has filed for bankruptcy protection. The taxpayer is not delinquent because enforced collection action is stayed under 11 U.S.C. 362 (the Bankruptcy Code).

(ii) The offeror ☐has, ☐ has not, within a three-year period preceding this offer, had one or more contracts terminated for default by any Federal agency.

(2) "Principals," for the purposes of this certification, means officers; directors; owners; partners; and, persons having primary management or supervisory responsibilities within a business entity (*e.g.*, general manager; plant manager; head of a subsidiary, division, or business segment, and similar positions).

This Certification Concerns a Matter Within the Jurisdiction of an Agency of the United States and the Making of a False, Fictitious, or Fraudulent Certification May Render the Maker Subject to Prosecution Under Section 1001, Title 18, United States Code.

(b) The offeror shall provide immediate written notice to the SHAW E&I Contract Administrator if, at any time prior to contract award, the offeror learns that its certification was erroneous when submitted or has become erroneous by reason of changed circumstances.

(c) A certification that any of the items in paragraph (a) of this provision exists will not necessarily result in withholding of an award under this solicitation. However, the certification will be considered in connection with a determination of the offeror's responsibility. Failure of the offeror to furnish a certification or provide such additional information as requested by the SHAW E&I Contract Administrator may render the offeror nonresponsible.

(d) Nothing contained in the foregoing shall be construed to require establishment of a system of records in order to render, in good faith, the certification required by paragraph (a) of this provision. The knowledge and information of an offeror is not required to exceed that which is normally possessed by a prudent person in the ordinary course of business dealings.

(e) The certification in paragraph (a) of this provision is a material representation of fact upon which reliance was placed when making award. If it is later determined that the offeror knowingly rendered an erroneous certification, in addition to other remedies available to SHAW E&I and the Government, the SHAW E&I Contract Administrator may terminate the contract resulting from this solicitation for default.

7. Women-Owned Business (Other than Small Business) (FAR 52.204-5) (May 1999)

Complete the following Representation only if the offeror is a women-owned business concern and has not represented itself as a small business concern in paragraph (b)(1) of FAR 52.219-1, Small Business Program Representations, of these Representations and Certifications.

The offeror represents that it:

☐ Is a women-owned business concern, or is not ☐ a women-owned business concern.

Definition. "Women-owned business concern," as used in this provision, means a concern which is at least 51 percent owned by one or more women; or in the case of any publicly owned business, at least 51 percent of the stock of which is owned by one or more women; and whose management and daily business operations are controlled by one or more women.

8. Certification and Disclosure Regarding Payments to Influence Certain Federal Transactions. (FAR 52.203-11) (Sep 2007)

(a) The definitions and prohibitions contained in the clause at FAR 52.203-12, Limitation on Payments to Influence Certain Federal Transactions, included in this solicitation, are hereby incorporated by reference in paragraph (b) of this certification.

(b) The offeror, by signing its offer, hereby certifies to the best of his or her knowledge and belief that on or after December 23, 1989:

(1) No Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or

employee of Congress or an employee of a Member of Congress on his or her behalf in connection with the awarding of this contract;

(2) If any registrants under the Lobbying Disclosure Act of 1995 have made a lobbying contact on behalf of the offeror with respect to this contract, the offeror shall complete and submit, with its offer, OMB Standard Form LLL, Disclosure of Lobbying Activities, to provide the name of the registrants. The offeror need not report regularly employed officers or employees of the offeror to whom payments of reasonable compensation were made; and

(3) He or she will include the language of this certification in all subcontract awards at any tier and require that all recipients of subcontract awards in excess of $150,000 shall certify and disclose accordingly.

(c) Submission of this certification and disclosure is a prerequisite for making or entering into this contract imposed by section 1352, title 31, United States Code. Any person who makes an expenditure prohibited under this provision or who fails to file or amend the disclosure form to be filed or amended by this provision, shall be subject to a civil penalty of not less than $10,000, and not more than $100,000, for each such failure.

9. Certification of Toxic Chemical Release Reporting (FAR 52.223-13) (Aug 2003) (Applies only if required by the prime contract)

(a) Executive Order 13148, of April 21, 2000, Greening the Government through Leadership in Environmental Management, requires submission of this certification as a prerequisite for contract award.

(b) By signing this offer, the offeror certifies that—

(1) As the owner or operator of facilities that will be used in the performance of this contract that are subject to the filing and reporting requirements described in section 313 of the Emergency Planning and Community Right-to-Know Act of 1986 (EPCRA) (42 U.S.C. 11023) and section 6607 of the Pollution Prevention Act of 1990 (PPA) (42 U.S.C. 13106), the offeror will file and continue to file for such facilities for the life of the contract the Toxic Chemical Release Inventory Form (Form R) as described in section 313(a) and (g) of EPCRA and section 6607 of PPA; or

(2) None of its owned or operated facilities to be used in the performance of this contract is subject to the Form R filing and reporting requirements because each such facility is exempt for at least one of the following reasons: *(Check each block that is applicable.)*

☐ (i) The facility does not manufacture, process or otherwise use any toxic chemicals listed in 40 CFR 372.65;

☐ (ii) The facility does not have 10 or more full-time employees as specified in section 313(b)(1)(A) of EPCRA, 42 U.S.C. 11023(b)(1)(A);

☐ (iii) The facility does not meet the reporting thresholds of toxic chemicals established under section 313(f) of EPCRA, 42 U.S.C. 11023(f) (including alternate thresholds at 40 CFR 372.27, provided an appropriate certification form has been filed with EPA);

☐ (iv) The facility does not fall within the following Standard Industrial Classification (SIC) codes or their corresponding North American Industry Classification System sectors:

A. Major group code 10 (except 1011, 1081, and 1094.

B. Major group code 12 (except 1241).

C. Major group codes 20 through 39.

D. Industry code 4911, 4931, or 4939 (limited to facilities that combust coal and/or oil for the purpose of generating power for distribution in commerce).

E. Industry code 4953 (limited to facilities regulated under the Resource Conservation and Recovery Act, Subtitle C (42 U.S.C. 6921, et seq.), or 5169, or 5171, or 7389 (limited to facilities primarily engaged in solvent recovery services on a contract or fee basis); or

☐ (v) The facility is not located in the United States or its outlying areas.

10. CERTIFICATE OF INDEPENDENT PRICE DETERMINATION (FAR 52.203-2) (APR 1985)

(a) The offeror certifies that—

(1) The prices in this offer have been arrived at independently, without, for the purpose of restricting competition, any consultation, communication, or agreement with any other offeror or competitor relating to

(i) those prices, (ii) the intention to submit a proposal, or (iii) the methods or factors used to calculate the prices offered;

(2) The prices in this offer have not been and will not be knowingly disclosed by the offeror, directly or indirectly, to any other offeror or competitor before bid opening (in the case of a sealed bid solicitation) or contract award (in the case of a negotiated solicitation) unless otherwise required by law; and

(3) No attempt has been made or will be made by the offeror to induce any other concern to submit or not to submit a proposal for the purpose of restricting competition.

(b) Each signature on the offer is considered to be a certification by the signatory that the signatory—

(1) Is the person in the offeror's organization responsible for determining the prices being offered in this bid or proposal, and that the signatory has not participated and will not participate in any action contrary to subparagraphs A(1) through A(3) above; or

(2) (i) Has been authorized, in writing, to act as agent for the following principals in certifying that those principals have not participated and will not participate in any action contrary to subparagraphs A(1) through A(3) above.

_____

[*insert full name of person(s) in the offeror's organization responsible for determining the prices offered in this bid or proposal, and the title of his or her position in the offeror's organization*];

(ii) As an authorized agent, does certify that the principals named in subdivision B(2)(i) above have not participated, and will not participate, in any action contrary to subparagraphs A(1) through A(3) above;

(iii) As an agent, has not personally participated, and will not participate, in any action contrary to subparagraphs A(1) through A(3) above.

(3) If the offeror deletes or modifies subparagraph A(2) above, the offeror must furnish with its proposal a signed statement setting forth in detail the circumstances of the disclosure.

11. Contractor Code of Business Ethics and Conduct:

1. Does your firm have a code of business ethics and conduct? ☐ Yes ☐ No
2. Are your employees provided a copy of the code of business ethics and conduct? ☐ Yes ☐ No
3. Does your firm have a business ethics and compliance training program? ☐ Yes ☐ No
4. Does your firm's internal control procedure address non-compliance with your company's business ethics and conduct? ☐ Yes ☐ No
5. What is your firm's method of communication to your clients on government contracts when you code of business ethics and conduct is breached or internal fraud is detected? _____
6. Does your firm have the Fraud Hotline Poster from the OIG posted in your offices? ☐ Yes ☐ No
7. If requested by Homeland Security, will your firm post the Disaster Assistance Fraud Posters Hot Line posters in your offices? ☐ Yes ☐ No

12. FAR 52.215-6 PLACE OF PERFORMANCE (OCTOBER 1997)

(a) The offeror or quoter, in the performance of any subcontract resulting from this solicitation, ☐ intends / ☐ does not intend (check applicable block) to use one or more plants or facilities located at a different address from the address of the offeror or quoter as indicated in this proposal or quotation.

(b) If the offeror or quoter checks "intends" in paragraph (a) above, it shall insert in the spaces provided below the required information:

Place of Performance (Street, City, State, ZIP)	Name and Address of Owner and Operator of Plant or Facility if Different from Offeror

13. SYSTEM APPROVALS

Accounting System: Do you have an Accounting system that has been deemed adequate by a Federal Government Agency? ☐ YES ☐ NO

Date of reportl:

Cognizant Government Audit Agency: _____

Address: _____

Phone: _____

Property System: Do you have a Property Management system that has been deemed adequate by a Federal Government Agency? ☐ YES ☐ NO

Date of reportl: _____

Approving Agency: _____

Purchasing System: Do you have a Purchasing system that has been deemed adequate by a Federal Government Agency? ☐ YES ☐ NO

Date of report: _____

Approving Agency: _____

14. CONFLICT OF INTEREST CERTIFICATION

The offeror recognizes and endorses the Purchaser's ongoing efforts to comply fully with the Federal procurement laws that govern the Federal work done by Purchaser. The offeror hereby certifies that it knows of no facts or circumstances as a result of its other activities or relationships with other persons or entities that could lead to an organizational conflict of interest as defined in Federal Acquisition Regulation 2.101 and Subpart 9.5 for purposes of this procurement. The offeror recognizes that it has a continuing obligation to examine its other activities and relationships to ensure the work being undertaken or considered will not conflict with or otherwise impair its judgment in performing the subcontract. If at any point during its performance of the subcontract, the offeror becomes aware of any facts or circumstances that could create an organizational conflict of interest, the offeror agrees to immediately disclose such information to Purchaser.

15. FAR 52.203-14 DISPLAY OF HOTLINE POSTER(S)

Pursuant to FAR 52.203-14, does Offeror display a Government-Issued Hotline Poster from any Agency or any appropriate Department of Homeland Security Fraud Hotline Poster during performance in the USA.

Yes [ ] Date Implemented:
No [ ] Planned Implementation Date:

NO SUBCONTRACT OR PURCHASE ORDER WILL BE ISSUED FOR GREATER THAN $5,000,000 FOR NON-COMMERCIAL ITEMS IF OFFEROR DOES NOT MAINTAIN A CODE OF BUSINESS ETHICS AND CONDUCT OR DISPLAY A GOVERNMENT ISSUED HOTLINE POSTER

16. FOREIGN CORRUPT PRACTICES ACT—(Applicable ONLY for work performed outside the United States)

Subcontractor hereby represents and warrants that none of its officers, directors, agents or employees are (a) an official, employee or agent of the Government or any state-owned enterprise, public international organization, candidate for public office, member of a royal family, an officer, director, or employee, or an affiliate of a Shaw E&I client; and (b) as of the date below, no Government official, and no official of any Government agency or instrumentality of the Government, is or will become associated with, or will own or presently owns an interest, whether direct or indirect, in Subcontractor or has or will have any legal or beneficial interest in this Agreement or the payments made by Shaw E&I to Subcontractor hereunder.

17. EXPORT CERTIFICATION

This Export Certification is required and hereby included in the representations and certifications completed for award of all Defense related subcontracts.

Shaw E&I requires that its offerors certify the following information to ensure compliance with the U.S. Government export laws and regulations including the U.S. International Traffic in Arms Regulations (ITAR), 22 C.F.R.
§§ 120 et seq., the Export Administration Regulations (EAR), 15 C.F.R. §§ 730 et seq., and the asset control and sanctions programs administered by the Treasury Department's Office of Foreign Assets Control (OFAC), 31 C.F.R. §§
500 et seq.

A. Offeror is [___], is not [___] a "U.S. Person" as defined in the ITAR 22 CFR Part 120.15 and the EAR 15 CFR Part 772.

ITAR 22 CFR Part 120.15 and the EAR 15 CFR Part 772 defines a U.S. person as a person who is a lawful permanent resident as defined by 8 U.S.C. 1101(a)(2) or who is a protected individual as defined by 8 U.S.C. 1324b(a)(3). It also means any corporation, business, association, a partnership, society, trust, or any other entity, organization or group that is incorporated to do business in the United States. It also includes any governmental (federal, state or local) entity.

B. Offeror is registered (____), is exempt from registration (____), is not registered (____) with the U.S. Department of State, Directorate of Defense Trade Controls per ITAR 22 CFR Part 122.1(a) and (b). Expiration Date of Registration (_____), if registered.

In accordance with ITAR 22 CFR Part 122.1(a) any person who engages in the United States in the business of either manufacturing or exporting defense articles or furnishing defense services is required to register with he Directorate of Defense Trade Controls (DDTC) unless exempted by one of the four conditions listed in ITAR 22 CFR Part 122.1(b).

Furthermore, the offeror is responsible for the protection of any information or defense articles provided to them by Shaw E&I *to assist in the manufacture of a defense article or provision of a defense service. The release of such information by the offeror to a Foreign Person employee or its transfer to another Foreign Person is defined as an export (ITAR 22 CFR parts 120.17 and 124.13 and EAR 15 CFR part 734.2(b)(2)(ii) and supplements 1 and 2 of Part 774 and subject to the licensing requirements of the ITAR and EAR as applicable.*

18. Read each section and complete or check each blank and/or box as appropriate:

1. ☐ The *Buy American Act Certificate* must be completed in solicitations containing the clause FAR 52.225-1 *Buy American Act—Supplies.*

Buy American Act Certificate (FAR 52.225-2) (FEB 2009)

(a) The offeror certifies that each end product, except those listed in paragraph (b) of this provision, is a domestic end product and that for other than COTS items, the offeror has considered components of unknown origin to have been mined, produced, or manufactured outside the United States. The offeror shall list as foreign end products those end products manufactured in the United States that do not qualify as domestic end products. The terms "component," "domestic end product," "end product," "foreign end product," and "United States" are defined in the clause of this solicitation entitled "Buy American Act—Supplies."

(b) Foreign End Products:

Line Item No.:	Country of Origin:

[*List as necessary]*

(c) The Government will evaluate offers in accordance with the policies and procedures of Part 25 of the Federal Acquisition Regulation.

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2. ☐ The *Buy American Act—Free Trade Agreements—Israeli Trade Act Certificate*, must be completed in solicitations containing the clause at FAR 52.225-3 *Buy American Act—Free Trade Agreements—Israeli Trade Act.* If the acquisition value is $25,000 or more but is less than $50,000, use the clause with its Alternate I. If the acquisition value is $50,000 or more but less than $70,079, use the clause with its Alternate II.

Buy American Act—Free Trade Agreements—Israeli Trade Act Certificate (FAR 52-225-4) (Jan 2005)

(a) The offeror certifies that each end product, except those listed in paragraph (b) or (c) of this provision, is a domestic end product and that the offeror has considered components of unknown origin to have been mined, produced, or manufactured outside the United States. The terms "component," "domestic end product," "end product," "end product of Australia, Canada, Chile, Mexico, or Singapore," "foreign end product," "Israeli end product," and "United States" are defined in the clause of this solicitation entitled "Buy American Act—Free Trade Agreements—Israeli Trade Act."

(b) The offeror certifies that the following supplies are end products of Australia, Canada, Chile, Mexico, or Singapore or Israeli end products as defined in the clause of this solicitation entitled "Buy American Act—Free Trade Agreements—Israeli Trade Act"

End Products of Australia, Canada, Chile, Mexico, or Singapore or Israeli End Products:

Line Item No.:	Country of Origin:

[List as necessary]

(c) The offeror shall list those supplies that are foreign end products (other than those listed in paragraph (b) of this provision) as defined in the clause of this solicitation entitled ``Buy American Act—Free Trade Agreement—Israeli Trade Act." The offeror shall list as other foreign end products those end products manufactured in the United States that do not qualify as domestic end products.

Other Foreign End Products

Line Item No.:	Country of Origin:

[List as necessary]

(d) The Government will evaluate offers in accordance with the policies and procedures of Part 25 of the Federal Acquisition Regulation.

(End of provision)

Alternate I (Jan 2004). As prescribed in FAR 25.1101 (b)(2)(ii), substitute the following paragraph (b) for paragraph (b) of the basic provision:

(b) The offeror certifies that the following supplies are Canadian end products as defined in the clause of this solicitation entitled “Buy American Act—Free Trade Agreements—Israeli Trade Act”:

Canadian End Products:

Line Item No. _____

[List as necessary]

Alternate II (Jan 2004). As prescribed in FAR 25.1101 (b)(2)(iii), substitute the following paragraph (b) for paragraph (b) of the basic provision:

(b) The offeror certifies that the following supplies are Canadian end products or Israeli end products as defined in the clause of this solicitation entitled “Buy American Act— Free Trade Agreements—Israeli Trade Act”:

Canadian or Israeli End Products

Line Item No.:	Country of Origin:

[List as necessary]

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3. ☐ The *Trade Agreements Certificate*, must be completed in solicitations containing the clause at FAR 52.225-5 *Trade Agreements.*

Trade Agreements Certificate (FAR 52-225-6) (Jan 2005)

(a) The offeror certifies that each end product, except those listed in paragraph (b) of this provision is a U.S.-made or designated country end product, as defined in the clause of this solicitation entitled "Trade Agreements."

(b) The offeror shall list as other end products those supplies that are not U.S.-made or designated country end products.

Other End Products

Line Item No.	Country of Origin:

[*List as necessary*]

(c) The Government will evaluate offers in accordance with the policies and procedures of Part 25 of the Federal Acquisition Regulation. For line items covered by the WTO GPA, the Government will evaluate offers of U.S.-made or designated country end products without regard to the restrictions of the Buy American Act. The Government will consider for award only offers of U.S.-made or designated country end products unless the Contracting Officer determines that there are no offers for such products or that the offers for those products are insufficient to fulfill the requirements of this solicitation.

(End of Provision)

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4. ☐ The *Notice of Buy American Act Requirement—Construction Materials*, applies in solicitations containing the clause at FAR 52.225-9 *Buy American Act —Construction Materials*.

Notice of Buy American Act Requirement—Construction Materials (FAR 52.225-10) (FEB 2009)

(a) Definitions. "Commercially available off-the-shelf (COTS) item", "Construction material," "domestic construction material," and "foreign construction material," as used in this provision, are defined in the clause of this solicitation entitled "Buy American Act—Construction Materials" (FAR clause 52.225-9).

(b) Requests for determinations of inapplicability. An offeror requesting a determination regarding the inapplicability of the Buy American Act should submit the request to the Contracting Officer in time to allow a determination before submission of offers. The offeror shall include the information and applicable supporting data required by paragraphs (c) and (d) of the clause at FAR 52.225-9 in the request. If an offeror has not requested a determination regarding the inapplicability of the Buy American Act before submitting its offer, or has not received a response to a previous request, the offeror shall include the information and supporting data in the offer.

(c) Evaluation of offers.

(1) The Government will evaluate an offer requesting exception to the requirements of the Buy American Act, based on claimed unreasonable cost of domestic construction material, by adding to the offered price the appropriate percentage of the cost of such foreign construction material, as specified in paragraph (b)(3)(i) of the clause at FAR 52.225-9.

(2) If evaluation results in a tie between an offeror that requested the substitution of foreign construction material based on unreasonable cost and an offeror that did not request an exception, the Contracting Officer will award to the offeror that did not request an exception based on unreasonable cost.

(d) Alternate offers.

(1) When an offer includes foreign construction material not listed by the Government in this solicitation in paragraph (b)(2) of the clause at FAR 52.225-9, the offeror also may submit an alternate offer based on use of equivalent domestic construction material.

(2) If an alternate offer is submitted, the offeror shall submit a separate Standard Form 1442 for the alternate offer, and a separate price comparison table prepared in accordance with paragraphs (c) and (d) of the clause at FAR 52.225-9 for the offer that is based on the use of any foreign construction material for which the Government has not yet determined an exception applies.

(3) If the Government determines that a particular exception requested in accordance with paragraph (c) of the clause at FAR 52.225-9 does not apply, the Government will evaluate only those offers based on use of the equivalent domestic construction material, and the offeror shall be required to furnish such domestic construction material. An offer based on use of the foreign construction material for which an exception was requested—

(i) Will be rejected as nonresponsive if this acquisition is conducted by sealed bidding; or

(ii) May be accepted if revised during negotiations.

(End of provision)

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5. ☐ The *Notice of Buy American Act Requirement—Construction Materials under Trade Agreements*, in solicitations containing the clause at FAR 52.225-11 *Buy American Act—Construction Materials under Trade Agreements*. If insufficient time is available to process a determination regarding the inapplicability of the Buy American Act before receipt of offers, use the provision with its Alternate I. For acquisitions valued at $7,804,000 or more, but less than $9,110,318, use the clause with its Alternate II.

Notice of Buy American Act Requirement—Construction Materials Under Trade Agreements (Jan 2005)

(a) Definitions. "Construction material," "designated country construction material," "domestic construction material," and "foreign construction material," as used in this provision, are defined in the clause of this solicitation entitled "Buy American Act—Construction Materials Under Trade Agreements" (FAR clause 52.225-11).

(b) Requests for determination of inapplicability. An offeror requesting a determination regarding the inapplicability of the Buy American Act should submit the request to the Contracting Officer in time to allow a determination before submission of offers. The offeror shall include the information and applicable supporting data required by paragraphs (c) and (d) of FAR clause 52.225-11 in the request. If an offeror has not requested a determination regarding the inapplicability of the Buy American Act before submitting its offer, or has not received a response to a previous request, the offeror shall include the information and supporting data in the offer.

(c) Evaluation of offers.

(1) The Government will evaluate an offer requesting exception to the requirements of the Buy American Act, based on claimed unreasonable cost of domestic construction materials, by adding to the offered price the appropriate percentage of the cost of such foreign construction material, as specified in paragraph (b)(4)(i) of FAR clause 52.225-11.

(2) If evaluation results in a tie between an offeror that requested the substitution of foreign construction material based on unreasonable cost and an offeror that did not request an exception, the Contracting Officer will award to the offeror that did not request an exception based on unreasonable cost.

(d) Alternate offers.

(1) When an offer includes foreign construction material, other than designated country construction material, that is not listed by the Government in this solicitation in paragraph (b)(3) of FAR clause 52.225-11, the offeror also may submit an alternate offer based on use of equivalent domestic or designated country construction material.

(2) If an alternate offer is submitted, the offeror shall submit a separate Standard Form 1442 for the alternate offer, and a separate price comparison table prepared in accordance with paragraphs (c) and (d) of FAR clause 52.225-11 for the offer that is based on the use of any foreign construction material for which the Government has not yet determined an exception applies.

(3) If the Government determines that a particular exception requested in accordance with paragraph (c) of FAR clause 52.225-11 does not apply, the Government will evaluate only those offers based on use of the equivalent domestic or designated country construction material, and the offeror shall be required to furnish such domestic or designated country construction material. An offer based on use of the foreign construction material for which an exception was requested—

(i) Will be rejected as nonresponsive if this acquisition is conducted by sealed bidding; or

(ii) May be accepted if revised during negotiations.

(End of provision)

Alternate I (May 2002). As prescribed in FAR 25.1102(d)(2), substitute the following paragraph (b) for paragraph (b) of the basic provision:

(b) Requests for determination of inapplicability. An offeror requesting a determination regarding the inapplicability of the Buy American Act shall submit the request with its offer, including the information and applicable supporting data required by paragraphs (c) and (d) of FAR clause 52.225-11.

Alternate II (Jan 2005). As prescribed in FAR 25.1102(d)(3), substitute the following paragraphs (a) and (d) for paragraphs (a) and (d) of the basic provision:

(a) Definitions. "Australian, Chilean, or Moroccan construction material," "Caribbean Basin country construction material," "construction material," "domestic construction material," "foreign construction material," "least developed country construction material," and "WTO GPA country construction material," as used in this provision, are defined in the clause of this solicitation entitled "Buy American Act—Construction Materials Under Trade Agreements" (FAR clause 52.225-11).

(d) *Alternate offers.*

(1) When an offer includes foreign construction material, other than WTO GPA country, Australian, Chilean, or Moroccan, least developed country, or Caribbean Basin country construction material, that is not listed by the Government in this solicitation in paragraph (b)(3) of FAR clause 52.225-11, the offeror also may submit

an alternate offer based on use of equivalent domestic, WTO GPA country, Australian, Chilean, or Moroccan, least developed country or Caribbean Basin country construction material.

(2) If an alternate offer is submitted, the offeror shall submit a separate Standard Form 1442 for the alternate offer, and a separate price comparison table prepared in accordance with paragraphs (c) and (d) of FAR clause 52.225-11 for the offer that is based on the use of any foreign construction material for which the Government has not yet determined an exception applies.

(3) If the Government determines that a particular exception requested in accordance with paragraph (c) of FAR clause 52.225-11 does not apply, the Government will evaluate only those offers based on use of the equivalent domestic, WTO GPA country, Australian, Chilean, or Moroccan, least developed country, or Caribbean Basin country construction material, and the offeror shall be required to furnish such domestic, WTO GPA country, Australian, Chilean, or Moroccan, least developed country, or Caribbean Basin country construction material. An offer based on use of the foreign construction material for which an exception was requested—

(i) Will be rejected as nonresponsive if this acquisition is conducted by sealed bidding; or

(ii) May be accepted if revised during negotiations.

19. DFARS 252.209-7001 DISCLOSURE OF OWNERSHIP OR CONTROL BY THE GOVERNMENT OF A TERRORIST COUNTRY (JAN 2009) *(Applicable over $150,000)*

(a) Definitions. As used in this provision—

(1) "Government of a terrorist country" includes the state and the government of a terrorist country, as well as any political subdivision, agency, or instrumentality thereto.

(2) "Terrorist country" means a country determined by the Secretary of State, under section 6(j)(1)(A) of the Export Administration Act of 1979 [50 U.S.C. App. 2405(j)(i)(A)], to be a country the government of which has repeatedly provided support for acts of international terrorism. As of the date of this provision, terrorist countries include: Cuba, Iran, Iraq, Libya, North Korea, Sudan and Syria.

(3) "Significant interest" means—

(i) Ownership of or beneficial interest in 5 percent or more of the firm's or subsidiary's securities. Beneficial interest includes holding 5 percent or more of any class of the firm's securities in "nominee shares," "street names," or some other method of holding securities that does not disclose the beneficial owner;

(ii) Holding a management position in the firm, such as a director or officer;

(iii) Ability to control or influence the election, appointment, or tenure of directors or officers in the firm;

(iv) Ownership of 10 percent or more of the assets of a firm such as equipment, buildings, real estate, or other tangible assets of the firm; or

(v) Holding 50 percent or more of the indebtedness of a firm.

(b) Prohibition of award.

In accordance with 10 U.S.C. 2327, no contract may be awarded to a firm or a subsidiary of a firm if the government of a terrorist country has a significant interest in the firm or subsidiary or, in the case of a subsidiary, the firm that owns the subsidiary, unless a waiver is granted by the Secretary of Defense.

(c) Disclosure.

If the government of a terrorist country has a significant interest in the Offeror or a subsidiary of the Offeror, the Offeror shall disclose such interest in an attachment to this document. If the Offeror is a subsidiary, it shall also disclose any significant interest the government of a terrorist country has in any firm that owns or controls the subsidiary. The disclosure shall include:

(1) Identification of each government holding a significant interest; and

(2) A description of the significant interest held by each government.

20. DFARS 252.209-7002 DISCLOSURE OF OWNERSHIP OR CONTROL BY A FOREIGN GOVERNMENT (JUN 2010) (Applicable when access to proscribed information is necessary for contract performance)

(a) Definitions

As used in this provision—

(1) "Effectively owned or controlled" means that a foreign government or any entity controlled by a foreign government has the power, either directly or indirectly, whether exercised or exercisable, to control the election, appointment, or tenure of the Officer's officers or a majority of the Officer's board of directors by any means, e.g., ownership, contract, or operation of law (equivalent power for unincorporated organization).

(2) "Entity controlled by a foreign government"

(i) Means—

(A) Any domestic or foreign organization or cooperation that is effectively owned or controlled, either directly or indirectly, by a foreign government if the ownership of that organization or corporation by that foreign government was effective before October 23, 1992.

(B) Any individual acting on behalf of a foreign government.

(ii) Does not include any organization or corporation that is owned, but is not controlled, either directly or indirectly, by a foreign government if the ownership of that organization or corporation by that foreign government was effective before October 23, 1992.

(3) "Foreign government" includes the state and the government of any country (other than the United States and its possessions and trust territories) as well as any political subdivision, agency, or instrumentality therefore.

(4) "Proscribed information" means—

(i) Top Secret information;

(ii) Communications Security (COMSEC) material, excluding controlled cryptographic items when unkeyed or utilized with unclassified keys;

(iii) Restricted Data as defined in the U.S. Atomic Energy Act of 1954, as amended;

(iv) Special Access Program (SAP) information; or

(v) Sensitive Compartmented Information (SCI).

(b) Prohibition on award

No contract under a national security program may be awarded to any entity controlled by a foreign government if that entity requires access to proscribed information to perform the contract, unless the Secretary of Defense or designee has waived application of 10 U.S.C. 2536(a).

(c) Disclosure

The Offeror shall disclose any interest foreign government has in the Offeror when that interest constitutes control by a foreign government as defined in the provision. If the Offeror is a subsidiary, it shall also disclose any reportable interest a foreign government has in any entity that owns or controls the subsidiary, including reportable interest concerning the Offeror's immediate parent,

intermediate parents, and the ultimate parent. Use separate paper when needed, and provide the information in the following format;

Offeror's Point of Contact for Questions about Disclosure: _____

_____

(Name and Phone Number with Country Code, City Code, and Area Code, as applicable)

Name and Address of Offeror: _____

Name and Address of Entity Controlled by a Foreign Government: _____

_____

Description of Interest, Ownership Percentage, and Identification of Foreign Government: _____

_____

_____

21. DFARS 252.247-7022 REPRESENTATION OF EXTENT OF TRANSPORTATION BY SEA (AUG 1992)

(a) The Offeror shall indicate by checking the appropriate blank in paragraph (b) of this provision whether transportation of supplies by sea is anticipated under the resultant contract. The term "supplies" is defined in the Transportation of Supplies by Sea clause of this solicitation.

(b) Representation: The Offeror represents that it—

☐ Does anticipate that supplies will be transported by sea in the performance of any contract or subcontract resulting from this solicitation.

☐ Does not anticipate that supplies will be transported by sea in the performance of any contract or subcontract resulting from this solicitation.

(c) Any contract resulting from this solicitation will include the Transportation of Supplies by Sea clause. If the Offeror represents that it will not use ocean transportation, the resulting contract will also include the Defense FAR Supplement clause at 252.247-7024, Notification of Transportation of Supplies by Sea.

PART II- REPORTING EXECUTIVE COMPENSATION AND FIRST-TIER SUBCONTRACT AWARDS

Instructions: Select and enter the information within the applicable shaded areas below, then save and print this form. Then sign and return.

Reporting Executive Compensation and First-Tier Subcontract Awards
[Authorizing Directive: FAR 52.204-10

Part A: If a subcontract or purchase order award to Offeror has an expected value of $25,000 or more in support of a prime contract which includes FAR 52.204-10, Shaw Environmental & Infrastructure, Inc. (Shaw) must, subject to certain exceptions, gather and publicly report information regarding the award.

Did Offeror have gross income under $300,000 in the previous tax year?

❑ Yes, (or) ❑ No

If Yes, Offeror is not required to complete Part B below. Please complete the Authorized Signature of Offeror.

If No, Offeror must proceed to Part B.

Part B: Total Compensation of Offeror's Executives

(a) Definitions. As used in this provision—"Executive" means officers, managing partners, or any other employees in management positions of Offeror.

"Total Compensation" means the cash and noncash dollar value earned by the Executive during Offeror's preceding fiscal year and includes the following (for more information see 17 CFR 229.402(c)(2)):

(1) Salary and bonus.

(2) Awards of stock, stock options, and stock appreciation rights. Use the dollar amount recognized for financial statement reporting purposes with respect to the fiscal year in accordance with the Statement of Financial Accounting Standards No. 123 (Revised 2004) (FAS 123R), Shared Based Payments.

(3) Earnings for services under non-equity incentive plans. This does not include group life, health, hospitalization or medical reimbursement plans that do not discriminate in favor of Executives, and are available generally to all salaried employees.

(4) Change in pension value. This is the change in present value of defined benefit and actuarial pension plans.

(5) Above-market earnings on deferred compensation which is not tax-qualified.

(6) Other compensation, if the aggregate value of all such other compensation (e.g., severance, termination payments, value of life insurance paid on behalf of the employee, perquisites or property) for the Executive exceeds $10,000.

(b) In Offeror's preceding fiscal year, did Offeror receive 80 percent or more of its annual gross revenues from Federal contracts (and subcontracts), loans, grants (and sub-grants), and cooperative agreements?

❑ Yes, (or) ❑ No

If Yes, proceed to (c), below.
If No, Offeror is not required to complete the remainder of this Section. Please complete the Authorized Signature of Offeror.

(c) In Offeror's preceding fiscal year, did Offeror receive $25,000,000 or more in annual gross revenues from Federal contracts (and subcontracts), loans, grants (and sub-grants), and cooperative agreements?

❑ Yes, (or) ❑ No

If Yes, proceed to (d), below

If No, Offeror is not required to complete the remainder of this section. Please complete the Authorized Signature of Offeror.

(d) Does the public have access to information about the compensation of the Executives through periodic reports filed under section 13(a) or 15(d) of the Securities Exchange Act of 1934 (15 U.S.C. 78m(a), 78o(d)) or section 6104 of the Internal Revenue Code of 1986? (To determine if the public has access to the compensation information, see the U.S. Security and Exchange Commission total compensation filings at http://www.sec.gov/answers/execomb.htm)

❑ Yes, (or) ❑ No

If Yes, Offeror is not required to complete the remainder of this Section. Please complete the Authorized Signature of Offeror.

If No, proceed to (e), below

(e) Offeror must provide in the space below the names and Total Compensation of each of Offeror's five most highly compensated Executives for Offeror's preceding completed fiscal year:

	Executive Name:	Executive Total Compensation:
(1)		_____
(2)	_____	_____
(3)	_____	_____
(4)	_ _____	
(5)	_____	_____

(f) Offeror hereby acknowledges and agrees that Offeror shall, at the time of a subcontract or Purchase Order award by Shaw to Offeror that is subject to FAR 52.204-10, provide Offeror's North American Industry Classification System (NAICS) code(s) that (is) are applicable to the specific subcontract or Purchase Order awarded.

PART III- Limitations On Pass Through Charges Certification

For Proposals: FAR 52.215-22, "Limitations on Pass-Through Charges—Identification of Subcontract Effort"

Offeror agrees to abide by the requirements of 52.215-23 as delineated below, and certifies that Offeror, if applicable, has provided or will provide the required information pursuant to the following:

If the Offeror intends to subcontract more than 70 percent of the total cost of work to be performed under its subcontract, the Offeror shall expressly identify the proposed subcontracting effort in its proposal. This statement shall include the amount of the Offeror's indirect costs and profit/fee applicable to the work to be performed by the lower-tier subcontractors, and a description of the added value provided by the Offeror as related to the work to be performed by the lower-tier subcontractor(s).

Offeror shall provide any additional information required FAR 52.215-22.

For Contracts, Subcontracts, Task Orders, Delivery Orders, Purchase Orders, and any other Contract Form: FAR 52.215-23, "Limitations on Pass-Through Charges"

Offeror agrees to abide by the requirements of 52.215.23 as delineated below: The Offeror shall promptly notify the Shaw Subcontract Administrator in writing if

1. The Offeror changes the amount of subcontract effort after award such that it exceeds 70 percent of the total cost of work to be performed under the contract, task order, or delivery order.

   The notification shall identify the revised cost of the subcontract effort and shall include verification that the Offeror will provide added value; or

2. Any lower tier subcontractor changes the amount of lower-tier subcontractor effort after award such that it exceeds 70 percent of the total cost of the work to be performed under its subcontract.

   The notification shall identify the revised cost of the subcontract effort and shall include verification of the subcontractor's added value as related to the work to be performed by the lower-tier subcontractor(s). If the Offeror is unable to provide verification of its added value, it understands and agrees that its indirect costs and profit/fee applicable to the subcontracted work may be unallowable.

Should Offeror report such change notice action, additional information may be required, as delineated in FAR 52.215-23, and Offeror agrees to provide additional information.

CERTIFICATION STATEMENT

I hereby acknowledge an understanding of the United States Government contracting and subcontracting programs and confirm the accuracy of the statements made above. This certification shall apply to all solicitations, agreements, purchase order or subcontracts received from Shaw E&I and shall be valid for the period of performance of all agreements placed under the document.

The Offeror certifies that no one within our corporation is involved in any manner in the development of materials or oral presentations for the cited solicitation or will be involved in delivery of materials or services on a subsequent award that was employed by the U.S. Government or by another contractor under a U.S. Government contract, as described by FAR 3.104-4.

SIGNATURE/CERTIFICATION

By signing below, the offeror certifies, under penalty of law, that the representations and certifications are accurate, current and complete. The offeror further certifies that it will notify the SHAW E&I Contract Administrator of any errors and/or changes to these representations and certifications which occurs during the effective period of the document. The representations and certifications made by the offeror, as contained herein, concern matters within the jurisdiction of an agency of the United States and the making of a false, fictitious, or fraudulent representation or certification may render the maker subject to prosecution under Title 18, United States Code, Section 1001.

Signature of Offeror Responsible for Offer Date

Typed Name of Person Responsible for the Offer

Title of Person Responsible for the Offer

Name of Organization

*NOTE: PENALTIES FOR FALSE MISREPRESENTATION. 1) FAR 52-219(e)(4)—Misrepresentations of business status as a small, small disadvantaged, women-owned small, veteran-owned small (including service disabled), and HUBZone small business concern for the purpose of obtaining a subcontract that is to be included as part or all of a goal contained in the Contractor's subcontracting plan, without remedy, can result in severe penalties. Additionally, 2) Under 15 U.S.C. 645(d), any person who misrepresents a firm's status as a small, small disadvantaged, women-owned small, veteran-owned small (including service disabled), and HUBZone small business concern in order to obtain a contract to be awarded under the preference programs established pursuant to section 8(a), 8(d), 9 or 15 of the Small Business Act or any other provision of Federal law that specifically references section 8(d) for a definition of program eligibility, shall: (i) Be punished by imposition of fine, imprisonment, or both; (ii) Be subject to administrative remedies, including suspension and debarment; and (iii) Be ineligible for participation in programs conducted under the authority of the Act.

Representations and Certifications – Cost Accounting Standards Notices and Certification

Submitting Firm Name: _____

DUNS Number: _____

Supplemental Representations and Certifications as required by Shaw E&I's Prime Contract No. _____

Cost Accounting Standards Notices and Certification (FAR 52.230-1) (October 2008)

Note: This notice does not apply to small businesses or foreign governments. Check here to indicate that the offeror ☐ is a small business ☐ or foreign government and does not need to complete the following certification. This notice is in three parts, identified by Roman numerals I through III.

Offerors shall examine each part and provide the requested information in order to determine Cost Accounting Standards (CAS) requirements applicable to any resultant contract.

If the offeror is an educational institution, Part II does not apply unless the contemplated contract will be subject to full or modified CAS coverage pursuant to 48 CFR 9903.201-2(c)(5) or 9903.201-2(c)(6), respectively.

I. Disclosure Statement -- Cost Accounting Practices and Certification

(a) Any contract in excess of $650,000 resulting from this solicitation will be subject to the requirements of the Cost Accounting Standards Board (48 CFR Chapter 99), except for those contracts which are exempt as specified in 48 CFR 9903.201-1.

(b) Any offeror submitting a proposal which, if accepted, will result in a contract subject to the requirements of 48 CFR Chapter 99 must, as a condition of contracting, submit a Disclosure Statement as required by 48 CFR 9903.202. When required, the Disclosure Statement must be submitted as a part of the offeror's proposal under this solicitation unless the offeror has already submitted a Disclosure Statement disclosing the practices used in connection with the pricing of this proposal. If an applicable Disclosure Statement has already been submitted, the offeror may satisfy the requirement for submission by providing the information requested in paragraph (c) of Part I of this provision.

Caution: In the absence of specific regulations or agreement, a practice disclosed in a Disclosure Statement shall not, by virtue of such disclosure, be deemed to be a proper, approved, or agreed-to practice for pricing proposals or accumulating and reporting contract performance cost data.

(c) Check the appropriate box below:

☐ (1) *Certificate of Concurrent Submission of Disclosure Statement.* The offeror hereby certifies that, as a part of the offer, copies of the Disclosure Statement have been submitted as follows:

(i) Original and one copy to the cognizant Administrative Contracting Officer (ACO) or cognizant Federal agency official authorized to act in that capacity (Federal official), as applicable; and

(ii) One copy to the cognizant Federal auditor.

(Disclosure must be on Form No. CASB DS-1 or CASB DS-2, as applicable. Forms may be obtained from the cognizant ACO or Federal official and/or from the loose-leaf version of the Federal Acquisition Regulation.)

Date of Disclosure Statement: _____ Name and Address of Cognizant ACO or Federal Official Where Filed: _____

The offeror further certifies that the practices used in estimating costs in pricing this proposal are consistent with the cost accounting practices disclosed in the Disclosure Statement.

☐ (2) *Certificate of Previously Submitted Disclosure Statement.* The offeror hereby certifies that the required Disclosure Statement was filed as follows:

Date of Disclosure Statement: _____ Name and Address of Cognizant ACO or Federal Official Where Filed:_____

The offeror further certifies that the practices used in estimating costs in pricing this proposal are consistent with the cost accounting practices disclosed in the applicable Disclosure Statement.

☐ (3) *Certificate of Monetary Exemption.* The offeror hereby certifies that the offeror, together with all divisions, subsidiaries, and affiliates under common control, did not receive net awards of negotiated prime contracts and subcontracts subject to CAS totaling $50 million or more in the cost accounting period immediately preceding the period in which this proposal was submitted. The offeror further certifies that if such status changes before an award resulting from this proposal, the offeror will advise the Contracting Officer immediately.

☐ (4) *Certificate of Interim Exemption.* The offeror hereby certifies that

(i) the offeror first exceeded the monetary exemption for disclosure, as defined in (3) of this subsection, in the cost accounting period immediately preceding the period in which this offer was submitted and

(ii) in accordance with 48 CFR 9903.202-1, the offeror is not yet required to submit a Disclosure Statement. The offeror further certifies that if an award resulting from this proposal has not been made within 90 days after the end of that period, the offeror will immediately submit a revised certificate to the Contracting Officer, in the form specified under subparagraph (c)(1) or (c)(2) of Part I of this provision, as appropriate, to verify submission of a completed Disclosure Statement.

Caution: Offerors currently required to disclose because they were awarded a CAS-covered prime contract or subcontract of $50 million or more in the current cost accounting period may not claim this exemption (4). Further, the exemption applies only in connection with proposals submitted before expiration of the 90-day period following the cost accounting period in which the monetary exemption was exceeded.

II. Cost Accounting Standards -- Eligibility for Modified Contract Coverage

If the offeror is eligible to use the modified provisions of 48 CFR 9903.201-2(b) and elects to do so, the offeror shall indicate by checking the box below. Checking the box below shall mean that the resultant contract is subject to the Disclosure and Consistency of Cost Accounting Practices clause in lieu of the Cost Accounting Standards clause.

☐ The offeror hereby claims an exemption from the Cost Accounting Standards clause under the provisions of 48 CFR 9903.201-2(b) and certifies that the offeror is eligible for use of the Disclosure and Consistency of Cost Accounting Practices clause because during the cost accounting period immediately preceding the period in which this proposal was submitted, the offeror received less than $50 million in awards of CAS-covered prime contracts and subcontracts. The offeror further certifies that if such status changes before an award resulting from this proposal, the offeror will advise the Contracting Officer immediately.

Caution: An offeror may not claim the above eligibility for modified contract coverage if this proposal is expected to result in the award of a CAS-covered contract of $50 million or more or if, during its current cost accounting period, the offeror has been awarded a single CAS-covered prime contract or subcontract of $50 million or more.

III. Additional Cost Accounting Standards Applicable to Existing Contracts

The offeror shall indicate below whether award of the contemplated contract would, in accordance with subparagraph (a)(3) of the Cost Accounting Standards clause, require a change in established cost accounting practices affecting existing contracts and subcontracts.

☐ yes ☐ no

Note: If the offeror is an educational institution under the transition provisions of 48 CFR 9903.202-1 (f), contact the SHAW E&I Contract Administrator for the appropriate alternate certification.

Proposal Disclosure—Cost Accounting Practice Changes (FAR 52.230-7) (Apr 2005)

The offeror shall check "yes" below if the contract award will result in a required or unilateral change in cost accounting practice, including unilateral changes requested to be desirable changes.

☐ Yes ☐ No

If the offeror checked "Yes" above, the offeror shall--

(1) Prepare the price proposal in response to the solicitation using the changed practice for the period of performance for which the practice will be used; and

(2) Submit a description of the changed cost accounting practice to the Contracting Officer and the Cognizant Federal Agency Official as pricing support for the proposal.

SIGNATURE/CERTIFICATION*

By signing below, the contractor hereby certifies and represents that the information provided is current, accurate, and complete. The contractor further certifies that it will notify the Shaw Environmental and Infrastructure, Inc. Procurement Associate of any changes to said information provided.

COMPANY NAME: _____

ADDRESS: _____

_____

PRINTED NAME: _____ AUTHORIZED SIGNATURE: _____

TITLE: _____ DATE: _____ EMAIL ADDRESS: _____

Annual Representations and Certifications—General Requirements for Foreign Owned Entities

SHAW E&I is performing work under various U.S. Federal Government prime contracts as well as many state and local government prime contracts. These prime contracts require SHAW E&I to obtain certain information and certifications from your organization. The information requested is in accordance with the Federal Acquisition Regulation (FAR), available at http://www.acquisition.gov/far/, and the related sections of the FAR are cited for your reference. You are required to fully complete the appropriate sections of this form and signed it prior to submission of any proposal to SHAW E&I. The Representations and Certifications must be executed by an individual capable to commit your company. An award to your company cannot be made until this document is completed, executed and received/acknowledged within our GSIS system. Your cooperation is greatly appreciated.

EFFECTIVE PERIOD

This Annual Representation and Certification Document is valid for all orders issued to your company for one year from the date of execution.

Instructions:

The Representations and Certifications contain three parts.

Part I—General Representations and Certifications

Part II—Reporting Executive Compensation and First-Tier Subcontract Awards

Part III—Limitations on Pass-Thru Charges Certification

PART I- GENERAL REPRESENTATIONS AND CERTIFICATIONS

Submitting Firm Name: _____

DUNS Number: ____

Read each section and complete or check each blank and/or box as appropriate:

1. DFARS 252.209-7001 DISCLOSURE OF OWNERSHIP OR CONTROL BY THE GOVERNMENT OF A TERRORIST COUNTRY (JAN 2009) *(Applicable over $150,000)*

(a) Definitions. As used in this provision—

(1) "Government of a terrorist country" includes the state and the government of a terrorist country, as well as any political subdivision, agency, or instrumentality thereto.

(2) "Terrorist country" means a country determined by the Secretary of State, under section 6(j)(1)(A) of the Export Administration Act of 1979 [50 U.S.C. App. 2405(j)(i)(A)], to be a country the government of which has repeatedly provided support for acts of international terrorism. As of the date of this provision, terrorist countries include: Cuba, Iran, Iraq, Libya, North Korea, Sudan and Syria.

(3) "Significant interest" means—

(i) Ownership of or beneficial interest in 5 percent or more of the firm's or subsidiary's securities. Beneficial interest includes holding 5 percent or more of any class of the firm's securities in "nominee shares," "street names," or some other method of holding securities that does not disclose the beneficial owner;

(ii) Holding a management position in the firm, such as a director or officer;

(iii) Ability to control or influence the election, appointment, or tenure of directors or officers in the firm;

(iv) Ownership of 10 percent or more of the assets of a firm such as equipment, buildings, real estate, or other tangible assets of the firm; or

(v) Holding 50 percent or more of the indebtedness of a firm.

(b) Prohibition of award.

In accordance with 10 U.S.C. 2327, no contract may be awarded to a firm or a subsidiary of a firm if the government of a terrorist country has a significant interest in the firm or subsidiary or, in the case of a subsidiary, the firm that owns the subsidiary, unless a waiver is granted by the Secretary of Defense.

(c) Disclosure.

If the government of a terrorist country has a significant interest in the Offeror or a subsidiary of the Offeror, the Offeror shall disclose such interest in an attachment to this document. If the Offeror is a subsidiary, it shall also disclose any significant interest the government of a terrorist country has in any firm that owns or controls the subsidiary. The disclosure shall include:

(1) Identification of each government holding a significant interest; and

(2) A description of the significant interest held by each government.

2. DFARS 252.209-7002 DISCLOSURE OF OWNERSHIP OR CONTROL BY A FOREIGN GOVERNMENT (JUN 2010) (Applicable when access to proscribed information is necessary for contract performance)

(a) Definitions

As used in this provision—

(1) “Effectively owned or controlled” means that a foreign government or any entity controlled by a foreign government has the power, either directly or indirectly, whether exercised or exercisable, to control the election, appointment, or tenure of the Officer’s officers or a majority of the Officer’s board of directors by any means, e.g., ownership, contract, or operation of law (equivalent power for unincorporated organization).

(2) “Entity controlled by a foreign government”

(i) Means—

(A) Any domestic or foreign organization or cooperation that is effectively owned or controlled, either directly or indirectly, by a foreign government if the ownership of that organization or corporation by that foreign government was effective before October 23, 1992.

(B) Any individual acting on behalf of a foreign government.

(ii) Does not include any organization or corporation that is owned, but is not controlled, either directly or indirectly, by a foreign government if the ownership of that organization or corporation by that foreign government was effective before October 23, 1992.

(3) “Foreign government” includes the state and the government of any country (other than the United States and its possessions and trust territories) as well as any political subdivision, agency, or instrumentality therefore.

(4) "Proscribed information" means—

(i) Top Secret information;

(ii) Communications Security (COMSEC) material, excluding controlled cryptographic items when unkeyed or utilized with unclassified keys;

(iii) Restricted Data as defined in the U.S. Atomic Energy Act of 1954, as amended;

(iv) Special Access Program (SAP) information; or

(v) Sensitive Compartmented Information (SCI).

(b) Prohibition on award

No contract under a national security program may be awarded to any entity controlled by a foreign government if that entity requires access to proscribed information to perform the contract, unless the Secretary of Defense or designee has waived application of 10 U.S.C. 2536(a).

(c) Disclosure

The Offeror shall disclose any interest foreign government has in the Offeror when that interest constitutes control by a foreign government as defined in the provision. If the Offeror is a subsidiary, it shall also disclose any reportable interest a foreign government has in any entity that owns or controls the subsidiary, including reportable interest concerning the Offeror's immediate parent, intermediate parents, and the ultimate parent. Use separate paper when needed, and provide the information in the following format;

Offeror's Point of Contact for Questions about Disclosure: ____

_____

(Name and Phone Number with Country Code, City Code, and Area Code, as applicable)

Name and Address of Offeror: ____

Name and Address of Entity Controlled by a Foreign Government: _____

_____

Description of Interest, Ownership Percentage, and Identification of Foreign Government: _

_____

3. DFARS 252.247-7022 REPRESENTATION OF EXTENT OF TRANSPORTATION BY SEA (AUG 1992)

(a) The Offeror shall indicate by checking the appropriate blank in paragraph (b) of this provision whether transportation of supplies by sea is anticipated under the resultant contract. The term "supplies" is defined in the Transportation of Supplies by Sea clause of this solicitation.

(b) Representation: The Offeror represents that it—

☐ Does anticipate that supplies will be transported by sea in the performance of any contract or subcontract resulting from this solicitation.

☐ Does not anticipate that supplies will be transported by sea in the performance of any contract or subcontract resulting from this solicitation.

(c) Any contract resulting from this solicitation will include the Transportation of Supplies by Sea clause. If the Offeror represents that it will not use ocean transportation, the resulting contract will also include the Defense FAR Supplement clause at 252.247-7024, Notification of Transportation of Supplies by Sea.

4. Certification Regarding Responsibility Matters (FAR 52.209-5) (APR 2010) (Applicable to Subcontracts expected to exceed the simplified acquisition threshold)

(a) (1) The offeror certifies, to the best of its knowledge and belief, that—

(i) The offeror and/or any of its Principals—

(A) Are ☐ are not ☐ presently debarred, suspended, proposed for debarment or declared ineligible for the award of contracts by any Federal Agency;

(B) Have ☐ have not ☐, within a three year period preceding this offer been convicted of or had a civil judgment rendered against them for: commission of fraud or a criminal offense in connection with obtaining, attempting to obtain, or performing a public (Federal, state, or local) contract or subcontract; violation of Federal or state antitrust statutes relating to the submission of offers; or commission of embezzlement, theft, forgery, bribery, falsification or destruction of records, making false statements, tax evasion, or receiving stolen property (if offeror checks “have”, the offeror shall also see 52.209-7, if included in this solicitation); and

(C) Are ☐ are not ☐ presently indicted for, or otherwise criminally or civilly charged by a governmental entity with, commission of any of the offenses enumerated in paragraph (a)(1)(i)(B) of this provision.

(D) Have ☐ have not ☐, within a three year period preceding this offer, been notified of any delinquent Federal taxes in an amount that exceeds $3,000 for which the liability remains unsatisfied.

(1) Federal taxes are considered delinquent if both of the following criteria apply:

(i) The tax liability is finally determined. The liability is finally determined if it has been assessed. A liability is not finally determined if there is a pending administrative or judicial challenge. In the case of a judicial challenge to the liability, the liability is not finally determined until all judicial appeal rights have been exhausted.

(ii) The taxpayer is delinquent in making payment. A taxpayer is delinquent if the taxpayer has failed to pay the tax liability when full payment was due and required. A taxpayer is not delinquent in cases where enforced collection action is precluded.

(2) Examples.

(i) The taxpayer has received a statutory notice of deficiency, under I.R.C. §6212, which entitles the taxpayer to seek Tax Court review of a proposed tax deficiency. This is not a delinquent tax because it is not a final tax liability. Should the taxpayer seek Tax Court review, this will not be a final tax liability until the taxpayer has exercised all judicial appeal rights.

(ii) The IRS has filed a notice of Federal tax lien with respect to an assessed tax liability, and the taxpayer has been issued a notice under I.R.C. §6320 entitling the taxpayer to request a hearing with the IRS Office of Appeals contesting the lien filing, and to further appeal to the Tax Court if the IRS determines to sustain the lien filing. In the course of the hearing, the taxpayer is entitled to contest the underlying tax liability because the taxpayer has had no prior opportunity to contest the liability. This is not a delinquent tax because it is not a final tax liability. Should

the taxpayer seek tax court review, this will not be a final tax liability until the taxpayer has exercised all judicial appeal rights.

(iii) The taxpayer has entered into an installment agreement pursuant to I.R.C. §6159. The taxpayer is making timely payments and is in full compliance with the agreement terms. The taxpayer is not delinquent because the taxpayer is not currently required to make full payment.

(iv) The taxpayer has filed for bankruptcy protection. The taxpayer is not delinquent because enforced collection action is stayed under 11 U.S.C. 362 (the Bankruptcy Code).

(ii) The offeror has ☐ has not ☐, within a three-year period preceding this offer, had one or more contracts terminated for default by any Federal agency.

5 "Principals," for the purposes of this certification, means officers; directors; owners; partners; and, persons having primary management or supervisory responsibilities within a business entity (e.g., general manager, plant manager, head of a subsidiary, division, or business segment, and similar positions).

THIS CERTIFICATION CONCERNS A MATTER WITHIN THE JURISDICTION OF AN AGENCY OF THE UNITED STATES AND THE MAKING OF A FALSE, FICTITIOUS, OR FRAUDULENT CERTIFICATION MAY RENDER THE MAKER SUBJECT TO PROSECUTION UNDER SECTION 1001, TITLE 18, UNITED STATES CODE.

(a) The offeror shall provide immediate notice to Shaw E&I if, at any time prior to contract award, the Offeror learns that its certification was erroneous when submitted or has become erroneous by reason of changed circumstances.

(b) A certification that any of the items in paragraph (a) of this provision exists will not necessarily result in withholding of an award under this solicitation. However, the certification will be considered in connection with a determination of the Offeror's responsibility. Failure of the Offeror to furnish a certification or provide such additional information as requested by Shaw E&I may render the Offeror non-responsible.

(c) Nothing contained in the foregoing shall be construed to require establishment of a system of records in order to render, in good faith, the certification required by paragraph (a) of this provision. The knowledge and information of an Offeror is not required to exceed that which is normally possessed by a prudent person in the ordinary course of business dealings.

(d) The certification in paragraph (a) of this provision is a material representation of fact upon which reliance was placed when making award. If it is later determined that the Offeror knowingly rendered an erroneous certification, in addition to the other remedies available to the Government *and to Shaw E&I,* may terminate the contract resulting from this solicitation for default.

6. Certification And Disclosure Regarding Payments To Influence Certain Federal Transactions (FAR 52.203-11) (SEP 2007) *(Applicable to Subcontracts expected to exceed $150,000.)*

(a) The definitions and prohibitions contained in the clause, at FAR 52.203-12, Limitation on Payments to Influence Certain Federal Transactions, included in this solicitation are hereby incorporated by reference in paragraph (b) of this certification.

(b) The offeror, by signing its offer, hereby certifies to the best of his or her knowledge and belief that on or after December 23, 1989,—

(1) No Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress on his or her behalf in connection with the awarding of any Federal contract, the

making of any Federal grant, the making of any Federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any Federal contract, grant, loan, or cooperative agreement;

(2) If any registrants under the Lobbying Disclosure Act of 1995 have made a lobbying contact on behalf of the offeror with respect to this contract, the offeror shall complete and submit, with its offer, OMB Standard Form LLL, Disclosure of Lobbying Activities, to provide the name of the registrants. The offeror need not report regularly employed officers or employees of the offeror to whom payments of reasonable compensation were made; and

(3) He or she will include the language of this certification in all subcontract awards at any tier and require that all recipients of subcontract awards in excess of $150,000 shall certify and disclose accordingly.

(c) Submission of this certification and disclosure is a prerequisite for making or entering into this contract imposed by section 1352, title 31, United States Code. Any person who makes an expenditure prohibited under this provision or who fails to file or amend the disclosure form to be filed or amended by this provision, shall be subject to a civil penalty of not less than $10,000, for each such failure.

7. Contractor Code of Business Ethics and Conduct:

1. Does your firm have a code of business ethics and conduct? ☐ Yes ☐ No
2. Are your employees provided a copy of the code of business ethics and conduct? ☐ Yes ☐ No
3. Does your firm have a business ethics and compliance training program? ☐ Yes ☐ No
4. Does your firm's internal control procedure address non-compliance with your company's business ethics and conduct? ☐ Yes ☐ No
5. What is your firm's method of communication to your clients on government contracts when you code of business ethics and conduct is breached or internal fraud is detected? _____
6. Does your firm have the Fraud Hotline Poster from the OIG posted in your offices? ☐ Yes ☐ No
7. If requested by Homeland Security, will your firm post the Disaster Assistance Fraud Posters Hot Line posters in your offices? ☐ Yes ☐ No

8. FAR 52.215-6 PLACE OF PERFORMANCE (OCTOBER 1997)

(a) The offeror or quoter, in the performance of any subcontract resulting from this solicitation, ☐ intends / ☐ does not intend (check applicable block) to use one or more plants or facilities located at a different address from the address of the offeror or quoter as indicated in this proposal or quotation.

(b) If the offeror or quoter checks "intends" in paragraph (a) above, it shall insert in the spaces provided below the required information:

Place of Performance (Street, City, State, ZIP)	Name and Address of Owner and Operator of Plant or Facility if Different from Offeror

9.SYSTEM APPROVALS

Accounting System: Do you have an Accounting system that has been deemed adequate by a Federal Government Agency? ☐ YES ☐ NO

Date of reportl:

Cognizant Government Audit Agency: _____

Address: _____

Phone: _____

Property System: Do you have a Property Management system that has been deemed adequate by a Federal Government Agency? ☐ YES ☐ NO

Date of report: _____

Approving Agency: _____

Purchasing System: Do you have a Purchasing system that has been deemed adequate by a Federal Government Agency? ☐ YES ☐ NO

Date of report: _____

Approving Agency: _____

10. CONFLICT OF INTEREST CERTIFICATION

The offeror recognizes and endorses the Purchaser's ongoing efforts to comply fully with the Federal procurement laws that govern the Federal work done by Purchaser. The offeror hereby certifies that it knows of no facts or circumstances as a result of its other activities or relationships with other persons or entities that could lead to an organizational conflict of interest as defined in Federal Acquisition Regulation 2.101 and Subpart 9.5 for purposes of this procurement. The offeror recognizes that it has a continuing obligation to examine its other activities and relationships to ensure the work being undertaken or considered will not conflict with or otherwise impair its judgment in performing the subcontract. If at any point during its performance of the subcontract, the offeror becomes aware of any facts or circumstances that could create an organizational conflict of interest, the offeror agrees to immediately disclose such information to Purchaser.

11.FAR 52.203-14 DISPLAY OF HOTLINE POSTER(S)

Pursuant to FAR 52.203-14, does Offeror display a Government-Issued Hotline Poster from any Agency or any appropriate Department of Homeland Security Fraud Hotline Poster during performance in the USA.

Yes [X] Date Implemented:

No [ ] Planned Implementation Date:

NO SUBCONTRACT OR PURCHASE ORDER WILL BE ISSUED FOR GREATER THAN $5,000,000 FOR NON-COMMERCIAL ITEMS IF OFFEROR DOES NOT MAINTAIN A CODE OF BUSINESS ETHICS AND CONDUCT OR DISPLAY A GOVERNMENT

ISSUED HOTLINE POSTER

12.FOREIGN CORRUPT PRACTICES ACT—(Applicable ONLY for work performed outside the United States)

Subcontractor hereby represents and warrants that none of its officers, directors, agents or employees are (a) an official, employee or agent of the Government or any state-owned enterprise, public international organization, candidate for public office, member of a royal family, an officer, director, or employee, or an affiliate of a Shaw E&I client; and (b) as of the date below, no Government official, and no official of any Government agency or instrumentality of the Government, is or will become associated with, or will own or presently owns an interest, whether direct or indirect, in Subcontractor or has or will have any legal or beneficial interest in this Agreement or the payments made by Shaw E&I to Subcontractor hereunder.

13.EXPORT CERTIFICATION

This Export Certification is required and hereby included in the representations and certifications completed for award of all Defense related subcontracts.

Shaw E&I requires that its offerors certify the following information to ensure compliance with the U.S. Government export laws and regulations including the U.S. International Traffic in Arms Regulations (ITAR), 22 C.F.R.

§§ 120 et seq., the Export Administration Regulations (EAR), 15 C.F.R. §§ 730 et seq., and the asset control and sanctions programs administered by the Treasury Department's Office of Foreign Assets Control (OFAC), 31 C.F.R. §§

500 et seq.

A. Offeror is [___], is not [___] a "U.S. Person" as defined in the ITAR 22 CFR Part 120.15 and the EAR 15 CFR Part

772.

ITAR 22 CFR Part 120.15 and the EAR 15 CFR Part 772 defines a U.S. person as a person who is a lawful permanent resident as defined by 8 U.S.C. 1101(a)(2) or who is a protected individual as defined by 8 U.S.C. 1324b(a)(3). It also means any corporation, business, association, a partnership, society, trust, or any other entity, organization or group that is incorporated to do business in the United States. It also includes any governmental (federal, state or local) entity.

B. Offeror is registered (____), is exempt from registration (____), is not registered (____) with the U.S. Department of State, Directorate of Defense Trade Controls per ITAR 22 CFR Part 122.1(a) and (b). Expiration Date of Registration (_____), if registered.

In accordance with ITAR 22 CFR Part 122.1(a) any person who engages in the United States in the business of either manufacturing or exporting defense articles or furnishing defense services is required to register with he Directorate of Defense Trade Controls (DDTC) unless exempted by one of the four conditions listed in ITAR 22 CFR Part 122.1(b).

Furthermore, the offeror is responsible for the protection of any information or defense articles provided to them by Shaw E&I *to assist in the manufacture of a defense article or provision of a defense service. The release of such information by the offeror to a Foreign Person employee or its transfer to another Foreign Person is defined as an*

export (ITAR 22 CFR parts 120.17 and 124.13 and EAR 15 CFR part 734.2(b)(2)(ii) and supplements 1 and 2 of Part 774 and subject to the licensing requirements of the ITAR and EAR as applicable.

PART II- REPORTING EXECUTIVE COMPENSATION AND FIRST-TIER SUBCONTRACT AWARDS

Instructions: Select and enter the information within the applicable shaded areas below, then save and print this form. Then sign and return.

Reporting Executive Compensation and First-Tier Subcontract Awards
[Authorizing Directive: FAR 52.204-10

Part A: If a subcontract or purchase order award to Offeror has an expected value of $25,000 or more in support of a prime contract which includes FAR 52.204-10, Shaw Environmental & Infrastructure, Inc. (Shaw) must, subject to certain exceptions, gather and publicly report information regarding the award.

Did Offeror have gross income under $300,000 in the previous tax year?

❑ Yes, (or) ❑ No

If Yes, Offeror is not required to complete Part B below. Please complete the Authorized Signature of Offeror.

If No, Offeror must proceed to Part B.

Part B: Total Compensation of Offeror's Executives

(a) Definitions. As used in this provision—"Executive" means officers, managing partners, or any other employees in management positions of Offeror.

"Total Compensation" means the cash and noncash dollar value earned by the Executive during Offeror's preceding fiscal year and includes the following (for more information see 17 CFR 229.402(c)(2)):

(1) Salary and bonus.

(2) Awards of stock, stock options, and stock appreciation rights. Use the dollar amount recognized for financial statement reporting purposes with respect to the fiscal year in accordance with the Statement of Financial Accounting Standards No. 123 (Revised 2004) (FAS 123R), Shared Based Payments.

(3) Earnings for services under non-equity incentive plans. This does not include group life, health, hospitalization or medical reimbursement plans that do not discriminate in favor of Executives, and are available generally to all salaried employees.

(4) Change in pension value. This is the change in present value of defined benefit and actuarial pension plans.

(5) Above-market earnings on deferred compensation which is not tax-qualified.

(6) Other compensation, if the aggregate value of all such other compensation (e.g., severance, termination payments, value of life insurance paid on behalf of the employee, perquisites or property) for the Executive exceeds $10,000.

(b) In Offeror's preceding fiscal year, did Offeror receive 80 percent or more of its annual gross revenues from Federal contracts (and subcontracts), loans, grants (and sub-grants), and cooperative agreements?

❑ Yes, (or) ❑ No

If Yes, proceed to (c), below.

If No, Offeror is not required to complete the remainder of this Section. Please complete the Authorized Signature of Offeror.

(c) In Offeror's preceding fiscal year, did Offeror receive $25,000,000 or more in annual gross revenues from Federal contracts (and subcontracts), loans, grants (and sub-grants), and cooperative agreements?

❑ Yes, (or) ❑ No

If Yes, proceed to (d), below

If No, Offeror is not required to complete the remainder of this section. Please complete the Authorized Signature of Offeror.

(d) Does the public have access to information about the compensation of the Executives through periodic reports filed under section 13(a) or 15(d) of the Securities Exchange Act of 1934 (15 U.S.C. 78m(a), 78o(d)) or section 6104 of the Internal Revenue Code of 1986? (To determine if the public has access to the compensation information, see the U.S. Security and Exchange Commission total compensation filings at http://www.sec.gov/answers/execomb.htm)

❑ Yes, (or) ❑ No

If Yes, Offeror is not required to complete the remainder of this Section. Please complete the Authorized Signature of Offeror.

If No, proceed to (e), below

(e) Offeror must provide in the space below the names and Total Compensation of each of Offeror's five most highly compensated Executives for Offeror's preceding completed fiscal year:

	Executive Name:	Executive Total Compensation:
(1)	_____	_____
(2)	_____	_____
(3)	_____	_____
(4)	_____	_____
(5)	_____	_____

(f) Offeror hereby acknowledges and agrees that Offeror shall, at the time of a subcontract or Purchase Order award by Shaw to Offeror that is subject to FAR 52.204-10, provide Offeror's North American Industry Classification System (NAICS) code(s) that (is) are applicable to the specific subcontract or Purchase Order awarded.

PART III- Limitations On Pass Through Charges Certification

For Proposals: FAR 52.215-22, "Limitations on Pass-Through Charges—Identification of Subcontract Effort"

Offeror agrees to abide by the requirements of 52.215-23 as delineated below, and certifies that Offeror, if applicable, has provided or will provide the required information pursuant to the following:

If the Offeror intends to subcontract more than 70 percent of the total cost of work to be performed under its subcontract, the Offeror shall expressly identify the proposed subcontracting effort in its proposal. This statement shall include the amount of the Offeror's indirect costs and profit/fee applicable to the work to be performed by the lower-tier subcontractors, and a description of the added value provided by the Offeror as related to the work to be performed by the lower-tier subcontractor(s).

Offeror shall provide any additional information required FAR 52.215-22.

For Contracts, Subcontracts, Task Orders, Delivery Orders, Purchase Orders, and any other Contract Form: FAR 52.215-23, "Limitations on Pass-Through Charges"

Offeror agrees to abide by the requirements of 52.215.23 as delineated below: The Offeror shall promptly notify the Shaw Subcontract Administrator in writing if

1. The Offeror changes the amount of subcontract effort after award such that it exceeds 70 percent of the total cost of work to be performed under the contract, task order, or delivery order.

   The notification shall identify the revised cost of the subcontract effort and shall include verification that the Offeror will provide added value; or

2. Any lower tier subcontractor changes the amount of lower-tier subcontractor effort after award such that it exceeds 70 percent of the total cost of the work to be performed under its subcontract.

   The notification shall identify the revised cost of the subcontract effort and shall include verification of the subcontractor's added value as related to the work to be performed by the lower-tier subcontractor(s). If the Offeror is unable to provide verification of its added value, it understands and agrees that its indirect costs and profit/fee applicable to the subcontracted work may be unallowable.

Should Offeror report such change notice action, additional information may be required, as delineated in FAR 52.215-23, and Offeror agrees to provide additional information.

CERTIFICATION STATEMENT

By signing below, the contractor hereby certifies and represents that the information provided is current, accurate, and complete. The contractor further certifies that it will notify the Shaw Environmental and Infrastructure, Inc. Procurement Associate of any changes to said information provided.

COMPANY NAME: _____

ADDRESS: _____

PRINTED NAME: _____ AUTHORIZED SIGNATURE: _____

TITLE: _____ DATE:_____ EMAIL ADDRESS: _____

Representations and Certifications – Supplemental for Buy American Act Certificates

Submitting Firm Name: _____

DUNS Number: _____

Supplemental Representations and Certifications as required by Shaw E&I's Prime Contract No. _____

Read each section and complete or check each blank and/or box as appropriate:

The following certifications or notices apply to this solicitation if checked.

1. ☐ The *Buy American Act Certificate* must be completed in solicitations containing the clause FAR 52.225-1 *Buy American Act—Supplies.*

Buy American Act Certificate (FAR 52.225-2) (FEB 2009)

(a) The offeror certifies that each end product, except those listed in paragraph (b) of this provision, is a domestic end product and that for other than COTS items, the offeror has considered components of unknown origin to have been mined, produced, or manufactured outside the United States. The offeror shall list as foreign end products those end products manufactured in the United States that do not qualify as domestic end products. The terms "component," "domestic end product," "end product," "foreign end product," and "United States" are defined in the clause of this solicitation entitled "Buy American Act—Supplies."

(b) Foreign End Products:

Line Item No.:	Country of Origin:

[*List as necessary]*

(c) The Government will evaluate offers in accordance with the policies and procedures of Part 25 of the Federal Acquisition Regulation.

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2. ☐ The *Buy American Act--Free Trade Agreements--Israeli Trade Act Certificate*, must be completed in solicitations containing the clause at FAR 52.225-3 *Buy American Act--Free Trade Agreements--Israeli Trade Act.* If the acquisition value is $25,000 or more but is less than $50,000, use the clause with its Alternate I. If the acquisition value is $50,000 or more but less than $70,079, use the clause with its Alternate II.

Buy American Act -- Free Trade Agreements--Israeli Trade Act Certificate (FAR 52-225-4) (Jan 2005)

(a) The offeror certifies that each end product, except those listed in paragraph (b) or (c) of this provision, is a domestic end product and that the offeror has considered components of unknown origin to have been mined, produced, or manufactured outside the United States. The terms "component," "domestic end product," "end product," "end product of Australia, Canada, Chile, Mexico, or Singapore," "foreign end product," "Israeli end product," and

"United States" are defined in the clause of this solicitation entitled "Buy American Act—Free Trade Agreements—Israeli Trade Act."

(b) The offeror certifies that the following supplies are end products of Australia, Canada, Chile, Mexico, or Singapore or Israeli end products as defined in the clause of this solicitation entitled "Buy American Act-- Free Trade Agreements--Israeli Trade Act"

End Products of Australia, Canada, Chile, Mexico, or Singapore or Israeli End Products:

Line Item No.:	Country of Origin:

[List as necessary]

(c) The offeror shall list those supplies that are foreign end products (other than those listed in paragraph (b) of this provision) as defined in the clause of this solicitation entitled ``Buy American Act--Free Trade Agreement--Israeli Trade Act." The offeror shall list as other foreign end products those end products manufactured in the United States that do not qualify as domestic end products.

Other Foreign End Products

Line Item No.:	Country of Origin:

[List as necessary]

(d) The Government will evaluate offers in accordance with the policies and procedures of Part 25 of the Federal Acquisition Regulation.

(End of provision)

Alternate I (Jan 2004). As prescribed in FAR 25.1101 (b)(2)(ii), substitute the following paragraph (b) for paragraph (b) of the basic provision:

(b) The offeror certifies that the following supplies are Canadian end products as defined in the clause of this solicitation entitled "Buy American Act--Free Trade Agreements--Israeli Trade Act":

Canadian End Products:

Line Item No. _____

[List as necessary]

Alternate II (Jan 2004). As prescribed in FAR 25.1101 (b)(2)(iii), substitute the following paragraph (b) for paragraph (b) of the basic provision:

(b) The offeror certifies that the following supplies are Canadian end products or Israeli end products as defined in the clause of this solicitation entitled "Buy American Act-- Free Trade Agreements--Israeli Trade Act":

Canadian or Israeli End Products

Line Item No.:	Country of Origin:

[List as necessary]

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3. ☐ The *Trade Agreements Certificate*, must be completed in solicitations containing the clause at FAR 52.225-5 *Trade Agreements.*

Trade Agreements Certificate (FAR 52-225-6) (Jan 2005)

(a) The offeror certifies that each end product, except those listed in paragraph (b) of this provision is a U.S.-made or designated country end product, as defined in the clause of this solicitation entitled "Trade Agreements."

(b) The offeror shall list as other end products those supplies that are not U.S.-made or designated country end products.

Other End Products

Line Item No.	Country of Origin:

[*List as necessary*]

(c) The Government will evaluate offers in accordance with the policies and procedures of Part 25 of the Federal Acquisition Regulation. For line items covered by the WTO GPA, the Government will evaluate offers of U.S.-made or designated country end products without regard to the restrictions of the Buy American Act. The Government will consider for award only offers of U.S.-made or designated country end products unless the Contracting Officer determines that there are no offers for such products or that the offers for those products are insufficient to fulfill the requirements of this solicitation.

(End of Provision)

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4. ☐ The *Notice of Buy American Act Requirement--Construction Materials*, applies in solicitations containing the clause at FAR 52.225-9 *Buy American Act --Construction Materials*.

Notice of Buy American Act Requirement--Construction Materials (FAR 52.225-10) (FEB 2009)

(a) Definitions. "Commercially available off-the-shelf (COTS) item", "Construction material," "domestic construction material," and "foreign construction material," as used in this provision, are defined in the clause of this solicitation entitled "Buy American Act--Construction Materials" (FAR clause 52.225-9).

(b) Requests for determinations of inapplicability. An offeror requesting a determination regarding the inapplicability of the Buy American Act should submit the request to the Contracting Officer in time to allow a determination before submission of offers. The offeror shall include the information and applicable supporting data required by paragraphs (c) and (d) of the clause at FAR 52.225-9 in the request. If an offeror has not requested a determination regarding the inapplicability of the Buy American Act before submitting its offer, or has not received a response to a previous request, the offeror shall include the information and supporting data in the offer.

(c) Evaluation of offers.

(1) The Government will evaluate an offer requesting exception to the requirements of the Buy American Act, based on claimed unreasonable cost of domestic construction material, by adding to the offered price the appropriate percentage of the cost of such foreign construction material, as specified in paragraph (b)(3)(i) of the clause at FAR 52.225-9.

(2) If evaluation results in a tie between an offeror that requested the substitution of foreign construction material based on unreasonable cost and an offeror that did not request an exception, the Contracting Officer will award to the offeror that did not request an exception based on unreasonable cost.

(d) Alternate offers.

(1) When an offer includes foreign construction material not listed by the Government in this solicitation in paragraph (b)(2) of the clause at FAR 52.225-9, the offeror also may submit an alternate offer based on use of equivalent domestic construction material.

(2) If an alternate offer is submitted, the offeror shall submit a separate Standard Form 1442 for the alternate offer, and a separate price comparison table prepared in accordance with paragraphs (c) and (d) of the clause at FAR 52.225-9 for the offer that is based on the use of any foreign construction material for which the Government has not yet determined an exception applies.

(3) If the Government determines that a particular exception requested in accordance with paragraph (c) of the clause at FAR 52.225-9 does not apply, the Government will evaluate only those offers based on use of the equivalent domestic construction material, and the offeror shall be required to furnish such domestic construction material. An offer based on use of the foreign construction material for which an exception was requested—

(i) Will be rejected as nonresponsive if this acquisition is conducted by sealed bidding; or

(ii) May be accepted if revised during negotiations.

(End of provision)

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5. ☐ The *Notice of Buy American Act Requirement--Construction Materials under Trade Agreements*, in solicitations containing the clause at FAR 52.225-11 *Buy American Act--Construction Materials under Trade Agreements*. If insufficient time is available to process a determination regarding the inapplicability of the Buy American Act before receipt of offers, use the provision with its Alternate I. For acquisitions valued at $7,804,000 or more, but less than $9,110,318, use the clause with its Alternate II.

Notice of Buy American Act Requirement—Construction Materials Under Trade Agreements (Jan 2005)

(a) Definitions. "Construction material," "designated country construction material," "domestic construction material," and "foreign construction material," as used in this provision, are defined in the clause of this solicitation entitled "Buy American Act--Construction Materials Under Trade Agreements" (FAR clause 52.225-11).

(b) Requests for determination of inapplicability. An offeror requesting a determination regarding the inapplicability of the Buy American Act should submit the request to the Contracting Officer in time to allow a determination before submission of offers. The offeror shall include the information and applicable supporting data required by paragraphs (c) and (d) of FAR clause 52.225-11 in the request. If an offeror has not requested a determination regarding the inapplicability of the Buy American Act before submitting its offer, or has not received a response to a previous request, the offeror shall include the information and supporting data in the offer.

(c) Evaluation of offers.

(1) The Government will evaluate an offer requesting exception to the requirements of the Buy American Act, based on claimed unreasonable cost of domestic construction materials, by adding to the offered price the appropriate percentage of the cost of such foreign construction material, as specified in paragraph (b)(4)(i) of FAR clause 52.225-11.

(2) If evaluation results in a tie between an offeror that requested the substitution of foreign construction material based on unreasonable cost and an offeror that did not request an exception, the Contracting Officer will award to the offeror that did not request an exception based on unreasonable cost.

(d) Alternate offers.

(1) When an offer includes foreign construction material, other than designated country construction material, that is not listed by the Government in this solicitation in paragraph (b)(3) of FAR clause 52.225-11, the offeror also may submit an alternate offer based on use of equivalent domestic or designated country construction material.

(2) If an alternate offer is submitted, the offeror shall submit a separate Standard Form 1442 for the alternate offer, and a separate price comparison table prepared in accordance with paragraphs (c) and (d) of FAR clause 52.225-11 for the offer that is based on the use of any foreign construction material for which the Government has not yet determined an exception applies.

(3) If the Government determines that a particular exception requested in accordance with paragraph (c) of FAR clause 52.225-11 does not apply, the Government will evaluate only those offers based on use of the equivalent domestic or designated country construction material, and the offeror shall be required to furnish such domestic or designated country construction material. An offer based on use of the foreign construction material for which an exception was requested--

(i) Will be rejected as nonresponsive if this acquisition is conducted by sealed bidding; or

(ii) May be accepted if revised during negotiations.

(End of provision)

Alternate I (May 2002). As prescribed in FAR 25.1102(d)(2), substitute the following paragraph (b) for paragraph (b) of the basic provision:

(b) Requests for determination of inapplicability. An offeror requesting a determination regarding the inapplicability of the Buy American Act shall submit the request with its offer, including the information and applicable supporting data required by paragraphs (c) and (d) of FAR clause 52.225-11.

Alternate II (Jan 2005). As prescribed in FAR 25.1102(d)(3), substitute the following paragraphs (a) and (d) for paragraphs (a) and (d) of the basic provision:

(a) Definitions. "Australian, Chilean, or Moroccan construction material," "Caribbean Basin country construction material," "construction material," "domestic construction material," "foreign construction material," "least developed country construction material," and "WTO GPA country construction material," as used in this provision, are defined in the clause of this solicitation entitled "Buy American Act--Construction Materials Under Trade Agreements" (FAR clause 52.225-11).

(d) *Alternate offers.*

(1) When an offer includes foreign construction material, other than WTO GPA country, Australian, Chilean, or Moroccan, least developed country, or Caribbean Basin country construction material, that is not listed by the Government in this solicitation in paragraph (b)(3) of FAR clause 52.225-11, the offeror also may submit an alternate offer based on use of equivalent domestic, WTO GPA country, Australian, Chilean, or Moroccan, least developed country or Caribbean Basin country construction material.

(2) If an alternate offer is submitted, the offeror shall submit a separate Standard Form 1442 for the alternate offer, and a separate price comparison table prepared in accordance with paragraphs (c) and (d) of FAR clause 52.225-11 for the offer that is based on the use of any foreign construction material for which the Government has not yet determined an exception applies.

(3) If the Government determines that a particular exception requested in accordance with paragraph (c) of FAR clause 52.225-11 does not apply, the Government will evaluate only those offers based on use of the equivalent domestic, WTO GPA country, Australian, Chilean, or Moroccan, least developed country, or Caribbean Basin country construction material, and the offeror shall be required to furnish such domestic, WTO GPA country, Australian, Chilean, or Moroccan, least developed country, or Caribbean Basin country construction material. An offer based on use of the foreign construction material for which an exception was requested--

(i) Will be rejected as nonresponsive if this acquisition is conducted by sealed bidding; or

(ii) May be accepted if revised during negotiations.

SIGNATURE/CERTIFICATION*

By signing below, the contractor hereby certifies and represents that the information provided is current, accurate, and complete. The contractor further certifies that it will notify the Shaw Environmental and Infrastructure, Inc. Procurement Associate of any changes to said information provided.

COMPANY NAME: _____

ADDRESS: _____

_____

PRINTED NAME: _____ AUTHORIZED SIGNATURE: _____

TITLE: _____ DATE: _____ EMAIL ADDRESS: _____

Subcontractor Qualification Routing and Approval Sheet

Company Name:		Date Requested:
Address:		Date Received:
Address: Email:		Vendor #:
Contact Name/Phone Number		
Requestor: Name/Location:		
Health and Safety		
Rating ~ (A) Full Qualified ~ (B) Qualified ~ (C) Limited Qualification ~ (D) Qualified for Engineering Design Work ~ (E) Qualified for Equipment Fabrication ~ (F) Unacceptable	Comments:	
Reviewed by	Title	Date
Quality Assurance		
Status ~ Acceptable ~ Unacceptable	Comments:	
Reviewed by	Title	Date
Subcontracts		
Status ~ Acceptable ~ Unacceptable	Comments:	
Reviewed by	Title	Date

1. PURPOSE

This procedure describes the methods and responsibilities for performing and documenting inspections on project work activities and materials to ensure compliance with established requirements.

2. SCOPE

This procedure applies to inspections performed during the course of performing project work activities.

3. REFERENCES

- EI-MAN-Q001, *Quality Management System Manual*
- EIP-Q-004, “Receipt Inspection”
- EIG-Q-007, “Nonconformance Reporting”
- E&I Construction Inspection Procedures & Checklists

4. DEFINITIONS

- **Inspection**—Examination or measurement to verify whether an item or activity conforms to a specified requirement(s).
- **Inspector**—Personnel performing inspection activities with the necessary expertise in the area to be inspected.
- **Record**—A document stating results achieved or providing evidence of activities performed.
- **Definable Feature of Work**—A task that is separate and distinct from other tasks and has separate control requirements.

5. RESPONSIBILITIES

5.1 Responsible Manager

The Responsible Manager or assigned personnel must ensure that an adequate inspection program is established for the work and is in full support of inspection activities. The Responsible Manager is also responsible for scheduling and providing prior notification to inspection personnel when items, systems, or activities requiring inspection are approaching readiness. The Responsible Manager may be the Project Manager, Construction Manager, Project Engineer, or other qualified designated personnel, depending on the project.

5.2 Project Quality Representative

The Project Quality Representative or assigned personnel is responsible for performing or verifying the status of inspections and tests performed during project activities, and for controlling and recording the unique identification of items where traceability is required.

5.3 Inspectors

Inspectors shall be responsible for conducting inspections in accordance with established criteria. Inspectors shall be responsible for maintaining any external credentials/qualifications for performing inspections deemed necessary by responsible management. Inspectors are

responsible for notifying the Responsible Manager if their qualifications have lapsed or if they are no longer qualified to perform a valid inspection.

6. PROCEDURE

6.1 Qualification of Inspectors

The inspector shall have the necessary expertise and qualifications in the area to be inspected and shall be sufficiently independent of the activity performed.

Prior to the performance of inspection activities, personnel designated for that responsibility shall review and be thoroughly familiar with the procedures, regulations, etc. governing the activities to be inspected.

6.2 Inspections

Inspection activities will be used to monitor project activities and materials. The objective of inspections is to determine whether the properties or composition of materials, or performance of activities, are within established requirements. Inspections shall be performed and documented as required by quality control activities and project requirements. Inspections shall be scheduled and performed to prevent unintended use or installation, to provide monitoring, to minimize delays in work, and to identify nonconformances while they are still correctible without significantly impacting work.

6.2.1 Inspection Requirements and Criteria

Inspections shall be performed upon materials or services to determine compliance with contractual, planning, or other requirements. Materials inspections may include evaluating the quality of components, material assemblies, supporting documentation, and/or techniques employed and verifying installation or performance under specified test conditions. Inspections related to services will include continuous monitoring and review of the service provided. Evaluations will be based upon requirements in the contract or other procurement documentation.

Inspection criteria shall be established prior to the inspection and shall be based upon project specifications, requirements, code specifications, and product acceptability. Acceptance criteria shall be adequate for the material or activity and shall be verified during inspection activities.

Inspections may be performed and verified through visual observation, measurement of materials or equipment, examination of documentation/certifications, evaluation of performance, or testing. Testing may be destructive or nondestructive, and it may be performed on samples taken of materials or may be performed in situ.

6.2.2 Inspection Performance and Documentation

The number and extent of Inspections shall be based upon the complexity of the item or task. Inspections shall be documented, preferably through the use of checklists. An example of an inspection checklist is provided in Section 8. A comprehensive series of generic construction inspection procedures can be found on Governance > Policies and Procedures > Quality Assurance Policies and Procedures > Construction Quality Proceduresand checklists may be found on Governance > Policies and Procedures > Environmental & Infrastructure > QA/QC Forms > Construction Quality Forms on the Shaw intranet. Inspections shall consider and document the following, as applicable:

- Name of project and contract or project number
- Type of inspection to be performed
- Evaluation criteria

- Date of the inspection
- Specification, requirement, or process to be examined
- Pass or fail criterion
- Results of inspection
- Identification of inspectors

6.2.3 Receiving Inspection

Receiving inspections include the examination or measurement of materials from suppliers and vendors. A receiving inspection is performed to verify that materials, parts, components, and assemblies meet specifications and contract requirements. This inspection will be performed for materials where specifications and/or quality requirements have been provided in procurement documentation. Additional information regarding procurement and receiving inspections is provided in Procedure No. EIP-Q-004, "Receipt Inspection."

Items and materials that are purchased and brought on site by a subcontractor shall be inspected. The inspection will ensure the items meet the specifications and requirements in planning, contractual, and/or procurement documents.

6.3 Three-Phase Inspection Process

If warranted by contract requirements or the complexity of the project, the Project Quality Representative, in collaboration with the Project Manager, may require implementation of the Three-Phase Inspection process. This process includes preparatory, initial, and follow-up inspections conducted for inspection elements referred to as "Features of Work." Inspections shall be performed as required and shall be documented on the inspection checklist. This approach is further explained in the following sections. A three-phase inspection shall include the requirements as specified in this section as well as the requirements specified in the above preceding sections.above.

6.3.1 Preparatory Inspections

Preparatory inspections will include all the prerequisites prior to starting any feature of work. A preparatory meeting is usually held prior to beginning work on each definable feature of work to ensure that there is a mutual understanding of the level of quality expected. The inspections shall be performed by the Shaw E & I staff and all associated lower-tier subcontractors. These inspections include the following:

- A review of the scope of work, specifications, and contract requirements with project personnel
- Verification that provisions have been made to provide required field control testing and inspection
- Documented tolerances and workmanship standards
- Examination of the work area to ascertain that all preliminary work has been completed
- Verification of field dimensions, lines, and grades
- Physical examination of materials and equipment
- Confirmation of measuring and test equipment calibrations
- Assurance that required hazards analyses and safety inspections have taken place and been passed

6.3.2 Initial Inspections

Initial inspections are performed when work begins on a particular feature of work. An initial phase meeting should be held at the beginning of each definable feature of work. The initial inspections include an examination of the quality of workmanship and a review of control testing for compliance with contract and work plan requirements. The initial inspection will include the following:

- Establishing the quality and level of workmanship required
- Verifying that acceptable workmanship standards and contractual requirements are met
- Verifying required control inspection and testing requirements
- Verifying compliance with the activity hazard analysis and safety plans

Daily reports will be completed to ensure that control activities are working to provide continued compliance until completion of the task. Deficiencies shall be documented in the report. The Responsible Manager will propose corrective actions and ensure their completion. Inspections and test statuses will be clearly indicated on daily reports and inspection records. Nonconforming items shall be clearly marked or identified appropriately.

6.3.3 Follow-up Inspections

Follow-up inspections are performed at appropriate intervals as the work progresses on any particular definable feature of work to verify compliance with contract requirements. As-built drawings will be checked for accuracy as required during this phase. The inspections will continue until completion of that feature of the work. Final follow-up inspections will be conducted and all deficiencies corrected before the start of additional features of work that may be affected by the deficient work.

6.3.4 Reporting

Documentation of completed inspections shall be included in the daily report when required. When appropriate, additional drawings or inspection information may be attached to the inspection documentation.

Items or activities not conforming to inspection acceptance criteria will be resolved and, when determined necessary, documented as a nonconformance in accordance with Procedure No. EIG-Q-007, “Nonconformance Reporting.” The Nonconformance Report should be referenced on the Daily Quality Control Report.

6.4 Disposition and Corrective Actions

Items, activities, or services that do not meet inspection objectives or requirements will be documented, and corrective actions will be performed. Discrepancies discovered during inspection activities will be resolved by corrective actions which must be completed prior to the start of additional work if future work is affected. The extent of corrective actions must be appropriate for the magnitude of the condition and associated risk factors. Discrepancies that meet the criteria for a nonconformance will be handled in accordance with Procedure No. EIG-Q-007.

7. ATTACHMENTS

None

8. FORMS

- EIP-Q-005.01, Inspection Checklist

9. RECORDS

- EIP-Q-005.01, Inspection Checklists/Report
- Nonconformance Report

10. REVISION HISTORY AND APPROVAL

Revision Level Revision Date	Revision Description	Responsible Manager
00 4/14/2003	Initial issue	Cheryl Prince
01 02/15/2007	Reference to: Shaw Procedure No. PR310, Receipt of Supplies, Materials, and Services was added. Definition for Definable Feature of Work was added, responsibility title changes, extensive revision to procedure.	Bryan Koehler
02 01/04/2012	Modified format to align with Governance Management framework. 3.0 Added x-reference for EIP-Q004, Receipt Inspection & generic construction inspection procedures and checklists 6.2.2 Added x-reference for construction inspecton procedures and checklists	Bryan Koehler

Shaw a world of Solutions	Title: Inspection Checklist	Form No: EIP-Q-005.01_2

Uncontrolled when printed: Verify latest version on ShawNet/Governance

PROJECT NAME: [Project Name]	PROJECT NUMBER: [Project Number]	CONTRACT NO: [Contract Number]
LOCATION: [Location]		
FEATURE OF WORK: [Feature of Work]		SPECIFICATIONS: [Specifications]

Requirements/Reference	Hold Pt.*	Org.	Initials	Remarks
Preparatory/Initial/Follow-up (circle one) Inspection				
1.		Shaw E & I		
2.				
3.				
4.				
5.				
6.				
7.				
8.				
9.				
10.				
11.				
12.				
13.				
14.				
15.				
16.				
17.				
18.				
19.				
20.				
21.				
22.				
23.				
24.				
25.				

*Hold Point—Requires the checklist item to be answered YES for conforms or NO for does not conform

Identification of Participating Organizations

Shaw E&I Personnel _____

Shaw E&I Project Contractor Personnel _____

Client Representative _____

_____ _____

Project Quality Representative Date

1. PURPOSE

To establish the system for documentation, processing, disposition, resolution, and control of hardware nonconformances (i.e., component, equipment, material, and processes).

2. SCOPE

This procedure applies to nonconforming product identified during the course of performing project work activities. Nonconformances may be identified during the execution, monitoring and control, or closure phases of a project or activity. The responsibilities and requirements provided in this procedure are applicable for project or programmatic activities. Deviations of program or procedure requirements that do not result in hardware nonconformances or program or process deficiencies that result in a hardware nonconformance should be documented in accordance with EIG-Q-008, Corrective Action Requests.

3. REFERENCES

- EI-MAN-Q001, *Quality Management System Manual*
- EIG-Q-008, “Corrective Action Requests”

4. DEFINITIONS

- **Conformity**—Fulfillment of a requirement.
- **Disposition**—An evaluation or arrangement provided to determine the fate or condition of use of an item, service, or activity.
  - **Rework**—The process by which a nonconformance is corrected and an item made to conform to original requirements.
  - **Repair**—The process of restoring a nonconforming item to a condition such that the item is capable of functioning reliably and safely even though the item does not conform to original specified requirements.
  - **Use-As-Is**—A disposition authorizing a nonconforming item to be used as originally intended without correcting the nonconformance.
  - **Reject/Scrap**—A disposition indicating that the nonconforming item is not fit for its intended use or is uneconomical to correct.
- **Nonconformance/Nonconformity**—A non-fulfillment of a requirement. An item, condition, material, or service that deviates from drawings, specifications, or other project requirements and cannot be corrected readily within the scope of such requirements or that otherwise requires a disposition. A nonconformance is not a deficiency whereby correction is part of the normal course of work outlined in project requirements (e.g., failing density tests that provide an indication of “in-process” work in a given point in time).
- **Correction**—Action to eliminate a detected nonconformity.
- **Corrective Action**—Action(s) to eliminate the cause(s) of a detected nonconformity, or other undesirable situation.

5. RESPONSIBILITIES

5.1 Responsible Manager

The Responsible Manager of the project, product, or service shall ensure further processing is stopped until a disposition is determined and corrective action is implemented. In addition, the Responsible Manager(s) shall ensure the disposition of nonconforming items to include the segregation of nonconforming products, when practical, to prevent unauthorized use, installation, or delivery.

5.2 Project Quality Representative

The Project Quality Representative is responsible for maintaining a status of nonconformance reports at project or program locations. This includes reviewing nonconformances, logging and tracking nonconformance reports (NCRs), and verifying the satisfactory completion and closure of corrective actions. These activities may be performed by oversight or project personnel independent of the activity.

5.3 All Personnel

Any individual assigned to a project or program location that discovers a nonconforming item, product, or service is responsible for initiating a nonconformance report by describing the condition and for notifying appropriate management. A written description should be provided for legitimate nonconformances.

6. PROCEDURE

6.1 General

Identified nonconformances shall be handled in a controlled system to ensure that the deviating condition is corrected as documented in the flowchart in Attachment 1.

In situations where the Quality Representative, Responsible Manager, or other staff determines that continued work would cause damage, jeopardize the safety of personnel, preclude subsequent inspections, or make corrective actions ineffective, work shall be stopped.

6.2 Identification and Reporting of Nonconformances

The identifying individual shall document the description of the nonconforming condition. The condition description will be clearly written after consultation with the responsible supervisor to ensure that the discrepancy is correctly described. Appropriate project criteria to include specifications, requirements, or codes violated must also be referenced to provide sufficient information to facilitate a proper and complete disposition. Sketches, photographs, reports, or other records may be included to supplement the NCR.

When this section of the NCR is completed, the report is sent to the Project Quality Representative for review. The Quality Representative shall review the NCR to ensure that it is complete and the reported condition(s) meets the criteria for a nonconformance. NCRs that are not complete or do not meet the criteria shall be reviewed with the originator to coordinate resolution. The NCR will be voided and filed if it is determined the criteria is not met. If the NCR is determined to be valid, the Quality Representative will assign a unique number or identifier and forward the NCR to the Responsible Manager for determining and documenting the appropriate corrective actions.

The Project Quality Representative shall maintain a status log of open and closed nonconformances. The log will also serve as the basis for numbering each discrepancy and tracking it through closure.

6.3 Disposition

The Responsible Manager shall evaluate the nonconforming characteristics of the item or service and determine the disposition. Disposition may include reject/scrap, use as is, rework, and/or repair. If a design change approval is required to disposition an item that deviates from a design document, the approved design change documentation should be referenced or a copy attached to the NCR.

Nonconforming product shall be dispositioned by one or more of the following ways: taking action to eliminate the detected nonconformity; authorizing its use, release or acceptance under concession by a relevant authority and, where applicable, by the client; taking action to preclude its original intended use or application; or by taking action appropriate to the effects or potential effects, of the nonconformity when nonconforming product is detected after delivery or use has started. The determination shall be documented on the NCR and a technical justification provided by an appropriate authority when the disposition is determined to be “repair” or “use as is.” The Quality Representative shall concur with the disposition.

Whenever practical, nonconforming items should be segregated from conforming items to prevent their inadvertent installation or use. When practical, identification tags or markings should be used to aid in this segregation.

When required by the contract or determined appropriate, the client shall be notified of the nonconformance by the Responsible Manager. The client must be promptly notified of technical errors in work previously completed and submitted to them.

6.4 Corrective Action

The Responsible Manager shall evaluate the nonconforming characteristics and determine the corrective actions for nonconforming items or services. The required section of the NCR shall be completed by the Responsible Manager who shall document the following:

- Corrective actions to be taken. Actions taken shall be appropriate for the nonconformance.
- Personnel responsible for implementing corrective actions.
- Date when necessary actions are to be completed.

The NCR shall be forwarded to the Project Quality Representative for review. If corrective actions are determined appropriate, then personnel responsible for implementation shall perform the corrective action in accordance with the scheduled due date. Extensions of time may be granted by the Project Quality Representative for extenuating circumstances.

After the completion of corrective actions, the Responsible Manager shall document the resolution on the NCR form, sign the form, and forward it to the Quality Representative. Any objective evidence of the corrective actions shall be included.

6.5 Verification and Closeout

Satisfactory resolution of nonconformances must be verified by the Quality Representative. The Quality Representative shall do the following to achieve resolution:

- Initiate an inspection and/or a review of objective evidence to verify satisfactory completion of the corrective action
- Sign off the NCR, if the work is satisfactory, and remove identification tags or markings as applicable

NCRs are not to be closed until the required corrective measures have been completed to the satisfaction of the Quality Representative. Nonconformances will be monitored until the action is verified as complete and closed as documented on the NCR.

6.6 Records

The original, signed NCR form and associated documentation shall be retained in the project records.

7. ATTACHMENTS

- Attachment 1, Nonconformance Process Flowchart

8. FORMS

- EIG-Q-007.01, Nonconformance Report

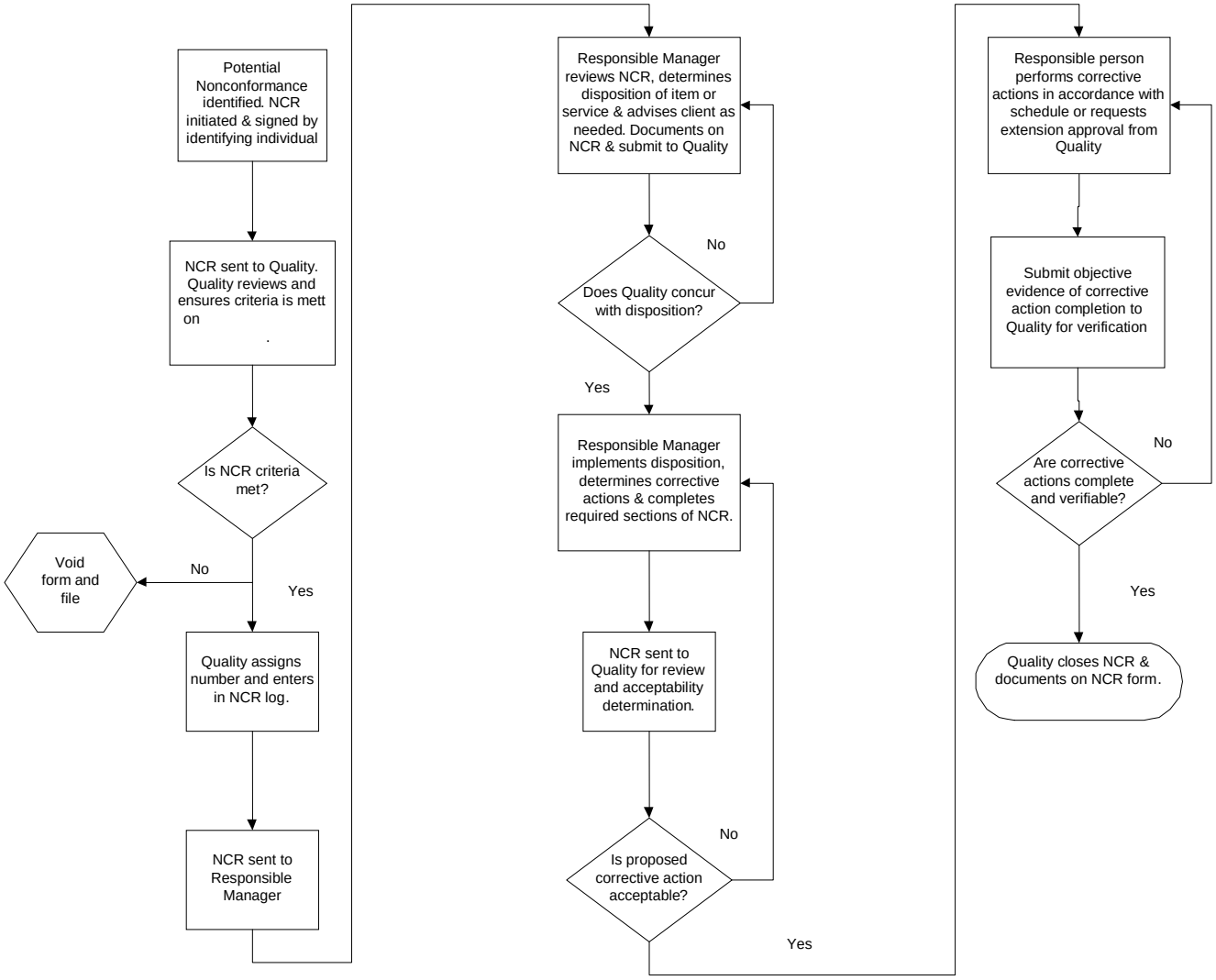
9. RECORDS

- EIG-Q-007.01, Nonconformance Report

10. REVISION HISTORY AND APPROVAL

Revision Level / Revision Date	Revision Description	Responsible Manager
00 04/14/2003	Initial Issue.	Cheryl Prince
01 02/15/2007	Sections 1 & 2 had minor changes, Section 5 Responsibilities was updated. Major re-write of procedure. Attachment 1, Nonconformance Process Flowchart was added.	Bryan Koehler
02 01/06/2012	Sections 1 & 2 minor changes. Definitions were added for Conformity, Rework, Repair, Use-As-Is, Reject/Scrap, and Correction. Updated Responsibilities. Major re-write of procedure. Modified format to align with Governance Management framework.	Bryan Koehler

Attachment 1
Nonconformance Process Flowchart



Shaw a world of Solutions	Title: Nonconformance Report	Form No: EIG-Q-007.01_2

Uncontrolled when printed: Verify latest version on ShawNet/Governance

1) NCR Number:	**2) Project Name and Number (include location):**	**3) Date:**

4) Nonconformance Description And Reference: (Specification __ Drawing __ Code __)

Identified by: _____ **Date**_____

Reviewed By: _____ **Date**_____

(Project Quality Representative)

5) Disposition of Nonconforming Condition (Indicate disposition type):
1) Rework, 2) Repair, 3) Use As Is, 4)Reject/Scrap (Note: Use-As-Is or Repair determinations must be technically justified)5)Other (e.g., Return to Supplier)

Evaluated by: _____ **Date**_____

Responsible Manager

Concurrence: _____ **Date** _____

Quality Representative

6) Corrective Action(s) to be taken (include date when action(s) will be complete):

Corrective Action to be Performed by: _____**Due Date**_____

Responsible Manager: _____**Date**_____

Reviewed by: _____ **Date** _____

Quality Representative

7) Client Notification Required: _____ **Yes** _____**No** **Date Notified:** _____

8) Corrective Action Completion

Comments:

Responsible Manager: _____**Date**_____

9) Corrective Action(s) Completion Verification and Date:

Comments:

Reviewed and Closed By: _____ **Date**_____

(Project Quality Representative)

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • February 2012 • WERC-09-13-019

Appendix D
Site-Specific SAP/QAPP Worksheets

Final
Site-Specific Sampling and Analysis Plan/Quality Assurance Project Plan
RCRA Facility Investigation
Group 2 – Five Former Underground Storage Tank Sites
Holloman Air Force Base, New Mexico

Prepared for U.S. Air Force Center for Engineering and the Environment
2261 Hughes Ave., Suite 155
Lackland Air Force Base, Texas 78236-9861

Prepared by Shaw Environmental & Infrastructure, Inc.
1401 Enclave Parkway, Suite 250
Houston, Texas 77077

Contract No. FA8903-09-D-8580, Task Order No. 0013
Project No. 144106
Revision 0
February 2012

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SITE-SPECIFIC SAP/QAPP WORKSHEET #1 – TITLE PAGE

Site-Specific Sampling and Analysis Plan/ Quality Assurance Project Plan

RCRA Facility Investigation
Group 2 – Five Former Underground Storage Tank Sites
Holloman Air Force Base, New Mexico

February 2012

Prepared for

U.S. Air Force Center for Engineering and the Environment
2261 Hughes Ave., Suite 155
Lackland Air Force Base, Texas 78236-9861

Prepared by

Shaw Environmental & Infrastructure, Inc.
1401 Enclave Parkway, Suite 250
Houston, Texas 77077

CONTENTS

Section **Page**

Site-Specific SAP/QAPP Worksheet **Page**

CONTENTS (Concluded)

Site-Specific SAP/QAPP Worksheet **Page**

ACRONYMS AND ABBREVIATIONS

>	Greater than
<	Less than
AFB	Air Force Base
AFCEE	Air Force Center for Engineering and the Environment
°C	degrees Celsius
CAC	Corrective Action Complete
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CAS	Chemical Abstract Service
CCB	continuing calibration blank
CCC	Calibration check compounds
CCV	Continuing calibration verification
CVAA	Cold vapor atomic absorption
CFR	Code of Federal Regulations
COC	constituent of concern
C-O-C	chain-of-custody
CY	cubic yard
%D	Percent Difference
DDT	dichlorodiphenyltrichloroethane
DERA	Defense Environmental Restoration Account
DFTPP	decafluorotriphenylphosphine
DOD	U.S. Department of Defense
DOT	U.S. Department of Transportation
DQO	Data Quality Objective
DRO	Diesel Range Organics
DUP	matrix duplicate
EDD	electronic data deliverable
ELAP	Environmental Laboratory Accreditation Program
EPA	U.S. Environmental Protection Agency
ERPIMS	Environmental Restoration Program Information Management System
°F	degrees Fahrenheit
FD	field duplicate
FedEx	Federal Express
ft	foot (feet)
FR	Federal Register
g	gram(s)
GC/MS	gas chromatograph(y)/mass spectrometer (spectroscopy)
GRO	Gasoline Range Organics

ACRONYMS AND ABBREVIATIONS (Continued)

HAZWOPER	hazardous waste operations and emergency response
HCl	hydrochloric acid
Hg	Mercury
HNO_3	nitric acid
HSA	hollow stem auger
HWB	Hazardous Waste Bureau
ICAL	Initial calibration
ICP	inductively coupled plasma
ICS	interference check
ICV	Initial calibration verification
ID	identification
IDW	investigation-derived waste
LCD	laboratory control duplicate
LCS	laboratory control sample
LCSD	laboratory control sample duplicate
L/min	liter per minute
LOD	limit of detection
LOQ	limit of quantitation
MCL	maximum contaminant level
MDL	minimum detection limit
MeOH	methanol
µg/kg	microgram per kilogram
µg/L	microgram per liter
mg/kg	milligrams per kilogram
mg/L	milligrams per liter
mL	milliliter(s)
mL/min	milliliter per minuteMS/MSD matrix spike/matrix spike duplicate
MSA	Method of Standard Addition
NA	not applicable or not available
ND	not detected
NE	not established
NM	New Mexico
NMAC	
NMWQCC	New Mexico Water Quality Control Commission
NMED	New Mexico Environment Department
ORO	Oil Range Organics
OPR	oxidation reduction potential
OSHA	Occupational Safety and Health Administration
OVA	organic vapor analyzer
oz	ounce

ACRONYMS AND ABBREVIATIONS (Continued)

PBR	performance-based remediation
PCP	pentachlorolphenol
PDS	post-digestion spike
PID	photoionization detector
PM	Project Manager
PMP	Project Management Plan
PQO	Project Quality Objective
QA	quality assurance
QAPP	Quality Assurance Project Plan
QC	quality control
QL	quantitation limit
QPP	Quality Program Plan
QSM	Quality Systems Manual
%R	% Recovery
RCI	Reactivity, toxicity, ignitability
RF	Response factor
RCRA	Resource Conservation and Recovery Act
RFI	RCRA Facility Investigation
RL	Reporting limit
RDW	remediation-derived waste
RPD	relative percent difference
RSD	Relative Standard Deviation
RSL	regional soil level
SAP	Sampling and Analysis Plan
Shaw	Shaw Environmental & Infrastructure, Inc.
SOP	Standard Operating Procedure
SPCC	System performance check compounds
SSHP	Site Safety and Health Plan
SSL	soil screening level
S.U.	Standard unit
SVOC	semivolatile organic compound
TAL	target analyte list
TBD	to be determined
TCL	target compound list
TCLP	toxicity characteristic leaching procedure
TDS	total dissolved solids
TIC	tentatively identified compound
TPH	total petroleum hydrocarbons

ACRONYMS AND ABBREVIATIONS (Concluded)

UFP	Uniform Federal Policy
UPS	United Parcel Service
UST	underground storage tank
VCM	Voluntary Corrective Measure
VOA	volatile organic analysis
VOC	volatile organic compound
XA	Concentration in the matrix spike sample
XB	Concentration in the matrix spike duplicate sample
XM	Average value of the concentrations of matrix spike and matrix spike duplicate

Executive Summary

A Resource Conservation and Recovery Act (RCRA) Facility Investigation (RFI) will be performed on five former underground storage tank (UST) sites located at Building 2395 (TU/US-C502), Building 1272 (TU/US-C507), Building 882 (TU/US-C514), Building 889 (TU/US-C515), and Building 684 (TU/US-C516), at Holloman Air Force Base (AFB), New Mexico, which are also referred to as the Group 2 UST sites under the Midwestern Region Performance-Based Remediation (PBR) Contract with the Air Force Center for Engineering and the Environment (AFCEE). Site descriptions for the former USTs are presented in Table 1-1 of the RFI Work Plan. The RFI Work Plan has been prepared pursuant to the requirements of the Holloman AFB Hazardous Waste Facility RCRA Permit Number NM6572124422 (the Permit) (New Mexico Environment Department [NMED], 2004).

The objective of this RFI at each of the five former UST sites is to delineate potential constituents of concern (COCs) that may have been released to the environment, and provide physical and spatial data to allow for design and implementation of future remedial measures as required.

Project quality objectives for each UST site consist of the following:

- Gather and review of all site historical information
- Identify UST components and historical uses
- Communicate and gain acceptance of planned investigatory measures with all stakeholders
- Determine the nature and extent of potential COCs at each system
- Evaluate the risk at each site
- Develop of remedial options for each site

The tasks described in this project technical plan will be performed in accordance with the Quality Program Plan (QPP) (Shaw, 2012). The QPP contains the Site Safety and Health Plan (SSHP) which describes the health and safety guidelines developed by Shaw to protect Shaw personnel, subcontractors, and government personnel involved in the project at Holloman AFB. The Uniform Federal Policy (UFP)–Sampling and Analysis Plan (SAP)/Quality Assurance Project Plan (QAPP) was prepared in accordance with the *Uniform Federal Policy (UFP) for Quality Assurance Project Plans (QAPPs): Evaluating, Assessing, and Documenting Environmental Collection and Use Programs Part 2A: UFP-QAPP Workbook* (Intergovernmental Data Quality Task Force, 2005). The UFP-SAP/QAPP presented in the QPP establishes the analytical and data collection protocols and documentation requirements necessary to ensure data are generated, reviewed, and analyzed in a consistent manner.

SITE-SPECIFIC SAP/QAPP WORKSHEET #2 – SAP/QAPP IDENTIFYING INFORMATION

Site Name/Number:	Five underground storage tank (UST) sites at Holloman Air Force Base (AFB) (Group 2)
Site Location:	Multiple locations – Group 2 USTs.
Contractor Name:	Shaw Environmental & Infrastructure, Inc. (Shaw)
Contract Number:	FA8903-09-D-8580-0013, Task Order 0013, Modification 01, Midwestern Region Performance-Based Remediation (PBR)
Contract Title:	PBR Task Order for the Midwestern Region: Holloman AFB
Work Assignment Number:	Shaw Project Number 144106

1. This Site-Specific Sampling and Analysis Plan (SAP)/Quality Assurance Project Plan (QAPP) was prepared in accordance with the requirements of the following documents:

   - *Uniform Federal Policy (UFP) for Quality Assurance Project Plans (QAPPs): Evaluating, Assessing, and Documenting Environmental Collection and Use Programs Part 2A: UFP-QAPP Workbook* (Intergovernmental Data Quality Task Force, 2005)
   - *Guidance on Systematic Planning Using the Data Quality Objectives Process, United States (U.S.) Environmental Protection Agency (EPA) QA/G-4* (EPA, 2006)
   - *U.S. Department of Defense (DOD) Quality Systems Manual (QSM) for Environmental Laboratories, Version 4.2* (DOD, 2010)
   - *EPA Guidance for Quality Assurance Project Plans*, *EPA QA/G-5*, (EPA, 2002)
   - *EPA Requirements for Quality Assurance Project Plans*, EPA QA/R-5, (EPA, 2001)

2. Identify regulatory program: Following the Resource Conservation and Recovery Act (RCRA) process as administered by the New Mexico Environment Department (NMED). All tasks will be performed in accordance with the Holloman AFB, RCRA Permit NM6572124422-2, prepared and administered by the NMED, Hazardous Waste Bureau (HWB), Santa Fe, New Mexico (NM), Holloman AFB Standard Operating Procedures (SOPs), and Shaw SOPs.

3. 4. List dates of scoping sessions that were held:

Scoping Session	Date
Scoping sessions have not yet been held.	Not Applicable
A project kick-off meeting took place in San Antonio, Texas	October 11, 2011

5. List dates and titles of any SAP/QAPP documents written for previous site work that are relevant to the current investigations.

Title	Date
Hazardous Waste Facility Permit for Holloman AFB, RCRA Permit NM6572124422-2, prepared by the NMED, HWB, Santa Fe, NM.	NMED, February 2004

6. List organizational partners (stakeholders) and connection with lead organization:

Oversight by the NMED HWB at Holloman AFB sites

Oversight by the Air Force Center for Engineering and the Environment (AFCEE)

Oversight by the EPA, Region 6 (New Mexico)

7. Lead organization

AFCEE

8. If any required SAP/QAPP elements or required information are not applicable to the project or are provided elsewhere, then note the omitted SAP/QAPP elements and provide an explanation for their exclusion below:

This Site-Specific SAP/QAPP contains worksheets (WS) applicable to the collection, sampling, and analysis of soil and groundwater samples to be collected at five UST locations at Holloman AFB.

UFP-SAP/QAPP Worksheet #	Required Information	Crosswalk to Related Information
A. Project Management		
Documentation		
1	Title Page	Site-specific SAP/QAPP
2	Table of Contents; SAP/QAPP Identifying Information	Site-specific SAP/QAPP
3	Distribution List	PMP
4	Project Personnel Sign-Off Sheet	Site-specific SAP/QAPP
Project Organization		
5	Project Organizational Chart	PMP Figure 2-1
6	Communication Pathways	PMP Chapter 2.0
7	Personnel Responsibilities and Qualifications Table	PMP Table 2-2
8	Special Personnel Training Requirements Table	Site-specific SAP/QAPP
Project Planning/Problem Definition		
9	Project Planning Session Documentation (including Data Needs tables); Project Scoping Session Participants Sheet	Site-specific SAP/QAPP
10	Problem Definition, Site History, and Background. Site Maps (historical and present)	RFI Work Plan Section 1.0 and 2.0; Site-specific SAP/QAPP
11	Site-specific Project Quality Objectives	RFI Work Plan Section 1.0; Site-specific SAP/QAPP
12	Measurement Performance Criteria Table	Site-specific SAP/QAPP
13	Sources of Secondary Data and Information Secondary Data Criteria and Limitations Table	PMP Chapter 1.0, Section 1.3; Site-specific SAP/QAPP
14	Summary of Project Tasks	RFI Work Plan Section 3.0; Site-specific SAP/QAPP
15	Reference Limits and Evaluation Table	Site-specific SAP/QAPP
16	Project Schedule/Timeline Table	RFI Work Plan Section 6.0 (Project Schedule)
B. Measurement Data Acquisition		
Sampling Tasks		
17	Sampling Design and Rationale	RFI Work Plan Section 3.0
18	Sampling Locations and Methods/SOP Requirements Table Sample Location Map(s)	RFI Work Plan Section 3.0; Site-specific SAP/QAPP
19	Analytical Methods/SOP Requirements Table	RFI Work Plan Section 3.0; Site-specific SAP/QAPP
20	Field QC Sample Summary Table	RFI Work Plan Section 3.0; Site-specific SAP/QAPP
21	Project Sampling SOP References Table Sampling SOPs	RFI Work Plan Section 3.0
22	Field Equipment Calibration, Maintenance, Testing, and Inspection Table	Site-specific SAP/QAPP
Analytical Tasks		
23	Analytical SOPs Analytical SOP References Table	RFI Work Plan Appendix C
24	Analytical Instrument Calibration Table	RFI Work Plan Appendix A
25	Analytical Instrument and Equipment Maintenance, Testing, and Inspection Table	RFI Work Plan Appendix A
Sample Collection		
26	Sample Handling System, Documentation Collection, Tracking, Archiving and Disposal Sample Handling Flow Diagram	RFI Work Plan Section 3.0; Site-specific SAP/QAPP
27	Sample Custody Requirements, Procedures/SOPs, Sample Container Identification Example Chain-of-Custody Form and Seal	RFI Work Plan Section 3.0; Site-specific SAP/QAPP
Quality Control Samples		
28	QC Samples Table Screening/Confirmatory Analysis Decision Tree	RFI Work Plan Section 4.0; Site-specific SAP/QAPP

UFP-SAP/QAPP Worksheet #	Required Information	Crosswalk to Related Information
Data Management Tasks		
29	Project Documents and Records Table	RFI Work Plan Section 3.0; Site-specific SAP/QAPP
30	Analytical Services Table Analytical and Data Management SOPs	RFI Work Plan Section 3.0; Site-specific SAP/QAPP
C. Assessment Oversight		
31	Planned Project Assessments Table Audit Checklists	Site-specific SAP/QAPP
32	Assessment Findings and Corrective Action Responses Table	Site-specific SAP/QAPP
33	QA Management Reports Table	Site-specific SAP/QAPP
D. Data Review		
34	Verification (Step I) Process Table	RFI Work Plan Appendix A
35	Validation (Steps IIa and IIb) Process Table	RFI Work Plan Appendix A
36	Validation (Steps IIa and IIb) Summary Table	RFI Work Plan Appendix A
37	Usability Assessment	RFI Work Plan Appendix A

PMP Project Management Plan.
QA Quality assurance.
QC Quality control.
RFI RCRA Facility Investigation.
SAP Sampling and Analysis Plan.
SOP Standard Operating Procedure.
UFP Uniform Federal Policy.

SITE-SPECIFIC QAPP WORKSHEET #4 – PROJECT PERSONNEL SIGN-OFF SHEET
RCRA FACILITY INVESTIGATION
GROUP 2 – FIVE FORMER UNDERGROUND STORAGE TANK SITES
HOLLOMAN AIR FORCE BASE, NEW MEXICO

The Project Personnel Sign-Off Sheet will be used to document that key project personnel overseeing and/or performing site work have read the applicable sections of the site-specific SAP/QAPP worksheets and will perform the sampling and analysis tasks as described.

Project Personnel	Organization/Title/Role	Telephone Number	Signature*	Date Site-Specific SAP/QAPP Read
Kathleen Romalia	Shaw Project Manager	720-554-8207		
Christopher Long	Shaw Senior Scientist	281-531-3179		
Subramanyam "Van" Vangala	Shaw Senior Engineer	281-531-3159		
William Foss	Shaw Senior Scientist	281-531-3180		
Maqsud Rahman	Shaw Project Chemist	513-782-4859		
Dezbah Tso-Jesus	Shaw Regulatory Specialist	505-262-8718		
Mark Weisberg	Shaw Risk Assessor	412-858-3996		
Craig Givens	Shaw Quality Control Specialist	505-262-8742		
David Mummert	Health and Safety Manager	419-425-6129		
Sue Bell	Laboratory Project Manager	813-741-3338		
Svetlana Izosimova	Laboratory Quality Assurance Manager	407-425-6700		

*I have read and I understand this site-specific SAP/QAPP and will perform the tasks as described.

Please forward the original signed form with all columns completed to Shaw Environmental & Infrastructure, Inc., c/o Craig Givens – 2440 Louisiana Blvd NE, Suite 300, Albuquerque, NM 87110 or forward an electronic version via e-mail to Craig.Givens@shawgrp.com for the project files upon completion.

SITE-SPECIFIC SAP/QAPP WORKSHEET #8 – SPECIAL PERSONNEL TRAINING REQUIREMENTS

All field personnel will be required to have completed the Occupational Safety and Health Administration (OSHA) 40-hour Hazardous Waste Operations and Emergency Response (HAZWOPER) Standard Protection training, continued 8-hour HAZWOPER and submit to annual medical surveillance, as required by OSHA. The Shaw Site Health and Safety Manager will be responsible for ensuring that training and/or certification is met and that qualified personnel are performing the work.

Sample collection activities will be performed by field technicians, chemists, geologists, or qualified subcontractors. The field technicians will be trained and monitored by the Project Chemist or Installation Leads while performing any sampling tasks.

The laboratory will have an established policy and procedure on training and documenting of the analyst's competency. Each staff member who performs sample preparation and analysis will demonstrate his or her proficiency through preparation and analysis of four Laboratory Control Samples (LCSs) as described in EPA SW-846 (EPA, 1986). Analysts will be considered proficient if the acceptance criteria for method accuracy and precision are met. The laboratory will maintain all training records on file.

There are no specialized/non-routine site-specific training requirements or certifications needed by personnel in order to successfully complete the Holloman AFB RCRA Facility Investigation (RFI) for five former UST sites (Group 2). Routine OSHA or sampling training requirements are not required elements of this worksheet.

SITE-SPECIFIC SAP/QAPP WORKSHEET #9 – PROJECT SCOPING SESSION PARTICIPANTS SHEET

Worksheet #9 will be used to document (to the extent practicable) information about project scoping sessions. This worksheet will be used to identify team members that are responsible for planning the project. If this worksheet is not used for site-specific SAP/QAPPs then the crosswalk table (Worksheet #2) should be used to identify where information about scoping can be found. The information for this worksheet will be provided, as applicable, in each site-specific SAP/QAPP.

Project Name: Midwestern Region PBR	Site Name:
Projected Date(s) of Sampling: To Be Determined (TBD)	Site Location: Holloman AFB, NM
Project Manager: Kathleen Romalia	

Date of Session: Project Scoping Session To Be Determined

Scoping Session Purpose:

Name	Title	Affiliation	Phone #	E-mail Address	Project Role

Comments/Decisions:

Action Items:

Consensus Decisions:

SITE-SPECIFIC SAP/QAPP WORKSHEET #10 – PROBLEM DEFINITION

Table 1-1 in the Project Management Plan (PMP) lists the programmed Midwestern Region PBR sites for Holloman AFB, the proposed performance objective, and the planned technical approaches. Site-specific SAP/QAPP Worksheet #10 addresses elements of SAP/QAPP Worksheets #10 and #11, the project problem definitions and quality objectives/systematic planning process. The Quality Assurance (QA) objectives are expressed in terms of project data quality objectives (DQOs). DQOs are qualitative and quantitative statements that clarify the project objectives; specify the most appropriate type of data for the project decisions; determine the most appropriate conditions from which to collect data; and specify tolerable limits on decision errors. DQOs are based on the end uses of the data and are determined through a seven-step process as described in EPA QA/G-4 (EPA, 2006).

10.1 DQO Process

Problem Definition

The RFI Work Plan presents the approach for remediation and closure of five former UST sites at Holloman AFB, NM (Group 2). The former UST sites are located at Building 2395 (TU/US-C502), Building 1272 (TU/US-C507), Building 882 (TU/US-C514), Building 889 (TU/US-C515), and Building 684 (TU/US-C516). The RFI is being submitted concurrently with a Voluntary Corrective Measure (VCM) Request for corrective action at these sites. The RFI will be implemented at any of the five former UST sites that require additional soil removal than that proposed in the VCM.

The objective of this RFI at each of the five former UST sites is to delineate potential constituents of concern (COCs) that may have been released to the environment, and provide physical and spatial data to allow for design and implementation of future remedial measures as required.

Holloman AFB has prepared this RFI Work Plan pursuant to the requirements of the Holloman AFB RCRA Permit (NM6572124422) issued by the NMED HWB in February 2004. Permit No. NM6572124422 (the Permit) is for operating a hazardous waste storage facility on the Installation. The Permit discusses the requirements for corrective actions and investigations of the Solid Waste Management Units. The NMED has primary regulatory responsibility for these sites, and investigations must be performed under the guidelines of Title 20 of the New Mexico Administrative Code (NMAC).

In support of the removal of petroleum-contaminated soils and the assessment of potentially impacted groundwater at the five former UST sites, the general scope of work included in the RFI Work Plan.

All details relating to the RFI Work Plan's goals, informational inputs, boundaries, analytical inputs, performance and acceptance criteria, and plan for obtaining data can be found in the RFI Work Plan document.

SITE-SPECIFIC SAP/QAPP WORKSHEET #11 – PROJECT QUALITY OBJECTIVES/SYSTEMATIC PLANNING PROCESS STATEMENTS

The Project Quality Objectives (PQOs) may be presented in text or table format. Site-specific PQOs will be established and documented in site-specific plans.

Who will use the data?

Data will be used by the project team and will be reviewed, as applicable, by: the U.S. Air Force at Holloman AFB; AFCEE; and the regulatory body NMED.

What will the data be used for?

This approach includes soil and groundwater sampling, soil trenching and excavation, site boundary survey, and culminating in petitioning for a change in status from Corrective Action Required to Corrective Action Complete (CAC), and Class III Permit modification. Data will be collected to fill data gaps related to previous investigations, evaluate remedial action alternatives for each applicable site, monitor the effectiveness of applied technologies (as applicable), and determine achievement of Remedial Goals.

What types of data are needed? *(Define parameters/matrices.)*

Necessary data types are explained in RFI Work Plan, Sections 3.0.

How "good" do the data need to be in order to support the environmental decision? *(Screening or Definitive?)*

As defined in the EPA guidance document entitled *Guidance on Systematic Planning Using the Data Quality Objectives Process* (EPA, 2006), DQOs are qualitative and quantitative statements that specify the quality of data required to support decisions during investigation and remedial response activities. This guidance and the DQO process were developed specifically for the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) but may be also applied to RCRA sites. DQOs are applicable to all data collection activities, and the level of detail and data quality needed will vary based on the intended uses of the data.

Remediation activities and supporting investigations at the Midwestern Region PBR sites will require the collection of different kinds of data for each site, including both qualitative and quantitative data. From the DQO perspective, quantitative data will be categorized as screening data (data of sufficient quality to support an intermediate or preliminary decision but must eventually be supported by definitive data) or definitive data (analytical data that are suitable for final decision making).

Definitive site-specific data may be required to support engineering decisions, document confirmatory sampling, and make a determination for site closure. Screening data may be collected to support health and safety operations and make qualitative assessments in the field. Determination of data needs is provided in the RFI Work Plan Section 3.0.

How much data are needed? *(Number of samples for each analytical group, matrix, and concentration)*

All data quantities and types are listed in Worksheets #18 and #20.

Where, when, and how should the data be collected/generated?

Sampling requirements are defined in the RFI Work Plan, Section 4.0.

Who will collect and generate the data?

Project team personnel will collect all field samples, and samples will be sent to an approved off-site laboratory for analysis.

How will the data be reported?

Field data will be recorded in field logbooks/log sheets. Copies of laboratory analytical reports will be sent to the Project Chemist, including an electronic copy of the electronic data deliverable (EDD) that can be uploaded into an analytical database.

Laboratory data will be reviewed on an ongoing basis. All data reported by the laboratory will undergo a three-tiered internal review process by the analyst, a peer or supervisor review, and a project management review before being sent to the Task Manager and Data Coordinator for additional project review. In the data review process, the data are compared to information such as the sample history, sample preparation, and quality control (QC) sample data to evaluate the validity of the results.

How will the data be archived?

All data will be stored in the project central files records management system (as either hard copies or electronic copies).

Site-Specific SAP/QAPP Worksheet #11 – Project Quality Objectives/Systematic Planning Process Statements

Objective	Discussion
State the Problem	Although the USTs at the sites have been removed, unknown quantities of COCs may be present in soil and groundwater at concentrations above Holloman AFB cleanup levels. Investigation and delineation of COCs in soil and groundwater is necessary. Excavation of soils exceeding COCs may be necessary to gain site closure.
Identify the Decision	Has all impacted soil been removed from the site, and are remaining concentrations for target analyte list (TAL) metals, volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), total petroleum hydrocarbons (TPH)-diesel range organics (DRO), TPH-gasoline range organics (GRO), and TPH-oil range organics (ORO) below Holloman AFB cleanup levels and screening guidelines? Actions that may result from the decision include: 1. Yes, site closure through corrective action complete. 2. No, perform further excavations to remove up to 40 CY of impacted soil. 3. If volumes exceed 40 CY, stop work and perform additional investigation to define extent and volume of impacted soil (proceed to RFI).
Identify Inputs to the Decision	1. Results of the VCM investigation. 2. Historical background, current site information, and site-specific operational layouts. 3. Geologic, hydrologic, and soil data from published sources, previous investigations, and field observations. 4. Chemical contaminant concentration data in soil. COCs consist of TAL metals, VOCs, SVOCs, TPH-DRO/GRO/ORO. 5. Holloman AFB cleanup levels[a] 6. NMED residential soil screening levels (SSLs)[b]. 7. EPA RSLs[c]. 8. NMED-approved background concentrations for metals[d]. 9. New Mexico Water Quality Control Commission (NMWQCC) groundwater quality standards[e].

Objective	Discussion
	10. EPA maximum contaminant levels (MCLs)[f].
Define the Study Boundaries	The study boundaries are defined as follows: Horizontal: Soil excavation footprint Vertical: Two feet below the depth of contamination.
Develop Decision Rules	1. If concentrations for TAL metals, VOCs, SVOCs, TPH-DRO, TPH-ORO, and TPH-GRO in confirmation soil samples are below the Holloman AFB cleanup levels then the site will be recommended for corrective action complete without controls. 2. If some of the COC concentrations are found in confirmation soil samples above Holloman AFB cleanup levels, continue excavation up to a maximum of 40 CY. 3. If contaminated soil exceeds 40 CY, proceed to RFI.

Site-Specific SAP/QAPP Worksheet #11 – Project Quality Objectives/Systematic Planning Process Statements (Concluded)

Objective	Discussion
Specify Limits on Decision Errors	1. If sample analytical data from confirmation soil samples show false positive indicators, that is, the presence of COCs in soil when truly none are present, this could result in additional investigation when none is required. QC procedures followed in the field and laboratory, as well as the data from QC sample analyses, will minimize the probability of making the decision for additional investigation based on false positive data. 2. A false negative decision error, that is, failing to detect and measure COCs present in confirmation soil samples, could result in site closure determination when further investigation is warranted. The sampling plan design and QC procedures employed minimize the probability of making a false negative decision error. The investigation is designed to detect and measure COCs in the most likely exposure pathways.
Optimize the Sampling Design	1. Representative soil samples will be collected using a hand auger or disposable scoop per Shaw standard operating procedures. Three groundwater monitoring wells will be installed using HSA drilling techniques at each UST site. Fifteen boreholes will be sampled at the following intervals: 0 to 2 feet, the interval with the highest OVA field screen result, and immediately above groundwater. A total of 45 soil samples will be collected during monitoring well installation from the following intervals: 0 to 2 feet, the interval with the highest OVA field screen result, and immediately above groundwater. 2. Visual observations and PID measurements will be used to help guide the excavations. 3. Confirmation samples will be analyzed for TAL metals, TPH-DRO/GRO/ORO, VOCs, and SVOCs.

[a]NMED 2010, Hazardous Waste Facility Permit for Holloman Air Force Base, RCRA Permit NM6572124422-2, NMED HWB, Santa Fe, New Mexico.
[b]NMED 2012, Risk Assessment Guidance for Site Investigation and Remediation, Volume I, Tier 1: Soil Screening Guidance Technical Background Document, NMED, February.
[c]EPA 2011, EPA Regions 3, 6, and 9, Regional Screening Levels for Chemical Contaminants at Superfund Sites. http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/index.htm, accessed October 2011.
[d]NMED 2011, "Partial Approval, Basewide Background Study Report, January 2009, Holloman AFB, EPA ID# NM6572124422, HWB-HAFB-09-004," letter to D. Scruggs, Chief, Environmental Restoration Program, Holloman AFB from J.E. Kieling, Acting Chief, HWB, NMED, August 12, 2011.
[e]NMWQCC, 2002, Ground and Surface Water Protection, 20.6.2 New Mexico Administrative Code.
[f]EPA 2010, National Primary Drinking Water Regulations: List of Drinking Water Contaminants and Maximum Contaminant Levels: http://www.access.gpo.gov/nara/cfr/waisidx_10/40cfr141_10.html.

AFB	Air Force Base.
COC	Constituents of concern.
CY	Cubic yards.
DRO	Diesel range organics.
EPA	U.S. Environmental Protection Agency.
GRO	Gasoline range organics.
HSA	Hollow stem auger.
HWB	Hazardous Waste Bureau
MCL	Maximum contaminant level.
NMED	New Mexico Environment Department.
NMWQCC	New Mexico Water Quality Control Commission.
ORO	Oil range organics.
OVA	Organic vapor analyzer.
PID	Photoionization detector.
QC	Quality Control.
RCRA	Resource Conservation and Recovery Act.
RFI	RCRA Facility Investigation.
RSL	Regional soil level.
SSL	Soil screening level.
SVOC	Semivolatile organic compound.
TAL	Target Analyte List.
TPH	Total Petroleum Hydrocarbons.
VCM	Voluntary Corrective Measure.
VOC	Volatile organic compound.
UST	underground storage tank.

SITE-SPECIFIC SAP/QAPP WORKSHEET #12 – MEASUREMENT PERFORMANCE CRITERIA TABLE – FIELD QC SAMPLES

This section addresses the following elements of SAP/QAPP Worksheet #12. The site-specific SAP/QAPP provides separate Worksheets for each sample matrix. Worksheet Tables 12.1 (soil matrix) and 12.2 (water matrix) lists the minimum field QC samples for consideration in the site-specific SAP/QAPP.

Site-specific SAP/QAPP Worksheet #12.1 – Measurement Performance Criteria Table (Soil Matrix)

QC Sample	Analytical Group	Frequency	Data Quality Indicators	Measurement Performance Criteria	QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S&A)
Field Duplicates	All	1 per 10 field samples collected	Precision	50% - RPD	S&A
MS/MSD	All	5% (field samples); 1 per 20 field samples collected	Precision and Accuracy	DOD QSM LCS limits or laboratory statistically derived control limits in accordance with DOD QSM requirements	S&A
Equipment Rinse Blanks	All	None – if disposable sampling equipment is used, 1 per day, or event, or as appropriate for reusable sampling equipment	Sensitivity/ Contamination (Accuracy/Bias)	Detections < QLs (Site-Specific SAP/QAPP Worksheet #15), or as specified	S
Temperature Blanks	All	Every cooler shipped to the laboratory when temperature preservation is recommended	Representativeness	≤ 6°C	S

<	less than.
°C	degrees Celsius.
DOD	Department of Defense.
LCS	Laboratory control sample.
MS/MSD	Matrix spike/matrix spike duplicate.
QAPP	Quality Assurance Project Plan
QC	Quality control.
QL	Quantitation limit.
QSM	Quality Systems Manual.
RPD	Relative Percent Difference.
SAP	Sampling and Analysis Plan.

Site-Specific SAP/QAPP Worksheet #12.2 – Measurement Performance Criteria Table (Water Matrix)

QC Sample	Analytical Group	Frequency	Data Quality Indicators (DQIs)	Measurement Performance Criteria	QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S&A)
Field Duplicates	All	1 per 10 field samples collected	Precision	30% - RPD	S&A
MS/MSD	All	5% (field samples); 1 per 20 field samples collected	Precision and Accuracy	DOD QSM LCS limits or laboratory statistically derived control limits in accordance with DOD QSM requirements	S&A
Equipment Rinse Blanks	All	None – if disposable sampling equipment is used, 1 per day, or event, or as appropriate for reusable sampling equipment	Sensitivity/ Contamination (Accuracy/Bias)	Detections < QLs (Site-Specific SAP/QAPP Worksheet #15)), or as specified	S
Trip Blanks	VOCs	One per cooler with volatile samples	Sensitivity/ Contamination (Accuracy/Bias)	Detections < QLs (Site-Specific SAP/QAPP Worksheet #15)	S
Temperature Blanks	All	Every cooler shipped to the laboratory when temperature preservation is recommended	Representativeness	≤ 6°C	S

<	less than.
°C	degrees Celsius.
DOD	Department of Defense.
LCS	Laboratory control sample.
MS/MSD	Matrix spike/matrix spike duplicate.
QAPP	Quality Assurance Project Plan.
QC	Quality control.
QL	Quantitation limit.
QSM	Quality Systems Manual.
RPD	Relative Percent Difference.
SAP	Sampling and Analysis Plan.
VOC	Volatile organic compound.

12.1 Field Quality Control

To verify the reliability of field sampling procedures and materials, field QC samples will be collected for each sampled media. Field QC samples are necessary for establishing data comparability, determining the total measurement error (the overall precision of the measurement system from sample collection to analysis) and for quality assurance during sample handling and shipment. Field QC samples may include field duplicates, equipment rinse blanks, source blanks, trip blanks, and temperature blanks. The type and quantity of field QC samples required will depend on the project DQOs.

12.1.1 Field Duplicates

Field duplicates are secondary samples collected at the same time and from the same source as their corresponding primary samples. The identity of the duplicate is concealed or "blinded" from the laboratory. The purpose of duplicate samples is to evaluate the variability of the contaminant distribution in the sampled matrix. In general, field duplicates will represent at least 10% of all field samples. Site-specific DQOs may allow for changes to this frequency. Any changes will be documented in the site-specific SAP/QAPP (Worksheets #12 and #20).

Soil sample field duplicates will be collected as homogenized split samples for semivolatile organic compounds and nonvolatile inorganic analyses. Some soil types are not suitable for homogenization (i.e., high clay content). In these cases field duplicates may be collected as collocated duplicates. For volatile organic analysis (VOA), soil sample field duplicates will be collected as collocated samples that are not homogenized.

12.1.2 Matrix Spike/Matrix Spike Duplicate

Matrix Spike(MS)/Matrix Spike Duplicate (MSD) are laboratory QC samples that may require additional field sample volume/mass collections. MS/MSD samples will be field collected and/or designated on the chain-of-custody (C-O-C) form, spiked at the laboratory with the contaminants of concern, and analyzed together with the field (primary) samples. MS/MSD samples measure the laboratory's overall accuracy and precision in the site-specific sample matrix. Additional sample mass may need to be collected for MS/MSD analyses.

Water samples designated for MS/MSD analyses should be collected in triplicate volumes. Samples for MS/MSD analysis will be clearly identified on the C-O-C record. MS/MSD pairs should be analyzed at the minimum frequency of 5 percent of all field samples, or one MS/MSD request for a primary sample for every 20 field samples collected.

12.1.3 Equipment Rinse Blank

Rinse Blank. An equipment rinse blank is a sample of analyte-free water collected from a final rinse of sampling equipment after the decontamination procedure has been performed. The purpose of rinse blanks is to determine whether the sampling equipment is adequately cleaned prior to sampling or, may be causing cross contamination between samples. Equipment rinse blank samples are collected from reusable, nondisposable sampling equipment only. During equipment decontamination, analyte-free water used as a final rinse will be collected in appropriate sample containers. The scope and frequency of equipment blank collection will be consistent with the project DQOs. As appropriate, rinse blank samples should be collected at a minimum frequency of one per day, or one per site, or per sampling event.

Source Blank. If justified by the project DQOs, decontamination source water samples will be collected at a frequency of one per source and submitted to the laboratory for all required analyses. Additional source blanks will be collected upon change of source and when decontamination events are interrupted for periods greater than 1 week.

12.1.4 Trip Blank

Trip blanks are samples of analyte-free water in 40-milliliter (mL) vials, which are prepared in the laboratory, shipped to the field together with sample containers, and returned to the laboratory for storage and analysis along with the field samples. The trip blank data demonstrate whether the samples were exposed to ambient contamination or cross-contamination during storage and transport to the laboratory.

Trip blanks will be analyzed for volatile organic compounds (VOCs) only; therefore, the 40-mL vials must not contain any headspace. The applicability of trip blanks is defined by the project DQOs.

When necessary, one trip blank is required for each day of sampling, and one trip blank must accompany each shipping cooler containing surface water or groundwater samples for VOC analysis. Trip blanks may not be necessary for analysis with wastewater or soil samples.

12.1.5 Temperature Blank

Temperature blanks are small volumes (typically 40-mL vials or 125 mL bottles) of tap water placed in each shipping cooler containing field samples. Laboratory personnel may use the temperature blanks to measure the temperature of the samples in the cooler upon arrival at the laboratory.

SITE-SPECIFIC SAP/QAPP WORKSHEET #13 – SECONDARY DATA CRITERIA AND LIMITATIONS TABLE

Worksheet #13 is used to document any previously collected data that will be used to develop the sampling objectives for the current project. This Worksheet will identifies the source of existing (secondary) data that may used and discusses the limitations (if any) of the existing data. If no secondary data are used, then this is documented in Worksheets #2 and #13.

Section 1.3 in the PMP, "Technical Approach and Site Descriptions," gives indications of data existing and possibly available for the sites at each of the four bases. These data will be reviewed, used, and documented as secondary data toward development of the sampling objectives.

Site-Specific SAP/QAPP Worksheet #13 – Secondary Data Criteria and Limitations Table

Secondary Data	Data Source (originating organization, report title and date)	Data Generator(s) (originating organization, data types, data generation/collection dates)	How Data Will Be Used	Limitations on Data Use
No existing records or data are available for these USTs.				

UST Underground storage tank.

SITE-SPECIFIC SAP/QAPP WORKSHEET #14 – SUMMARY OF PROJECT TASKS

14.1 Scope of Work

Worksheet #14 within each site-specific SAP/QAPP will be used to summarize all major tasks associated with the site-specific sampling effort. The scope of work for activities may include some of the following examples:

- Obtaining well permits
- Utility locating
- Concrete coring
- Structure demolition
- Soil sampling
- Installing monitoring wells
- Well abandonment
- Groundwater sampling
- Performing laboratory analyses
- Vapor Sampling
- Surveying
- Restoring site conditions
- Characterizing waste for disposal (including all investigation-derived waste [IDW])
- Collecting QC samples
- Reviewing and validating analytical data, and uploading to the AFCEE Environmental Restoration Program Information Management System (ERPIMS) database.

14.2 Sample Collection Procedures

This section within each site-specific SAP/QAPP will describe the sampling techniques that will be used to collect soil, surface water, groundwater, and IDW samples, etc. for chemical analysis.

Confirmation Soil Sampling

This section describes the sampling techniques that will be used to collect site-specific soil samples for chemical analysis.

The methodology for confirmation soil sampling will follow industry standard practices and the Holloman AFB Final RCRA Part B Hazardous Waste Permit (No. NM6572124422) (the Permit) (NMED, 2004). Confirmation soil samples will be collected from the sidewalls and floor of the excavations after visual and organic vapor analyzer (OVA) monitoring evidence indicates that the contaminated soil has been removed. At a minimum, one grab sample will be obtained from the floor, and one sample will be collected from each wall of the excavation area. One floor sample will be collected every 300 square feet (where applicable). Soil grab samples will be collected using disposable sampling equipment, a stainless steel trowel, or other suitable device as follows:

- Don a clean pair of gloves
- Remove any surficial debris from the sample location and surrounding area until soil is exposed
- Use a trowel or disposable sampling scoop to scrape and remove the top approximate 0.25 inch of weathered soil
- With a new trowel or disposable sampling scoop, place the point of the blade on the ground and partially rotate the blade in a clockwise/counter-clockwise motion while pushing at a downward angle until the blade is inserted to approximately 2 to 4 inches
- With a prying motion lift up the trowel with soil on the blade and place soil into the sample container(s)
- Repeat until the required sample volume is placed into the sample container(s)
- Cap the sample container(s), label the container(s), and complete the documentation and place containers into the sample cooler.

Split Spoon Soil Sampling

Split spoon soil sampling will be conducted in accordance with industry standards, Shaw SOP EI-GS001 (Shaw, 2007), and the Holloman AFB Final RCRA Part B Hazardous Waste Permit (No. NM6572124422) (NMED, 2004). The general methods for soil sampling with a split spoon are outlined as follows:

- Drill or advance the borehole to the desired depth or target horizon where the sampling run is to begin.
- During drilling, monitor vapors in the breathing zone according to the project work plan and health and safety plan.
- When the desired sampling depth or target horizon is reached, remove the drill bit or plug from inside the drive casing or augers. Check the bottom depth with a tape to measure for the presence of "flowing sands" or slough inside the auger, casing, or borehole.
- Insert the sleeves into the split-spoon sampler, connect the halves, and screw together the rear threaded collar and front drive shoe. Attach the split-spoon sampler to the bottom end of the drill rod string or wireline sampling string. Set up and attach the specified-weight hammer, if used.
- Drive the sampler into the soil at the bottom of the borehole. Record the type of sampler assembly and hammer weight on the appropriate form(s) (an example Visual Classification of Soil Form [i.e.,

field log] is included as an attachment to this SOP), as specified in the project work plans. To minimize off-gassing of the volatiles, the sampler should not be driven until the sampling team is ready to process the sample.

- When conducting penetration testing, observe and record on the appropriate form the number of hammer blows as described in appropriate Shaw- and/or project-specific procedures.

- Pull the drill rod or wireline sampling string up from the bottom of the borehole and remove the sampler.

- Remove the drive shoe and rear collar from the sampler and open the split barrel.

- Remove the sleeves one at a time, starting with the sleeve adjoining the drive shoe. Observe and record the amount of sample recovery on the appropriate form per applicable Shaw procedures. Any observed field problems associated with the sampling attempt (e.g., refusal) or lack of recovery should be noted on the appropriate form. Log the sample in accordance with applicable Shaw and/or project-specific requirements.

- Select the sleeve(s) to be submitted for laboratory analysis. Sample sleeve selection should be based on five factors: (1) judgment that the sample represents relatively undisturbed intact material, not slough; (2) proximity to the drive shoe; (3) minimal exposure to air; (4) lithology; and (5) obvious evidence of contamination. The project work plans should specify which sample sleeves will be submitted for specific analyses and confirm the selection factor(s).

- Place Teflon™ film over each end of sleeves to be submitted for chemical analysis, and seal each end with plastic end caps. Do not use any type of tape to seal the cap, because tape causes a toluene interference. All samples should be individually stored in resealable plastic bags. Note: Additional project-specific sample preparation steps or modifications may be required as stated in the project work plans.

- Appropriately label and number each sleeve to be submitted for analysis. The label will be filled out using waterproof ink and may contain the following information:

  - Project number
  - Boring number
  - Sample number
  - Bottom depth of sleeve
  - Date and time of sample collection
  - Parameters of analysis
  - Sampler's initials

- Document the sampling event on the appropriate form(s), as specified in the project work plans. The information listed on the form should, at a minimum, include the following:

  - Project name/number
  - Date and time of the sampling event
  - Drilling and sampling methods used – specify sample type
  - Sample number
  - Sample location
  - Boring number
  - Sample depth interval

  - Sample description (type of matrix)
  - Weather conditions
  - Unusual events
  - Signature or initials of the sampler

- Appropriately preserve, package, handle, and ship the sample in accordance with applicable Shaw and/or project-specific procedures.

Soil samples collected for the purpose of analyzing for semivolatile organic compounds (SVOCs), VOCs, and total petroleum hydrocarbon (TPH)-gasoline range organics (GRO) will not be mixed to homogenize samples for any reason. All collected soil samples will be analyzed by a DOD Environmental Laboratory Accreditation Program (ELAP)-certified laboratory. The remaining portions of the sample will be used for field screening and logging.

Groundwater Sampling

Groundwater sampling will be conducted at the installed monitoring wells (3 wells per site) after the wells are properly developed. Monitoring wells will be sampled using low-flow sampling techniques in accordance with NMED's guidance document entitled *Use of Low-Flow and Other Non-Traditional Sampling Techniques for RCRA Compliant Groundwater Monitoring* (NMED, 2001) and Shaw SOP EI-FS-111 *Low Flow Sampling*. Groundwater purging and sampling will be conducted according to the following steps:

1. Measure water levels (recorded to the nearest 0.01 feet [ft]) prior to purging in each monitoring well in accordance with Shaw SOP EI-FS-108 *Water Level Measurements*. Water levels should be monitored at 5-minute intervals during purging to ensure that minimal drawdown is occurring in the well during the purge event.

2. Begin purging the well at a predetermined low-flow rate based on site and well-specific characteristics in accordance with Shaw SOP EI-FS-110 *Well Purging*. If the water-yielding capability of the well is unknown, low-flow purging can be initiated at approximately 100 milliliters per minute (mL/min), and the drawdown measured. Based on results, the purging rate may be increased incrementally up to approximately 500 mL/min, but will not exceed 1 liter per minute (L/min).

3. Monitor indicator parameters at least every 5 minutes until stabilization is achieved. The well is considered to be stable when the indicator parameters have stabilized over three consecutive readings spaced a minimum of 5 minutes apart.

4. Collect groundwater samples if minimal drawdown is achieved during purging. If the well consistently purges dry, an alternate purge method will be necessary. Groundwater samples for VOC analysis should be collected first.

Field water quality measurements (pH, specific conductivity, oxidation reduction potential, dissolved oxygen, turbidity, and temperature) will be recorded during purging of the monitoring wells using a field-calibrated water quality meter. Field instruments such as those used for the measurement of water quality parameters will be calibrated in accordance with methods specified by the manufacturer and will be recorded on calibration record forms. Purge water will be collected in drums and handled as IDW/remediation-derived waste (RDW).

Groundwater samples will be collected within 24 hours of purging monitoring wells. Sampling methods will be documented on the field forms. Groundwater will be collected in the appropriate container for the proposed analysis. Samples will be handled as described in Section 4.5 of the RFI Work Plan. The location of duplicate samples may be modified in the field.

Groundwater samples will be analyzed for TPH-GRO, TPH-diesel range organics(DRO), TPH-oil range organics(ORO), target analyte list (TAL) metals, SVOCs, VOCs, and total dissolved solids (TDS).

14.3 Analytical Requirements

The laboratory will process, prepare, and analyze soil samples. Site-specific SAP/QAPP Worksheet #19 provides the analytical method requirements.

14.4 Data Recording and Transfer

This section within each site-specific SAP/QAPP details the requirements for data reporting and data package formats that will be provided by the laboratory.

14.4.1 Hard Copy Deliverables

All relevant raw data and documentation, including (but not limited to) logbooks, field and laboratory data sheets, electronic files, and final reports, will be maintained by the subcontractor laboratory, or laboratories, for at least 10 years. The laboratory will notify Shaw 30 days before disposal of any relevant laboratory records.

Shaw will maintain copies of all C-O-C forms until receipt of the laboratory report. Laboratory reports will be logged in upon receipt and filed in chronological order. If necessary, based on project DQOs, a second copy of the laboratory report will be available for in-house or third-party data validation.

The data deliverable requirements for projects will be compliant with DOD and AFCEE requirements. The project DQOs will establish the need for in-house or third-party data review and validation, and appropriate EPA data package levels (II, III or IV).

Data Deliverables Package Requirements

Deliverable Requirement	Level IV	Level III	Level II
Case Narrative	X	X	X
Corrective Action Report(s)	X	X	X
Cross-reference of field sample numbers, laboratory identification numbers, and analytical QC batches	X	X	X
C-O-C Form, Cooler Receipt Form	X	X	X
Sample log-in sheet	X		
Data summary for each blank and sample	X	X	X
TICs for each sample (10 peaks) (GC/MS only)	X	(Only if requested by project)	
LCS/LCD report (including concentration spiked, percent recovered, percent recovery acceptance limits, RPD, and RPD acceptance limits)	X	X	X
Surrogate recovery report (including concentration spiked, percent recovered, and percent recovery acceptance limits) – organic methods only	X	X	X
MS/MSD report (including concentration spiked, percent recovered, percent recovery acceptance limits, RPD, and RPD acceptance limits)	X	X	X

Data Deliverables Package Requirements (Concluded)

Deliverable Requirement	Level IV	Level III	Level II
Instrument performance check (tuning) report (GC/MS)	X	X	
Initial calibration data (including acceptance limits)	X	X (summary only)	
Calibration verification data (including acceptance limits) For GC indicate which column was used for quantitation)	X	X (summary only)	
Chromatograms for each sample (and reruns), confirmation runs, blank, spike, duplicate, and standards	X	X[b]	
Instrument quantitation report	X		
Internal standard areas and retention time reports (including acceptance limits and out-of-control flags)	X	X	
Reconstructed ion chromatogram for each sample and rerun, blank, spike, duplicate, and standard	X		
Raw and background subtracted mass spectra for each target analyte found (GC/MS only)	X		
Post-digestion spike recovery (metals)	X	X	X
Duplicate sample report (inorganic methods)	X	X	X
Instrument Blank results	X	X	X
ICP interference check sample report (metals)	X	X	X
Standard addition results (metals)	X	X	
ICP serial dilution results (metals)	X	X	X
Sample preparation bench sheets	X	X	
Gel permeation chromatograph cleanup logs (if performed)	X		
Method blank summary	X		
Standard preparation logs	X		
Analysis run logs	X	X	
Percent solids/moisture	X	X	X
pH	X[c]		

[a]Must include: field sample ID, laboratory ID, date/time sampled, date received, extracted/analyzed, QL, MDL, dilution factor(s), results, comments, approval signature/date.
[b]For petroleum fuels or PCB analyses chromatograms for samples with compound detection only.
[c]For water sample volatile analysis only.

C-O-C Chain-of-custody.
GC/MS Gas chromatography/Mass spectrometer.
ICP Inductively coupled plasma.
ID Identification.
LCD Laboratory control duplicate.
LCS Laboratory control sample.
LCSD Laboratory control sample duplicate.
MDL Method detection limit.
MS/MSD Matrix spike/matrix spike duplicate.
PCB Polychlorinated biphenyl.
QC Quality control.
QL Quantitation limit.
RPD Relative percent difference.
TIC Tentatively identified compound.

14.4.2 Electronic Deliverables

The laboratory's EDD will be in Enviro Data® or equivalent format (Shaw's current database format). The analytical laboratory will follow the requirements stated in the Laboratory Interface Document (Data Transfer Standard) for the Analytical Laboratory EDD and as specified by Shaw. Sampling and analytical data generated during execution of the projects will be uploaded to the AFCEE ERPIMS database as specified in the contract documents.

Field information (e.g., date and time collected, sample identification, field parameter measurements, etc.) will be entered into the database from the field logs, notebooks, C-O-C forms or uploaded from electronic files generated in the field.

14.5 Data Management

This section describes the data management procedures for data review, verification, reporting, and validation.

14.5.1 Data Reduction, Verification, and Reporting

All analytical data generated by the laboratory will be reviewed prior to reporting to ensure the validity of reported data. This internal laboratory data review process will consist of data reduction, three levels of documented review, and reporting. Review processes will be documented using appropriate checklist forms, or logbooks, that will be signed and dated by the reviewer.

14.5.2 Data Reduction

Data reduction involves the mathematical or statistical calculations used by the laboratory to convert raw data to the reported data. The laboratory will perform reduction of analytical data as specified in each of the appropriate analytical methods and laboratory SOPs. For each method, all raw data results will be recorded using method-specific forms or a standardized output from each of the various instruments.

All data calculations will be verified and initialed by personnel both generating and approving them. All raw and electronic data, notebook references, supporting documentation, and correspondence will be assembled, packaged, and stored for a minimum of 10 years for future use. All reports will be held client confidential. If the laboratory is unable to store project-related data for 10 years, then it is the responsibility of the laboratory to contact Shaw to make alternative arrangements.

14.5.3 Laboratory Data Verification and Review

The laboratory analyst who generates the analytical data will have the primary responsibility for the correctness and completeness of data. Each step of this verification and review process will involve the evaluation of data quality based on both the results of the QC data and the professional judgment of those conducting the review. This application of technical knowledge and experience to the evaluation of data is essential in ensuring that data of known quality are generated consistently. All data generated and reduced will follow well-documented, in-house protocols.

Level 1. Technical (Peer) Data Review

Analysts will review the quality of their work based on an established set of guidelines, including the QC criteria established in each method, in this site-specific SAP/QAPP, and as stated within the laboratory QA Manual. This review will, at a minimum, ensure that the following conditions have been met:

- Sample preparation information is correct and complete.
- Analysis information is correct and complete.
- Appropriate SOPs have been followed.
- Calculations are verified.
- There are no data transposition errors.
- Analytical results are correct and complete.
- QC samples are within established control limits.

- Blanks and LCSs are within appropriate QC limits.
- Special sample preparation and analytical requirements have been met.

Documentation is complete, for example, any anomalies and holding times have been documented and forms have been completed.

Level 2. Technical Data Review

A supervisor or data review specialist whose function is to provide an independent review of data packages will perform this review. This review will also be conducted according to an established set of guidelines and will be structured to verify the following finding of Level 1 data review:

- All appropriate laboratory SOPs have been followed.
- Calibration data are scientifically sound, appropriate to the method, and completely documented.
- QC samples are within established guidelines.
- Qualitative identification of contaminants is correct.
- Manual integrations are justified and properly documented.
- Quantitative results and calculations are correct.
- Data are qualified correctly.
- Documentation is complete, for example, any anomalies and holding times have been documented and appropriate forms have been completed.
- Data are ready for incorporation into the final report.
- The data package is complete and complies with contract requirements.

The Level 2 review will be structured so that all calibration data and QC sample results are reviewed and all of the analytical results from at least 10% of the samples are checked back to the sample preparation and analytical bench sheets. If no problems are found with the data package, the review will be considered complete.

If any problems are found with the data package, an additional 10% of the sample results will be checked against the sample preparatory and analytical bench sheets. This cycle will then be repeated until either no errors are found in the checked data set or all data has been checked. All errors and corrections noted will be documented.

Level 3. Administrative Quality Assurance Data Review

The Laboratory QA Manager will review 10% of all data packages. This review should be similar to the review as provided in Level 2, except that it will provide a total overview of the data package to ensure its consistency and compliance with project requirements. All errors noted will be corrected and documented.

14.6 Data Validation

The need for data validation by Shaw or a third-party, independent validation company will be determined based on the requirements of AFCEE and the site-specific DQOs. Data validation will be in accordance with the *EPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review* (EPA, 2004), *EPA Contract Laboratory Program National Functional Guidelines for Organic Data Review* (EPA 2008), the DOD QSM (DOD, 2010), and the QC criteria specified in the site-specific SAP/QAPP document. Data will be validated and qualified with the following data qualifiers:

- *J qualifier* denotes the analyte was positively identified, but the associated numerical value is estimated.
- *U qualifier* denotes the analyte was analyzed for, but not detected. The associated numerical value is at or below the reporting limit.
- *R qualifier* denotes the data are unusable due to deficiencies in the ability to analyze the sample and meet QC criteria.
- *B qualifier* denotes blank contamination.

14.6.1 Data Review

The Shaw Project Chemist will review the laboratory data packages for samples that are not submitted for third-party data validation to establish that holding times for extraction and analysis and internal QC check requirements have been met and to determine data usability.

SITE-SPECIFIC SAP/QAPP WORKSHEET #15 – REFERENCE LIMITS AND EVALUATION TABLE

Worksheet #15 is completed for each planned analysis method and matrix sampled (e.g., soil, water, or air). Worksheet #15 identifies target analytes, sample analysis detection and quantification limits, project quantification limit goals, and project comparison criteria or action limits. The project comparison criteria columns indicate human-health risk-based soil screening levels, preliminary remediation goals, codified regulatory limits, or applicable background concentration values that the projects may use as site-specific decision criteria at project sites in New Mexico. Regulatory standards will typically be the NMED Risk-Based soil screening levels (SSLs) for residential land use (NMED, 2012), EPA's Regional Screening Levels (RSLs) for residential land use (EPA 2011), EPA Drinking Water Program, maximum contamination limits (MCLs) (EPA 2010), or New Mexico Water Quality Control Commission (NMWQCC) Standards for Protection of Groundwater (NMWQCC, 2002). Other reference limits may be appropriate on a site-specific basis. All comparison criteria sources are noted in Worksheet #15.

Worksheet 15.1
Matrix: Soil
Analytical Group: VOCs - SW846 - 8260B - Target Compound List
Concentration Level: Low

Analyte	CAS Number	NM Sites Project Comparison Criteria (mg/kg)	NM Sites Comparison Criteria Reference	Project Quantitation Limit Goal (µg/kg)[a]	Achievable Laboratory Limits, Accutest Laboratories			Method Performance Criteria	
					LOQ (µg/kg)	LOD (µg/kg)	MDL (µg/kg)	Bias Control Limits (%R) (LCS, MS)	Precision Limits (RPD) (LCSD, MSD)
VOCs 8260B									
1,1,1-Trichloroethane	71-55-6	1.56E+04	NMED 2012	600000	5	2	1.1	80-133	27
1,1,2,2-Tetrachloroethane	79-34-5	8.02E+00	NMED 2012	1000000	5	2	1.2	70-128	30
1,1,2-Trichloroethane	79-00-5	2.81E+00	NMED 2012	155000	5	2	1.1	76-118	28
1,1-Dichloroethane	75-34-3	6.45E+01	NMED 2012	650000	5	2	1.1	77-132	26
1,1-Dichloroethylene	75-35-4	6.18E+02	NMED 2012	350000	5	2	1.4	66-132	27
1,2,4-Trichlorobenzene	120-82-1	7.30E+01	NMED 2012	390000	5	2	1.2	82-137	32
1,2-Dibromo-3-chloropropane	96-12-8	1.86E+00	NMED 2012	230	5	2.5	2.3	67-129	29
1,2-Dibromoethane	106-93-4	5.88E-01	NMED 2012	160	5	2	1	77-126	24
1,2-Dichloroethane	107-06-2	7.89E+00	NMED 2012	200	5	2	1	78-129	24
1,2-Dichloropropane	78-87-5	1.52E+01	NMED 2012	4500	5	2	1.2	74-127	27
2-Hexanone	591-78-6	2.1E+02	EPA 2011	105000	25	10	5.4	67-130	29
4-Methyl-2-pentanone	108-10-1	5.82E+03	NMED 2012	440000	25	10	5.5	69-125	24
Acetone	67-64-1	6.66E+04	NMED 2012	35000000	50	25	20	61-144	29
Benzene	71-43-2	1.55E+01	NMED 2012	400	5	2	1.5	78-130	25
Bromodichloromethane	75-27-4	5.41E+00	NMED 2012	5000	5	2	1.1	73-122	25
Bromoform	75-25-2	6.16E+02	NMED 2012	26500	5	2	1.5	70-139	26
Carbon disulfide	75-15-0	1.53E+03	NMED 2012	410000	5	4	2	61-142	27
Carbon tetrachloride	56-23-5	1.08E+01	NMED 2012	150	5	2	1.8	79-135	29
Chlorobenzene	108-90-7	3.76E+02	NMED 2012	65000	5	2	1	83-122	23
Chloroethane	75-00-3	4.36E+04	NMED 2012	750000	5	4	2	61-153	31
Chloroform	67-66-3	5.86E+00	NMED 2012	150	5	2	1.2	79-129	27
cis-1,2-Dichloroethylene	156-59-2	7.82E+02	NMED 2012	390000	5	2	1.5	74-123	26
cis-1,3-Dichloropropene	10061-01-5	NA	NA	5	5	2	1	79-130	23
Cyclohexane	110-82-7	7.0E+03	EPA 2011	3500000	5	2	1.4	76-135	25
Dibromochloromethane	124-48-1	1.21E+01	NMED 2012	650000	5	2	1	78-117	27
Dichlorodifluoromethane	75-71-8	1.68E+02	NMED 2012	125000	5	2	1.5	35-162	30
Ethylbenzene	100-41-4	6.84E+01	NMED 2012	200000	5	2	1	82-124	25
Freon 113	76-13-1	7.21E+04	NMED 2012	21500000	5	2	1.7	62-147	29

Worksheet 15.1 (Continued)
Matrix: Soil
Analytical Group: VOCs - SW846 - 8260B - Target Compound List
Concentration Level: Low

Analyte	CAS Number	NM Sites Project Comparison Criteria (mg/kg)	NM Sites Comparison Criteria Reference	Project Quantitation Limit Goal (µg/kg)[a]	Achievable Laboratory Limits, Accutest Laboratories			Method Performance Criteria	
					LOQ (µg/kg)	LOD (µg/kg)	MDL (µg/kg)	Bias Control Limits (%R) (LCS, MS)	Precision Limits (RPD) (LCSD, MSD)
VOCs 8260B (Continued)									
Isopropylbenzene	98-82-8	2.43E+03	NMED 2012	240000	5	2	1.1	82-133	27
m-Dichlorobenzene	541-73-1	NE	NA	5	5	2	1.2	82-126	29
Methyl acetate	79-20-9	7.82E+04	NMED 2012	39000000	25	20	13	67-130	26
Methyl bromide	74-83-9	1.65E+01	NMED 2012	3650	5	4	2	60-146	31
Methyl chloride	74-87-3	2.75E+02	NMED 2012	60000	5	4	2	58-163	26
Methyl ethyl ketone	78-93-3	3.71E+04	NMED 2012	14000000	25	10	6.1	66-134	23
Methyl Tert Butyl Ether	1634-04-4	8.62E+02	NMED 2012	390000	5	4	2	70-131	25
Methylcyclohexane	108-87-2	1.20E+04	NMED 2012	5	5	2	1.3	81-145	27
Methylene chloride	75-09-2	4.09E+02	NMED 2012	6500	10	5	4.6	62-140	25
o-Dichlorobenzene	95-50-1	2.31E+03	NMED 2012	950000	5	2	1.1	83-123	28
p-Dichlorobenzene	106-46-7	3.17E+01	NMED 2012	1200	5	2	1.1	84-124	28
Styrene	100-42-5	7.28E+03	NMED 2012	750000	5	4	2.6	79-123	28
Tetrachloroethylene	127-18-4	7.02E+00	NMED 2012	5500	5	2	1	79-132	27
Toluene	108-88-3	5.27E+03	NMED 2012	325000	5	2	1.2	80-123	26
trans-1,2-Dichloroethylene	156-60-5	2.73E+02	NMED 2012	800000	5	2	1.5	77-129	27
trans-1,3-Dichloropropene	10061-02-6	NE	NA	5	5	2	1.1	87-131	27
Trichloroethylene	79-01-6	8.77E+00	NMED 2012	2500	5	2	1.2	78-132	28
Trichlorofluoromethane	75-69-4	1.41E+03	NMED 2012	415000	5	4	2	67-149	29
Vinyl chloride	75-01-4	7.28E-01	NMED 2012	140	5	2	1.5	60-145	29
Xylene (total)	1330-20-7	8.14E+02	NMED 2012	160000	15	6	3.2	83-127	24

Worksheet 15.1 (Concluded)
Matrix: Soil
Analytical Group: VOCs - SW846 - 8260B - Target Compound List
Concentration Level: Low

Analyte	CAS Number	NM Sites Project Comparison Criteria (mg/kg)	NM Sites Comparison Criteria Reference	Project Quantitation Limit Goal (µg/kg)[a]	Achievable Laboratory Limits, Accutest Laboratories			Method Performance Criteria	
					LOQ (µg/kg)	LOD (µg/kg)	MDL (µg/kg)	Bias Control Limits (%R) (LCS, MS)	Precision Limits (RPD) (LCSD, MSD)
Surrogate Spike Compounds									
Dibromofluoromethane	1868-53-7	NE	NA	NA	NA	NA	NA	80-121	NA
Toluene-D8	2037-26-5	NE	NA	NA	NA	NA	NA	71-130	NA
4-Bromofluorobenzene	460-00-4	NE	NA	NA	NA	NA	NA	59-148	NA
1,2-Dichloroethane-D4	17060-07-0	NE	NA	NA	NA	NA	NA	77-123	NA

[a]The Project Quantification Limit was calculated as half of the Project Comparison Criteria.

%R % recovery.
CAS Chemical Abstract Service
EPA U.S. Environmental Protection Agency.
LCS Laboratory control sample.
LCSD Laboratory control sample duplicate.
LOD Limit of detection.
LOQ Limit of quantitation.
MDL Minimum detection limit.
µg/kg Microgram per kilogram.
mg/kg Milligrams per kilogram.
MS Matrix spike.
MSD Matrix spike duplicate.
NA Not available.
NE Not established.
NM New Mexico.
NMED New Mexico Environment Department.
RPD Relative percent difference.
VOC Volatile organic compound.

(NMED 2012) Risk Assessment Guidance for Site Investigation and Remediation, Volume I, Tier 1: Soil Screening Guidance Technical Background Document, Table A-1: NMED Soil Screening Levels, February.

(EPA 2011) U.S. Environmental Protection Agency, Regions 3, 6, and 9, Regional Screening Levels for Chemical Contaminants at Superfund Sites. http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/index.htm, accessed October 2011.

Worksheet 15.2
Matrix: Water
Analytical Group: VOCs - SW846 - 8260B - Target Compound List
Concentration Level: Low

Analyte	CAS Number	NM Sites Project Comparison Criteria (mg/L)	NM Sites Comparison Criteria Reference	Project Quantitation Limit Goal (µg/L)[a]	Achievable Laboratory Limits, Accutest Laboratories			Method Performance Criteria	
					LOQ (µg/kg)	LOD (µg/kg)	MDL (µg/kg)	Bias Control Limits (%R) (LCS, MS)	Precision Limits (RPD) (LCSD, MSD)
VOCs 8260B									
1,1,1-Trichloroethane	71-55-6	6.0E-02	NMWQCC 2002	30	1	0.5	0.2	79-133	11
1,1,2,2-Tetrachloroethane	79-34-5	1.0E-02	NMWQCC 2002	5	1	0.5	0.23	71-120	11
1,1,2-Trichloroethane	79-00-5	1.0E-02	NMWQCC 2002	2.5	1	0.5	0.22	80-114	11
1,1-Dichloroethane	75-34-3	2.5E-02	NMWQCC 2002	12.5	1	0.5	0.25	82-127	10
1,1-Dichloroethylene	75-35-4	5.0E-03	NMWQCC 2002	2.5	1	0.5	0.23	75-133	13
1,2,4-Trichlorobenzene	120-82-1	7.0E-02	EPA 2010	35	1	0.75	0.5	68-123	11
1,2-Dibromo-3-chloropropane	96-12-8	2.0E-04	EPA 2010	0.1	2	1	0.5	61-118	15
1,2-Dibromoethane	106-93-4	1.0E-04	NMWQCC 2002	0.025	1	0.5	0.37	80-115	10
1,2-Dichloroethane	107-06-2	1.0E-02	NMWQCC 2002	2.5	1	0.5	0.2	76-122	11
1,2-Dichloropropane	78-87-5	5.0E-03	EPA 2010	2.5	1	0.5	0.25	81-120	11
2-Hexanone	591-78-6	NE	NA	10	10	5	4	58-125	14
4-Methyl-2-pentanone	108-10-1	NE	NA	280	5	4	2	62-125	13
Acetone	67-64-1	NE	NA	3150	25	20	10	59-134	14
Benzene	71-43-2	1.0E-02	NMWQCC 2002	2.5	1	0.5	0.2	83-124	11
Bromodichloromethane	75-27-4	Tox	NMWQCC 2002	0.1	1	0.5	0.2	76-116	10
Bromoform	75-25-2	NE	NA	1	1	0.5	0.2	68-128	11
Carbon disulfide	75-15-0	NE	NA	2	2	1	0.5	67-147	12
Carbon tetrachloride	56-23-5	1.0E-02	NMWQCC 2002	2.5	1	0.5	0.25	74-139	13
Chlorobenzene	108-90-7	1.0E-01	EPA 2010	50	1	0.5	0.2	87-115	9
Chloroethane	75-00-3	NE	NA	1400	2	1	0.5	54-166	20
Chloroform	67-66-3	1.0E-01	NMWQCC 2002	0.1	1	0.5	0.22	85-123	10
cis-1,2-Dichloroethylene	156-59-2	7.0E-02	EPA 2010	35	1	0.5	0.26	81-114	10
cis-1,3-Dichloropropene	10061-01-5	NE	NA	1	1	0.5	0.2	83-119	10
Cyclohexane	110-82-7	NE	NA	1	1	0.5	0.31	79-131	11
Dibromochloromethane	124-48-1	NE	NA	70	1	0.5	0.2	74-116	11
Dichlorodifluoromethane	75-71-8	Tox	NMWQCC 2002	700	2	1	0.5	34-158	22
Ethylbenzene	100-41-4	7.5E-01	NMWQCC 2002	350	1	0.5	0.2	87-118	10

Worksheet 15.2 (Continued)
Matrix: Water
Analytical Group: VOCs - SW846 - 8260B - Target Compound List
Concentration Level: Low

Analyte	CAS Number	NM Sites Project Comparison Criteria (mg/L)	NM Sites Comparison Criteria Reference	Project Quantitation Limit Goal (µg/L)[a]	Achievable Laboratory Limits, Accutest Laboratories			Method Performance Criteria	
					LOQ (µg/kg)	LOD (µg/kg)	MDL (µg/kg)	Bias Control Limits (%R) (LCS, MS)	Precision Limits (RPD) (LCSD, MSD)
VOCs 8260B (Continued)									
Freon 113	76-13-1	NE	NA	1	1	0.5	0.47	74-139	13
Isopropylbenzene	98-82-8	NE	NA	350	1	0.5	0.2	87-131	10
m-Dichlorobenzene	541-73-1	NE	NA	1	1	0.5	0.2	86-115	9
Methyl Acetate	79-20-9	NE	NA	20	20	10	5	65-122	13
Methyl bromide	74-83-9	Tox	NMWQCC 2002	2	2	1	0.5	55-151	21
Methyl chloride	74-87-3	Tox	NMWQCC 2002	2	2	1	0.5	55-173	22
Methyl ethyl ketone	78-93-3	NE	NA	5	5	4	2	61-127	13
Methyl Tert Butyl Ether	1634-04-4	NE	NA	35	1	0.5	0.34	75-116	10
Methylcyclohexane	108-87-2	NE	NA	1	1	0.5	0.38	86-132	11
Methylene chloride	75-09-2	1.0E-01	NMWQCC 2002	2.5	5	4	2	69-125	11
o-Dichlorobenzene	95-50-1	6.0E-01	EPA 2010	300	1	0.5	0.25	85-115	9
p-Dichlorobenzene	106-46-7	7.5E-02	EPA 2010	37.5	1	0.5	0.23	87-113	10
Styrene	100-42-5	1.0E-01	EPA 2010	50	1	0.5	0.2	78-118	11
Tetrachloroethylene	127-18-4	5.0E-03	EPA 2010	2.5	1	0.5	0.25	80-131	12
Toluene	108-88-3	7.5E-01	NMWQCC 2002	375	1	0.5	0.2	86-116	10
trans-1,2-Dichloroethylene	156-60-5	NE	NA	50	1	0.5	0.35	82-126	10
trans-1,3-Dichloropropene	10061-02-6	NE	NA	37.5	1	0.5	0.2	87-123	10
Trichloroethylene	79-01-6	NE	NA	2.5	1	0.5	0.26	85-124	10
Trichlorofluoromethane	75-69-4	NE	NA	1050	2	1	0.5	66-156	15
Vinyl chloride	75-01-4	1.0E-03	NMWQCC 2002	1	1	0.5	0.22	57-153	22
Xylene (total)	1330-20-7	6.2E-01	NMWQCC 2002	310	3	1	0.52	86-120	10

Worksheet 15.2 (Concluded)
Matrix: Water
Analytical Group: VOCs - SW846 - 8260B - Target Compound List
Concentration Level: Low

Analyte	CAS Number	NM Sites Project Comparison Criteria (mg/L)	NM Sites Comparison Criteria Reference	Project Quantitation Limit Goal (µg/L)[a]	Achievable Laboratory Limits, Accutest Laboratories			Method Performance Criteria	
					LOQ (µg/kg)	LOD (µg/kg)	MDL (µg/kg)	Bias Control Limits (%R) (LCS, MS)	Precision Limits (RPD) (LCSD, MSD)
Surrogate Spike Compounds									
Dibromofluoromethane	1868-53-7	NE	NA	NA	NA	NA	NA	87-116	
1,2-Dichloroethane-D4	17060-07-0	NE	NA	NA	NA	NA	NA	76-127	
Toluene-D8	2037-26-5	NE	NA	NA	NA	NA	NA	86-112	
4-Bromofluorobenzene	460-00-4	NE	NA	NA	NA	NA	NA	84-120	

[a]The Project Quantification Limit was calculated as half of the Project Comparison Criteria.

%R	% recovery.
CAS	Chemical Abstract Service
EPA	U.S. Environmental Protection Agency.
LCS	Laboratory control sample.
LCSD	Laboratory control sample duplicate.
LOD	Limit of detection.
LOQ	Limit of quantitation.
MDL	Minimum detection limit.
µg/L	Microgram per liter.
mg/L	Milligrams per liter.
µg/kg	Microgram per kilogram.
MS	Matrix spike.
MSD	Matrix spike duplicate.
NA	Not available.
NE	Not established.
NM	New Mexico.
NMED	New Mexico Environment Department.
NMWQCC	New Mexico Water Quality Control Commission.
RPD	Relative percent difference.
VOC	Volatile organic compound.
	Comparison Criteria is less than LOQ

(EPA 2010) National Primary Drinking Water Regulations: List of Drinking Water Contaminants and Maximum Contaminant Levels: http://www.access.gpo.gov/nara/cfr/waisidx_10/40cfr141_10.html.

(NMWQCC 2002) Ground and Surface Water Protection, 20.6.2 New Mexico Administrative Code.

Worksheet 15.3
Matrix: Soil
Analytical Group: SVOCs - SW846 - 8270C - Target Compound List
Concentration Level: Low

Analyte	CAS Number	NM Sites Project Comparison Criteria (mg/kg)	NM Sites Comparison Criteria Reference	Project Quantitation Limit Goal (µg/kg)[a]	Achievable Laboratory Limits, Accutest Laboratories			Method Performance Criteria	
					LOQ (µg/kg)	LOD (µg/kg)	MDL (µg/kg)	Bias Control Limits (%R) (LCS, MS)	Precision Limits (RPD) (LCSD, MSD)
SVOCs 8270C									
1,1'-Biphenyl	92-52-4	5.71E+01	NMED 2012	25500	170	33	17	57-92	29
2,4,5-Trichlorophenol	95-95-4	6.11E+03	NMED 2012	3055246	170	33	17	60-101	28
2,4,6-Trichlorophenol	88-06-2	6.11E+01	NMED 2012	29000	170	33	17	60-100	27
2,4-Dichlorophenol	120-83-2	1.83E+02	NMED 2012	91657	170	33	17	60-101	30
2,4-Dimethylphenol	105-67-9	1.22E+03	NMED 2012	611049	170	67	21	49-89	31
2,4-Dinitrophenol	51-28-5	1.22E+02	NMED 2012	61105	830	670	330	39-107	40
2,4-Dinitrotoluene	121-14-2	1.57E+01	NMED 2012	450	170	33	17	59-103	30
2,6-Dinitrotoluene	606-20-2	6.12E+01	NMED 2012	450	170	33	20	57-99	30
2-Chloronaphthalene	91-58-7	6.26E+03	NMED 2012	3150000	170	33	33	57-95	28
2-Chlorophenol	95-57-8	3.91E+02	NMED 2012	195000	170	33	17	54-97	31
2-Methylnaphthalene	91-57-6	3.1E+02	EPA 2011	1150000	170	33	17	57-103	32
2-Methylphenol	95-48-7	3.1E+03	EPA 2011	1550000	170	33	17	53-94	29
2-Nitroaniline	88-74-4	6.1E+02	EPA 2011	36500	170	67	33	53-106	29
2-Nitrophenol	88-75-5	NE	NA	170	170	33	17	55-96	30
3&4-Methylphenol		NE	NA	170	170	67	24	54-95	31
3,3'-Dichlorobenzidine	91-94-1	1.08E+01	NMED 2012	500	330	67	33	34-88	31
3-Nitroaniline	99-09-2	NE	NA	170	170	67	33	29-85	31
4,6-Dinitro-o-cresol	534-52-1	4.89E+00	NMED 2012	3055	330	130	67	58-109	37
4-Bromophenyl phenyl ether	101-55-3	NE	NA	170	170	33	17	60-104	26
4-Chloro-3-methyl phenol	59-50-7	6.1E+03	EPA 2011	2750000	170	33	17	59-102	27
4-Chloroaniline	106-47-8	2.4E+00	EPA 2011	1200	170	33	17	19-85	34
4-Chlorophenyl phenyl ether	7005-72-3	NE	NA	170	170	33	17	60-101	26
4-Nitroaniline	100-01-6	2.4E+01	EPA 2011	12000	170	67	33	49-104	31
4-Nitrophenol	100-02-7	NE	NA	830	830	330	130	56-106	29
Acenaphthene	83-32-9	3.44E+03	NMED 2012	2350000	170	33	17	59-97	29
Acenaphthylene	208-96-8	NE	NA	1150000	170	33	17	58-98	30
Acetophenone	98-86-2	7.82E+03	NMED 2012	3900000	170	33	17	47-95	30
Anthracene	120-12-7	1.72E+04	NMED 2012	11500000	170	33	17	61-104	29
Atrazine	1912-24-9	2.1E+00	EPA 2011	1050	170	33	17	61-105	31
Benzaldehyde	100-52-7	7.8E+03	EPA 2011	3900000	830	330	170	37-113	31
Benzo(a)anthracene	56-55-3	1.48E+00	NMED 2012	900	170	33	17	60-106	31

Worksheet 15.3 (Continued)
Matrix: Soil
Analytical Group: SVOCs - SW846 - 8270C - Target Compound List
Concentration Level: Low

Analyte	CAS Number	NM Sites Project Comparison Criteria (mg/kg)	NM Sites Comparison Criteria Reference	Project Quantitation Limit Goal (µg/kg)[a]	Achievable Laboratory Limits, Accutest Laboratories			Method Performance Criteria	
					LOQ (µg/kg)	LOD (µg/kg)	MDL (µg/kg)	Bias Control Limits (%R) (LCS, MS)	Precision Limits (RPD) (LCSD, MSD)
SVOCs 8270C (Continued)									
Benzo(a)pyrene	50-32-8	1.48E-01	NMED 2012	311	170	33	17	59-102	32
Benzo(b)fluoranthene	205-99-2	1.48E+00	NMED 2012	1050	170	33	17	60-107	31
Benzo(g,h,i)perylene	191-24-2	NE	NA	1150000	170	33	17	56-103	32
Benzo(k)fluoranthene	207-08-9	1.48E+01	NMED 2012	4500	170	33	17	61-107	30
bis(2-Chloroethoxy)methane	111-91-1	1.8E+02	EPA 2011	90000	170	33	17	51-89	30
bis(2-Chloroethyl)ether	111-44-4	2.68E+00	NMED 2012	170	170	33	17	50-96	33
bis(2-Chloroisopropyl)ether	108-60-1	9.15E+01	EPA 2011	2300	170	33	17	44-94	32
bis(2-Ethylhexyl)phthalate	117-81-7	3.47E+02	NMED 2012	23000	330	130	67	57-111	29
Butyl benzyl phthalate	85-68-7	2.6E+02	EPA 2011	130000	170	67	33	57-110	28
Caprolactam	105-60-2	3.1E+04	EPA 2011	15500000	170	67	53	53-107	33
Carbazole	86-74-8	NE	NA	170	170	33	17	60-106	30
Chrysene	218-01-9	1.48E+02	NMED 2012	44000	170	33	17	60-107	31
Dibenzo(a,h)anthracene	53-70-3	1.48E-01	NMED 2012	210	170	33	17	57-105	29
Dibenzofuran	132-64-9	7.8E+01	EPA 2011	39000	170	33	17	58-103	27
Diethyl phthalate	84-66-2	4.89E+04	NMED 2012	1000000	330	130	67	59-106	27
Dimethyl phthalate	131-11-3	6.11E+05	NMED 2012	650000	170	67	33	60-100	26
Di-n-butyl phthalate	84-74-2	6.11E+03	NMED 2012	1150000	330	130	67	59-105	27
Di-n-octyl phthalate	117-84-0	NE	NA	800000	170	67	33	59-117	28
Fluoranthene	206-44-0	2.29E+03	NMED 2012	1550000	170	33	17	60-110	32
Fluorene	86-73-7	2.29E+03	NMED 2012	170	170	33	17	60-99	30
Hexachlorobenzene	118-74-1	3.04E+00	NMED 2012	200	170	33	17	58-103	27
Hexachlorobutadiene	87-68-3	6.11E+01	NMED 2012	3100	170	67	33	49-95	33
Hexachlorocyclopentadiene	77-47-4	3.67E+02	NMED 2012	5000	170	83	73	36-94	41
Hexachloroethane	67-72-1	4.28E+01	NMED 2012	30552	170	67	33	44-89	38
Indeno(1,2,3-cd)pyrene	193-39-5	1.48E+00	NMED 2012	800	170	33	17	57-104	33
Isophorone	78-59-1	5.12E+03	NMED 2012	2300000	170	33	17	58-97	30
Naphthalene	91-20-3	4.30E+01	NMED 2012	85000	170	33	27	54-93	32
Nitrobenzene	98-95-3	5.35E+01	NMED 2012	19500	170	33	17	53-92	32
N-Nitroso-di-n-propylamine	621-64-7	6.9E-02	EPA 2011	34.5	170	33	17	49-94	28
N-Nitrosodiphenylamine	86-30-6	9.93E+02	NMED 2012	65000	170	33	17	53-107	28
Pentachlorophenol	87-86-5	8.94E+01	NMED 2012	445	830	330	200	50-115	33
Phenanthrene	85-01-8	1.83E+03	NMED 2012	1150000	170	33	17	61-103	32

Worksheet 15.3 (Concluded)
Matrix: Soil
Analytical Group: SVOCs - SW846 - 8270C - Target Compound List
Concentration Level: Low

Analyte	CAS Number	NM Sites Project Comparison Criteria (mg/kg)	NM Sites Comparison Criteria Reference	Project Quantitation Limit Goal (µg/kg)[a]	Achievable Laboratory Limits, Accutest Laboratories			Method Performance Criteria	
					LOQ (µg/kg)	LOD (µg/kg)	MDL (µg/kg)	Bias Control Limits (%R) (LCS, MS)	Precision Limits (RPD) (LCSD, MSD)
SVOCs 8270C (Continued)									
Phenol	108-95-2	1.83E+04	NMED 2012	1150000	170	33	17	55-99	28
Pyrene	129-00-0	1.72E+03	NMED 2012	1150000	170	33	17	58-109	33
Surrogate Spike Compounds									
2-Fluorophenol	367-12-4	NE	NA	NA	NA	NA	NA	40-102	
Phenol-d5	4165-62-2	NE	NA	NA	NA	NA	NA	41-100	
2,4,6-Tribromophenol	118-79-6	NE	NA	NA	NA	NA	NA	42-108	
Nitrobenzene-d5	4165-60-0	NE	NA	NA	NA	NA	NA	40-105	
2-Fluorobiphenyl	321-60-8	NE	NA	NA	NA	NA	NA	43-107	
Terphenyl-d14	1718-51-0	NE	NA	NA	NA	NA	NA	45-119	

[a]The Project Quantification Limit was calculated as half of the Project Comparison Criteria.

%R % recovery.
CAS Chemical Abstract Service.
EPA U.S. Environmental Protection Agency.
LCS Laboratory control sample.
LCSD Laboratory control sample duplicate.
LOD Limit of detection.
LOQ Limit of quantitation.
MDL Minimum detection limit.
µg/kg Microgram per kilogram.
mg/kg Milligrams per kilogram.
MS Matrix spike.
MSD Matrix spike duplicate.
NA Not available.
NE Not established.
NM New Mexico.
NMED New Mexico Environment Department.
RPD Relative percent difference.
SVOC Semivolatile organic compound.

Comparison Criteria is less than LOQ

(NMED 2012) Risk Assessment Guidance for Site Investigation and Remediation, Volume I, Tier 1: Soil Screening Guidance Technical Background Document, Table A-1: NMED Soil Screening Levels, February.

(EPA 2011) U.S. Environmental Protection Agency, Regions 3, 6, and 9, Regional Screening Levels for Chemical Contaminants at Superfund Sites. http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/index.htm, accessed October 2011.

Worksheet 15.4
Matrix: Water
Analytical Group: SVOCs - SW846 - 8270C - Target Compound List
Concentration Level: Low

Analyte	CAS Number	NM Sites Project Comparison Criteria (mg/L)	NM Sites Comparison Criteria Reference	Project Quantitation Limit Goal (µg/L)[a]	Achievable Laboratory Limits, Accutest Laboratories			Method Performance Criteria	
					LOQ (µg/kg)	LOD (µg/kg)	MDL (µg/kg)	Bias Control Limits (%R) (LCS, MS)	Precision Limits (RPD) (LCSD, MSD)
SVOCs 8270C									
2-Chlorophenol	95-57-8	NA	NA	3.50E-02	5	1	0.5	44-103	29
4-Chloro-3-methyl phenol	59-50-7	NA	NA	NA	5	1	0.5	53-105	24
2,4-Dichlorophenol	120-83-2	tox	NMWQCC 2002	2.10E-02	5	1	0.5	53-108	26
2,4-Dimethylphenol	105-67-9	NA	NA	1.40E-01	5	2	1.1	37-91	28
2,4-Dinitrophenol	51-28-5	NA	NA	1.40E-02	25	20	10	37-111	30
4,6-Dinitro-o-cresol	534-52-1	NA	NA	9.80E-03	10	4	2	62-115	26
2-Methylphenol	95-48-7	NA	NA	3.50E-01	5	1	0.54	35-91	30
3&4-Methylphenol		NA	NA	NA	5	2	1.1	32-85	29
2-Nitrophenol	88-75-5	NA	NA	NA	5	1	0.54	49-111	30
4-Nitrophenol	100-02-7	NA	NA	NA	25	10	5	13-55	31
Pentachlorophenol	87-86-5	1.00E-03	EPA 2010	1.00E-03	25	10	5.4	57-118	26
Phenol	108-95-2	tox	NMWQCC 2002	1.00E-01	5	2	0.5	13-54	34
2,4,5-Trichlorophenol	95-95-4	tox	NMWQCC 2002	7.00E-01	5	1	0.5	59-106	23
2,4,6-Trichlorophenol	88-06-2	tox	NMWQCC 2002	1.00E-02	5	1	0.5	58-107	24
Acenaphthene	83-32-9	NA	NA	4.20E-01	5	1	0.5	58-106	21
Acenaphthylene	208-96-8	NA	NA	2.10E-01	5	1	0.5	58-105	21
Acetophenone	98-86-2	NA	NA	NA	5	1	0.51	54-102	27
Anthracene	120-12-7	tox	NMWQCC 2002	2.10E+00	5	1	0.5	65-108	19
Atrazine	1912-24-9	3.00E-03	EPA 2010	3.00E-03	5	1	0.68	65-109	20
Benzaldehyde	100-52-7	NA	NA	NA	25	10	5	42-130	27
Benzo(a)anthracene	56-55-3	NA	NA	1.30E-04	5	1	0.5	63-111	19
Benzo(a)pyrene	50-32-8	2.00E-04	EPA 2010	2.00E-04	5	1	0.5	62-106	20
Benzo(b)fluoranthene	205-99-2	NA	NA	1.80E-04	5	1	0.5	63-109	20
Benzo(g,h,i)perylene	191-24-2	NA	NA	2.10E-01	5	1	0.5	61-111	21
Benzo(k)fluoranthene	207-08-9	tox	NMWQCC 2002	1.70E-04	5	1	0.5	64-111	20
4-Bromophenyl phenyl ether	101-55-3	NA	NA	NA	5	1	0.5	64-107	20
Butyl benzyl phthalate	85-68-7	NA	NA	1.40E+00	5	2	1.1	59-114	20
1,1'-Biphenyl	92-52-4	NA	NA	NA	5	1	0.5	55-101	24
2-Chloronaphthalene	91-58-7	NA	NA	5.60E-01	5	1	0.5	54-105	24
4-Chloroaniline	106-47-8	NA	NA	2.80E-02	5	1	0.5	53-103	22
Caprolactam	105-60-2	NA	NA	NA	10	5	4	10-35	32
Carbazole	86-74-8	NA	NA	NA	5	1	0.5	66-109	20

Worksheet 15.4 (Continued)
Matrix: Water
Analytical Group: SVOCs - SW846 - 8270C - Target Compound List
Concentration Level: Low

Analyte	CAS Number	NM Sites Project Comparison Criteria (mg/L)	NM Sites Comparison Criteria Reference	Project Quantitation Limit Goal (µg/L)[a]	Achievable Laboratory Limits, Accutest Laboratories			Method Performance Criteria	
					LOQ (µg/kg)	LOD (µg/kg)	MDL (µg/kg)	Bias Control Limits (%R) (LCS, MS)	Precision Limits (RPD) (LCSD, MSD)
SVOCs 8270C (Continued)									
Chrysene	218-01-9	NA	NA	0.75	5	1	0.5	64-111	19
bis(2-Chloroethoxy)methane	111-91-1	NA	NA	5	5	1	0.5	48-101	28
bis(2-Chloroethyl)ether	111-44-4	NA	NA	5	5	1	0.54	51-108	27
bis(2-Chloroisopropyl)ether	108-60-1	NA	NA	140	5	1	0.54	43-106	27
4-Chlorophenyl phenyl ether	7005-72-3	NA	NA	5	5	1	0.5	61-107	20
2,4-Dinitrotoluene	121-14-2	tox	NMWQCC 2002	0.01	5	1	0.5	60-109	20
2,6-Dinitrotoluene	606-20-2	tox	NMWQCC 2002	0.155	5	1	0.5	58-104	21
3,3'-Dichlorobenzidine	91-94-1	NA	NA	10	10	2	1	57-105	25
Dibenzo(a,h)anthracene	53-70-3	NA	NA	0.15	5	1	0.52	62-112	20
Dibenzofuran	132-64-9	NA	NA	14	5	1	0.5	61-108	20
Di-n-butyl phthalate	84-74-2	tox	NMWQCC 2002	350	5	1	0.87	62-109	20
Di-n-octyl phthalate	117-84-0	NA	NA	70	5	2	1.1	60-120	24
Diethyl phthalate	84-66-2	tox	NMWQCC 2002	2800	5	2	1.1	62-109	19
Dimethyl phthalate	131-11-3	tox	NMWQCC 2002	35000	5	1	0.99	63-106	19
bis(2-Ethylhexyl)phthalate	117-81-7	tox	NMWQCC 2002	3	5	2	1.1	59-116	21
Fluoranthene	206-44-0	tox	NMWQCC 2002	140	5	1	0.5	65-114	21
Fluorene	86-73-7	tox	NMWQCC 2002	140	5	1	0.5	61-106	19
Hexachlorobenzene	118-74-1	1.00E-03	EPA 2010	0.03	5	1	0.56	62-107	20
Hexachlorobutadiene	87-68-3	tox	NMWQCC 2002	5	5	2	1	38-107	30
Hexachlorocyclopentadiene	77-47-4	5.00E-02	EPA 2010	25	10	2	1.9	19-84	35
Hexachloroethane	67-72-1	tox	NMWQCC 2002	5	5	2	1	35-101	29
Indeno(1,2,3-cd)pyrene	193-39-5	NA	NA	0.215	5	1	0.5	61-113	20
Isophorone	78-59-1	NA	NA	700	5	1	0.5	56-111	26
2-Methylnaphthalene	91-57-6	NA	NA	105	5	1	0.57	56-112	26
2-Nitroaniline	88-74-4	NA	NA	5	5	1	0.5	60-109	20
3-Nitroaniline	99-09-2	NA	NA	5	5	1	0.5	52-107	21
4-Nitroaniline	100-01-6	NA	NA	5	5	1	0.5	59-111	21
Naphthalene	91-20-3	NA	NA	70	5	1	0.8	50-104	28
Nitrobenzene	98-95-3	tox	NMWQCC 2002	1.75	5	1	0.59	52-105	28
N-Nitroso-di-n-propylamine	621-64-7	NA	NA	0.9	5	1	0.5	51-104	28

Worksheet 15.4 (Concluded)
Matrix: Water
Analytical Group: SVOCs - SW846 - 8270C - Target Compound List
Concentration Level: Low

Analyte	CAS Number	NM Sites Project Comparison Criteria (mg/L)	NM Sites Comparison Criteria Reference	Project Quantitation Limit Goal (µg/L)[a]	Achievable Laboratory Limits, Accutest Laboratories			Method Performance Criteria	
					LOQ (µg/kg)	LOD (µg/kg)	MDL (µg/kg)	Bias Control Limits (%R) (LCS, MS)	Precision Limits (RPD) (LCSD, MSD)
SVOCs 8270C (Continued)									
N-Nitrosodiphenylamine	86-30-6	tox	NMWQCC 2002	1.6	5	2	1	57-110	19
Phenanthrene	85-01-8	tox	NMWQCC 2002	105	5	1	0.5	65-108	20
Pyrene	129-00-0	tox	NMWQCC 2002	105	5	1	0.5	60-113	20
Surrogate Spike Compounds									
2-Fluorophenol	367-12-4	NA	NA	NA	NA	NA	NA	14-62	
Phenol-d5	4165-62-2	NA	NA	NA	NA	NA	NA	10-40	
2,4,6-Tribromophenol	118-79-6	NA	NA	NA	NA	NA	NA	33-118	
Nitrobenzene-d5	4165-60-0	NA	NA	NA	NA	NA	NA	42-108	
2-Fluorobiphenyl	321-60-8	NA	NA	NA	NA	NA	NA	40-106	
Terphenyl-d14	1718-51-0	NA	NA	NA	NA	NA	NA	39-121	

[a]The Project Quantification Limit was calculated as half of the Project Comparison Criteria.

%R	% recovery.	mg/L	Milligrams per liter.
CAS	Chemical Abstract Service.	MS	Matrix spike.
EPA	U.S. Environmental Protection Agency.	MSD	Matrix spike duplicate.
LCS	Laboratory control sample.	NA	Not available.
LCSD	Laboratory control sample duplicate.	NE	Not established.
LOD	Limit of detection.	NM	New Mexico.
LOQ	Limit of quantitation.	NMED	New Mexico Environment Department.
MDL	Minimum detection limit.	NMWQCC	New Mexico Water Quality Control Commission.
µg/kg	Microgram per kilogram.	RPD	Relative percent difference.
µg/L	Microgram per liter.	SVOC	Semivolatile organic compound.

Comparison Criteria is less than LOQ

(NMWQCC 2002) Ground and Surface Water Protection, 20.6.2 New Mexico Administrative Code.

(EPA 2010) National Primary Drinking Water Regulations: List of Drinking Water Contaminants and Maximum Contaminant Levels: http://www.access.gpo.gov/nara/cfr/waisidx_10/40cfr141_10.html.

Worksheet 15.5
Matrix: Soil
Analytical Group: Total Petroleum Hydrocarbons (TPH), Gasoline Range Organics (GRO) - SW846 - 8015C
Concentration Level: Low

Analyte	CAS Number	NM Sites Project Comparison Criteria (mg/kg)	NM Sites Comparison Criteria Reference	Project Quantitation Limit Goal (mg/kg)	Achievable Laboratory Limits, Accutest Laboratories			Method Performance Criteria	
					LOQ (mg/kg)	LOD (mg/kg)	MDL (mg/kg)	Bias Control Limits (%R) (LCS, MS)	Precision Limits (RPD) (LCSD, MSD)
TPH-GRO (C6-C10)	NA		NMED 2012	5	5	2.5	2.5	74-121	17
Surrogate Spike Compounds									
4-Bromofluorobenzene	460-00-4							56-136	
aaa-Trifluorotoluene	98-08-8							61-121	

[a]The Project Quantification Limit was calculated as half of the Project Comparison Criteria.

%R % recovery.
CAS Chemical Abstract Service.
EPA U.S. Environmental Protection Agency.
GRO Gasoline range organics.
LCS Laboratory control sample.
LCSD Laboratory control sample duplicate.
LOD Limit of detection.
LOQ Limit of quantitation.
MDL Minimum detection limit.
mg/kg Milligrams per kilogram.
MS Matrix spike.
MSD Matrix spike duplicate.
NA Not available.
NM New Mexico.
NMED New Mexico Environment Department.
RPD Relative percent difference.
TPH Total petroleum hydrocarbon.

(NMED 2012) Risk Assessment Guidance for Site Investigation and Remediation, Volume I, Tier 1: Soil Screening Guidance Technical Background Document, Table 6-2: TPH Screening Guidelines for Potable Water, February.

(EPA 2011) U.S. Environmental Protection Agency, Regions 3, 6, and 9, Regional Screening Levels for Chemical Contaminants at Superfund Sites. http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/index.htm, accessed October 2011.

Worksheet 15.6
Matrix: Water
Analytical Group: Total Petroleum Hydrocarbons (TPH), Gasoline Range Organics (GRO) - SW846 - 8015C
Concentration Level: Low

Analyte	CAS Number	NM Sites Project Comparison Criteria (mg/L)	NM Sites Comparison Criteria Reference	Project Quantitation Limit Goal (mg/L)[a]	Achievable Laboratory Limits, Accutest Laboratories			Method Performance Criteria	
					LOQ (mg/L)	LOD (mg/L)	MDL (mg/L)	Bias Control Limits (%R) (LCS, MS)	Precision Limits (RPD) (LCSD, MSD)
TPH-GRO (C6-C10)				0.1	0.1	0.05	0.05	75-129	13
Surrogate Spike Compounds									
4-Bromofluorobenzene	460-00-4	NA	NA	NA	NA	NA	NA	57-129	
aaa-Trifluorotoluene	98-08-8	NA	NA	NA	NA	NA	NA	58-120	

[a]The Project Quantification Limit was calculated as half of the Project Comparison Criteria.

%R % recovery.
CAS Chemical Abstract Service.
EPA U.S. Environmental Protection Agency.
GRO Gasoline range organics.
LCS Laboratory control sample.
LCSD Laboratory control sample duplicate.
LOD Limit of detection.
LOQ Limit of quantitation.
MDL Minimum detection limit.
mg/L Milligrams per liter.
MS Matrix spike.
MSD Matrix spike duplicate.
NA Not available.
NM New Mexico.
NMED New Mexico Environment Department.
RPD Relative percent difference.
TPH Total petroleum hydrocarbon.

(NMED 2012) Risk Assessment Guidance for Site Investigation and Remediation, Volume I, Tier 1: Soil Screening Guidance Technical Background Document, Table 6-2: TPH Screening Guidelines for Potable Water, February.

(EPA 2010) National Primary Drinking Water Regulations: List of Drinking Water Contaminants and Maximum Contaminant Levels: http://www.access.gpo.gov/nara/cfr/waisidx_10/40cfr141_10.html.

Worksheet 15.7
Matrix: Soil
Analytical Group: Total Petroleum Hydrocarbons (TPH), Diesel and Oil Range Organics (DRO and ORO) - SW846 - 8015C
Concentration Level: Low

Analyte	CAS Number	NM Sites Project Comparison Criteria (mg/kg)	NM Sites Comparison Criteria Reference	Project Quantitation Limit Goal (mg/kg)	Achievable Laboratory Limits, Accutest Laboratories			Method Performance Criteria	
					LOQ (mg/kg)	LOD (mg/kg)	MDL (mg/kg)	Bias Control Limits (%R) (LCS, MS)	Precision Limits (RPD) (LCSD, MSD)
TPH-DRO (C10-C28)	NA	1.0E+03	NMED 2012	8.3	8.3	4.2	3.3	60-107	36
TPH-ORO (>C28-C40)	NA	1.0E+03	NMED 2012	8.3	8.3	4.2	3.3	47-124	33
Surrogate Spike Compounds									
o-Terphenyl	84-15-1							49-108	

[a]For Diesel #2 crankcase oil.

%R % recovery.
CAS Chemical Abstract Service.
DRO Diesel range organics.
LCS Laboratory control sample.
LCSD Laboratory control sample duplicate.
LOD Limit of detection.
LOQ Limit of quantitation.
MDL Minimum detection limit.
mg/kg Milligrams per kilogram.
MS Matrix spike.
MSD Matrix spike duplicate.
NA Not available.
NM New Mexico.
NMED New Mexico Environment Department.
RPD Relative percent difference.
TPH Total petroleum hydrocarbon.

(NMED 2012) Risk Assessment Guidance for Site Investigation and Remediation, Volume I, Tier 1: Soil Screening Guidance Technical Background Document, Table 6-2: TPH Screening Guidelines for Potable Water, February.

Worksheet 15.8
Matrix: Water
Analytical Group: Total Petroleum Hydrocarbons (TPH), Diesel and Oil Range Organics (DRO and ORO) - SW846 - 8015C
Concentration Level: Low

Analyte	CAS Number	NM Sites Project Comparison Criteria (mg/L)	NM Sites Comparison Criteria Reference	Project Quantitation Limit Goal (mg/L)	Achievable Laboratory Limits, Accutest Laboratories			Method Performance Criteria	
					LOQ (mg/L)	LOD (mg/L)	MDL (mg/L)	Bias Control Limits (%R) (LCS, MS)	Precision Limits (RPD) (LCSD, MSD)
TPH-DRO (C10-C28)		.4	NMED 2012	0.25	0.25	0.13	0.1	59-114	34
TPH-ORO (>C28-C40)		.4	NMED 2012	0.25	0.25	0.13	0.1	60-140	30
Surrogate Spike Compounds									
o-Terphenyl	84-15-1							42-114	

%R % recovery.
CAS Chemical Abstract Service.
DRO Diesel range organics.
LCS Laboratory control sample.
LCSD Laboratory control sample duplicate.
LOD Limit of detection.
LOQ Limit of quantitation.
MDL Minimum detection limit.
mg/L Milligrams per liter.
MS Matrix spike.
MSD Matrix spike duplicate.
NA Not available.
NM New Mexico.
NMED New Mexico Environment Department.
RPD Relative percent difference.
TPH Total petroleum hydrocarbon.

(NMED 2012) Risk Assessment Guidance for Site Investigation and Remediation, Volume I, Tier 1: Soil Screening Guidance Technical Background Document, Table 6-2: TPH Screening Guidelines for Potable Water, February.

Worksheet 15.9
Matrix: Soil
Analytical Group: Metals - SW846 - 6010C/6020A
Concentration Level: Low

Analyte	CAS Number	NM Sites Project Comparison Criteria (mg/kg)	NM Sites Comparison Criteria Reference	Project Quantitation Limit Goal (µg/kg)[a]	Achievable Laboratory Limits, Accutest Laboratories			Method Performance Criteria	
					LOQ (mg/kg)	LOD (mg/kg)	MDL (mg/kg)	Bias Control Limits (%R) (LCS, MS)	Precision Limits (RPD) (LCSD, MSD)
Metals 6010C									
Aluminum	7429-90-5	7.80E+04	NMED 2012	39000	10	1.25	1.2	80-120	20
Antimony	7440-36-0	3.13E+01	NMED 2012	16	1	0.1	0.1	80-120	20
Arsenic	7440-38-2	3.90E+00	NMED 2012	2	0.5	0.1	0.1	80-120	20
Barium	7440-39-3	1.56E+04	NMED 2012	2750	10	0.5	0.5	80-120	20
Beryllium	7440-41-7	1.56E+02	NMED 2012	80	0.25	0.05	0.05	80-120	20
Cadmium	7440-43-9	7.03E+01	NMED 2012	39	0.2	0.05	0.05	80-120	20
Calcium	7440-70-2	NE	NE	4650	250	5	5	80-120	20
Chromium	7440-47-3	1.17E+05	NMED 2012	115	0.5	0.05	0.05	80-120	20
Cobalt	7440-48-4	2.3E+01	EPA 2011	2350	2.5	0.05	0.05	80-120	20
Copper	7440-50-8	3.13E+03	NMED 2012	1450	1.25	0.1	0.1	80-120	20
Iron	7439-89-6	5.48E+04	NMED 2012	11500	15	2.5	1.7	80-120	20
Lead	7439-92-1	4.00E+02	NMED 2012	200	1	0.05	0.05	80-120	20
Magnesium	7439-95-4	NE	NE	162500	250	5	5	80-120	20
Manganese	7439-96-5	1.86E+03	NMED 2012	800	0.75	0.05	0.05	80-120	20
Molybdenum	7439-98-7	3.91E+02	NMED 2012	195	2.5	0.05	0.05	80-120	20
Nickel	7440-02-0	1.56E+03	NMED 2012	800	2	0.05	0.05	80-120	20
Potassium	7440-09-7	NE	NE	634	500	25	25	80-120	20
Selenium	7782-49-2	3.91E+02	NMED 2012	195	1	0.2	0.2	80-120	20
Silver	7440-22-4	3.91E+02	NMED 2012	195	0.5	0.05	0.05	80-120	20
Sodium	7440-23-5	NE	NE	65	500	100	55	80-120	20
Strontium	7440-24-6	4.69E+04	NMED 2012	23464	0.5	0.05	0.05	80-120	20
Thallium	7440-28-0	7.82E-01	NMED 2012	3	0.5	0.25	0.13	80-120	20
Tin	7440-31-5	4.7E+04	EPA 2011	23500	2.5	0.05	0.05	80-120	20
Titanium	7440-32-6	NE	NE	0.5	0.5	0.1	0.1	80-120	20
Vanadium	7440-62-2	3.91E+02	NMED 2012	275	2.5	0.05	0.05	80-120	20
Zinc	7440-66-6	2.35E+04	NMED 2012	11500	1	0.25	0.25	80-120	20

Worksheet 15.9 (Continued)
Matrix: Soil
Analytical Group: Metals - SW846 - 6010C/6020A
Concentration Level: Low

Analyte	CAS Number	NM Sites Project Comparison Criteria (mg/kg)	NM Sites Comparison Criteria Reference	Project Quantitation Limit Goal (µg/kg)[a]	Achievable Laboratory Limits, Accutest Laboratories			Method Performance Criteria	
					LOQ (mg/kg)	LOD (mg/kg)	MDL (mg/kg)	Bias Control Limits (%R) (LCS, MS)	Precision Limits (RPD) (LCSD, MSD)
Metals 6020A									
Aluminum	7429-90-5	7.80E+04	NMED 2012	39000	10	15	0.697	80-120	20
Antimony	7440-36-0	3.13E+01	NMED 2012	16	1	0.15	0.073	80-120	20
Arsenic	7440-38-2	3.90E+00	NMED 2012	2	0.5	0.15	0.029	80-120	20
Barium	7440-39-3	1.56E+04	NMED 2012	2750	10	0.3	0.079	80-120	20
Beryllium	7440-41-7	1.56E+02	NMED 2012	78	0.25	0.15	0.002	80-120	20
Cadmium	7440-43-9	7.03E+01	NMED 2012	39	0.2	0.15	0.01	80-120	20
Calcium	7440-70-2	NE	NE	4650	250	75	7.21	80-120	20
Chromium	7440-47-3	1.17E+05	NMED 2012	115	0.5	0.6	0.085	80-120	20
Cobalt	7440-48-4	2.30E+01	EPA 2011	12	2.5	0.15	0.002	80-120	20
Copper	7440-43-9	3.13E+03	NMED 2012	1450	1.25	0.6	0.04	80-120	20
Iron	7439-89-6	5.48E+04	NMED 2012	11500	15	15	2.6	80-120	20
Lead	7439-92-1	4.00E+02	NMED 2012	200	1	0.15	0.008	80-120	20
Magnesium	7439-95-4	NE	NE	162500	250	75	2.34	80-120	20
Manganese	7439-96-5	1.86E+04	NMED 2012	800	0.75	0.15	0.018	80-120	20
Nickel	7440-02-0	1.56E+03	NMED 2012	782	2	0.6	0.256	80-120	20
Potassium	7440-09-7	NE	NE	634	500	75	4.9	80-120	20
Selenium	7782-49-2	3.91E+02	NMED 2012	195	1	0.15	0.06	80-120	20
Silver	7440-22-4	3.91E+02	NMED 2012	195	0.5	0.15	0.009	80-120	20
Sodium	7440-23-5	NE	NE	65	500	75	3.84	80-120	20

Worksheet 15.9 (Concluded)
Matrix: Soil
Analytical Group: Metals - SW846 - 6010C/6020A
Concentration Level: Low

Analyte	CAS Number	NM Sites Project Comparison Criteria (mg/kg)	NM Sites Comparison Criteria Reference	Project Quantitation Limit Goal (µg/kg)[a]	Achievable Laboratory Limits, Accutest Laboratories			Method Performance Criteria	
					LOQ (mg/kg)	LOD (mg/kg)	MDL (mg/kg)	Bias Control Limits (%R) (LCS, MS)	Precision Limits (RPD) (LCSD, MSD)
Thallium	7440-28-0	7.82E-01	NMED 2012	3	0.5	0.15	0.035	80-120	20
Vanadium	7440-62-2	3.91E+02	NMED 2012	196	2.5	0.6	0.144	80-120	20
Zinc	7440-66-6	2.35E+04	NMED 2012	11500	1	1.2	0.466	80-120	20

[a]The Project Quantification Limit was calculated as half of the Project Comparison Criteria.

< Less than.
%R % recovery.
CAS Chemical Abstract Service.
EPA U.S. Environmental Protection Agency
LCS Laboratory control sample.
LCSD Laboratory control sample duplicate.
LOD Limit of detection.
LOQ Limit of quantitation.
MDL Minimum detection limit.
µg/kg Microgram per kilogram.
mg/kg Milligram per kilogram.
MS Matrix spike.
MSD Matrix spike duplicate.
NA Not available.
NE Not established.
NM New Mexico.
NMED New Mexico Environment Department.
RPD Relative percent difference.

(NMED 2012) Risk Assessment Guidance for Site Investigation and Remediation, Volume I, Tier 1: Soil Screening Guidance Technical Background Document, Table A-1: NMED Soil Screening Levels, February.

(EPA 2011) U.S. Environmental Protection Agency, Regions 3, 6, and 9, Regional Screening Levels for Chemical Contaminants at Superfund Sites. http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/index.htm, accessed October 2011.

Worksheet 15.10
Matrix: Water
Analytical Group: Metals - SW846 - 6010C/6020A
Concentration Level: Low

Analyte	CAS Number	NM Sites Project Comparison Criteria (mg/L)	NM Sites Comparison Criteria Reference	Project Quantitation Limit Goal (µg/L)[a]	Achievable Laboratory Limits, Accutest Laboratories			Method Performance Criteria	
					LOQ (µ/L)	LOD (µg/L)	MDL (µg/L)	Bias Control Limits (%R) (LCS, MS)	Precision Limits (RPD) (LCSD, MSD)
Metals 6010C									
Aluminum	7429-90-5	5.00E+00	NMWQCC 2002	1750	200	25	25	80-120	20
Antimony	7440-36-0	6.00E-03	EPA 2010	6	6	2	2	80-120	20
Arsenic	7440-38-2	1.00E-01	NMWQCC 2002	25	10	2	2	80-120	20
Barium	7440-39-3	1.00E+00	NMWQCC 2002	1000	200	5	5	80-120	20
Beryllium	7440-41-7	4.00E-03	EPA 2010	4	4	1	1	80-120	20
Cadmium	7440-43-9	1.00E-02	NMWQCC 2002	5	5	1	1	80-120	20
Calcium	7440-70-2	NA	NA	1	1000	100	100	80-120	20
Chromium	7440-47-3	5.00E-02	NMWQCC 2002	50	10	1	1	80-120	20
Cobalt	7440-48-4	5.00E-02	NMWQCC 2002	25	50	1	1	80-120	20
Copper	7440-43-9	1.00E+00	NMWQCC 2002	325	25	2	2	80-120	20
Iron	7439-89-6	1.00E+00	NMWQCC 2002	500	300	50	35	80-120	20
Lead	7439-92-1	5.00E-02	NMWQCC 2002	5	5	1	1	80-120	20
Magnesium	7439-95-4	NA	NA	5	5000	100	100	80-120	20
Manganese	7439-96-5	2.00E-01	NMWQCC 2002	75	15	1	1	80-120	20
Molybdenum	7439-98-7	1.00E+00	NMWQCC 2002	17.5	50	2	2	80-120	20
Nickel	7440-02-0	2.00E-01	NMWQCC 2002	50	40	2	2	80-120	20
Potassium	7440-09-7	NA	NA	10	10000	500	500	80-120	20
Selenium	7782-49-2	5.00E-02	NMWQCC 2002	25	10	2	2	80-120	20
Silver	7440-22-4	5.00E-02	NMWQCC 2002	25	10	1	1	80-120	20
Sodium	7440-23-5	NA	NA	10	10000	2000	1900	80-120	20
Strontium	7440-24-6	NA	NA	10	10	1	1	80-120	20
Thallium	7440-28-0	2.00E-03	EPA 2010	1	10	2	1.85	80-120	20
Tin	7440-31-5	NA	NA	50	50	1	1	80-120	20
Titanium	7440-32-6	NA	NA	10	10	2	2	80-120	20
Vanadium	7440-62-2	NA	NA	24.5	50	1	1	80-120	20
Zinc	7440-66-6	1.00E+01	NMWQCC 2002	2500	20	5	5	80-120	20

Worksheet 15.10 (Continued)
Matrix: Water
Analytical Group: Metals - SW846 - 6010C/6020A
Concentration Level: Low

Analyte	CAS Number	NM Sites Project Comparison Criteria (mg/L)	NM Sites Comparison Criteria Reference	Project Quantitation Limit Goal (µg/L)[a]	Achievable Laboratory Limits, Accutest Laboratories			Method Performance Criteria	
					LOQ (µ/L)	LOD (µg/L)	MDL (µg/L)	Bias Control Limits (%R) (LCS, MS)	Precision Limits (RPD) (LCSD, MSD)
Metals 6020A									
Aluminum	7429-90-5	5.00E+00	NMWQCC 2002	1750	50	25	5.27	80-120	20
Antimony	7440-36-0	6.00E-03	EPA 2010	3	1	0.5	0.361	80-120	20
Arsenic	7440-38-2	1.00E-01	NMWQCC 2002	25	1	0.5	0.093	80-120	20
Barium	7440-39-3	1.00E+00	NMWQCC 2002	1000	2	1	0.055	80-120	20
Beryllium	7440-41-7	4.00E-03	EPA 2010	2	1	0.5	0.023	80-120	20
Cadmium	7440-43-9	1.00E-02	NMWQCC 2002	2.5	1	0.5	0.023	80-120	20
Calcium	7440-70-2	NA	NA	500	500	100	24.25	80-120	20
Chromium	7440-47-3	5.00E-02	NMWQCC 2002	50	2	1	0.114	80-120	20
Cobalt	7440-48-4	5.00E-02	NMWQCC 2002	25	1	0.5	0.024	80-120	20
Copper	7440-43-9	1.00E+00	NMWQCC 2002	325	2	1	0.252	80-120	20
Iron	7439-89-6	1.00E+00	NMWQCC 2002	500	50	25	4.27	80-120	20
Lead	7439-92-1	5.00E-02	NMWQCC 2002	3.75	1	0.5	0.106	80-120	20
Magnesium	7439-95-4	NA	NA	500	500	250	3.68	80-120	20
Manganese	7439-96-5	2.00E-01	NMWQCC 2002	75	1	0.5	0.089	80-120	20
Nickel	7440-02-0	2.00E-01	NMWQCC 2002	50	2	1.5	1.19	80-120	20
Potassium	7440-09-7	NA	NA	500	500	100	15.8	80-120	20
Selenium	7782-49-2	5.00E-02	NMWQCC 2002	25	1	0.5	0.165	80-120	20
Silver	7440-22-4	5.00E-02	NMWQCC 2002	25	1	0.5	0.021	80-120	20
Sodium	7440-23-5	NA	NA	500	500	100	24.1	80-120	20
Thallium	7440-28-0	2.00E-03	EPA 2010	1	1	0.5	0.249	80-120	20
Vanadium	7440-62-2	NA	NA	24.5	2	1	0.258	80-120	20
Zinc	7440-66-6	1.00E+01	NMWQCC 2002	2500	4	3	2.21	80-120	20

[a]The Project Quantification Limit Goal was calculated as half of the Project Comparison Criteria.

<	Less than.
%R	% recovery.
CAS	Chemical Abstract Service.
EPA	U.S. Environmental Protection Agency
LCS	Laboratory control sample.
LCSD	Laboratory control sample duplicate.
LOD	Limit of detection.
LOQ	Limit of quantitation.
MDL	Minimum detection limit.
µg/L	Microgram per liter.
mg/L	Milligram per liter.

Worksheet 15.10 (Concluded)
Matrix: Water
Analytical Group: Metals - SW846 - 6010C/6020A
Concentration Level: Low

MS	Matrix spike.
MSD	Matrix spike duplicate.
NA	Not available.
NE	Not established.
NM	New Mexico.
NMED	New Mexico Environment Department.
NMWQCC	New Mexico Water Quality Control Commission.
RPD	Relative percent difference.

Comparison criteria is less than LOQ

(NMWQCC 2002) Ground and Surface Water Protection, 20.6.2 New Mexico Administrative Code.

(EPA 2010) National Primary Drinking Water Regulations: List of Drinking Water Contaminants and Maximum Contaminant Levels: http://www.access.gpo.gov/nara/cfr/waisidx_10/40cfr141_10.html..

Worksheet 15.11
Matrix: Soil
Analytical Group: Metals - SW846 - 7471B – Mercury
Concentration Level: Low

Analyte	CAS Number	NM Sites Project Comparison Criteria (mg/kg)	NM Sites Comparison Criteria Reference	Project Quantitation Limit Goal (mg/kg)[a]	Achievable Laboratory Limits, Accutest Laboratories			Method Performance Criteria	
					LOQ (mg/kg)	LOD (mg/kg)	MDL (mg/kg)	Bias Control Limits (%R) (LCS, MS)	Precision Limits (RPD) (LCSD, MSD)
Mercury 7471B									
Mercury	7439-97-6	7.82E+00	NMED 2012	4	0.083	NA	0.0103	80-120	20

[a]The Project Quantification Limit was calculated as half of the Project Comparison Criteria.

< Less than.
%R % recovery.
CAS Chemical Abstract Service.
LCS Laboratory control sample.
LCSD Laboratory control sample duplicate.
LOD Limit of detection.
LOQ Limit of quantitation.
MDL Minimum detection limit.
mg/kg Milligrams per kilogram.
MS Matrix spike.
MSD Matrix spike duplicate.
NA Not available.
NM New Mexico.
NMED New Mexico Environment Department.
RPD Relative percent difference.

(NMED 2012) Risk Assessment Guidance for Site Investigation and Remediation, Volume I, Tier 1: Soil Screening Guidance Technical Background Document, Table A-1: NMED Soil Screening Levels, February.

Worksheet 15.12
Matrix: Water
Analytical Group: Metals - SW846 - 7470A – Mercury
Concentration Level: Low

Analyte	CAS Number	NM Sites Project Comparison Criteria (mg/L)	NM Sites Comparison Criteria Reference	Project Quantitation Limit Goal (µg/L)[a]	Achievable Laboratory Limits, Accutest Laboratories			Method Performance Criteria	
					LOQ (µg/L)	LOD (µg/L)	MDL (µg/L)	Bias Control Limits (%R) (LCS, MS)	Precision Limits (RPD) (LCSD, MSD)
Mercury 7470A									
Mercury	7439-97-6	2.0E-03	NMWQCC 2002	1	1	NA	0.071	80-120	20

[a]The Project Quantification Limit was calculated as half of the Project Comparison Criteria.

<	Less than.
%R	% recovery.
CAS	Chemical Abstract Service.
LCS	Laboratory control sample.
LCSD	Laboratory control sample duplicate.
LOD	Limit of detection.
LOQ	Limit of quantitation.
MDL	Minimum detection limit.
µg/L	Microgram per liter.
mg/L	Milligrams per liter.
MS	Matrix spike.
MSD	Matrix spike duplicate.
NA	Not available.
NM	New Mexico.
NMED	New Mexico Environment Department.
NMWQCC	New Mexico Water Quality Control Commission.
RPD	Relative percent difference.

(NMWQCC 2002) Ground and Surface Water Protection, 20.6.2 New Mexico Administrative Code.

Worksheet 15.13a
Matrix: Waste
Analytical Group: Toxic Characteristic Volatile Organic Compounds (TCLP VOCs) - SW846 - 1311/8260B
Concentration Level: Low

Analyte	CAS Number	NM Sites Project Comparison Criteria (mg/L)	NM Sites Comparison Criteria Reference	Project Quantitation Limit Goal (mg/L)[a]	Achievable Laboratory Limits, Accutest Laboratories			Method Performance Criteria	
					LOQ (mg/L)	LOD (mg/L)	MDL (mg/L)	Bias Control Limits (%R) (LCS, MS)	Precision Limits (RPD) (LCSD, MSD)
TCLP VOC 1311/8260B									
Benzene	71-43-2	5.0E-01	CFR 2006	0.25	0.01	0.005	0.002	83-124	11
Chlorobenzene	108-90-7	1.0E+02	CFR 2006	50	0.01	0.005	0.002	87-115	9
Chloroform	67-66-3	6.0E+00	CFR 2006	3	0.01	0.005	0.0022	85-123	10
Carbon tetrachloride	56-23-5	5.0E-01	CFR 2006	0.25	0.01	0.005	0.0025	74-139	13
1,1-Dichloroethylene	75-35-4	7.0E-01	CFR 2006	0.35	0.01	0.005	0.0023	75-133	13
1,2-Dichloroethane	107-06-2	5.0E-01	CFR 2006	0.25	0.01	0.005	0.002	76-122	11
p-Dichlorobenzene	106-46-7	7.5E+00	CFR 2006	3.75	0.01	0.005	0.0023	87-113	10
Methyl ethyl ketone	78-93-3	2.0E+02	CFR 2006	100	0.05	0.04	0.02	61-127	13
Tetrachloroethylene	127-18-4	7.0E-01	CFR 2006	0.35	0.01	0.005	0.0025	80-131	12
Trichloroethylene	79-01-6	5.0E-01	CFR 2006	0.25	0.01	0.005	0.0026	85-124	10
Vinyl chloride	75-01-4	2.0E-01	CFR 2006	0.1	0.01	0.005	0.0022	57-153	22
Surrogate Spike Compounds									
Dibromofluoromethane	1868-53-7	NA	NA	NA	NA	NA	NA	87-116	
1,2-Dichloroethane-D4	17060-07-0	NA	NA	NA	NA	NA	NA	76-127	
Toluene-D8	2037-26-5	NA	NA	NA	NA	NA	NA	86-112	
4-Bromofluorobenzene	460-00-4	NA	NA	NA	NA	NA	NA	84-120	

[a]The Project Quantification Limit was calculated as half of the Project Comparison Criteria.

%R % recovery.
CAS Chemical Abstract Service.
CFR Code of Federal Regulations.
FR Federal Register.
LCS Laboratory control sample.
LCSD Laboratory control sample duplicate.
LOD Limit of detection.
LOQ Limit of quantitation.
MDL Minimum detection limit.
mg/L Milligrams per liter.
MS Matrix spike.
MSD Matrix spike duplicate.
NA Not available.
NM New Mexico.
RPD Relative percent difference.
TCLP Toxicity characteristic leaching procedure.
VOC Volatile organic compound.

(CFR 2006) 40 CFR 261.24 Toxicity Characteristic Table 1 FR 40259, July 14, 2006.

Worksheet 15.13b
Matrix: Waste
Analytical Group: Toxic Characteristic Semi-volatile Organic Compounds (TCLP SVOCs) - SW846 - 1311/8270D
Concentration Level: Low

Analyte	CAS Number	NM Sites Project Comparison Criteria (mg/L)	NM Sites Comparison Criteria Reference	Project Quantitation Limit Goal (mg/L)[a]	Achievable Laboratory Limits, Accutest Laboratories			Method Performance Criteria	
					LOQ (mg/L)	LOD (mg/L)	MDL (mg/L)	Bias Control Limits (%R) (LCS, MS)	Precision Limits (RPD) (LCSD, MSD)
TCLP SVOC 1311/8270D									
2-Methylphenol	95-48-7	2.0E+02	CFR 2006	100	0.05	0.01	0.0054	35-91	30
3&4-Methylphenol		2.0E+02	CFR 2006	100	0.05	0.02	0.011	32-85	29
Pentachlorophenol	87-86-5	1.0E+02	CFR 2006	50	0.25	0.1	0.054	57-118	26
2,4,5-Trichlorophenol	95-95-4	4.0E+02	CFR 2006	200	0.05	0.01	0.005	59-106	23
2,4,6-Trichlorophenol	88-06-2	2.0E+00	CFR 2006	1	0.05	0.01	0.005	58-107	24
1,4-Dichlorobenzene	106-46-7	7.5E+00	CFR 2006	3.75	0.05	0.02	0.01	40-100	28
2,4-Dinitrotoluene	121-14-2	1.3E-01	CFR 2006	0.065	0.05	0.01	0.005	60-109	20
Hexachlorobenzene	118-74-1	1.3E-01	CFR 2006	0.065	0.05	0.01	0.0056	62-107	20
Hexachlorobutadiene	87-68-3	5.0E-01	CFR 2006	0.25	0.05	0.02	0.01	38-107	30
Hexachloroethane	67-72-1	3.0E+00	CFR 2006	1.5	0.05	0.02	0.01	35-101	29
Nitrobenzene	98-95-3	2.0E+00	CFR 2006	1	0.05	0.01	0.0059	52-105	28
Pyridine	110-86-1	5.0E+00	CFR 2006	2.5	0.1	0.02	0.016	15-67	40
2-Fluorophenol	367-12-4	NA	NA	NA	NA	NA	NA	14-62	
Phenol-d5	4165-62-2	NA	NA	NA	NA	NA	NA	10-40	
2,4,6-Tribromophenol	118-79-6	NA	NA	NA	NA	NA	NA	33-118	
Nitrobenzene-d5	4165-60-0	NA	NA	NA	NA	NA	NA	42-108	
2-Fluorobiphenyl	321-60-8	NA	NA	NA	NA	NA	NA	40-106	
Terphenyl-d14	1718-51-0	NA	NA	NA	NA	NA	NA	39-121	

[a]The Project Quantification Limit was calculated as half of the Project Comparison Criteria.

%R % recovery.
CAS Chemical Abstract Service.
CFR Code of Federal Regulations.
FR Federal Register.
LCS Laboratory control sample.
LCSD Laboratory control sample duplicate.
LOD Limit of detection.
LOQ Limit of quantitation.
MDL Minimum detection limit.
mg/L Milligram per liter.
MS Matrix spike.
MSD Matrix spike duplicate.
NA Not available.
NM New Mexico.
RPD Relative percent difference.
SVOC Semivolatile organic compound.
TCLP Toxicity characteristic leaching procedure.

(CFR 2006) 40 CFR 261.24 Toxicity Characteristic Table 1 FR 40259, July 14, 2006.

Worksheet 15.13c
Matrix: Waste
Analytical Group: Toxic Characteristic Metals (TCLP MET) - SW846 - 1311/6010C/7470A
Concentration Level: Low

Analyte	CAS Number	NM Sites Project Comparison Criteria (mg/L)	NM Sites Comparison Criteria Reference	Project Quantitation Limit Goal (mg/L)[a]	Achievable Laboratory Limits, Accutest Laboratories			Method Performance Criteria	
					LOQ (mg/L)	LOD (mg/L)	MDL (mg/L)	Bias Control Limits (%R) (LCS, MS)	Precision Limits (RPD) (LCSD, MSD)
TCLP Metals 1311/6010C/7470A									
Arsenic	7440-38-2	5	CFR 2006	2.5	0.05	NA	0.002	80-120	20
Barium	7440-39-3	100	CFR 2006	50	1.0	NA	0.005	80-120	20
Cadmium	7440-43-9	1	CFR 2006	0.5	0.005	NA	0.001	80-120	20
Chromium	7440-47-3	5	CFR 2006	2.5	0.01	NA	0.001	80-120	20
Lead	7439-92-1	5	CFR 2006	2.5	0.05	NA	0.001	80-120	20
Mercury	7439-97-6	0.2	CFR 2006	0.1	0.01	NA	0.001	80-120	20
Selenium	7782-49-2	1	CFR 2006	0.5	0.05	NA	0.002	80-120	20
Silver	7440-22-4	5	CFR 2006	2.5	0.01	NA	0.001	80-120	20

[a]The Project Quantification Limit was calculated as half of the Project Comparison Criteria.

< Less than.
%R % recovery.
CAS Chemical Abstract Service.
CFR Code of Federal Regulations.
FR Federal Register.
LCS Laboratory control sample.
LCSD Laboratory control sample duplicate.
LOD Limit of detection.
LOQ Limit of quantitation.
MDL Minimum detection limit.
mg/L Milligram per liter.
MS Matrix spike.
MSD Matrix spike duplicate.
NA Not available.
NM New Mexico.
RPD Relative percent difference.
TCLP Toxicity characteristic leaching procedure.

(CFR 2006) 40 CFR 261.24 Toxicity Characteristic Table 1 FR 40259, July 14, 2006.

Worksheet 15.13d
Matrix: Waste
Analytical Group: Hazardous Waste Characteristics Reactivity, Corrosivity, Ignitibility (RCI) - SW846 - 9012B/1010/SW846-Ch.7/9045
Concentration Level: Low

Analyte	CAS Number	NM Sites Project Comparison Criteria (mg/L)	NM Sites Comparison Criteria Reference	Project Quantitation Limit Goal (mg/L)[a]	Achievable Laboratory Limits, Accutest Laboratories			Method Performance Criteria	
					LOQ	LOD	MDL	Bias Control Limits (%R) (LCS, MS)	Precision Limits (RPD) (LCSD, MSD)
Hazardous Waste Characteristics RCI									
Cyanide, Reactive	57-12-5				1.5 mg/kg	NA	1.5 mg/kg	0-100	30
Sulfide, Reactive	NA				50 mg/kg	NA	50 mg/kg	0-100	30
Ignitability (Flashpoint)	NA				>200 Deg. F	NA	NA	NA	25
Corrosivity as pH	NA				0.01 S.U.	NA	NA	NA	NA
Paint Filter Test	NA				0.5 mL/100 g	NA	NA	NA	NA

[a]The Project Quantification Limit was calculated as half of the Project Comparison Criteria.
[b]Undergoes violent changes without detonating water reactive.

°F Degrees Fahrenheit.
> Greater than.
< Less than.
%R % recovery.
CAS Chemical Abstract Service.
CFR Code of Federal Regulations.
FR Federal Register.
g grams.
LCS Laboratory control sample.
LCSD Laboratory control sample duplicate.
LOD Limit of detection.
LOQ Limit of quantitation.
MDL Minimum detection limit.
mg/kg Milligram per kilogram.
mg/L Milligram per liter.
mL Milliliter(s).
MS Matrix spike.
MSD Matrix spike duplicate.
NA Not available.
NM New Mexico.
RCI Reactivity, Corrosivity, Ignitibility
RPD Relative percent difference.
S.U. Standard unit.

(CFR 2006) 40 CFR 261.24 Toxicity Characteristic Table 1 FR 40259, July 14, 2006.

SITE-SPECIFIC SAP/QAPP WORKSHEET #17 – SAMPLING DESIGN AND RATIONALE

This section describes some typical sampling procedures for most commonly used sampling techniques. Each site-specific SAP/QAPP will describe in detail the procedures applicable to the particular site.

17.1 Sampling Design

This section describes the sampling strategy that Shaw will implement during sampling activities conducted under this program. This is a general overview of a sampling design process, and each project will have an individual sampling design detailed in the site-specific SAP/QAPP Worksheet #17.

17.1.1 Sampling Strategy

Excavation Confirmation Samples

Once the visual inspection indicates that soil is not potentially contaminated, confirmation samples will be collected in accordance with Section 4.1.1 of the RFI Work Plan. Confirmation samples will be collected from excavation sidewall and floor locations. Excavation activities and subsequent sampling and analysis will continue until confirmation sampling and analysis indicate that concentrations of COCs do not exceed the applicable NMED residential SSLs (NMED, 2012).

Groundwater Well Boring Soil Sampling

Shaw will collect three soil samples during the advancement of each well boring at the following intervals: 0 to 2 ft interval, interval with the highest OVA field screen result, and the interval immediately above groundwater. The split- spoon sampling technique will be used for the collection of downhole soil samples. Soil samples collected from the well borings will be analyzed for the same parameters as the soil confirmation samples as described in Section 4.1.2.

Groundwater Sampling

Groundwater samples will be collected from the wells (following well development) and analyzed in accordance with the procedures provided in Section 4.1.3 of the RFI Work Plan. If groundwater at the site exceeds NMED Water Quality standards, Shaw will use the TDS levels from the newly installed monitoring wells and nearby monitoring wells to develop a TDS survey. Shaw anticipates the survey will indicate that the present-day groundwater in the immediate vicinity of these sites is over NMED 10,000 milligrams per liter (mg/L) potable water threshold. The NMED does not regulate groundwater that has a TDS over this threshold and results will be compared to EPA MCL.

17.1.2 Surface Soil

Worksheet #18 describes sampling locations, sample types (grab or composite), sample frequency, required analysis, and appropriate QA/QC samples. The RFI Work Plan will include figures of sampling grids, if necessary.

17.1.3 Subsurface Soil

Worksheet #18 describes soil boring locations, sample types (grab or composite), sampling depths and frequency, required analysis, and appropriate QA/QC samples. The RFI Work Plan will include figures of soil boring locations.

17.1.4 Groundwater

Worksheet #18 describes well locations, required analysis, and appropriate QA/QC samples. The RFI Work Plan will include figures showing well locations.

17.1.5 Air or Vapor

Air or vapor samples will not be collected.

17.1.6 Stockpile Characterization

Excavated soil stockpile sampling and analysis will be conducted for disposal purposes. The volume of an excavated soil stockpile will be estimated prior to sampling to determine the appropriate number of soil samples to collect. The volume in cubic yards (CY) of the stockpile will be calculated using the following equations based on their shape:

a) Cone or Pyramid:

$$V = 0.037\ (1/3)\ (L)\ (W)\ (H)$$

b) Flat Rectangle:

$$V = 0.037\ (1/2)\ (L)\ (W)\ (H)$$

Where:

V = volume in CY

L = length in feet

W = width in feet

H = height in feet and

0.037 = the conversion from cubic feet to CY

For each stockpile, sample collection will be conducted at a frequency of one sample per 100 CY or as required by the disposal facility. Stockpile sample locations should be biased towards areas of highest suspected contamination determined through field screening methods (visual or olfactory observations, photoionization detector [PID] measurements, etc.), as described in Shaw SOP EI-FS-203 *Jar Headspace Screening*. A minimum of 6 inches of overlaying soil will be removed prior to collecting the stockpile samples. If compositing stockpile samples is warranted, it will be done in accordance with Shaw SOP EI-FS-011.

17.1.7 IDW

The IDW or RDW will be properly containerized and temporarily stored at a location specified by Holloman AFB prior to transportation. Depending on the constituents of concern, fencing or other special marking may be required. Acceptable waste containers include sealed, U.S. Department of Transportation (DOT)-approved, steel 55-gallon drums, small dumping bins with lids, or roll-off boxes with liners and covers. The containers will be transported in such a manner as to prevent spillage or particulate loss to the atmosphere. When required, sampling of the drums or roll-off boxes will be done in accordance with Shaw SOP EI-FS-116*Sampling of Drums and Other Containers* or Shaw SOP EI-FS-107 *Roll-Off Sampling*, respectively.

The IDW/RDW will be segregated at the site according to matrix (solid or liquid) and how the IDW/RDW was derived (e.g., drill cuttings, drilling fluid, decontamination fluids, excavation, tank contents, and purged groundwater). Each container will be properly labeled with site identification, sampling point, depth, matrix, constituents of concern, and other pertinent information for handling.

17.2 Equipment Decontamination

Decontamination of nondisposable, reusable sampling equipment that comes into contact with samples (such as sleeve rings and the split-spoon sampling device) will be performed to prevent the introduction of extraneous material into samples and to prevent cross-contamination between samples. All sampling equipment will be decontaminated by steam cleaning or washing with a nonphosphate detergent such as Liquinox™ or equivalent. Decontamination water will be collected in appropriately sized containers (e.g., 5-gallon buckets, 55-gallon, DOT-approved drums, or poly-tank) and may require sampling and analysis for characterization prior to disposal.

The following procedures will be used for decontamination of nondisposable sampling equipment:

1. Dry brush or wipe with paper towels, rags, or similar. Rinse with clean nonpotable or tap water. This step will decrease the gross contamination and reduce the frequency at which the nonphosphate detergent and water solution need to be changed.

2. Wash with the nonphosphate detergent and water solution. This step will remove remaining contamination from the equipment. Dilute the nonphosphate detergent as directed by the manufacturer.

3. Rinse with potable water. This step will rinse the detergent solution from the equipment.

4. Rinse with deionized water. This step will rinse any detergent solution and potable water residues. Rinsing will be done by applying the deionized water from a clean squeeze or spray bottle (or equivalent) while holding equipment over a bucket.

5. Decontamination of drilling equipment will be done by hot water pressure-washing.

17.3 Field Screening

Field screening with test instruments may be performed in accordance with health and safety requirements for specification of personal protective equipment and engineering controls, or to locate and delineate contaminated areas, or areas for investigation and sampling. Field screening may include measurements for volatile organic compounds. All field screening instruments will be operated by trained personnel following manufacturer instructions for calibration, operation, and maintenance. Per example, a

portable OVA such as a PID may be used at sites to field-screen soil for evidence of VOC contamination. The PID measures the presence of volatile, ionizable contaminants in vapor. The PID will be operated and calibrated daily according to the manufacturer's directions. The procedure for PID operation is summarized as follows:

1. Turn on instrument according to the manufacturer's directions and allow the lamp to stabilize.

2. Establish "zero" for the PID calibration using atmospheric air.

3. Verify the instrument is in calibration by reading a known concentration, usually 50 to 100 parts per million by volume of isobutylene in air (calibration gas). If the instrument reading deviation is more than 20% true value, recalibrate the PID following manufacturer's directions.

4. Attach inlet of the meter to the location requiring monitoring (i.e., breathing space, sealed plastic bag or jar containing soil, top of well or vapor sampling port).

5. Collect the reading from the instrument, and record it in the field logbook.

SITE-SPECIFIC SAP/QAPP WORKSHEET #18 – SAMPLING LOCATIONS AND METHODS/SOP REQUIREMENTS TABLE

Site-specific SAP/QAPP Worksheet #18 is used to summarize all samples to be collected for the specific site. If special conditional sampling (i.e., step-out hot-spot sampling) is necessary for the site-specific work plan, notes can be added to Worksheet #18 to describe the special sampling condition and decisions. Site-specific sampling locations and methods will be documented in each site-specific plan.

Site-Specific SAP/QAPP Worksheet #18 – Sampling Locations and Methods/SOP Requirements Table

Sampling Location/ID Number	Matrix	Depth (units)	Analytical Group	Estimated Number of Samples (identify field duplicates)	Sampling SOP Reference[a]	Rationale for Sampling Location
All UST Sites	Soil	TBD (Sidewall and Floor of each excavation or soil borings)	VOCs, SVOCs, TPH-DRO/GRO/ORO, TAL Metals	28 (25 primary + 3 FD)	Chemical analytical procedures from EPA SW-846[b], other recognized standard methods, or laboratory-specific SOPs will be used for all laboratory analyses. EPA sample preparation and analytical methods to be used consist of: Methods 3005A, 3015, 3050B, 3051A, 6010C, 6020A, ICP-AES and ICP-MS, as well as Method 7470A or 7471B will be used for definitive analysis of TAL metals in soil. Methods 8260B, 8270C, 8015C, and 160.1 will be used for definitive analysis of the other analytical groups. Preparation (i.e., acid digestion) of soil samples may follow a modified version of EPA Method 3050B under a laboratory-specific SOP whereby 10 grams of soil are digested and volumetrically diluted for analysis.	Analysis for COCs/QC
Groundwater Well Boring Locations	Soil	0-2 ft	VOCs, SVOCs, TPH-DRO/GRO/ORO, TAL Metals	17 (15 primary + 2 FD)		Analysis for COCs/QC
Groundwater Well Boring Locations	Soil	TBD (Highest OVA field screen result interval)	VOCs, SVOCs, TPH-DRO/GRO/ORO, TAL Metals	17 (15 primary + 2 FD)		Analysis for COCs/QC
Groundwater Well Boring Locations	Soil	TBD (Immediately above groundwater)	VOCs, SVOCs, TPH-DRO/GRO/ORO, TAL Metals	17 (15 primary + 2 FD)		Analysis for COCs/QC
Groundwater Wells	Water	Groundwater Depth	VOCs, SVOCs, TPH-DRO/GRO/ORO, TAL Metals, TDS	17 (15 primary + 2 FD)		Analysis for COCs/QC

[a]Field sampling methods are described in the Project Sampling SOP References Table (Worksheet #21).
[b]EPA, 1986, Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW-846, 3rd ed., Including All Promulgated Updates and New Methods, July 2010.

COC	constituent of concern.	SOP	Standard Operating Procedure.
DRO	Diesel range organics.	SVOC	Semivolatile organic compound.
EPA	U.S. Environmental Protection Agency.	TAL	Target analyte list.
FD	Field duplicate.	TBD	To be determined.
ft	Foot (feet).	TDS	Total dissolved solids.
GRO	Gasoline range organics.	TPH	Total petroleum hydrocarbons.
ORO	Oil range organics.	UST	Underground storage tank.
OVA	Organic vapor analyzer.	VOC	Volatile organic compound.
QC	Quality control.		

SITE-SPECIFIC SAP/QAPP WORKSHEET #19 – ANALYTICAL SOP REQUIREMENTS TABLE, ACCUTEST LABORATORIES

Matrix	Analytical Group	Concentration Level	Analytical and Preparation Method/SOP Reference[a]	Sample Size	Containers (number, size, and type)[b]	Preservation Requirements (chemical, temperature, light protected)	Maximum Holding Time (preparation/analysis)
Soil	Metals– ICP/CVAA	Low	SW-846 3050B 6010B/7471B SOP# MET104/MET100/MET105	5 grams	(2)-8oz jar	None specified per Ch.3 of SW-846	6 months/28 days for Hg
Soil	TPH DRO/ORO	Low	SW-846 3550B 8015M/ SOP # OP011/GC011	30 grams		Cool <6°C	14 days to extraction/ 40 days for analysis
Soil	TPH GRO	Low	SW-846 5035A 8015M/ SOP #OP020/GC010	10 grams	(2)-VOC pre-pared vials with 5 mL of MeOH	Cool <6°C	14 days
Soil	VOC	Low	SW-846 5035A 8260B/ SOP #OP020/MS005	15 grams	1 pre-pared VOC vial w/MeOH and 2 VOC vials with 5 mL water	Cool <6°C, freeze within 48 hours	14 days
Water	Metals– ICP/CVAA	Low	SW-846 3010A 6010B/7470A SOP #MET 103/MET100/MET106	1000 mL	(1)-1 liter nalgene bottle	1:1 HNO_3, ambient	6 months/28 days for Hg
Water	Semivolatiles	Low	SW-846 3510C 8270D/ SOP #OP006/MS011	1 liter	(2)-1 liter amber bottle	Cool <6°C	7 days to extraction/ 40 days for analysis
Water	TPH DRO/ORO	Low	SW-846 3510C 8015D/ SOP#OP010/GC011	1 liter	(2)-1 liter amber bottle	Cool <6°C pH <2 with H2SO4	7 days to extraction/ 40 days for analysis
Water	TPH GRO	Low	SW-846 5030B 8015M/ SOP #OP021/GC010	5 ml	(3) 45-ml VOC vials	Cool <6°C pH <2 with HCl	14 days
Water	VOC	Low	SW-846 5030B 8260B/ SOP #OP021/MS005	5 ml	(3) 45-ml VOC vials	Cool <6°C pH <2 with HCl	14 days
Solid	TCLP Volatiles	Low	SW-846 1311 5030B 8260B/ SOP #OP041/OP021/MS005	30 grams	(1)-4 oz glass jar	Cool <6°C	14 days to leaching/14 Days
Solid	TCLP Semivolatiles	Low	SW-846 1311 3510C 8270D/ SOP #OP040/OP006/MS011	30 grams	(3)-8oz jar	Cool <6°C	14 days to leaching 7 days/40 days
Solid	TCLP Metals ICP	Low	SW-846 1311 3010A 6010C/ SOP# OP040/MET103/MET100	30 grams		Cool <6°C	180 Days

SITE-SPECIFIC SAP/QAPP WORKSHEET #19 – ANALYTICAL SOP REQUIREMENTS TABLE, ACCUTEST LABORATORIES (Concluded)

Matrix	Analytical Group	Concentration Level	Analytical and Preparation Method/SOP Reference[a]	Sample Size	Containers (number, size, and type)[b]	Preservation Requirements (chemical, temperature, light protected)	Maximum Holding Time (preparation/analysis)
Solid	TCLP Metals Hg	Low	SW-846 1311 7470A/SOP # OP040/MET106	30 grams		Cool <6°C	28 days
Solid	Cyanide, Reactive	Low	SW-846 Ch.7/SOP #GN136	15 grams		Cool <6°C	14 Days
Solid	Sulfide, Reactive	Low	SW-846 Ch.7/SOP #GN136	15 grams		Cool <6°C	14 Days
Solid	Ignitability (Flashpoint)	Low	SW-846 1010/SOP #GN121	5 grams		Cool <6°C	14 Days
Solid	Corrosivity as pH	Low	SW-846 CHAP7/9045D/SOP #GN179	5 grams		Cool <6°C	ASAP per method

[a]Laboratory Standard Operating Procedures are subject to revision and updates during duration of the project, lab will use the most current revision of the SOP at the time of analysis.
[b]Sample size is a minimum, the containers listed will be filled to compensate for any required re-analysis or re-extractions. For samples requiring MS/MSD containers listed should be tripled.

°C Degrees Celsius.
ASAP As soon as possible.
DRO Diesel Range Organics.
GRO Gasoline Range Organics.
HCl Hydrochloric acid.
Hg Mercury.
HNO_3 Nitric acid.
ICP Inductively coupled plasma.
ID Identification.
MeOH Methanol.
mL milliliter.
ORO Oil Range Organics.
oz ounce.
SOP Standard Operating Procedure.
TCLP Toxicity characteristic leaching procedure.
TDS Total dissolved solids.
TPH Total Petroleum Hydrocarbons.
VOC Volatile organic compound.

SITE-SPECIFIC SAP/QAPP WORKSHEET #20 – FIELD QUALITY CONTROL SAMPLE SUMMARY TABLE

Worksheet #20 is a numeric summary of the field samples and field QC samples to be collected for the project. This Worksheet will be completed for each applicable site in the site-specific SAP/QAPP.

Site-specific SAP/QAPP Worksheet #20 – Field Quality Control Sample Summary Table

Matrix	Analytical Group	Number of Primary Sampling Locations	Number of Field Duplicates	Number of MS/MSDS	Number of Field Blanks	Number of Equipment Rinse Blanks	Number of Trip Blanks	Total Number of Samples to Laboratory
Soil	VOCs	70	9	1 per 20 samples	NA	1 (if nondisposable sampling equipment used)	NA	70 (primary), 7 (FD)
Soil	SVOCs	70	9	1 per 20 samples	NA	1 (if nondisposable sampling equipment used)	NA	70 (primary), 7 (FD)
Soil	TPH – GRO/ DRO/ORO	70	9	1 per 20 samples	NA	1 (if nondisposable sampling equipment used)	NA	70 (primary), 7 (FD)
Soil	TAL Metals	70	9	1 per 20 samples	NA	1 (if nondisposable sampling equipment used)	NA	70 (primary), 7 (FD)
Water	TAL Metals	15	2	1 per 20 samples	NA	1 per day or per sampling event (if nondisposable sampling equipment used)	NA	15 (primary), 2 (FD)
Water	VOCs	15	2	1 per 20 samples	NA	1 per day or per sampling event (if nondisposable sampling equipment used)	1 per shipping cooler	15 (primary), 2 (FD)
Water	SVOCs	15	2	1 per 20 samples	NA	1 per day or per sampling event (if nondisposable sampling equipment used)	1 per shipping cooler	15 (primary), 2 (FD)
Water	TPH – GRO/DRO/ORO	15	2	1 per 20 samples	NA	1 per day or per sampling event (if nondisposable sampling equipment used)	NA	15 (primary), 2 (FD)
Water	TDS	5	1	1 per 20 samples	NA	1 per day or per sampling event (if nondisposable sampling equipment used)	NA	5(primary), 1 (FD)

DRO Diesel Range Organics.
FD Field duplicate.
GRO Gasoline Range Organics.
NA Not applicable.
ORO Oil range organics.
SVOC Semivolatile organic compound.
TAL Target Analyte List.
TDS Total dissolved solids.
TPH Total Petroleum Hydrocarbons.
VOC Volatile organic compound.

SITE-SPECIFIC SAP/QAPP WORKSHEET #22 – FIELD EQUIPMENT CALIBRATION, MAINTENANCE, TESTING, AND INSPECTION TABLE

Field equipment (i.e., water quality meters, PIDs) will be calibrated according to manufacturers' directions. Worksheet #22 identifies field equipment and instructions for calibration and testing. Field meters are generally received at the site with calibration records from the supplier/rental company. Field meter calibrations procedures for site-specific SAP/QAPPs will be documented on the site-specific SAP/QAPP Worksheet #22 (example shown as follows):

Site-Specific SAP/QAPP Worksheet 22 – Field Equipment Calibration, Maintenance, Testing, and Inspection Table

Field Equipment	Calibration Activity	Maintenance Activity	Testing Activity	Inspection Activity	Frequency	Acceptance Criteria	Corrective Action	Responsible Person	SOP Reference
Organic Vapor Monitor or Photo-ionization Detector	Daily calibration before use with 100 parts per million isobutylene gas	As required by manufacturer specifications	Screen for VOCs.	Check all sensors and battery charge.	At beginning of work activity before use	Within ±10% of calibration gas	Replace sensors if damaged Replace battery if not charged If calibration not within ±10%, repeat or tag as "out of calibration – do not use."	Shaw Site Manager/Field Sampler	Manufacturer's Instrument Operating and Calibration Manual
Electronic Water Level Meter	Minimum: Calibrate with steel tape annually	As required by manufacturer specifications	Groundwater level measurement	Check all sensors, cables, and battery charge if applicable. Check for proper instrument response by inserting probe into water. Instrument typically indicates water with an intermittent light and tone.	At beginning of work activity before use	Meets specification. Cable must have graduations to 0.01 feet.	Replace battery if not charged. If meter doesn't register water, replace and tag as "needs service – do not use."	Shaw Site Manager/Field Sampler	Manufacturer's Instrument Operating and Calibration Manual
Electrical Conductivity Probe/Meter	Minimum: Daily calibration before use and at conclusion of the day's sample event with two standards that bracket range of measurements	As required by manufacturer specifications	Measure groundwater quality field parameters (electrical conductivity) during purging and sampling.	Check all sensors, cable and battery charge.	Minimum: At beginning of work activity before use and at the conclusion of the day's sampling event	Within ±10% of calibration solution	Replace probe if damaged. Replace battery if not charged. If calibration not within ±10%, repeat or tag as "out of calibration – do not use."	Shaw Site Manager/Field Sampler	Manufacturer's Instrument Operating and Calibration Manual

QAPP Worksheet 22 – Field Equipment Calibration, Maintenance, Testing, and Inspection Table (Continued)

Field Equipment	Calibration Activity	Maintenance Activity	Testing Activity	Inspection Activity	Frequency	Acceptance Criteria	Corrective Action	Responsible Person	SOP Reference
pH Probe/Meter	Minimum: Daily calibration before use and at conclusion of the day's sampling event, with two buffer solutions that bracket range of measurements	As required by manufacturer specifications	Measure groundwater quality field parameter (pH) during purging and sampling.	Check all sensors, cable, and battery charge.	Minimum: At beginning of work activity before use and at the conclusion of the day's sampling event	Within ±0.5 pH unit of calibration solution	Replace probe if damaged Replace battery if not charged If calibration not within ±0.5 pH unit, repeat or tag as "out of calibration – do not use."	Shaw Site Manager/Field Sampler	Manufacturer's Instrument Operating and Calibration Manual
Temperature Probe/Meter	Self calibrating	As required by manufacturer specifications	Measure groundwater quality field parameter (temp.) during purging and sampling.	Check all sensors, cable, and battery charge.	Minimum: At beginning of work activity before use and at the conclusion of the day's sampling event	Meets internal specification	Replace sensor if damaged Replace battery if not charged If meter doesn't record temperature, repeat, or tag as "needs service – do not use."	Shaw Site Manager/Field Sampler	Manufacturer's Instrument Operating and Calibration Manual
Dissolved Oxygen Probe/Meter	Minimum: Daily calibration before use and at the conclusion of the day's sampling event with temperature-corrected, air-saturated water	As required by manufacturer specifications	Collect groundwater quality field parameters (dissolved oxygen) during purging and sampling.	Check all sensors, cable, and battery charge.	Minimum: At beginning of work activity before use and at the conclusion of the day's sampling event	Within ±25% of calibration solution	Replace probe if damaged Replace battery if not charged If calibration not within ±25% repeat, or tag as "out of calibration – do not use."	Shaw Site Manager/Field Sampler	Manufacturer's Instrument Operating and Calibration Manual
Turbidity Probe/Meter	Minimum: Daily calibration before use and at the conclusion of the day's sampling event, with standard within range of measurements	As required by manufacturer specifications	Collect groundwater quality field parameter (turbidity) during purging and sampling.	Check all sensors, cable, and battery charge.	Minimum: At beginning of work activity before use and at the conclusion of the day's sampling event	Within ±10% of calibration solution	Replace probe if damaged. Replace battery if not charged. If calibration not within ±10%, repeat or tag as "out of calibration – do not use."	Shaw Site Manager/Field Sampler	Manufacturer's Instrument Operating and Calibration Manual

QAPP Worksheet 22 – Field Equipment Calibration, Maintenance, Testing, and Inspection Table (Concluded)

Field Equipment	Calibration Activity	Maintenance Activity	Testing Activity	Inspection Activity	Frequency	Acceptance Criteria	Corrective Action	Responsible Person	SOP Reference
Oxidiation Reduction Potential	Minimum: Daily calibration before use and at the conclusion of the day's sampling event, with standard within range of measurements	As required by manufacturer specifications	Collect groundwater quality field parameter (ORP) during purging and sampling.	Check all sensors, cable, and battery charge.	Minimum: At beginning of work activity before use and at the conclusion of the day's sampling event	Within ±10% of calibration solution	Replace probe if damaged. Replace battery if not charged. If calibration not within ±10%, repeat or tag as "out of calibration – do not use."	Shaw Site Manager/Field Sampler	Manufacturer's Instrument Operating and Calibration Manual

ORP Oxidation Reduction Potential.
SOP Standard operating procedure.
VOC Volatile organic compound.

SITE-SPECIFIC SAP/QAPP WORKSHEET #26 – SAMPLE HANDLING SYSTEM

Worksheet #26 records personnel (or organizations) that are responsible for the proper handling, custody, storage, and disposal of field samples.

SAMPLE COLLECTION, PACKAGING, AND SHIPMENT
Sample Collection (Personnel/Organization): Shaw Field Technician, Geologist, Chemist; or subcontractor to be determined
Sample Packaging (Personnel/Organization): Shaw Field Technician, Geologist, Chemist; or subcontractor to be determined
Coordination of Shipment (Personnel/Organization): Shaw Field Technician, Geologist, Chemist; or subcontractor to be determined
Type of Shipment/Carrier: Laboratory Courier, United Parcel Service (UPS) or Federal Express (FedEx)
SAMPLE RECEIPT AND ANALYSIS
Sample Receipt (Personnel/Organization): Accutest Laboratories Southeast
Sample Custody and Storage (Personnel/Organization): Accutest Laboratories Southeast
Sample Preparation (Personnel/Organization): Accutest Laboratories Southeast
Sample Determinative Analysis (Personnel/Organization): Accutest Laboratories Southeast
SAMPLE ARCHIVING
Field Sample Storage (Number of days from sample collection): Shipped to laboratory the same day as collection if possible, if not possible to ship the same day; storage on site in refrigerator or ice-packed cooler in locked building under Chain of Custody.
Sample Extract/Digestate Storage (Number of days from extraction/digestion): Accutest Laboratories Southeast, 40 days after analysis
Biological Sample Storage (Number of days from sample collection): Accutest Laboratories Southeast – Not Applicable
SAMPLE DISPOSAL
Personnel/Organization: Accutest Laboratories Southeast
Number of Days from Analysis: Accutest Laboratories Southeast Hold samples for 90 days (all analyses). Hold metals samples for 6 months.

SITE-SPECIFIC SAP/QAPP WORKSHEET #27 – SAMPLE CUSTODY REQUIREMENTS TABLE

27.1 Sample Custody and Documentation

Sampling information will be recorded on a C-O-C record form and/or spreadsheet and in a permanently bound field logbook or Sample Collection Log sheet. All entries will be legible and recorded in indelible ink.

27.2 Sample Labeling

Sample labels will be filled out with indelible ink and affixed to each sample container. Sample labels that may not be waterproof can be covered with clear tape. Sample containers will be placed in re-sealable plastic bags to protect the sample from moisture during transportation to the laboratory. Each sample container will be labeled with the following, at minimum:

- Sample identification number
- Sample collection date (month/day/year)
- Time of collection (24-hour clock)
- Sampler's name or initials
- Analyses to be performed
- Preservation (if any)

27.3 Chain of Custody

In addition to providing a custody exchange record for the samples, the C-O-C record form serves as a formal request for sample analyses. The C-O-C will be completed, signed, and distributed as follows:

- One copy retained by the field team for the sample coordinator and inclusion in the project files
- The original sent to the analytical laboratory with the sample shipment

After the laboratory receives the samples, the Sample Custodian will inventory each shipment before signing for it and note on the original C-O-C form any discrepancy in the number of samples, temperature of the cooler, or broken samples. The Project Chemist will be notified immediately of any problems identified with shipped samples. The Project Chemist will in turn notify the QC Specialist, and together they will determine the appropriate course of action. The Shaw Project Chemist will also notify the Shaw Project Manager (PM) if the project budget and schedule may be impacted.

The laboratory will initiate an internal C-O-C that will track the sample within the various areas of the laboratory. The relinquishing signature of the Sample Custodian and the custody acceptance signature of the laboratory personnel transfer custody of the sample. This procedure is followed each time a sample changes hands. The laboratory will archive the samples and maintain its custody as required by the contract or until further notification from the Project Chemist, at which time the samples will be either returned to the project for disposal or disposed of by the laboratory.

27.4 Sample Packing and Shipment

After sample collection, sample labels will be affixed to each sample container. Each sample will be placed in a re-sealable plastic bag to keep the sample container and label dry. All glass sample containers

will be protected with bubble wrap (or other cushioning material) to prevent breakage. A temperature blank will be placed in every cooler with samples requiring temperature preservation.

Samples to be shipped by commercial carrier will be packed in a sample cooler lined with a plastic bag. If temperature preservation is required, ice, bagged in re-sealable bags, will be added to the cooler in sufficient quantity to keep the samples cooled to less than or equal to 6°C for the duration of the shipment to the laboratory. Sample cooler drain spouts will be taped on the inside and outside of the cooler to prevent any leakage. Saturday deliveries will be coordinated with the laboratory.

If samples are picked up by a laboratory courier service, the C-O-C form will be completed and signed by the laboratory courier. The cooler will then be released to the courier for transportation to the laboratory.

If a commercial carrier is used, the C-O-C form will be sealed in a re-sealable bag placed inside or taped to the inside of the sample cooler lid. The cooler will be taped shut with packing tape, and custody seals will be taped across the cooler lid. Clear tape will be applied to the custody seals to prevent accidental breakage during shipping. The samples will then be shipped to the analytical laboratory. A copy of the courier air bill, which is part of the sample custody records, will be retained for documentation.

The shipping of samples to the analytical laboratory by land delivery services will be performed according to DOT regulations. The International Air Transportation Association regulations will be adhered to when shipping samples by air courier services. Transportation methods will be selected to assure that the samples arrive at the laboratory in time to permit testing according to established holding times and project schedules. Samples will not be accepted by the receiving laboratory without a properly prepared C-O-C record and properly labeled and sealed shipping container(s).

27.5 Field Logbooks

Permanently bound field logbooks or loose field log sheets (Field Activity Daily Log, Sample Collection Logs, etc.) will be used during the project to document activities. All entries will be recorded in indelible ink. Corrections will be made following the procedure described in Section 27.6, “Document Corrections.” At the end of each workday, the responsible sampler will sign the logbook pages or field sheets; any unused portions of pages will be crossed out, initialed or signed, and dated.

At a minimum, the logbook or field sheets will contain the following information:

- Project name and location
- Date and time of collection for each sample
- Sample number
- Sample location (i.e., soil boring or sampling point)
- Sample type (i.e., soil and water)
- Composite or grab
- Composite type (the number of grab samples)
- Depth of sample
- Weather information (e.g., rain, sunny, approximate temperature, etc.)
- Containers used (e.g., metal liners, glass bottles, etc.)
- Requested analyses

On graph paper portions of the logbook or field sheets the sampler may fill in the following information:

- A map with sampling locations (drawn or pasted copy). Each sampling location must be clearly identified on the map. Several sampling locations may be presented on one map; however, the page with the map must be referred to on each of the individual sample pages.
- Field analyses performed, including results, instrument checks, problems, and calibration records for field instruments.
- Descriptions of deviations from this site-specific SAP/QAPP.
- Problems encountered and corrective action taken.
- Identification of field QC samples and list of QC activities.
- Verbal or written instructions from client personnel and/or Shaw PM.
- Any other events that may affect the samples.

27.6 Document Corrections

Changes or corrections to any project documentation will be made by crossing out the item with a single line, initialing by the person performing the correction, and dating the correction. The original item, although erroneous, will remain legible beneath the cross out. The new information will be written above or near the crossed-out item. Corrections will be written clearly and legibly with indelible ink.

SITE-SPECIFIC SAP/QAPP WORKSHEET #28 – LABORATORY QC SAMPLES TABLE

28.1 Subcontract Laboratory Qualifications

The subcontract laboratory providing analytical services for the project will meet the requirements stated in the DOD QSM, Version 4.2, and hold a current DOD Environmental Laboratory Accreditation Program accreditation for all appropriate fields-of-testing.

QA personnel for the laboratory will be designated in the laboratory's QA Manual. The laboratory's QA Program will be compliant with the DOD QSM 4.2 (DOD, 2010). The analytical laboratory will designate a PM for each project.

28.2 Laboratory Quality Control Checks

The recovery of known additives is a part of laboratory analytical protocols. The use of additives at known concentrations allows project personnel to detect matrix interferences and to estimate the impact of these interferences when present. It also allows personnel to evaluate the efficiency of extraction procedures and the overall accuracy of analysis. Laboratory internal QC checks will include the following:

- LCS
- Laboratory control sample duplicate (LCSD)
- MS /MSD
- Laboratory duplicates
- Surrogate spikes
- Internal standards
- Method and instrument blanks
- Post-digestion spikes

Site-specific SAP/QAPP Worksheet #28 will be used to define the acceptance limits for laboratory QC samples. A separate table will be completed for each analytical method and matrix (if necessary).

28.2.1 Laboratory Control Samples

LCSs are matrix-equivalent QC check samples (analyte-free water, laboratory sand, or sodium sulfate) spiked with a known quantity of specific analytes that are carried through the entire sample preparation and analysis process. The spiking solution used for LCS/LCSD preparation is of a source different from the stock that was used to prepare calibration standards.

28.2.2 Laboratory Duplicates

For laboratory sample duplicate analyses, a sample is prepared and analyzed twice. Laboratory sample duplicates are prepared and analyzed with each batch of samples for most inorganic analyses.

28.2.3 Matrix Spikes

MS samples are QC check samples that measure matrix-specific method performance. An MS sample is prepared by adding a known quantity of target analytes to a sample prior to sample digestion or

extraction. In general, for organic compound and metal analyses, an MS/MSD pair is prepared and analyzed with each preparation batch or for every 20 field samples. The frequency of MS/MSD analysis depends on the project DQOs. For inorganic compound analysis, a single matrix spike and a laboratory sample duplicate are often prepared and analyzed with each batch. The LCS results, together with MS results, allow verification of the presence of matrix effects.

28.2.4 Surrogate Spikes

Organic compound analyses include the addition, quantitation, and recovery calculation of surrogate spikes. Compounds selected to serve as surrogate spikes must meet all of the following requirements:

- They are not the target analytes.
- They do not interfere with the determination of target analytes.
- They are not naturally occurring, yet are chemically similar to the target analytes.
- They are compounds exhibiting similar response to target analytes.

Surrogate spikes are added to every project sample, blank sample, and QC check sample at the beginning of the sample preparation process. The surrogate spike recovery is used to monitor matrix effects and losses during sample preparation. Surrogate spike control criteria are applied to all analytical and QC check samples, and if surrogate criteria are not met, reextraction and reanalysis may be performed.

28.2.5 Internal Standards

Some organic compound analyses include the addition, quantitation, and recovery calculation of internal standards. Internal standards are usually synthetic compounds, which are similar in chemical behavior to the target analytes. They are added to sample extracts at the time of instrument analysis and used to quantify results through internal standards calibration procedure. Internal standard recoveries are used to correct for injection and detector variability. gas chromatography (GC)/mass spectrometer(MS) must use internal standards and have acceptability limits for internal standard areas. Use of internal standard quantitation for GC methods is optional.

28.2.6 Method Blanks

A method blank is used to monitor the laboratory preparation and analysis systems for interferences and contamination from glassware, reagents, sample manipulations, and the general laboratory environment. A method blank is carried through the entire sample preparation process and is included with each batch of samples. Some methods of inorganic analysis do not have a distinctive preparation step. For these tests the instrument blank, which contains all reagents used with samples, is considered to be the method blank.

28.2.7 Instrument Blanks

An instrument blank is used to monitor the cleanliness of the instrument portion of a sample analytical process. Instrument blanks are usually just the solvent or acid solution of the standard used to calibrate the instrument. During metal analyses, 1 instrument blank is usually analyzed for every 10 samples. For GC and GC/MS analysis, instrument blanks are analyzed on an as-needed basis for troubleshooting and chromatography column carryover determination purposes.

28.2.8 Post-Digestion Spikes and the Method of Standard Addition

A post-digestion spike (PDS) is used during metal analysis to assess analytical interferences that may be caused by general matrix effects or high concentrations of analytes present in the sample. A digested sample is spiked with the analyte of interest at a known concentration, and the spike recovery is used to estimate the presence and magnitude of interferences.

If a post-digestion spike recovery fails to meet acceptance criteria, the method of standard addition (MSA) may be used to quantify the sample result. The MSA technique compensates for a sample constituent that enhances or depresses the analyte signal. To perform the MSA, known amounts of a standard at different concentrations are added to two to three aliquots of digested sample, and each spiked sample and the original unspiked sample are analyzed. The absorbance is then plotted against the concentration, and the resulting line is extrapolated to zero absorbance. The point of interception with the concentration axis is the indigenous concentration of the analyte in the sample.

Site-Specific SAP/QAPP Worksheet #28a – Laboratory QC Samples Table
Volatile Organic Compounds

Matrix	Soil, Aqueous
Analytical Group	Volatiles
Concentration Level	Low
Sampling SOP	
Analytical Method/ SOP Reference	SW-846 8260/ LAB SOP#MS005
Sampler's Name	
Field Sampling Organization	
Analytical Organization	Accutest Laboratories Southeast, Inc.
Number of Sample Locations	

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator	Measurement Performance Criteria
Mass spectrometer Tuning	Prior to calibration and every 12 hours during sample analysis	Refer to method for specific ion criteria.	Retune instrument and verify. Rerun affected samples. Flagging criteria are not appropriate and problem must be corrected. No samples may be accepted without a valid tune.	Analyst	Laboratory Accuracy	Refer to method for specific ion criteria.
Initial Retention Time window establishment (all targets)	Once per ICAL	Position set using mid-point calibration standard from ICAL	Not Applicable	Analyst	Laboratory Accuracy	Chromatographic system performance
ICAL	As needed (see CCV passing criteria below and SW-846 8000 method)	%RSD <15%, or Correlation coefficient R≥0.995 %RSD for CCC ≤30%, RF for SPCC ≥ 0.01 and 0.03	If the acceptance criteria were not met, re-calibration is performed before any samples may be analyzed.	Analyst	Laboratory Accuracy	%RSD <15%, or Correlation coefficient R≥0.995 %RSD for CCC ≤30%, RF for SPCC ≥ 0.01 and 0.03
ICV	1 per ICAL, analyzed after ICAL, before field samples	%D for CCC ≤25%, poor purgers ≥40%, RF see above	If the acceptance criteria were not met, re-calibration is performed before any samples may be analyzed.	Analyst	Laboratory Accuracy	%D for CCC ≤25%, poor purgers ≥40%, RF see above

Site-Specific SAP/QAPP Worksheet #28a – Laboratory QC Samples Table
Volatile Organic Compounds (Continued)

Matrix	Soil, Aqueous
Analytical Group	Volatiles
Concentration Level	Low
Sampling SOP	
Analytical Method/ SOP Reference	SW-846 8260/ LAB SOP#MS005
Sampler's Name	
Field Sampling Organization	
Analytical Organization	Accutest Laboratories Southeast, Inc.
Number of Sample Locations	

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator	Measurement Performance Criteria
CCV	1 per analytical run. Analytical run not to exceed 12 hours.	%D for CCC ≤20%, RF see above	If the criterion has not achieved corrective action, re-calibration is performed before any samples may be analyzed. Corrective action may include re-analysis of the samples.	Analyst	Laboratory Accuracy	%D for CCC ≤20%, RF see above
Evaluation of absolute retention time shift (Internal Standards only)	Every CCV	Within 30 seconds of initial Retention Time (ICAL mid-point)	Determine source of malfunction, perform maintenance and verify. Rerun affected samples. Rerun ICAL, if necessary. Flagging criteria are not appropriate and problem must be corrected	Analyst	Laboratory Accuracy	Overall chromatographic system performance
Evaluation of relative retention time shift (all targets)	Every injection following CCV	Within 0.06% of daily CCV retention time	Determine source of malfunction, perform maintenance and verify. Rerun affected samples. Flagging criteria are not appropriate and problem must be corrected	Analyst	Laboratory Accuracy	Overall chromatographic system performance

Site-Specific SAP/QAPP Worksheet #28a – Laboratory QC Samples Table
Volatile Organic Compounds (Continued)

Matrix	Soil, Aqueous
Analytical Group	Volatiles
Concentration Level	Low
Sampling SOP	
Analytical Method/ SOP Reference	SW-846 8260/ LAB SOP#MS005
Sampler's Name	
Field Sampling Organization	
Analytical Organization	Accutest Laboratories Southeast, Inc.
Number of Sample Locations	

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator	Measurement Performance Criteria
Method Blank	1 per extraction batch	<1/2 RL	The source of the contamination is investigated and eliminated before proceeding with further analysis. Corrective actions are: 1. Samples ND – report without qualification 2. Samples >10X contamination level – report with qualification 3. Samples <10x contamination – re-extract and reanalyze. Insufficient sample - qualify and footnote	Analyst	Absence of interference/contamination	<1/2 RL

Site-Specific SAP/QAPP Worksheet #28a – Laboratory QC Samples Table
Volatile Organic Compounds (Continued)

Matrix	Soil, Aqueous
Analytical Group	Volatiles
Concentration Level	Low
Sampling SOP	
Analytical Method/ SOP Reference	SW-846 8260/ LAB SOP#MS005
Sampler's Name	
Field Sampling Organization	
Analytical Organization	Accutest Laboratories Southeast, Inc.
Number of Sample Locations	

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator	Measurement Performance Criteria
LCS	1 per extraction batch	%Recovery = (Calculated Value/True Value) *100%	Source of poor recovery is investigated and eliminated before proceeding with further analysis, corrective actions are: 1. Biased high, samples ND – report without qualifications. 2. Biased low – re-extract and reanalyze. Insufficient volume – qualify and footnote	Analyst	Laboratory Accuracy/Method bias in ideal matrix	%Recovery = (Calculated Value/True Value) *100%
MS	1 per 20 samples or 1 for each extraction batch	%Recovery = (Calculated Value - Sample Value/True Value) *100%	If the recoveries indicate that the problem is procedure related, re-extraction and re-analysis is required. If the recoveries indicate that the failures are matrix-related, refer to Blank Spike as measure of method performance in clean matrix.	Analyst	Precision and Accuracy in field samples	%Recovery = (Calculated Value - Sample Value/True Value) *100%

Site-Specific SAP/QAPP Worksheet #28a – Laboratory QC Samples Table
Volatile Organic Compounds (Continued)

Matrix	Soil, Aqueous
Analytical Group	Volatiles
Concentration Level	Low
Sampling SOP	
Analytical Method/ SOP Reference	SW-846 8260/ LAB SOP#MS005
Sampler's Name	
Field Sampling Organization	
Analytical Organization	Accutest Laboratories Southeast, Inc.
Number of Sample Locations	

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator	Measurement Performance Criteria
MSD	1 per 20 samples or 1 for each extraction batch	%Recovery = (Calculated Value – Sample Value/True Value) *100% RPD (%) = [(XA-XB)/XM] * 100 Where: XA and XB are the concentration in the MS and MSD, and XM is the average value of the concentrations in the MS and MSD, (XA + XB)/2	See above	Analyst	Precision and Accuracy in field samples	%Recovery = (Calculated Value – Sample Value/True Value) *100% RPD (%) = [(XA-XB)/XM] * 100 Where: XA and XB are the concentration in the MS and MSD, and XM is the average value of the concentrations in the MS and MSD, (XA + XB)/2

Site-Specific SAP/QAPP Worksheet #28a – Laboratory QC Samples Table
Volatile Organic Compounds (Continued)

Matrix	Soil, Aqueous
Analytical Group	Volatiles
Concentration Level	Low
Sampling SOP	
Analytical Method/ SOP Reference	SW-846 8260/ LAB SOP#MS005
Sampler's Name	
Field Sampling Organization	
Analytical Organization	Accutest Laboratories Southeast, Inc.
Number of Sample Locations	

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator	Measurement Performance Criteria
Surrogate Spikes	Every sample	%Recovery = (Calculated Value/True Value) *100%	Reason for poor recoveries is investigated and eliminated before further analytical activities. Corrective actions are: 1. High bias, samples ND – report without qualification. 2. Low bias – re-extract and reanalyze. Insufficient volume – qualify and footnote	Analyst	Individual sample preparation efficiency control	%Recovery = (Calculated Value/True Value) *100%
Internal standards	Every sample	Internal standard Area = -50% to +100% of CCV	If failure is due to instrument performance issues, the problem must be identified, corrected, and the sample must be re-analyzed. If no instrument problem is found the sample must be re-analyzed. If upon re-analysis the responses are still not within limits, the problem may be considered sample matrix interference.	Analyst	Instrument sensitivity control	Internal standard Area = -50% to +100% of CCV

Site-Specific SAP/QAPP Worksheet #28a – Laboratory QC Samples Table
Volatile Organic Compounds (Concluded)

<	Greater than.
>	Less than.
10X	Ten times. The “X” combined with a number indicates a multiplier and may be used with numbers other than 10.
CCC	Calibration check compounds.
CCV	Continuing calibration verification.
%D	Percent difference.
ICAL	Initial calibration.
ICV	Initial calibration verification.
LCS	Laboratory control sample.
MS	Matrix spike.
MSD	Matrix spike duplicate.
ND	Not detected.
QAPP	Quality Assurance Project Plan.
QC	Quality control.
RF	Response factor.
RL	Reporting limit.
RPD	Relative percent difference.
%RSD	% Relative Standard Deviation
SAP	Sampling and Analysis Plan.
SOP	Standard operating procedure.
SPCC	System performance check compounds.
VOC	Volatile organic compound.
XA	Concentration in the matrix spike sample.
XB	Concentration in the matrix spike duplicate sample.
XM	Average value of the concentrations of matrix spike and matrix spike duplicate.

Site-Specific SAP/QAPP Worksheet #28b – Laboratory QC Samples Table
Semivolatile Organic Compounds

Matrix	Soil, Aqueous
Analytical Group	Semivolatiles
Concentration Level	Low
Analytical Method/ SOP Reference	SW-846 8270D/LAB SOP#MS011
Analytical Organization	Accutest Laboratories Southeast, Inc.

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator	Measurement Performance Criteria
Mass spectrometer tuning – DFTPP/DDT/PCP/Benzidine	Prior to calibration and every 12 hours during sample analysis	Passing DFTPP breakdown criteria, DDT breakdown <20%, PCP and Benzidine tailing factor <2	Retune instrument and verify. Rerun affected samples. Flagging criteria are not appropriate and problem must be corrected. No samples may be accepted without a valid tune.	Analyst	Laboratory Accuracy	Refer to method for specific ion criteria.
ICAL	As needed (see CCV passing criteria below and SW-846 8000 method)	%RSD <20%, Correlation coefficient R>0.995	If the acceptance criteria were not met, re-calibration is performed before any samples may be analyzed.	Analyst	Laboratory Accuracy	%RSD <20%, Correlation coefficient R>0.995, minimum RF met for all analytes on all calibration levels
Initial Retention Time window establishment (all targets)	Once per ICAL	Position set using mid-point calibration standard from ICAL	Not Applicable	Analyst	Laboratory Accuracy	Chromatographic system performance
ICV	1 per ICAL, analyzed after ICAL, before field samples	%D for all analytes <20%, RF for SPCC >0.05, each calibration level	If the acceptance criteria were not met, re-calibration is performed before any samples may be analyzed.	Analyst	Laboratory Accuracy	%D for all analytes <20%,

Site-Specific SAP/QAPP Worksheet #28b – Laboratory QC Samples Table
Semivolatile Organic Compounds (Continued)

Matrix	Soil, Aqueous
Analytical Group	Semivolatiles
Concentration Level	Low
Analytical Method/ SOP Reference	SW-846 8270D/LAB SOP#MS011
Analytical Organization	Accutest Laboratories Southeast, Inc.

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator	Measurement Performance Criteria
CCV	1 per analytical run. Analytical run not to exceed 12 hours.	%D for all analytes <20%, RF for SPCC >0.05, each calibration level	If the criterion has not achieved corrective action, re-calibration is performed before any samples may be analyzed. Corrective action may include re-analysis of the samples.	Analyst	Laboratory Accuracy	%D for all analytes <20%,
Evaluation of absolute retention time shift (Internal Standards only)	Every CCV	Within 30 seconds of initial Retention Time (ICAL mid-point)	Determine source of malfunction, perform maintenance and verify. Rerun affected samples. Rerun ICAL, if necessary. Flagging criteria are not appropriate and problem must be corrected	Analyst	Laboratory Accuracy	Overall chromatographic system performance

Site-Specific SAP/QAPP Worksheet #28b – Laboratory QC Samples Table
Semivolatile Organic Compounds (Continued)

Matrix	Soil, Aqueous
Analytical Group	Semivolatiles
Concentration Level	Low
Analytical Method/ SOP Reference	SW-846 8270D/LAB SOP#MS011
Analytical Organization	Accutest Laboratories Southeast, Inc.

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator	Measurement Performance Criteria
Evaluation of relative retention time shift (all targets)	Every injection following CCV	Within 0.06% of daily CCV Retention time	Determine source of malfunction, perform maintenance and verify. Rerun affected samples. Flagging criteria are not appropriate and problem must be corrected	Analyst	Laboratory Accuracy	Overall chromatographic system performance
Method Blank	1 per extraction batch	<1/2 RL	The source of the contamination is investigated and eliminated before proceeding with further analysis. Corrective actions are: 1. Samples ND – report without qualification 2. Samples >10X contamination level – report with qualification 3. Samples <10x contamination – re-extract and reanalyze. Insufficient sample - qualify and footnote	Analyst/Prep analyst	Absence of interference/contamination	<1/2 RL

Site-Specific SAP/QAPP Worksheet #28b – Laboratory QC Samples Table
Semivolatile Organic Compounds (Continued)

Matrix	Soil, Aqueous
Analytical Group	Semivolatiles
Concentration Level	Low
Analytical Method/ SOP Reference	SW-846 8270D/LAB SOP#MS011
Analytical Organization	Accutest Laboratories Southeast, Inc.

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator	Measurement Performance Criteria
LCS	1 per extraction batch	%Recovery = (Calculated Value/True Value) *100%	Source of poor recovery is investigated and eliminated before proceeding with further analysis, corrective actions are: 1. Biased high, samples ND – report without qualifications. 2. Biased low – re-extract and reanalyze. Insufficient volume – qualify and footnote	Analyst/Prep analyst	Laboratory Accuracy/Method bias in ideal matrix	%Recovery = (Calculated Value/True Value) *100%
MS	1 per 20 samples or 1 for each extraction batch	%Recovery = (Calculated Value - Sample Value/True Value) *100%	If the recoveries indicate that the problem is procedure related, re-extraction and re-analysis is required. If the recoveries indicate that the failures are matrix-related, refer to Blank Spike as measure of method performance in clean matrix. The project Chemist will be contacted and a decision will be made to either report the data as is with a notation in the analytical narrative or if the samples should be re-extract and re-analyzed.	Analyst/Prep analyst	Precision and Accuracy in field samples	%Recovery = (Calculated Value - Sample Value/True Value) *100%

Site-Specific SAP/QAPP Worksheet #28b – Laboratory QC Samples Table
Semivolatile Organic Compounds (Continued)

Matrix	Soil, Aqueous
Analytical Group	Semivolatiles
Concentration Level	Low
Analytical Method/ SOP Reference	SW-846 8270D/LAB SOP#MS011
Analytical Organization	Accutest Laboratories Southeast, Inc.

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator	Measurement Performance Criteria
MSD	1 per 20 samples or 1 for each extraction batch	%Recovery = (Calculated Value – Sample Value/True Value) *100% RPD (%) = [(XA-XB)/XM] * 100 Where: XA and XB are the concentration in the MS and MSD, and XM is the average value of the concentrations in the MS and MSD, (XA + XB)/2	See above	Analyst/Prep analyst	Precision and Accuracy in field samples	%Recovery = (Calculated Value – Sample Value/True Value) *100% RPD (%) = [(XA-XB)/XM] * 100 Where: XA and XB are the concentration in the MS and MSD, and XM is the average value of the concentrations in the MS and MSD, (XA + XB)/2
Surrogate Spikes	Every sample	%Recovery = (Calculated Value/True Value) *100%	Reason for poor recoveries is investigated and eliminated before further analytical activities. Corrective actions are: 1. High bias, samples ND – report without qualification. 2. Low bias – re-extract and reanalyze. Insufficient volume – qualify and footnote	Analyst/Prep analyst	Individual sample preparation efficiency control	%Recovery = (Calculated Value/True Value) *100%

Site-Specific SAP/QAPP Worksheet #28b – Laboratory QC Samples Table
Semivolatile Organic Compounds (Concluded)

Matrix	Soil, Aqueous
Analytical Group	Semivolatiles
Concentration Level	Low
Analytical Method/ SOP Reference	SW-846 8270D/LAB SOP#MS011
Analytical Organization	Accutest Laboratories Southeast, Inc.

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator	Measurement Performance Criteria
Internal standard	Every sample	Internal standard Area = -50% to +100% of CCV	If failure is due to instrument performance issues, the problem must be identified, corrected, and the sample must be re-analyzed. If no instrument problem is found the sample must be re-analyzed. If upon re-analysis the responses are still not within limits, the problem may be considered sample matrix interference.	Analyst	Instrument sensitivity control	Internal standard Area = -50% to +100% of CCV

<	Greater than.
>	Less than.
10X	Ten times. The "X" combined with a number indicates a multiplier and may be used with numbers other than 10.
CCV	Continuing calibration verification.
%D	Percent difference.
DDT	dichlorodiphenyltrichloroethane
DFTPP	decafluorotriphenylphosphine
ICAL	Initial calibration.
ICV	Initial calibration verification.
LCS	Laboratory control sample.
MS	Matrix spike.
MSD	Matrix spike duplicate.
ND	Not detected.
PCP	pentachlorolphenol
QC	Quality control.
RF	Response factor.
RL	Reporting limit.
RPD	Relative percent difference.
%RSD	% Relative Standard Deviation
SOP	Standard operating procedure.
SPCC	System performance check compounds.
XA	Concentration in the matrix spike sample.
XB	Concentration in the matrix spike duplicate sample.
XM	Average value of the concentrations of matrix spike and matrix spike duplicate.

Site-Specific SAP/QAPP Worksheet #28c – Laboratory QC Samples Table
Total Petroleum Hydrocarbons (TPH), Gasoline Range Organics (GRO)

Matrix	Soil, Aqueous
Analytical Group	GRO Petroleum
Concentration Level	Low
Analytical Method/ SOP Reference	SW-846 8015D/LAB SOP#GC010
Analytical Organization	Accutest Laboratories Southeast, Inc.

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator	Measurement Performance Criteria
ICAL	As needed (see CCV passing criteria below and SW-846 8000 method)	%RSD <20%, or Correlation coefficient R≥0.995	If the acceptance criteria were not met, re-calibration is performed before any samples may be analyzed.	Laboratory Analyst	Laboratory Accuracy	%RSD <20%, or Correlation coefficient R≥0.995
ICV	1 per ICAL, analyzed after ICAL, before field samples	%D ≤15%	If the acceptance criteria were not met, re-calibration is performed before any samples may be analyzed.	Laboratory Analyst	Laboratory Accuracy	%D ≤15%
CCV	Opening CCV, then every 10 samples, with closing CCV	%D ≤15%	If the criterion has not achieved corrective action, re-calibration is performed before any samples may be analyzed. Corrective action may include re-analysis of the samples.	Laboratory Analyst	Laboratory Accuracy	%D ≤15%

Site-Specific SAP/QAPP Worksheet #28c – Laboratory QC Samples Table
Total Petroleum Hydrocarbons (TPH), Gasoline Range Organics (GRO) (Continued)

Matrix	Soil, Aqueous
Analytical Group	GRO Petroleum
Concentration Level	Low
Analytical Method/ SOP Reference	SW-846 8015D/LAB SOP#GC010
Analytical Organization	Accutest Laboratories Southeast, Inc.

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator	Measurement Performance Criteria
Method Blank	1 per extraction batch	<1/2 RL	The source of the contamination is investigated and eliminated before proceeding with further analysis. Corrective actions are: 1. Samples ND – report without qualification 2. Samples >10X contamination level – report with qualification 3. Samples <10x contamination – re-extract and reanalyze. Insufficient sample - qualify and footnote	Laboratory Analyst	Absence of interference/contamination	<1/2 RL
LCS	1 per extraction batch	%Recovery = (Calculated Value/True Value) *100%	Source of poor recovery is investigated and eliminated before proceeding with further analysis, corrective actions are: 1. Biased high, samples ND – report without qualifications. 2. Biased low – re-extract and reanalyze. Insufficient volume – qualify and footnote	Laboratory Analyst	Laboratory Accuracy/Method bias in ideal matrix	%Recovery = (Calculated Value/True Value) *100%

Site-Specific SAP/QAPP Worksheet #28c – Laboratory QC Samples Table
Total Petroleum Hydrocarbons (TPH), Gasoline Range Organics (GRO) (Continued)

Matrix	Soil, Aqueous
Analytical Group	GRO Petroleum
Concentration Level	Low
Analytical Method/ SOP Reference	SW-846 8015D/LAB SOP#GC010
Analytical Organization	Accutest Laboratories Southeast, Inc.

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator	Measurement Performance Criteria
MS	1 per 20 samples or 1 for each extraction batch	%Recovery = (Calculated Value - Sample Value/True Value) *100%	If the recoveries indicate that the problem is procedure related, re-extraction and re-analysis is required. If the recoveries indicate that the failures are matrix-related, refer to Blank Spike as measure of method performance in clean matrix. The Shaw Chemist will be contacted and a decision will be made to either report the data as is with a notation in the analytical narrative or if the samples should be re-extract and re-analyzed.	Laboratory Analyst	Precision and Accuracy in field samples	%Recovery = (Calculated Value - Sample Value/True Value) *100%

Site-Specific SAP/QAPP Worksheet #28c – Laboratory QC Samples Table
Total Petroleum Hydrocarbons (TPH), Gasoline Range Organics (GRO) (Continued)

Matrix	Soil, Aqueous
Analytical Group	GRO Petroleum
Concentration Level	Low
Analytical Method/ SOP Reference	SW-846 8015D/LAB SOP#GC010
Analytical Organization	Accutest Laboratories Southeast, Inc.

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator	Measurement Performance Criteria
MSD	1 per 20 samples or 1 for each extraction batch	%Recovery = (Calculated Value – Sample Value/True Value) *100% RPD (%) = [(XA-XB)/XM] * 100 Where: XA and XB are the concentration in the MS and MSD, and XM is the average value of the concentrations in the MS and MSD, (XA + XB)/2	See above	Laboratory Analyst	Precision and Accuracy in field samples	%Recovery = (Calculated Value – Sample Value/True Value) *100% RPD (%) = [(XA-XB)/XM] * 100 Where: XA and XB are the concentration in the MS and MSD, and XM is the average value of the concentrations in the MS and MSD, (XA + XB)/2
Surrogate Spikes	Every sample	%Recovery = (Calculated Value/True Value) *100%	Reason for poor recoveries is investigated and eliminated before further analytical activities. Corrective actions are: 1. High bias, samples ND – report without qualification. 2. Low bias – re-extract and reanalyze. Insufficient volume – qualify and footnote	Laboratory Analyst	Individual sample preparation efficiency control	%Recovery = (Calculated Value/True Value) *100%

Site-Specific SAP/QAPP Worksheet #28c – Laboratory QC Samples Table
Total Petroleum Hydrocarbons (TPH), Gasoline Range Organics (GRO) (Concluded)

<	Greater than.
>	Less than.
10X	Ten times. The "X" combined with a number indicates a multiplier and may be used with numbers other than 10.
CCV	Continuing calibration verification.
%D	Percent difference.
ICAL	Initial calibration.
ICV	Initial calibration verification.
LCS	Laboratory control sample.
MS	Matrix spike.
MSD	Matrix spike duplicate.
ND	Not detected.
QC	Quality control.
RL	Reporting limit.
RPD	Relative percent difference.
%RSD	% Relative Standard Deviation
SOP	Standard operating procedure.
XA	Concentration in the matrix spike sample.
XB	Concentration in the matrix spike duplicate sample.
XM	Average value of the concentrations of matrix spike and matrix spike duplicate.

Site-Specific SAP/QAPP Worksheet #28d – Laboratory QC Samples Table
Total Petroleum Hydrocarbons (TPH), Diesel Range (DRO) and Oil Range (ORO) Organics

Matrix	Soil, Aqueous
Analytical Group	DRO/ORO Petroleum
Concentration Level	Low
Analytical Method/ SOP Reference	SW-846 8015 DRO/LAB SOP#GC011
Analytical Organization	Accutest Laboratories Southeast, Inc.

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator	Measurement Performance Criteria
ICAL	As needed (see CCV passing criteria below and SW-846 8000 method)	%RSD <20%, or Correlation coefficient R≥0.995	If the acceptance criteria were not met, re-calibration is performed before any samples may be analyzed.	Laboratory Analyst	Laboratory Accuracy	%RSD <20%, or Correlation coefficient R≥0.995
ICV	1 per ICAL, analyzed after ICAL, before field samples	%D ≤15%	If the acceptance criteria were not met, re-calibration is performed before any samples may be analyzed.	Laboratory Analyst	Laboratory Accuracy	%D ≤15%
CCV	Opening CCV, then every 10 samples, with closing CCV	%D ≤15%	If the criterion has not achieved corrective action, re-calibration is performed before any samples may be analyzed. Corrective action may include re-analysis of the samples.	Laboratory Analyst	Laboratory Accuracy	%D ≤15%

Site-Specific SAP/QAPP Worksheet #28d – Laboratory QC Samples Table
Total Petroleum Hydrocarbons (TPH), Diesel Range (DRO) and Oil Range (ORO) Organics (Continued)

Matrix	Soil, Aqueous
Analytical Group	DRO/ORO Petroleum
Concentration Level	Low
Analytical Method/ SOP Reference	SW-846 8015 DRO/LAB SOP#GC011
Analytical Organization	Accutest Laboratories Southeast, Inc.

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator	Measurement Performance Criteria
Method Blank	1 per extraction batch	<1/2 RL	The source of the contamination is investigated and eliminated before proceeding with further analysis. Corrective actions are: 1. Samples ND – report without qualification 2. Samples >10X contamination level – report with qualification 3. Samples <10x contamination – re-extract and reanalyze. Insufficient sample - qualify and footnote	Laboratory Analyst/Prep Analyst	Absence of interference/contamination	<1/2 RL
LCS	1 per extraction batch	%Recovery = (Calculated Value/True Value) *100%	Source of poor recovery is investigated and eliminated before proceeding with further analysis, corrective actions are: 1. Biased high, samples ND – report without qualifications. 2. Biased low – re-extract and reanalyze. Insufficient volume – qualify and footnote	Laboratory Analyst/Prep Analyst	Laboratory Accuracy/Method bias in ideal matrix	%Recovery = (Calculated Value/True Value) *100%

Site-Specific SAP/QAPP Worksheet #28d – Laboratory QC Samples Table
Total Petroleum Hydrocarbons (TPH), Diesel Range (DRO) and Oil Range (ORO) Organics (Continued)

Matrix	Soil, Aqueous
Analytical Group	DRO/ORO Petroleum
Concentration Level	Low
Analytical Method/ SOP Reference	SW-846 8015 DRO/LAB SOP#GC011
Analytical Organization	Accutest Laboratories Southeast, Inc.

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator	Measurement Performance Criteria
MS	1 per 20 samples or 1 for each extraction batch	%Recovery = (Calculated Value - Sample Value/True Value) *100%	If the recoveries indicate that the problem is procedure related, re-extraction and re-analysis is required. If the recoveries indicate that the failures are matrix-related, refer to Blank Spike as measure of method performance in clean matrix. The Shaw Chemist will be contacted and a decision will be made to either report the data as is with a notation in the analytical narrative or if the samples should be re-extract and re-analyzed.	Laboratory Analyst/Prep Analyst	Precision and Accuracy in field samples	%Recovery = (Calculated Value - Sample Value/True Value) *100%

Site-Specific SAP/QAPP Worksheet #28d – Laboratory QC Samples Table
Total Petroleum Hydrocarbons (TPH), Diesel Range (DRO) and Oil Range (ORO) Organics (Continued)

Matrix	Soil, Aqueous
Analytical Group	DRO/ORO Petroleum
Concentration Level	Low
Analytical Method/ SOP Reference	SW-846 8015 DRO/LAB SOP#GC011
Analytical Organization	Accutest Laboratories Southeast, Inc.

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator	Measurement Performance Criteria
MSDs	1 per 20 samples or 1 for each extraction batch	%Recovery = (Calculated Value – Sample Value/True Value) *100% RPD (%) = [(XA-XB)/XM] * 100 Where: XA and XB are the concentration in the MS and MSD, and XM is the average value of the concentrations in the MS and MSD, (XA + XB)/2	See above	Laboratory Analyst/Prep Analyst	Precision and Accuracy in field samples	%Recovery = (Calculated Value – Sample Value/True Value) *100% RPD (%) = [(XA-XB)/XM] * 100 Where: XA and XB are the concentration in the MS and MSD, and XM is the average value of the concentrations in the MS and MSD, (XA + XB)/2
Surrogate Spikes	Every sample	%Recovery = (Calculated Value/True Value) *100%	Reason for poor recoveries is investigated and eliminated before further analytical activities. Corrective actions are: 1. High bias, samples ND – report without qualification. 2. Low bias – re-extract and reanalyze. Insufficient volume – qualify and footnote	Laboratory Analyst/Prep Analyst	Individual sample preparation efficiency control	%Recovery = (Calculated Value/True Value) *100%

Site-Specific SAP/QAPP Worksheet #28d – Laboratory QC Samples Table
Total Petroleum Hydrocarbons (TPH), Diesel Range (DRO) and Oil Range (ORO) Organics (Concluded)

<	Greater than.
>	Less than.
10X	Ten times. The "X" combined with a number indicates a multiplier and may be used with numbers other than 10.
CCV	Continuing calibration verification.
%D	Percent difference.
ICAL	Initial calibration.
ICV	Initial calibration verification.
LCS	Laboratory control sample.
MS	Matrix spike.
MSD	Matrix spike duplicate.
ND	Not detected.
QC	Quality control.
RL	Reporting limit.
RPD	Relative percent difference.
%RSD	% Relative Standard Deviation
SOP	Standard operating procedure.
XA	Concentration in the matrix spike sample.
XB	Concentration in the matrix spike duplicate sample.
XM	Average value of the concentrations of matrix spike and matrix spike duplicate.

Site-Specific SAP/QAPP Worksheet #28e – Laboratory QC Samples Table
Inductively Coupled Plasma (ICP) Metals

Matrix	Soil, Aqueous
Analytical Group	ICP Metals
Concentration Level	Low
Analytical Method/ SOP Reference	SW-846 6010C/LAB SOP# Met100
Analytical Organization	Accutest Laboratories Southeast, Inc.

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator	Measurement Performance Criteria
ICAL	As needed (see CCV passing criteria below)	%RSD <5%, or Correlation coefficient R>0.995	If the acceptance criteria were not met, re-calibration is performed before any samples may be analyzed.	Analyst	Laboratory Accuracy	%RSD <5%, or Correlation coefficient R>0.995
ICV	1 per ICAL, analyzed after ICAL, before field samples	%D <10%	If the acceptance criteria were not met, re-calibration is performed before any samples may be analyzed.	Analyst	Laboratory Accuracy	%D <10%
CCV	Opening CCV, then every 10 samples, with closing CCV	%D <10%	If the criterion has not achieved corrective action, re-calibration is performed before any samples may be analyzed. Corrective action may include re-analysis of the samples.	Analyst	Laboratory Accuracy	%D <10%

Site-Specific SAP/QAPP Worksheet #28e – Laboratory QC Samples Table
Inductively Coupled Plasma (ICP) Metals (Continued)

Matrix	Soil, Aqueous
Analytical Group	ICP Metals
Concentration Level	Low
Analytical Method/ SOP Reference	SW-846 6010C/LAB SOP# Met100
Analytical Organization	Accutest Laboratories Southeast, Inc.

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator	Measurement Performance Criteria
Calibration Blank	After every ICV and CCV, including terminal CCV	No analytes detected above LOD	Determine source of contamination, correct problem. Qualify associated data with B qualifier and appropriate footnote. Corrective action may include reanalysis of CCB and reanalysis of associated samples.	Analyst	Absence of interference/contamination	<LOD
Method Blank	1 per extraction batch	<1/2 RL	The source of the contamination is investigated and eliminated before proceeding with further analysis. Corrective actions are: 1. Samples ND – report without qualification 2. Samples >10X contamination level – report with qualification 3. Samples <10x contamination – re-extract and reanalyze. Insufficient sample - qualify and footnote	Analyst/Prep analyst	Absence of interference/contamination	<1/2 RL

Site-Specific SAP/QAPP Worksheet #28e – Laboratory QC Samples Table
Inductively Coupled Plasma (ICP) Metals (Continued)

Matrix	Soil, Aqueous
Analytical Group	ICP Metals
Concentration Level	Low
Analytical Method/ SOP Reference	SW-846 6010C/LAB SOP# Met100
Analytical Organization	Accutest Laboratories Southeast, Inc.

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator	Measurement Performance Criteria
LCS	1 per extraction batch	%Recovery = (Calculated Value/True Value) *100%; 80%<%Recovery<120%	Source of poor recovery is investigated and eliminated before proceeding with further analysis, corrective actions are: 1. Biased high, samples ND – report without qualifications. 2. Biased low – re-extract and reanalyze. Insufficient volume – qualify and footnote	Analyst/Prep analyst	Laboratory Accuracy/Method bias in ideal matrix	%Recovery = (Calculated Value/True Value) *100%; 80%<%Recovery<120%
MS	1 per 20 samples or 1 for each extraction batch	%Recovery = (Calculated Value - Sample Value/True Value) *100%: 80%<%Recovery<120%	If the recoveries indicate that the problem is procedure related, re-extraction and re-analysis is required. If the recoveries indicate that the failures are matrix-related, refer to Blank Spike as measure of method performance in clean matrix.	Analyst/Prep analyst	Precision and Accuracy in field samples	%Recovery = (Calculated Value - Sample Value/True Value) *100%: 80%<%Recovery<120%

Site-Specific SAP/QAPP Worksheet #28e – Laboratory QC Samples Table
Inductively Coupled Plasma (ICP) Metals (Continued)

Matrix	Soil, Aqueous
Analytical Group	ICP Metals
Concentration Level	Low
Analytical Method/ SOP Reference	SW-846 6010C/LAB SOP# Met100
Analytical Organization	Accutest Laboratories Southeast, Inc.

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator	Measurement Performance Criteria
MSD	1 per 20 samples or 1 for each extraction batch	%Recovery = (Calculated Value – Sample Value/True Value) *100% RPD (%) = [(XA-XB)/XM] * 100 Where: XA and XB are the concentration in the MS and MSD, and XM is the average value of the concentrations in the MS and MSD, (XA + XB)/2	See above	Analyst/Prep analyst	Precision and Accuracy in field samples	%Recovery = (Calculated Value – Sample Value/True Value) *100% RPD (%) = [(XA-XB)/XM] * 100 Where: XA and XB are the concentration in the MS and MSD, and XM is the average value of the concentrations in the MS and MSD, (XA + XB)/2
Linear dynamic range or High-level calibration check standard	Every 6 months	Within ±10%Recovery of expected value.	Not Applicable	Analyst	Laboratory Accuracy	Within ±10%Recovery of expected value.
Low-level calibration check standard	Daily, after one-point initial calibration	Within ±20%Recovery of expected value. Low-level calibration check standard should be less than or equal to the reporting limit.	Correct problem then repeat initial calibration. Flagging criteria are not appropriate. Problem must be corrected. No samples may be run until ICAL has passed.	Analyst	Laboratory Accuracy	Within ±20%Recovery of expected value. Low-level calibration check standard should be less than or equal to the reporting limit.

Site-Specific SAP/QAPP Worksheet #28e – Laboratory QC Samples Table
Inductively Coupled Plasma (ICP) Metals (Continued)

Matrix	Soil, Aqueous
Analytical Group	ICP Metals
Concentration Level	Low
Analytical Method/ SOP Reference	SW-846 6010C/LAB SOP# Met100
Analytical Organization	Accutest Laboratories Southeast, Inc.

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator	Measurement Performance Criteria
ICS	At the beginning of an analytical run.	ICS-A: Absolute value of concentration for all nonspiked analytes <2x MDL (unless they are a verified trace impurity from one of the spiked analytes) ICS-AB: Within ± 20% of expected value	Terminate analysis; locate and correct problem; reanalyze ICS. Flagging criteria are not appropriate. No samples may be analyzed without a valid ICS.	Analyst	Accuracy	ICS-A: Absolute value of concentration for all nonspiked analytes <2x MDL (unless they are a verified trace impurity from one of the spiked analytes) ICS-AB: Within ± 20% of expected value
Serial Dilution Test	Each preparatory batch or when a new or unusual matrix is encountered	Five-fold dilution must agree within ± 10% of the original determination. Only applicable for samples with concentrations >50x MDL for ICP.	Perform post-digestion spike (PDS) addition. Flagging criteria are not appropriate.	Analyst	Precision (field samples)	Five-fold dilution must agree within ± 10% of the original determination. Only applicable for samples with concentrations >50x MDL for ICP.
PDS addition	When dilution test fails or analyte concentration in all samples <50x MDL	Recovery within 75-125% of expected result. The spike addition should produce a level between 10x to 100x MDL.	Run samples by method of standard additions (MSA) or Apply J-flag to all sample results (for same matrix) for specific analyte(s) for all samples associated with the post-digestion spike addition.	Analyst	Accuracy	Recovery within 75-125% of expected result. The spike addition should produce a level between 10x to 100x MDL.

Site-Specific SAP/QAPP Worksheet #28e – Laboratory QC Samples Table
Inductively Coupled Plasma (ICP) Metals (Concluded)

<	Greater than.
>	Less than.
10X	Ten times. The “X” combined with a number indicates a multiplier and may be used with numbers other than 10.
CCB	Continuing calibration blank.
CCV	Continuing calibration verification.
%D	Percent difference.
ICAL	Initial calibration.
ICP	Inductively coupled plasma.
ICV	Initial calibration verification.
LCS	Laboratory control sample.
LOD	Limit of detection.
MS	Matrix spike.
MSD	Matrix spike duplicate.
ND	Not detected.
QC	Quality control.
RL	Reporting limit.
RPD	Relative percent difference.
%RSD	% Relative Standard Deviation
SOP	Standard operating procedure.
XA	Concentration in the matrix spike sample.
XB	Concentration in the matrix spike duplicate sample.
XM	Average value of the concentrations of matrix spike and matrix spike duplicate.

Site-Specific SAP/QAPP Worksheet #28f – Laboratory QC Samples Table
Mercury

Matrix	Aqueous, Solid
Analytical Group	Mercury
Concentration Level	Low
Analytical Method/ SOP Reference	SW-846 7471B, 7470A, LAB SOP#MET105, MET 106
Analytical Organization	Accutest Laboratories Southeast, Inc.

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator	Measurement Performance Criteria
ICAL	As needed (see CCV passing criteria)	Minimum 5 standards and a Blank. Correlation coefficient R≥0.995	If the acceptance criteria were not met, re-calibration is performed before any samples may be analyzed.	Analyst	Laboratory Accuracy	Correlation coefficient R≥0.995
ICV	1 per ICAL, analyzed after ICAL, before field samples	%D ≤10%	If the acceptance criteria were not met, re-calibration is performed before any samples may be analyzed.	Analyst	Laboratory Accuracy	%D ≤10%
CCV	Opening CCV, then every 10 samples, with closing CCV	%D ≤20%	If the criterion has not achieved corrective action, re-calibration is performed before any samples may be analyzed. Corrective action may include re-analysis of the samples.	Analyst	Laboratory Accuracy	%D ≤20%

Site-Specific SAP/QAPP Worksheet #28f – Laboratory QC Samples Table
Mercury (Continued)

Matrix	Aqueous, Solid
Analytical Group	Mercury
Concentration Level	Low
Analytical Method/ SOP Reference	SW-846 7471B, 7470A, LAB SOP#MET105, MET 106
Analytical Organization	Accutest Laboratories Southeast, Inc.

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator	Measurement Performance Criteria
Method Blank	1 per digestion batch	<1/2 RL	The source of the contamination is investigated and eliminated before proceeding with further analysis. Corrective actions are: 1. Samples ND – report without qualification 2. Samples >10X contamination level – report with qualification 3. Samples <10x contamination – re-extract and reanalyze. Insufficient sample - qualify and footnote	Analyst/Prep analyst	Absence of interference/contamination	<1/2 RL

Site-Specific SAP/QAPP Worksheet #28f – Laboratory QC Samples Table
Mercury (Continued)

Matrix	Aqueous, Solid
Analytical Group	Mercury
Concentration Level	Low
Analytical Method/ SOP Reference	SW-846 7471B, 7470A, LAB SOP#MET105, MET 106
Analytical Organization	Accutest Laboratories Southeast, Inc.

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator	Measurement Performance Criteria
LCS	1 per digestion batch	%Recovery = (Calculated Value/True Value) *100%; 80%≤%Recovery≤120%	Source of poor recovery is investigated and eliminated before proceeding with further analysis, corrective actions are: 1. Biased high, samples ND – report without qualifications. 2. Biased low – re-extract and reanalyze. Insufficient volume – qualify and footnote	Analyst/Prep analyst	Laboratory Accuracy/Method bias in ideal matrix	%Recovery = (Calculated Value/True Value) *100%; 80%≤%Recovery≤120%
MS	1 per 20 samples or 1 for each digestion batch	%Recovery = (Calculated Value - Sample Value/True Value) *100%: 80%≤%Recovery≤120%	If the recoveries indicate that the problem is procedure related, re-extraction and re-analysis is required. If the recoveries indicate that the failures are matrix-related, refer to Blank Spike as measure of method performance in clean matrix.	Analyst/Prep analyst	Precision and Accuracy in field samples	%Recovery = (Calculated Value - Sample Value/True Value) *100%: 80%≤%Recovery≤120%

Site-Specific SAP/QAPP Worksheet #28f – Laboratory QC Samples Table
Mercury (Continued)

Matrix	Aqueous, Solid
Analytical Group	Mercury
Concentration Level	Low
Analytical Method/ SOP Reference	SW-846 7471B, 7470A, LAB SOP#MET105, MET 106
Analytical Organization	Accutest Laboratories Southeast, Inc.

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator	Measurement Performance Criteria
MSDs	1 per 20 samples or 1 for each digestion batch	%Recovery = (Calculated Value – Sample Value/True Value) *100% RPD (%) = [(XA-XB)/XM] * 100 Where: XA and XB are the concentration in the MS and MSD, and XM is the average value of the concentrations in the MS and MSD, (XA + XB)/2: RPD $\leq$ 20%	See above	Analyst/Prep analyst	Precision and Accuracy in field samples	%Recovery = (Calculated Value – Sample Value/True Value) *100% RPD (%) = [(XA-XB)/XM] * 100 Where: XA and XB are the concentration in the MS and MSD, and XM is the average value of the concentrations in the MS and MSD, (XA + XB)/2: RPD $\leq$ 20%
Serial Dilution Test	Each preparatory batch or when a new or unusual matrix is encountered	Five-fold dilution must agree within ± 10% of the original determination. Only applicable for samples with concentrations >25x MDL for CVAA.	Perform matrix spike. Flagging criteria are not appropriate.	Analyst	Precision (field samples)	Five-fold dilution must agree within ± 10% of the original determination. Only applicable for samples with concentrations >25x MDL for CVAA.

Site-Specific SAP/QAPP Worksheet #28f – Laboratory QC Samples Table
Mercury (Concluded)

<	Greater than.
>	Less than.
10X	Ten times. The “X” combined with a number indicates a multiplier and may be used with numbers other than 10.
CCV	Continuing calibration verification.
CVAA	Cold vapor atomic absorption.
%D	Percent difference.
ICAL	Initial calibration.
ICV	Initial calibration verification.
LCS	Laboratory control sample.
MDL	Method detection limit.
MS	Matrix spike.
MSD	Matrix spike duplicate.
ND	Not detected.
QC	Quality control.
RF	Response factor.
RL	Reporting limit.
RPD	Relative percent difference.
SOP	Standard operating procedure.
XA	Concentration in the matrix spike sample.
XB	Concentration in the matrix spike duplicate sample.
XM	Average value of the concentrations of matrix spike and matrix spike duplicate.

Site-Specific SAP/QAPP Worksheet #28g – Laboratory QC Samples Table
Waste Characterization TCLP Volatile Organic Compounds

Matrix	Waste
Analytical Group	TCLP Volatiles
Concentration Level	Low
Analytical Method/ SOP Reference	SW-846 8260/LAB SOP#MS005
Analytical Organization	Accutest Laboratories Southeast, Inc.

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator	Measurement Performance Criteria
Mass Spectrometer Tuning	Prior to calibration and every 12 hours during sample analysis	Refer to method for specific ion criteria.	Retune instrument and verify. Rerun affected samples. Flagging criteria are not appropriate and problem must be corrected. No samples may be accepted without a valid tune.	Analyst	Laboratory Accuracy	Refer to method for specific ion criteria.
ICAL	As needed (see CCV passing criteria below and SW-846 8000 method)	%RSD <15%, or Correlation coefficient R>0.995 %RSD for CCC <30%, RF for SPCC > 0.01 and 0.03	If the acceptance criteria were not met, re-calibration is performed before any samples may be analyzed.	Analyst	Laboratory Accuracy	%RSD <15%, or Correlation coefficient R>0.995 %RSD for CCC <30%, RF for SPCC > 0.01 and 0.03
Initial Retention Time window establishment (all targets)	Once per ICAL	Position set using mid-point calibration standard from ICAL	Not Applicable	Analyst	Laboratory Accuracy	Chromatographic system performance

Site-Specific SAP/QAPP Worksheet #28g – Laboratory QC Samples Table
Waste Characterization TCLP Volatile Organic Compounds (Continued)

Matrix	Waste
Analytical Group	TCLP Volatiles
Concentration Level	Low
Analytical Method/ SOP Reference	SW-846 8260/LAB SOP#MS005
Analytical Organization	Accutest Laboratories Southeast, Inc.

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator	Measurement Performance Criteria
ICV	1 per ICAL, analyzed after ICAL, before field samples	%D for CCC <25%, poor purgers >40%, RF see above	If the acceptance criteria were not met, re-calibration is performed before any samples may be analyzed.	Analyst	Laboratory Accuracy	%D for CCC <25%, poor purgers >40%, RF see above
CCV	1 per analytical run. Analytical run not to exceed 12 hours.	%D for CCC <20%, RF see above	If the criterion has not achieved corrective action, re-calibration is performed before any samples may be analyzed. Corrective action may include re-analysis of the samples.	Analyst	Laboratory Accuracy	%D for CCC <20%, RF see above
Evaluation of absolute retention time shift (Internal Standards only)	Every CCV	Within 30 seconds of initial Retention Time (ICAL mid-point)	Determine source of malfunction, perform maintenance and verify. Rerun affected samples. Rerun ICAL, if necessary. Flagging criteria are not appropriate and problem must be corrected	Analyst	Laboratory Accuracy	Overall chromatographic system performance

Site-Specific SAP/QAPP Worksheet #28g – Laboratory QC Samples Table
Waste Characterization TCLP Volatile Organic Compounds (Continued)

Matrix	Waste
Analytical Group	TCLP Volatiles
Concentration Level	Low
Analytical Method/ SOP Reference	SW-846 8260/LAB SOP#MS005
Analytical Organization	Accutest Laboratories Southeast, Inc.

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator	Measurement Performance Criteria
Evaluation of relative retention time shift (all targets)	Every injection following CCV	Within 0.06% of daily CCV Retention time	Determine source of malfunction, perform maintenance and verify. Rerun affected samples. Flagging criteria are not appropriate and problem must be corrected	Analyst	Laboratory Accuracy	Overall chromatographic system performance
Method Blank	1 per extraction batch	<1/2 RL	The source of the contamination is investigated and eliminated before proceeding with further analysis. Corrective actions are: 1. Samples ND – report without qualification 2. Samples >10X contamination level – report with qualification 3. Samples <10x contamination – re-extract and reanalyze. Insufficient sample - qualify and footnote	Analyst	Absence of interference/contamination	<1/2 RL

Site-Specific SAP/QAPP Worksheet #28g – Laboratory QC Samples Table
Waste Characterization TCLP Volatile Organic Compounds (Continued)

Matrix	Waste
Analytical Group	TCLP Volatiles
Concentration Level	Low
Analytical Method/ SOP Reference	SW-846 8260/LAB SOP#MS005
Analytical Organization	Accutest Laboratories Southeast, Inc.

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator	Measurement Performance Criteria
LCS	1 per extraction batch	%Recovery = (Calculated Value/True Value) *100%	Source of poor recovery is investigated and eliminated before proceeding with further analysis, corrective actions are: 1. Biased high, samples ND – report without qualifications. 2. Biased low – re-extract and reanalyze. Insufficient volume – qualify and footnote	Analyst	Laboratory Accuracy/Method bias in ideal matrix	%Recovery = (Calculated Value/True Value) *100%

Site-Specific SAP/QAPP Worksheet #28g – Laboratory QC Samples Table
Waste Characterization TCLP Volatile Organic Compounds (Continued)

Matrix	Waste
Analytical Group	TCLP Volatiles
Concentration Level	Low
Analytical Method/ SOP Reference	SW-846 8260/LAB SOP#MS005
Analytical Organization	Accutest Laboratories Southeast, Inc.

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator	Measurement Performance Criteria
MS	1 per 20 samples or 1 for each extraction batch	%Recovery = (Calculated Value - Sample Value/True Value) *100%	If the recoveries indicate that the problem is procedure related, re-extraction and re-analysis is required. If the recoveries indicate that the failures are matrix-related, refer to Blank Spike as measure of method performance in clean matrix. The Shaw Chemist will be contacted and a decision will be made to either report the data as is with a notation in the analytical narrative or if the samples should be re-extract and re-analyzed.	Analyst	Precision and Accuracy in field samples	%Recovery = (Calculated Value - Sample Value/True Value) *100%

Site-Specific SAP/QAPP Worksheet #28g – Laboratory QC Samples Table
Waste Characterization TCLP Volatile Organic Compounds (Continued)

Matrix	Waste
Analytical Group	TCLP Volatiles
Concentration Level	Low
Analytical Method/ SOP Reference	SW-846 8260/LAB SOP#MS005
Analytical Organization	Accutest Laboratories Southeast, Inc.

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator	Measurement Performance Criteria
MSD	1 per 20 samples or 1 for each extraction batch	%Recovery = (Calculated Value – Sample Value/True Value) *100% RPD (%) = [(XA-XB)/XM] * 100 Where: XA and XB are the concentration in the MS and MSD, and XM is the average value of the concentrations in the MS and MSD, (XA + XB)/2	See above	Analyst	Precision and Accuracy in field samples	%Recovery = (Calculated Value – Sample Value/True Value) *100% RPD (%) = [(XA-XB)/XM] * 100 Where: XA and XB are the concentration in the MS and MSD, and XM is the average value of the concentrations in the MS and MSD, (XA + XB)/2

Site-Specific SAP/QAPP Worksheet #28g – Laboratory QC Samples Table
Waste Characterization TCLP Volatile Organic Compounds (Continued)

Matrix	Waste
Analytical Group	TCLP Volatiles
Concentration Level	Low
Analytical Method/ SOP Reference	SW-846 8260/LAB SOP#MS005
Analytical Organization	Accutest Laboratories Southeast, Inc.

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator	Measurement Performance Criteria
Surrogate Spikes	Every sample	%Recovery = (Calculated Value/True Value) *100%	Reason for poor recoveries is investigated and eliminated before further analytical activities. Corrective actions are: 1. High bias, samples ND – report without qualification. 2. Low bias – re-extract and reanalyze. Insufficient volume – qualify and footnote	Analyst	Individual sample preparation efficiency control	%Recovery = (Calculated Value/True Value) *100%
Internal standard	Every sample	Internal standard Area = -50% to +100% of CCV	If failure is due to instrument performance issues, the problem must be identified, corrected, and the sample must be re-analyzed. If no instrument problem is found the sample must be re-analyzed. If upon re-analysis the responses are still not within limits, the problem may be considered sample matrix interference.	Analyst	Instrument sensitivity control	Internal standard Area = -50% to +100% of CCV

Site-Specific SAP/QAPP Worksheet #28g – Laboratory QC Samples Table
Waste Characterization TCLP Volatile Organic Compounds (Concluded)

<	Greater than.
>	Less than.
10X	Ten times. The “X” combined with a number indicates a multiplier and may be used with numbers other than 10.
CCC	Calibration check compounds.
CCV	Continuing calibration verification.
%D	Percent difference.
ICAL	Initial calibration.
ICV	Initial calibration verification.
LCS	Laboratory control sample.
MS	Matrix spike.
MSD	Matrix spike duplicate.
ND	Not detected.
QC	Quality control.
RF	Response factor.
RL	Reporting limit.
%RSD	% Relative Standard Deviation
SOP	Standard operating procedure.
SPCC	System performance check compounds.
TCLP	Toxicity Characteristic Leaching Procedure.
XA	Concentration in the matrix spike sample.
XB	Concentration in the matrix spike duplicate sample.
XM	Average value of the concentrations of matrix spike and matrix spike duplicate.

Site-Specific SAP/QAPP Worksheet #28h – Laboratory QC Samples Table
Waste Characterization TCLP Semivolatile Organic Compounds

Matrix	Waste
Analytical Group	TCLP Semivolatiles
Concentration Level	Low
Analytical Method/ SOP Reference	SW-846 8270D/LAB SOP#MS011
Analytical Organization	Accutest Laboratories Southeast, Inc.

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator	Measurement Performance Criteria
Mass Spectrometer tuning – DFTPP/DDT/PCP/ Benzidine	Prior to calibration and every 12 hours during sample analysis	Passing DFTPP breakdown criteria, DDT breakdown <20%, PCP and Benzidine tailing factor <2	Retune instrument and verify. Rerun affected samples. Flagging criteria are not appropriate and problem must be corrected. No samples may be accepted without a valid tune.	Analyst	Laboratory accuracy	System inertness and GC column performance
ICAL	As needed (see CCV passing criteria below and SW-846 8000 method)	%RSD <20%, Correlation coefficient R>0.995, minimum RF as per method	If the acceptance criteria were not met, re-calibration is performed before any samples may be analyzed.	Analyst	Laboratory Accuracy	%RSD <20%, Correlation coefficient R>0.995, minimum RF met for all analytes on all calibration levels
Initial Retention Time window establishment (all targets)	Once per ICAL	Position set using mid-point calibration standard from ICAL	Not Applicable	Analyst	Laboratory Accuracy	Chromatographic system performance
ICV	1 per ICAL, analyzed after ICAL, before field samples	%D <20%, minimum RF as per method	If the acceptance criteria were not met, re-calibration is performed before any samples may be analyzed.	Analyst	Laboratory Accuracy	%D for all analytes <20%,

Site-Specific SAP/QAPP Worksheet #28h – Laboratory QC Samples Table
Waste Characterization TCLP Semivolatile Organic Compounds (Continued)

Matrix	Waste
Analytical Group	TCLP Semivolatiles
Concentration Level	Low
Analytical Method/ SOP Reference	SW-846 8270D/LAB SOP#MS011
Analytical Organization	Accutest Laboratories Southeast, Inc.

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator	Measurement Performance Criteria
CCV	1 per analytical run. Analytical run not to exceed 12 hours.	%D <20%, minimum RF as per method	If the criterion has not achieved corrective action, re-calibration is performed before any samples may be analyzed. Corrective action may include re-analysis of the samples.	Analyst	Laboratory Accuracy	%D for all analytes <20%,
Evaluation of absolute retention time shift (Internal Standards only)	Every CCV	Within 30 seconds of initial Retention Time (ICAL mid-point)	Determine source of malfunction, perform maintenance and verify. Rerun affected samples. Rerun ICAL, if necessary. Flagging criteria are not appropriate and problem must be corrected	Analyst	Laboratory Accuracy	Overall chromatographic system performance
Evaluation of relative retention time shift (all targets)	Every injection following CCV	Within 0.06% of daily CCV Retention time	Determine source of malfunction, perform maintenance and verify. Rerun affected samples. Flagging criteria are not appropriate and problem must be corrected	Analyst	Laboratory Accuracy	Overall chromatographic system performance

Site-Specific SAP/QAPP Worksheet #28h – Laboratory QC Samples Table
Waste Characterization TCLP Semivolatile Organic Compounds (Continued)

Matrix	Waste
Analytical Group	TCLP Semivolatiles
Concentration Level	Low
Analytical Method/ SOP Reference	SW-846 8270D/LAB SOP#MS011
Analytical Organization	Accutest Laboratories Southeast, Inc.

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator	Measurement Performance Criteria
Method Blank	1 per extraction batch	<1/2 RL	The source of the contamination is investigated and eliminated before proceeding with further analysis. Corrective actions are: 1. Samples ND – report without qualification 2. Samples >10X contamination level – report with qualification 3. Samples <10x contamination – re-extract and reanalyze. Insufficient sample - qualify and footnote	Analyst/Prep analyst	Absence of interference/contamination	<1/2 RL

Site-Specific SAP/QAPP Worksheet #28h – Laboratory QC Samples Table
Waste Characterization TCLP Semivolatile Organic Compounds (Continued)

Matrix	Waste
Analytical Group	TCLP Semivolatiles
Concentration Level	Low
Analytical Method/ SOP Reference	SW-846 8270D/LAB SOP#MS011
Analytical Organization	Accutest Laboratories Southeast, Inc.

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator	Measurement Performance Criteria
LCS	1 per extraction batch	%Recovery = (Calculated Value/True Value) *100%	Source of poor recovery is investigated and eliminated before proceeding with further analysis, corrective actions are: 1. Biased high, samples ND – report without qualifications. 2. Biased low – re-extract and reanalyze. Insufficient volume – qualify and footnote	Analyst/Prep analyst	Laboratory Accuracy/Method bias in ideal matrix	%Recovery = (Calculated Value/True Value) *100%

Site-Specific SAP/QAPP Worksheet #28h – Laboratory QC Samples Table
Waste Characterization TCLP Semivolatile Organic Compounds (Continued)

Matrix	Waste
Analytical Group	TCLP Semivolatiles
Concentration Level	Low
Analytical Method/ SOP Reference	SW-846 8270D/LAB SOP#MS011
Analytical Organization	Accutest Laboratories Southeast, Inc.

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator	Measurement Performance Criteria
MS	1 per 20 samples or 1 for each extraction batch	%Recovery = (Calculated Value - Sample Value/True Value) *100%	If the recoveries indicate that the problem is procedure related, re-extraction and re-analysis is required. If the recoveries indicate that the failures are matrix-related, refer to Blank Spike as measure of method performance in clean matrix. The Shaw Chemist will be contacted and a decision will be made to either report the data as is with a notation in the analytical narrative or if the samples should be re-extract and re-analyzed.	Analyst/Prep analyst	Precision and Accuracy in field samples	%Recovery = (Calculated Value - Sample Value/True Value) *100%

Site-Specific SAP/QAPP Worksheet #28h – Laboratory QC Samples Table
Waste Characterization TCLP Semivolatile Organic Compounds (Continued)

Matrix	Waste
Analytical Group	TCLP Semivolatiles
Concentration Level	Low
Analytical Method/ SOP Reference	SW-846 8270D/LAB SOP#MS011
Analytical Organization	Accutest Laboratories Southeast, Inc.

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator	Measurement Performance Criteria
MSD	1 per 20 samples or 1 for each extraction batch	%Recovery = (Calculated Value – Sample Value/True Value) *100% RPD (%) = [(XA-XB)/XM] * 100 Where: XA and XB are the concentration in the MS and MSD, and XM is the average value of the concentrations in the MS and MSD, (XA + XB)/2	See above	Analyst/Prep analyst	Precision and Accuracy in field samples	%Recovery = (Calculated Value – Sample Value/True Value) *100% RPD (%) = [(XA-XB)/XM] * 100 Where: XA and XB are the concentration in the MS and MSD, and XM is the average value of the concentrations in the MS and MSD, (XA + XB)/2
Surrogate Spikes	Every sample	%Recovery = (Calculated Value/True Value) *100%	Reason for poor recoveries is investigated and eliminated before further analytical activities. Corrective actions are: 1. High bias, samples ND – report without qualification. 2. Low bias – re-extract and reanalyze. Insufficient volume – qualify and footnote	Analyst/Prep analyst	Individual sample preparation efficiency control	%Recovery = (Calculated Value/True Value) *100%

Site-Specific SAP/QAPP Worksheet #28h – Laboratory QC Samples Table
Waste Characterization TCLP Semivolatile Organic Compounds (Concluded)

Matrix	Waste
Analytical Group	TCLP Semivolatiles
Concentration Level	Low
Analytical Method/ SOP Reference	SW-846 8270D/LAB SOP#MS011
Analytical Organization	Accutest Laboratories Southeast, Inc.

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator	Measurement Performance Criteria
Internal standard	Every sample	Internal standard Area = -50% to +100% of CCV	If failure is due to instrument performance issues, the problem must be identified, corrected, and the sample must be re-analyzed. If no instrument problem is found the sample must be re-analyzed. If upon re-analysis the responses are still not within limits, the problem may be considered sample matrix interference.	Analyst	Instrument sensitivity control	Internal standard Area = -50% to +100% of CCV

<	Greater than.
>	Less than.
10X	Ten times. The "X" combined with a number indicates a multiplier and may be used with numbers other than 10.
CCV	Continuing calibration verification.
%D	Percent difference.
DDT	dichlorodiphenyltrichloroethane
DFTPP	decafluorotriphenylphosphine
ICAL	Initial calibration.
ICV	Initial calibration verification.
LCS	Laboratory control sample.
MS	Matrix spike.
MSD	Matrix spike duplicate.
ND	Not detected.
PCP	pentachlorolphenol
QC	Quality control.
RF	Response factor.
RL	Reporting limit.
RPD	Relative percent difference.
%RSD	% Relative Standard Deviation
SOP	Standard operating procedure.
TCLP	Toxicity characteristic leaching procedure.
XA	Concentration in the matrix spike sample.
XB	Concentration in the matrix spike duplicate sample.
XM	Average value of the concentrations of matrix spike and matrix spike duplicate.

Site-Specific SAP/QAPP Worksheet #28i – Laboratory QC Samples Table
Waste Characterization TCLP ICP Metals

Matrix	Waste
Analytical Group	TCLP ICP Metals
Concentration Level	Low
Analytical Method/ SOP Reference	SW-846 6010C/LAB SOP# Met 100, Met 103
Analytical Organization	Accutest Laboratories Southeast, Inc.

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator	Measurement Performance Criteria
ICAL	As needed (see CCV passing criteria below)	%RSD <5%, or Correlation coefficient R>0.995	If the acceptance criteria were not met, re-calibration is performed before any samples may be analyzed.	Analyst	Laboratory Accuracy	%RSD <5%, or Correlation coefficient R>0.995
ICV	1 per ICAL, analyzed after ICAL, before field samples	%D <10%	If the acceptance criteria were not met, re-calibration is performed before any samples may be analyzed.	Analyst	Laboratory Accuracy	%D <10%
CCV	Opening CCV, then every 10 samples, with closing CCV	%D <10%	If the criterion has not achieved corrective action, re-calibration is performed before any samples may be analyzed. Corrective action may include re-analysis of the samples.	Analyst	Laboratory Accuracy	%D <10%

Site-Specific SAP/QAPP Worksheet #28i – Laboratory QC Samples Table
Waste Characterization TCLP ICP Metals (Continued)

Matrix	Waste
Analytical Group	TCLP ICP Metals
Concentration Level	Low
Analytical Method/ SOP Reference	SW-846 6010C/LAB SOP# Met 100, Met 103
Analytical Organization	Accutest Laboratories Southeast, Inc.

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator	Measurement Performance Criteria
Calibration Blank	After every ICV and CCV, including terminal CCV	No analytes detected above LOD	Determine source of contamination, correct problem. Qualify associated data with B qualifier and appropriate footnote. Corrective action may include reanalysis of CCB and reanalysis of associated samples.	Analyst	Absence of interference/contamination	<LOD
Method Blank	1 per extraction batch	<1/2 RL	The source of the contamination is investigated and eliminated before proceeding with further analysis. Corrective actions are: 1. Samples ND – report without qualification 2. Samples >10X contamination level – report with qualification 3. Samples <10x contamination – re-extract and reanalyze. Insufficient sample - qualify and footnote	Analyst/Prep analyst	Absence of interference/contamination	<1/2 RL

Site-Specific SAP/QAPP Worksheet #28i – Laboratory QC Samples Table
Waste Characterization TCLP ICP Metals (Continued)

Matrix	Waste
Analytical Group	TCLP ICP Metals
Concentration Level	Low
Analytical Method/ SOP Reference	SW-846 6010C/LAB SOP# Met 100, Met 103
Analytical Organization	Accutest Laboratories Southeast, Inc.

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator	Measurement Performance Criteria
LCS	1 per extraction batch	%Recovery = (Calculated Value/True Value) *100%; 80%<%Recovery<120%	Source of poor recovery is investigated and eliminated before proceeding with further analysis, corrective actions are: 1. Biased high, samples ND – report without qualifications. 2. Biased low – re-extract and reanalyze. Insufficient volume – qualify and footnote	Analyst/Prep analyst	Laboratory Accuracy/Method bias in ideal matrix	%Recovery = (Calculated Value/True Value) *100%; 80%<%Recovery<120%

Site-Specific SAP/QAPP Worksheet #28i – Laboratory QC Samples Table
Waste Characterization TCLP ICP Metals (Continued)

Matrix	Waste
Analytical Group	TCLP ICP Metals
Concentration Level	Low
Analytical Method/ SOP Reference	SW-846 6010C/LAB SOP# Met 100, Met 103
Analytical Organization	Accutest Laboratories Southeast, Inc.

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator	Measurement Performance Criteria
MS	1 per 20 samples or 1 for each extraction batch	%Recovery = (Calculated Value - Sample Value/True Value) *100%: 80%<%Recovery<120%	If the recoveries indicate that the problem is procedure related, re-extraction and re-analysis is required. If the recoveries indicate that the failures are matrix-related, refer to Blank Spike as measure of method performance in clean matrix. The Shaw Chemist will be contacted and a decision will be made to either report the data as is with a notation in the analytical narrative or if the samples should be re-extract and re-analyzed.	Analyst/Prep analyst	Precision and Accuracy in field samples	%Recovery = (Calculated Value - Sample Value/True Value) *100%: 80%<%Recovery<120%

Site-Specific SAP/QAPP Worksheet #28i – Laboratory QC Samples Table
Waste Characterization TCLP ICP Metals (Continued)

Matrix	Waste
Analytical Group	TCLP ICP Metals
Concentration Level	Low
Analytical Method/ SOP Reference	SW-846 6010C/LAB SOP# Met 100, Met 103
Analytical Organization	Accutest Laboratories Southeast, Inc.

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator	Measurement Performance Criteria
MSD	1 per 20 samples or 1 for each extraction batch	%Recovery = (Calculated Value – Sample Value/True Value) *100% RPD (%) = [(XA-XB)/XM] * 100 Where: XA and XB are the concentration in the MS and MSD, and XM is the average value of the concentrations in the MS and MSD, (XA + XB)/2	See above	Analyst/Prep analyst	Precision and Accuracy in field samples	%Recovery = (Calculated Value – Sample Value/True Value) *100% RPD (%) = [(XA-XB)/XM] * 100 Where: XA and XB are the concentration in the MS and MSD, and XM is the average value of the concentrations in the MS and MSD, (XA + XB)/2
Serial Dilution Test	Each preparatory batch or when a new or unusual matrix is encountered	Five-fold dilution must agree within ± 10% of the original determination. Only applicable for samples with concentrations >50x MDL for ICP.	Perform PDS addition. Flagging criteria are not appropriate.	Analyst	Precision (field samples)	Five-fold dilution must agree within ± 10% of the original determination. Only applicable for samples with concentrations >50x MDL for ICP.

Site-Specific SAP/QAPP Worksheet #28i – Laboratory QC Samples Table
Waste Characterization TCLP ICP Metals (Concluded)

<	Greater than.
>	Less than.
10X	Ten times. The “X” combined with a number indicates a multiplier and may be used with numbers other than 10.
CCB	Continuing calibration blank.
CCV	Continuing calibration verification.
%D	Percent difference.
ICAL	Initial calibration.
ICP	Inductively coupled plasma.
ICS	Interference check.
ICV	Initial calibration verification.
LCS	Laboratory control sample.
LOD	Limit of detection.
MDL	Method detection limit.
MS	Matrix spike.
MSA	Method of standard addition.
MSD	Matrix spike duplicate.
ND	Not detected.
PDS	Post-digestion spike.
QC	Quality control.
RF	Response factor.
RL	Reporting limit.
RPD	Relative percent difference.
%RSD	% Relative Standard Deviation
SOP	Standard operating procedure.
TCLP	Toxicity characteristic leaching procedure.
XA	Concentration in the matrix spike sample.
XB	Concentration in the matrix spike duplicate sample.
XM	Average value of the concentrations of matrix spike and matrix spike duplicate.

Site-Specific SAP/QAPP Worksheet #28i – Laboratory QC Samples Table
Waste Characterization TCLP Mercury

Matrix	Waste
Analytical Group	TCLP Mercury
Concentration Level	Low
Analytical Method/ SOP Reference	SW-846 7470A, LAB SOP#MET106
Analytical Organization	Accutest Laboratories Southeast, Inc.

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator	Measurement Performance Criteria
ICAL	As needed (see CCV passing criteria)	Correlation coefficient R≥0.995	If the acceptance criteria were not met, re-calibration is performed before any samples may be analyzed.	Analyst	Laboratory Accuracy	Correlation coefficient R≥0.995
ICV	1 per ICAL, analyzed after ICAL, before field samples	%D ≤10%	If the acceptance criteria were not met, re-calibration is performed before any samples may be analyzed.	Analyst	Laboratory Accuracy	%D ≤10%
CCV	Opening CCV, then every 10 samples, with closing CCV	%D ≤20%	If the criterion has not achieved corrective action, re-calibration is performed before any samples may be analyzed. Corrective action may include re-analysis of the samples.	Analyst	Laboratory Accuracy	%D ≤20%

Site-Specific SAP/QAPP Worksheet #28i – Laboratory QC Samples Table
Waste Characterization TCLP Mercury (Continued)

Matrix	Waste
Analytical Group	TCLP Mercury
Concentration Level	Low
Analytical Method/ SOP Reference	SW-846 7470A, LAB SOP#MET106
Analytical Organization	Accutest Laboratories Southeast, Inc.

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator	Measurement Performance Criteria
Method Blank	1 per extraction batch	<1/2 RL	The source of the contamination is investigated and eliminated before proceeding with further analysis. Corrective actions are: 1. Samples ND – report without qualification 2. Samples >10X contamination level – report with qualification 3. Samples <10x contamination – re-extract and reanalyze. Insufficient sample - qualify and footnote	Analyst/Prep analyst	Absence of interference/contamination	<1/2 RL

Site-Specific SAP/QAPP Worksheet #28i – Laboratory QC Samples Table
Waste Characterization TCLP Mercury (Continued)

Matrix	Waste
Analytical Group	TCLP Mercury
Concentration Level	Low
Analytical Method/ SOP Reference	SW-846 7470A, LAB SOP#MET106
Analytical Organization	Accutest Laboratories Southeast, Inc.

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator	Measurement Performance Criteria
LCS	1 per extraction batch	%Recovery = (Calculated Value/True Value) *100%; 80%≤%Recovery≤ 120%	Source of poor recovery is investigated and eliminated before proceeding with further analysis, corrective actions are: 1. Biased high, samples ND – report without qualifications. 2. Biased low – re-extract and reanalyze. Insufficient volume – qualify and footnote	Analyst/Prep analyst	Laboratory Accuracy/Method bias in ideal matrix	%Recovery = (Calculated Value/True Value) *100%; 80%≤%Recovery≤120 %

Site-Specific SAP/QAPP Worksheet #28i – Laboratory QC Samples Table
Waste Characterization TCLP Mercury (Continued)

Matrix	Waste
Analytical Group	TCLP Mercury
Concentration Level	Low
Analytical Method/ SOP Reference	SW-846 7470A, LAB SOP#MET106
Analytical Organization	Accutest Laboratories Southeast, Inc.

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator	Measurement Performance Criteria
MS	1 per 20 samples or 1 for each extraction batch	%Recovery = (Calculated Value - Sample Value/True Value) *100%: 80%≤%Recovery≤ 120%	If the recoveries indicate that the problem is procedure related, re-extraction and re-analysis is required. If the recoveries indicate that the failures are matrix-related, refer to Blank Spike as measure of method performance in clean matrix. The Shaw Chemist will be contacted and a decision will be made to either report the data as is with a notation in the analytical narrative or if the samples should be re-extract and re-analyzed.	Analyst/Prep analyst	Precision and Accuracy in field samples	%Recovery = (Calculated Value - Sample Value/True Value) *100%: 80%≤%Recovery≤120 %

Site-Specific SAP/QAPP Worksheet #28i – Laboratory QC Samples Table
Waste Characterization TCLP Mercury (Concluded)

Matrix	Waste
Analytical Group	TCLP Mercury
Concentration Level	Low
Analytical Method/ SOP Reference	SW-846 7470A, LAB SOP#MET106
Analytical Organization	Accutest Laboratories Southeast, Inc.

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator	Measurement Performance Criteria
MSD	1 per 20 samples or 1 for each extraction batch	%Recovery = (Calculated Value – Sample Value/True Value) *100% RPD (%) = [(XA-XB)/XM] * 100 Where: XA and XB are the concentration in the MS and MSD, and XM is the average value of the concentrations in the MS and MSD, (XA + XB)/2: RPD ≤ 20%	See above	Analyst/Prep analyst	Precision and Accuracy in field samples	%Recovery = (Calculated Value – Sample Value/True Value) *100% RPD (%) = [(XA-XB)/XM] * 100 Where: XA and XB are the concentration in the MS and MSD, and XM is the average value of the concentrations in the MS and MSD, (XA + XB)/2: RPD ≤ 20%

<	Greater than.
>	Less than.
10X	Ten times. The "X" combined with a number indicates a multiplier and may be used with numbers other than 10.
CCC	Calibration check compounds.
CVAA	Cold vapor atomic absorption.
%D	Percent difference.
ICAL	Initial calibration.
ICV	Initial calibration verification.
LCS	Laboratory control sample.
MDL	Method detection limit.
MS	Matrix spike.
MSA	Method of standard addition.
MSD	Matrix spike duplicate.
ND	Not detected.
QC	Quality control.
RF	Response factor.
RL	Reporting limit.
RPD	Relative percent difference.
%RSD	% Relative Standard Deviation
SOP	Standard operating procedure.
TCLP	Toxicity characteristic leaching procedure.
XA	Concentration in the matrix spike sample.
XB	Concentration in the matrix spike duplicate sample.
XM	Average value of the concentrations of matrix spike and matrix spike duplicate.

SAP/QAPP Worksheet #28i – Laboratory QC Samples Table
Waste Characterization Reactive Sulfide

Matrix	Waste
Analytical Group	Reactivity
Concentration Level	Low
Analytical Method/ SOP Reference	SW-846 Ch.7/LAB SOP#GN136
Analytical Organization	Accutest Laboratories Southeast, Inc.

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator	Measurement Performance Criteria
Method Blank	1 per batch	< RL	The source of the contamination is investigated and eliminated before proceeding with further analysis. Corrective actions are: 1. Samples ND – report without qualification 2. Samples >10X contamination level – report with qualification 3. Samples <10x contamination – re-extract and reanalyze. Insufficient sample - qualify and footnote	Laboratory Analyst/Prep Analyst	Absence of interference/contamination	< RL

Site-Specific SAP/QAPP Worksheet #28i – Laboratory QC Samples Table
Waste Characterization Reactive Sulfide (Continued)

Matrix	Waste
Analytical Group	Reactivity
Concentration Level	Low
Analytical Method/ SOP Reference	SW-846 Ch.7/LAB SOP#GN136
Analytical Organization	Accutest Laboratories Southeast, Inc.

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator	Measurement Performance Criteria
LCS	1 per batch	%Recovery = (Calculated Value/True Value) *100%; 0%≤%Recovery≤100%	Source of poor recovery is investigated and eliminated before proceeding with further analysis, corrective actions are: 1. Biased high, samples ND – report without qualifications. 2. Biased low – re-extract and reanalyze. Insufficient volume – qualify and footnote	Laboratory Analyst	Laboratory Accuracy/Method bias in ideal matrix	%Recovery = (Calculated Value/True Value) *100%; 0%≤%Recovery≤100%
DUP	1 per 20 samples or 1 for each preparation batch	RPD (%) = [(XA-XB)/XM] * 100 Where: XA and XB are the concentration in the Sample and DUP, and XM is the average value of the concentrations in the MS and MSD, (XA + XB)/2: RPD ≤ 30%	See above	Laboratory Analyst	Precision and Accuracy in field samples	RPD (%) = [(XA-XB)/XM] * 100 Where: XA and XB are the concentration in the Sample and DUP, and XM is the average value:(XA + XB)/2: RPD ≤ 30%

Site-Specific SAP/QAPP Worksheet #28i – Laboratory QC Samples Table
Waste Characterization Reactive Sulfide (Concluded)

<	Greater than.
>	Less than.
10X	Ten times.
DUP	Matrix duplicate.
LCS	Laboratory control sample.
MS	Matrix spike.
MSD	Matrix spike duplicate.
ND	Not detected.
QC	Quality control.
RL	Reporting limit.
RPD	Relative percent difference.
SOP	Standard operating procedure.
XA	Concentration in the matrix spike sample.
XB	Concentration in the matrix spike duplicate sample.
XM	Average value of the concentrations of MS and MSD.

Site-Specific SAP/QAPP Worksheet #28i – Laboratory QC Samples Table
Waste Characterization Ignitability (Flashpoint)

Matrix	Waste
Analytical Group	Flash Point
Concentration Level	Low
Analytical Method/ SOP Reference	SW-846 1010/LAB SOP#GN121
Analytical Organization	Accutest Laboratories Southeast, Inc.

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator	Measurement Performance Criteria
p-Xylene, second source	1 per day	flash point of p-Xylene is 77 ± 4.3°F	Second analyst witnessing flash. Calibrate thermometer	Laboratory Analyst	Laboratory Accuracy	flash point of p-Xylene is 81 ± 4.3°F
p-Xylene, first source	Opening sequence, then every 10 samples and at the end	flash point of p-Xylene is 77 ± 4.3°F	Second analyst witnessing flash. Calibrate thermometer	Laboratory Analyst	Laboratory Accuracy	flash point of p-Xylene is 81 ± 4.3°F

°F Degrees Fahrenheit.

Site-Specific SAP/QAPP Worksheet #28i – Laboratory QC Samples Table
Waste Characterization Corrosivity (pH)

Matrix	Waste
Analytical Group	pH
Concentration Level	Low
Analytical Method/ SOP Reference	SW-846 9045D/LAB SOP#GN166
Analytical Organization	Accutest Laboratories Southeast, Inc.

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator	Measurement Performance Criteria
CCV	Every 10 samples	Within 0.05 pH units of true value	Rerun standard, and/or recalibrate instrument and reanalyzed all samples since last acceptable CCV.	Laboratory Analyst	Laboratory Accuracy	Within 0.05 pH units of true value
Duplicate samples	Every 20 samples	RPD $\leq$ 10%	If sufficient sample volume is available, reanalyze affected samples. Qualify data as needed.	Laboratory Analyst	Laboratory Accuracy	RPD $\leq$ 10%

CCC Calibration check compounds.
CCV Continuing calibration verification.
QC Quality control.
RPD Relative percent difference.
SOP Standard operating procedure.

SITE-SPECIFIC SAP/QAPP WORKSHEET #29 – PROJECT DOCUMENTS AND RECORDS TABLE

Document	Where Maintained
Final Work Plan and Sampling and Analysis Plans	Shaw Project file Project Repository and Administrative Record
Field notes/logbook	Shaw Project file
Chain of custody forms	Shaw Project file
Laboratory raw data package	Shaw Project file
Audit/assessment checklists/reports	Shaw Project file and laboratory
Corrective action forms/reports	Shaw Project file and laboratory
Laboratory equipment calibration logs	Accutest Laboratories, Southeast
Sample preparation logs	Accutest Laboratories, Southeast
Run logs	Accutest Laboratories, Southeast
Sample disposal records	Accutest Laboratories, Southeast
Validated data	Shaw Project file

Shaw Shaw Environmental & Infrastructure, Inc.

SITE-SPECIFIC SAP/QAPP WORKSHEET #30 – ANALYTICAL SERVICES TABLE

Worksheet #30 identifies the laboratory (or laboratories) providing analytical services for the project.

Site-Specific SAP/QAPP Worksheet #30 – Analytical Services Table

Matrix	Analytical Group	Sample Locations/ ID Numbers	Analytical Method	Data Package Turnaround Time	Laboratory/Organization (Name, Address, Contact, & Telephone #)	Backup Laboratory (Name, Address, Contact, & Telephone #)
Soil	VOC SVOC TPH TAL Metals	Site-specific	8260B 8270C 8015B 6010B/6020/7471B	15 working days	Accutest Laboratories Southeast 4405 Vineland Road Suite C-15 Orlando, FL 32811 Phone: (407) 425-6700 Fax: (407) 425-0707 Sue Bell (813) 741-3338 sueb@accutest.com	Accutest Laboratories Southeast 4405 Vineland Road Suite C-15 Orlando, FL 32811 Phone: (407) 425-6700 Fax: (407) 425-0707 Norm Farmer (407) 425-6700 normf@accutest.com
Investigation-Derived Waste	TCLP Extraction TCLP Metals TCLP VOC TCLP SVOC Ignitibility Corrosivity Reactivity	Site-specific	1311 1311/6010B/7470B 1311/8260B 1311/8270C 1010A 9045 SW-846, Chapter 7	15 working days	Accutest Laboratories Southeast 4405 Vineland Road Suite C-15 Orlando, FL 32811 Phone: (407) 425-6700 Fax: (407) 425-0707 Sue Bell (813) 741-3338 sueb@accutest.com	Accutest Laboratories Southeast 4405 Vineland Road Suite C-15 Orlando, FL 32811 Phone: (407) 425-6700 Fax: (407) 425-0707 Norm Farmer (407) 425-6700 normf@accutest.com

ID Identification.
SVOC Semivolatile organic compound.
TAL Target analyte list.
TCLP Toxicity characteristic leaching procedure.
TPH Total petroleum hydrocarbons.
VOC Volatile organic compound.

SITE-SPECIFIC SAP/QAPP WORKSHEET #31 – PLANNED PROJECT ASSESSMENTS TABLE

Worksheet #31 summarizes the planned project assessment activities for each site-specific task.

Site-Specific SAP/QAPP Worksheet #31 – Planned Project Assessments Table

Assessment Type	Frequency	Internal or External	Organization Performing Assessment	Person(s) Responsible for Performing Assessment	Person(s) Responsible for Responding to Assessment Findings	Person(s) Responsible for Identifying and Implementing Corrective Action	Person(s) Responsible for Monitoring Effectiveness of Corrective Action
Review of Work Plans and QAPP with Field Staff	1/prior to sampling start	Internal	Shaw	Shaw PM or Field Lead	Shaw Sampling Field Lead	Shaw Sampling Field Lead	Shaw PM or Field Lead
Daily QC Report	Daily	Internal	Shaw	Shaw Field Lead or Field QC	Shaw Sampling Field Lead	Shaw Sampling Field Lead	Shaw PM or Field Lead
Daily Tailgate Safety Meeting	Daily	Internal	Shaw	Shaw Site Safety Officer	Shaw, PM or Field Lead; Shaw H&S Manager	Shaw, PM or Field Lead; Shaw H&S Manager	Shaw Site Safety Officer
Field Sampling and COC Review Against QAPP Requirements	Daily	Internal	Shaw	Shaw Field Lead or Shaw Project Chemist	Shaw Sampling Field Lead	Shaw Sampling Field Lead	Shaw Field Lead or Shaw Project Chemist
Laboratory Technical System Audit	If deemed necessary prior to start of sampling activities	External	Shaw	Shaw Project Chemist	Laboratory QA Officer	Laboratory QA Officer	Laboratory QA Officer and Shaw Project Chemist
Performance evaluation samples	If deemed necessary during sampling activities	Both	Shaw	Shaw Project Chemist	Shaw Project Chemist and Laboratory QA Officer	Shaw Project Chemist and Laboratory QA Officer	Shaw Project Chemist or Laboratory QA Officer
Initial Inspection/ Preparatory Meeting	Prior to the start of sampling activities	Internal	Shaw	Shaw QC Specialist or Project Chemist	Shaw Field Lead, Field Chemist, or Sample Technician	Shaw QC Specialist or Project Chemist	Shaw Project Chemist or QC Specialist
Field audits	As needed as the project progresses	Internal	Shaw or AFCEE QA Officer	Shaw or AFCEE QA Officer	Shaw Field Lead, Field Chemist	Shaw QC Specialist or Project Chemist	Shaw QC Specialist or Project Chemist

AFCEE Air Force Center for Engineering and the Environment.
COC Constituent of concern.
H&S Health & Safety.
PM Project Manager.
QA Quality assurance.
QAPP Quality Assurance Project Plan.
QC Quality control.
Shaw Shaw Environmental & Infrastructure, Inc.

SITE-SPECIFIC SAP/QAPP WORKSHEET #32 – ASSESSMENT FINDINGS AND CORRECTIVE ACTION RESPONSES

Worksheet #32 describes the activities for correcting any problems identified during project assessments (Worksheet #31).

Site-Specific SAP/QAPP Worksheet #32 – Assessment Findings and Corrective Action Responses

Assessment Type	Nature of Deficiencies Documentation	Individual(s) Notified of Findings	Timeframe of Notification	Nature of Corrective Action Response Documentation	Individual(s) Receiving Corrective Action Response	Timeframe for Response
Field Sampling Technical System Audit	Written Audit Report	(Shaw Installation Lead)	48 hours after audit	E-Mail or letter	Field Technician, Shaw Project Chemist, Shaw QC Specialist	24 hours after notification
Off-Site Laboratory Audit (if performed for project)	Written Audit Report	Laboratory QA Manager, Laboratory PM	5 days after Audit	Corrective Action Plan	Shaw Project Chemist, Shaw QC Specialist	10 business days after receiving report
Laboratory Data Review Findings	Memo	Laboratory QA Manager, Laboratory PM	48 hours after audit	E-Mail or letter	Shaw Project Chemist	3 days after notification

PM Project Manager.
QA Quality assurance.
QC Quality control.
Shaw Shaw Environmental & Infrastructure, Inc.

SITE-SPECIFIC SAP/QAPP WORKSHEET #33 – QA MANAGEMENT REPORTS TABLE

Worksheet #33 describes the process for addressing QA management reports for the project. Copies of QA management reports should be included in the final report for the project where appropriate.

Site-Specific SAP/QAPP Worksheet #33 – QA Management Reports Table

Type of Report	Frequency	Projected Delivery Date(s)	Person(s) Responsible for Report Preparation	Report Recipient(s)
Field Sampling, Audit Report Initial and Follow up inspections	At least once at the beginning of sampling activities and then as needed as the project progresses	Within 24 hours of Field Sampling Audit	Shaw QC Specialist or Shaw Project Chemist	Shaw Installation Lead or Shaw PM
Off-Site Laboratory Technical System Audit Report (if performed)	Prior to sample receipt at laboratory	Within 48 hours of on-site audit	Shaw Project Chemist	Laboratory QA Manager, Laboratory PM
Data Review Report	After sample and analysis data reviewed by Project Chemist	As received from laboratory	Shaw Project Chemist	Shaw Installation Lead or Shaw PM
Data Validation Report	After all data packages are received from laboratory	Within 2 weeks of data package receipt	Shaw Chemist or Independent 3rd party data validation company	Shaw Project Chemist
Final Project Report	After completion of all fieldwork activities	Project document delivery schedule is provided in the Work Plan	Shaw Installation Lead or Shaw PM	AFCEE Contracting Officer's Representative and regulatory agencies

PM Project Manager.
QA Quality assurance.
QC Quality control.
Shaw Shaw Environmental & Infrastructure, Inc.

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Table 1-1
Group 2 (Five Former UST Sites) Descriptions

Site Name	Site ID	Site Description
Holloman AFB		
Building 2395	TU/US-C502	Records indicate that a 1000-gallon diesel UST was removed from Building 2395 in 1990. There were no records to indicate whether there was evidence of spills/leaks and no samples to show whether the site was contaminated.
Building 1272	TU/US-C507	Soil sample results from 1991 associated with Building 1272 indicate TPH contamination of 268 mg/kg. There are no records to indicate what these sampling results are associated with, however the results are included with a report that lists sampling results for UST removal locations. It is assumed that a UST associated with Building 1272 was removed. There are no records to indicate whether the site was remediated.
Building 882	TU/US-C514	Records indicate that a 110-gallon gasoline UST associated with Building 882 was removed in 1990. Sample results indicate xylenes contamination of 2,900 µg/kg in the soil; however there are no records to indicate that the site was remediated.
Building 889	TU/US-C515	Records indicate that a UST associated with Building 889 was closed in 1992. There are no records available to identify the size, contents, or possible contaminants associated with the tank.
Building 684	TU/US-C516	Records indicate that a UST associated with Building 684 was closed in 1991. There are no records to indicate the size, contents, or possible contamination associated with the tank.

µg/kg denotes microgram per kilogram.
AFB denotes Air Force Base.
ID denotes identification.
mg/kg denotes milligrams per kilogram.
TPH denotes Total petroleum hydrocarbons.
UST denotes Underground storage tank.

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • February 2012 • WERC-09-13-019

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • February 2012 • WERC-09-13-019

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Table 3-1
Analytical Procedures

Analysis	Analytical Method (SW846 unless otherwise specified)
VOCs	8260B/5035
SVOCs	8270D
TPH-GRO / TPH-DRO/TPH-ORO	8015B
TDS	160.1
TAL Metals	6010C and 7471A
Mercury – Solid Samples	7471A
Mercury - Aqueous Samples	7470A
TCLP	1311

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DRO denotes diesel range organics.

EPA denotes U.S. Environmental Protection Agency.

GRO denotes gasoline range organics.

ORO denotes oil range organics.

SVOC denotes semivolatile organic compound.

TAL denotes target analyte list.

TCLP denotes toxicity characteristic leaching procedure.

TDS denotes total dissolved solids.

TPH denotes total petroleum hydrocarbons.

VOC denotes volatile organic compound.

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • February 2012 • WERC-09-13-019

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • February 2012 • WERC-09-13-019

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Table 3-2
Required Containers, Preservatives, and Holding Times for Solid Samples

Analysis	Sample Container	Preservative	Holding Time	Sample Quantity
VOCs	TerraCore® sampler	Cool to 4°C	14 days	Fill completely
SVOCs	One 8-oz glass bottle with Teflon-lined cap	Cool to 4°C	14 days	Fill to shoulder
TPH-GRO, TPH-DRO, TPH-ORO	One 8-oz glass bottle with Teflon-lined cap	Cool to 4°C	14 days	Fill to shoulder
TAL Metals	One 4-oz glass bottle with Teflon-lined cap	Cool to 4°C	6 months; 28 days for mercury	Fill to shoulder
Reactivity, Corrosivity, Ignitability	One 8-oz glass bottle with Teflon-lined cap	Cool to 4°C	7 days for sulfide; 14 days for cyanide	Fill to shoulder
TCLP Volatiles	One 8-oz glass bottle with Teflon-lined cap	Cool to 4°C	14 days to extraction, 14 days to analysis	Fill completely
TCLP, all other organics	One 8-oz glass bottle with Teflon-lined cap	Cool to 4°C	14 days to leach, 7 days to extraction, 40 days to analysis	Fill completely
TCLP Metals	One 8-oz glass bottle with Teflon-lined cap	Cool to 4°C	180 days to leach,180 days to analysis	Fill completely
TCLP Mercury	One 8-oz glass bottle with Teflon-lined cap	Cool to 4°C	28 days to leach, 28 days to analysis	Fill completely

°C denotes degrees Celsius.
DRO denotes diesel range organics.
GRO denotes gasoline range organics.
ORO denotes oil range organics.
oz denotes ounces.
SVOC denotes semivolatile organic compound.
TAL denotes target analyte list.
TCLP denotes toxicity characteristic leaching procedure.
TPH denotes total petroleum hydrocarbons.
VOC denotes volatile organic compound.

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • February 2012 • WERC-09-13-019

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • February 2012 • WERC-09-13-019

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Table 3-3
Required Containers, Preservatives, and Holding Times for Liquid Samples

Analysis	Sample Container	Preservative	Holding Time	Sample Quantity
VOCs	Three 40-mL glass vial with Teflon-lined cap (TerraCore® sampler)	HCl to pH <2; Cool to 4°C	14 days	Fill completely; no air bubbles
SVOCs	Two 1-liter glass bottles with Teflon-lined cap	Cool to 4°C	7 days to extraction, 40 days to analysis	Fill to shoulder
TPH-GRO, TPH-DRO, TPH-ORO	Two 1-liter glass bottles with Teflon-lined cap	Cool to 4°C	7 days to extraction, 40 days to analysis	Fill to shoulder
TAL Metals	1-liter polyethylene bottle	HNO_3 to pH <2 Cool to 4°C	6 months; 28 days for mercury	Fill to shoulder
TDS	500-mL polyethylene bottle	Cool to 4°C	7 days from collection	Fill to shoulder
Reactivity, Corrosivity, Ignitability	1-liter polyethylene bottle	Cool to 4°C	7 days	Fill to shoulder
TCLP Volatiles	Three 40-mL glass vial with Teflon-lined cap	HCl to pH <2; Cool to 4°C	14 days to extraction, 14 days to analysis	Fill completely; no air bubbles
TCLP, all other organics	Two 1-liter glass bottles with Teflon-lined cap	Cool to 4°C	14 days to leach, 7 days to extraction, 40 days to analysis	Fill to shoulder
TCLP Metals	1-liter polyethylene bottle	HNO_3 to pH <2; Cool to 4°C	180 days to leach,180 days to analysis	Fill to shoulder
TCLP Mercury	1-liter polyethylene bottle	HNO_3 to pH <2; Cool to 4°C	28 days to leach, 28 days to analysis	Fill to shoulder

< denotes less than.
°C denotes degrees Celsius.
DRO denotes diesel range organics.
GRO denotes gasoline range organics.
HCl denotes hydrochloric acid.
HNO_3 denotes nitric acid.
mL denotes milliliter.
ORO denotes oil range organics.
SVOC denotes semivolatile organic compound.
TAL denotes target analyte list.
TCLP denotes toxicity characteristic leaching procedure.
TDS denotes total dissolved solids.
TPH denotes total petroleum hydrocarbons.
VOC denotes volatile organic compound.

Contract No. FA8903-09-D-8580, Task Order No. 0013 • Final • Revision 0 • February 2012 • WERC-09-13-019

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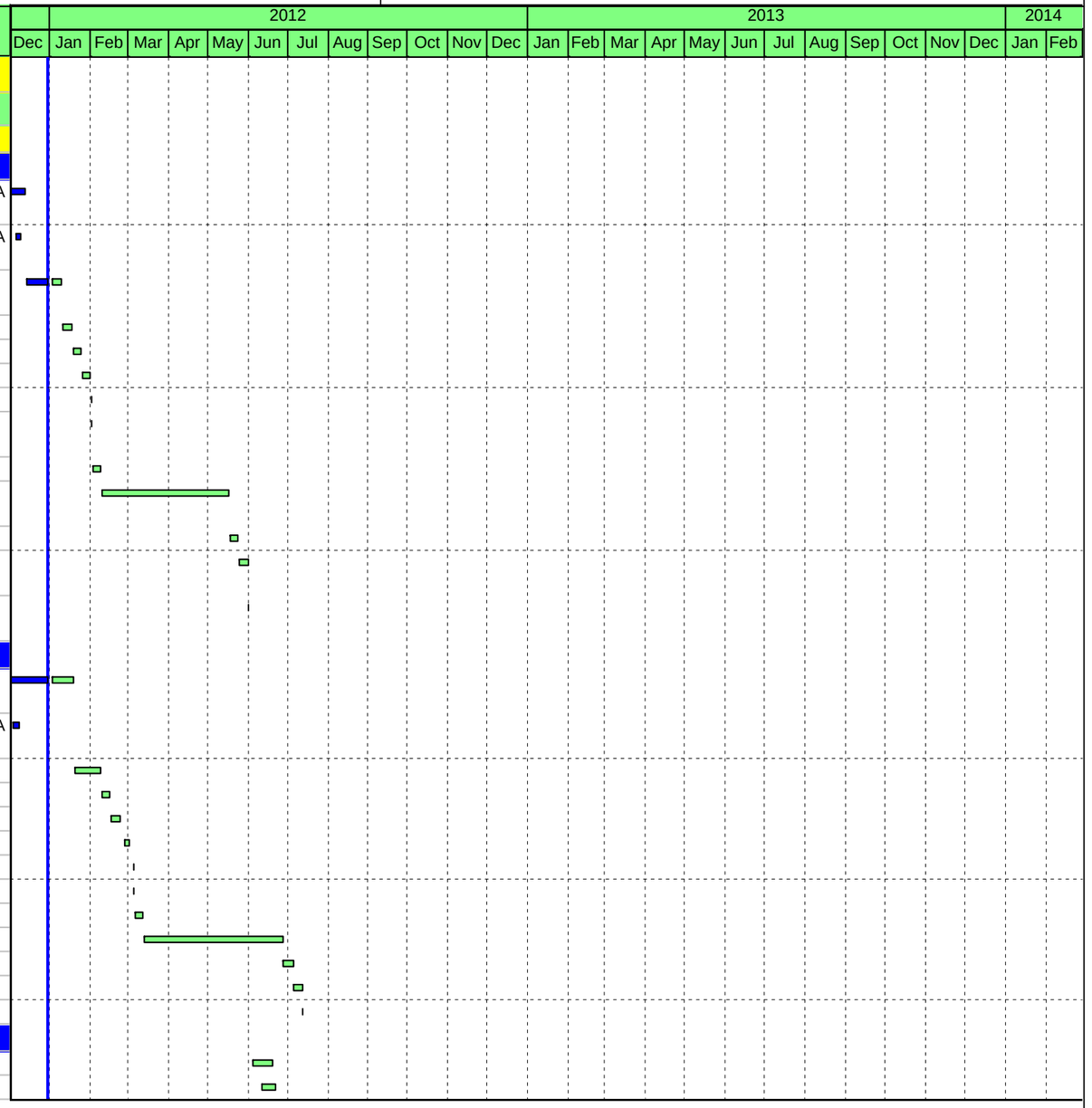
Activity ID	Activity Name	Original Duration	Start	Finish
Mid-Western Region Performance Based Remediation		492	25-Oct-11 A	07-Oct-13
HOLLOMAN AFB		492	25-Oct-11 A	07-Oct-13
GROUP 2 - 5 UST's (SC)		492	25-Oct-11 A	07-Oct-13
Voluntary Corrective Measures Request		152	25-Oct-11 A	01-Jun-12
JU10005	Prepare Working Copy Voluntary Corrective Measures Request	19	25-Oct-11 A	14-Dec-11 A
JU10000	Perform Records Search	3	07-Dec-11 A	09-Dec-11 A
JU10010QA	Air Force Review of Working Copy Voluntary Corrective Measures Request	15	15-Dec-11 A	10-Jan-12
JU10020	Comment Resolution	5	11-Jan-12	18-Jan-12
JU10030	Prepare Final Voluntary Corrective Measures Request	5	19-Jan-12	25-Jan-12
JU10040QA	Air Force Review Final and Sign Submittal Letter	5	26-Jan-12	01-Feb-12
JU10050	Distribute Submittal Letter & Documents to Regulators	1	02-Feb-12	02-Feb-12
JU10055PM	Payment for Final Voluntary Corrective Measures Request	1	02-Feb-12	02-Feb-12
JU10051	Payment of Regulatory Fees	5	03-Feb-12	09-Feb-12
JU10060	Regulators Review of Final Voluntary Corrective Measures Request	69	10-Feb-12	17-May-12
JU10070	Comment Resolution	5	18-May-12	24-May-12
JU10080	Prepare Revised Final Voluntary Corrective Measures Request	5	25-May-12	01-Jun-12
JU10090PM	Payment for Revised Final Voluntary Corrective Measures Request	1	01-Jun-12	01-Jun-12
RFI Work Plan		180	25-Oct-11 A	12-Jul-12
JU11005	RFI Work Plan (WP) Working Copy	19	25-Oct-11 A	19-Jan-12
JU11000	Perform Records Search	3	05-Dec-11 A	09-Dec-11 A
JU11010QA	Air Force Review of Working Copy RFI Work Plan	15	20-Jan-12	09-Feb-12
JU11020	Comment Resolution	5	10-Feb-12	16-Feb-12
JU11030	Prepare Final RFI Work Plan	5	17-Feb-12	24-Feb-12
JU11040QA	Air Force Review Final and Sign Submittal Letter	5	27-Feb-12	02-Mar-12
JU11050	Distribute Submittal Letter & Document to Regulators	1	05-Mar-12	05-Mar-12
JU11055PM	Payment for Final RFI Work Plan	1	05-Mar-12	05-Mar-12
JU11051	Payment of Regulatory Fees	5	06-Mar-12	12-Mar-12
JU11060	Regulators Review of Final RFI Work Plan	76	13-Mar-12	27-Jun-12
JU11070	Comment Resolution	5	28-Jun-12	05-Jul-12
JU11080	Prepare Revised Final RFI Work Plan	5	06-Jul-12	12-Jul-12
JU11090PM	Payment for Revised Final RFI Work Plan	1	12-Jul-12	12-Jul-12
Field Work		14	04-Jun-12	21-Jun-12
JU20001	Field Effort First Set of UST's	12	04-Jun-12	19-Jun-12
JU20002	Field Effort Second set of UST's	9	11-Jun-12	21-Jun-12



Remaining Level of Effort
Actual Level of Effort
Actual Work
Remaining Work
Critical Remaining Work
Milestone

Figure 6-1

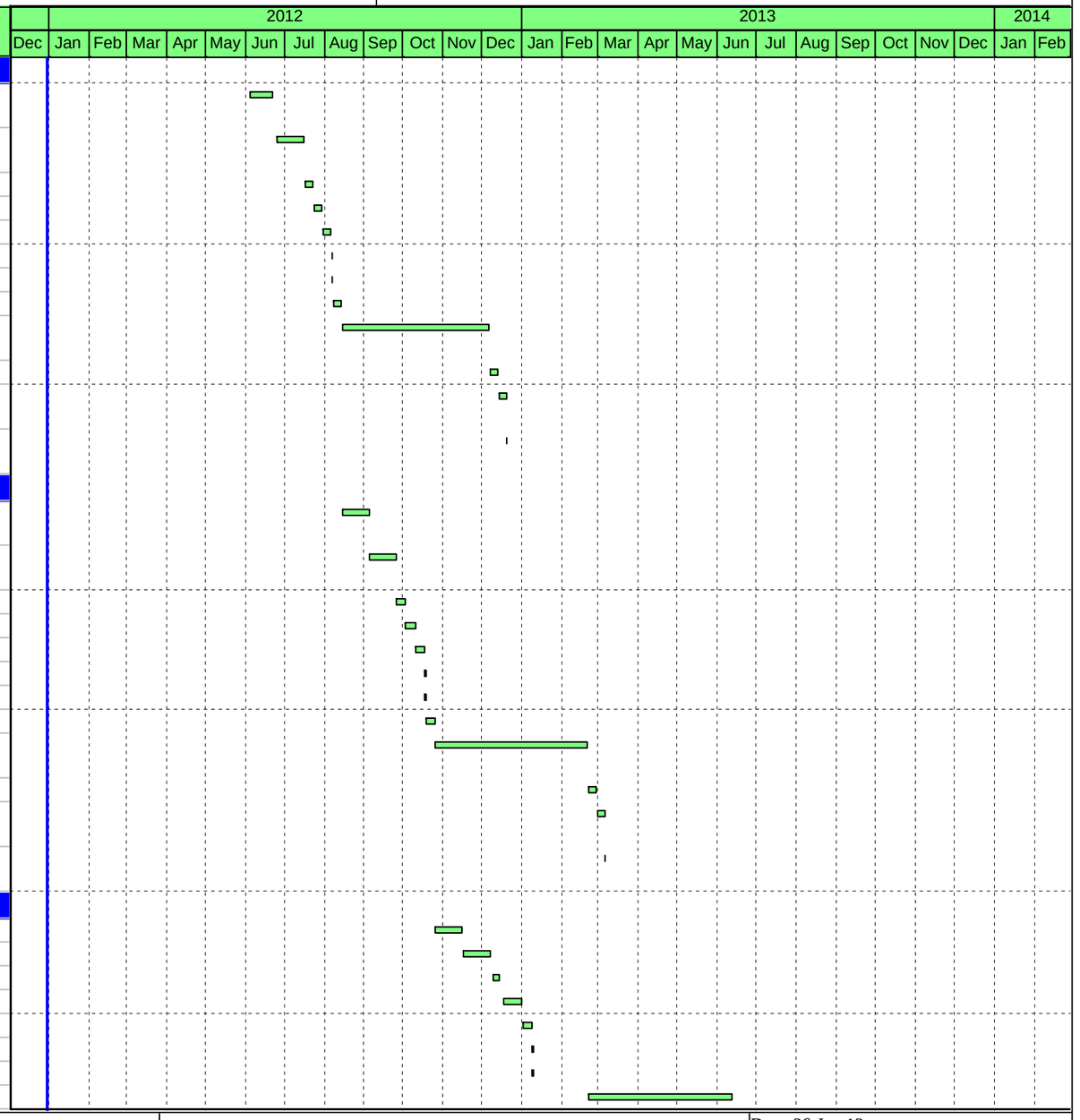
Project Schedule - Holloman AFB, New Mexico

Date: 26-Jan-12

DD: 31-Dec-11

Finish: 30-Dec-13

Activity ID	Activity Name	Original Duration	Start	Finish
Voluntary Corrective Measures Report		140	04-Jun-12	20-Dec-12
JU30000	Prepare Working Copy Voluntary Corrective Measures Report	15	04-Jun-12	22-Jun-12
JU30001QA	Air Force Review of Working Copy Voluntary Corrective Measures Report	15	25-Jun-12	16-Jul-12
JU30020	Comment Resolution	5	17-Jul-12	23-Jul-12
JU30030	Prepare Final Voluntary Corrective Measures Report	5	24-Jul-12	30-Jul-12
JU30040QA	Air Force Review Final and Sign Submittal Letter	5	31-Jul-12	06-Aug-12
JU30050	Distribute Submittal Letter & Document to Regulators	1	07-Aug-12	07-Aug-12
JU30055PM	Payment for Final Voluntary Corrective Measures Report	1	07-Aug-12	07-Aug-12
JU30051	Payment of Regulatory Fees	5	08-Aug-12	14-Aug-12
JU30060	Regulators Review of Final Voluntary Corrective Measures Report	79	15-Aug-12	06-Dec-12
JU30070	Comment Resolution	5	07-Dec-12	13-Dec-12
JU30080	Prepare Revised Final Voluntary Corrective Measures Report	5	14-Dec-12	20-Dec-12
JU30090PM	Payment for Revised Final Voluntary Corrective Measures Report	1	20-Dec-12	20-Dec-12
Corrective Action Completion Petition		139	15-Aug-12	06-Mar-13
JU40000	Prepare Working Copy Corrective Action Completion Petition	14	15-Aug-12	04-Sep-12
JU40001QA	Air Force Review of Working Copy Corrective Action Completion Petition	15	05-Sep-12	25-Sep-12
JU40020	Comment Resolution	5	26-Sep-12	02-Oct-12
JU40030	Prepare Final Corrective Action Completion Petition	5	03-Oct-12	10-Oct-12
JU40040QA	Air Force Review Final and Sign Submittal Letter	5	11-Oct-12	17-Oct-12
JU40050	Distribute Submittal Letter & Document to Regulators	1	18-Oct-12	18-Oct-12
JU40055PM	Payment for Final Corrective Action Completion Petition	1	18-Oct-12	18-Oct-12
JU40061	Payment of Regulatory Fees	5	19-Oct-12	25-Oct-12
JU40065	Regulators Review of Final Corrective Action Completion Petition	79	26-Oct-12	20-Feb-13
JU40070	Comment Resolution	5	21-Feb-13	27-Feb-13
JU40080	Prepare Revised Final Corrective Action Completion Petition	5	28-Feb-13	06-Mar-13
JU40090PM	Payment for Revised Final Corrective Action Completion Petition	1	06-Mar-13	06-Mar-13
Permit Modification		239	26-Oct-12	07-Oct-13
JU50001	Prepare Permit Mod Working Copy	15	26-Oct-12	15-Nov-12
JU50010QA	Air Force Review of Working Copy Permit Modification	15	16-Nov-12	07-Dec-12
JU50020	Comment Resolution	5	10-Dec-12	14-Dec-12
JU50030	Prepare Final Permit Mod	10	17-Dec-12	31-Dec-12
JU50040QA	Air Force Review Final and Sign Submittal Letter	5	02-Jan-13	08-Jan-13
JU50050	Distribute Submittal Letter & Document to Regulators	1	09-Jan-13	09-Jan-13
JU50055PM	Payment for Final Permit Modification	1	09-Jan-13	09-Jan-13
JU50060	Administrative Review for Completeness	79	21-Feb-13	12-Jun-13



Remaining Level of Effort
Actual Level of Effort
Actual Work
Remaining Work
Critical Remaining Work
Milestone

Figure 6-1

Project Schedule - Holloman AFB, New Mexico

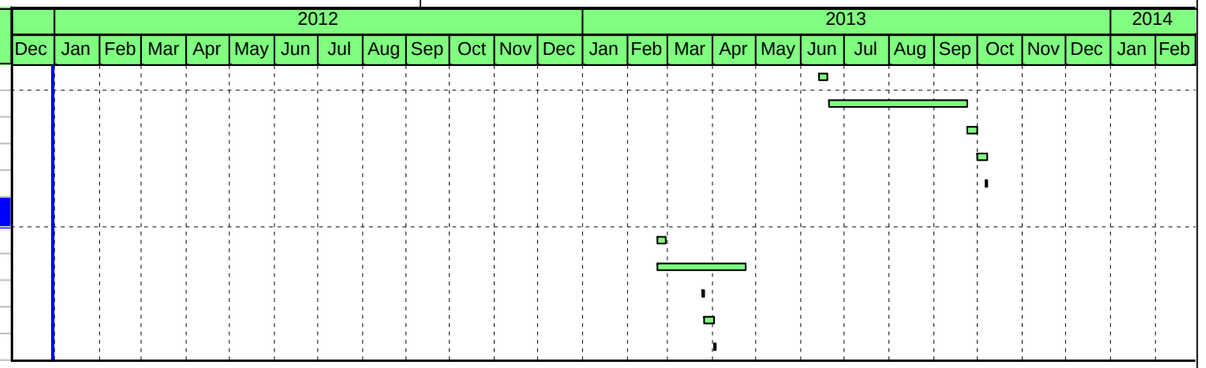
Shaw™ Shaw Environmental, Inc.

Date: 26-Jan-12

DD: 31-Dec-11

Finish: 30-Dec-13

Activity ID	Activity Name	Original Duration	Start	Finish
JU50061	Payment of Regulatory Fees	5	13-Jun-13	19-Jun-13
JU50065	Regulators Review of Final Permit Mod	66	20-Jun-13	23-Sep-13
JU50070	Comment Resolution	5	24-Sep-13	30-Sep-13
JU50080	Prepare Revised Final Permit Mod	5	01-Oct-13	07-Oct-13
JU50090PM	Payment for Revised Final Permit Mod	1	07-Oct-13	07-Oct-13
Public Meeting for Permit Modification		44	21-Feb-13	23-Apr-13
JU70000	Pre-Meeting Materials	5	21-Feb-13	27-Feb-13
JU70010	Public Meeting Public Review Period	44	21-Feb-13	23-Apr-13
JU70020	Public Meeting	1	25-Mar-13	25-Mar-13
JU70030	Public Meeting Transcript	5	26-Mar-13	01-Apr-13
JU70040PM	Payment for Public Meeting for Permit Mod	1	02-Apr-13	02-Apr-13



Remaining Level of Effort
Actual Level of Effort
Actual Work
Remaining Work
Critical Remaining Work
Milestone

Figure 6-1

Project Schedule - Holloman AFB, New Mexico

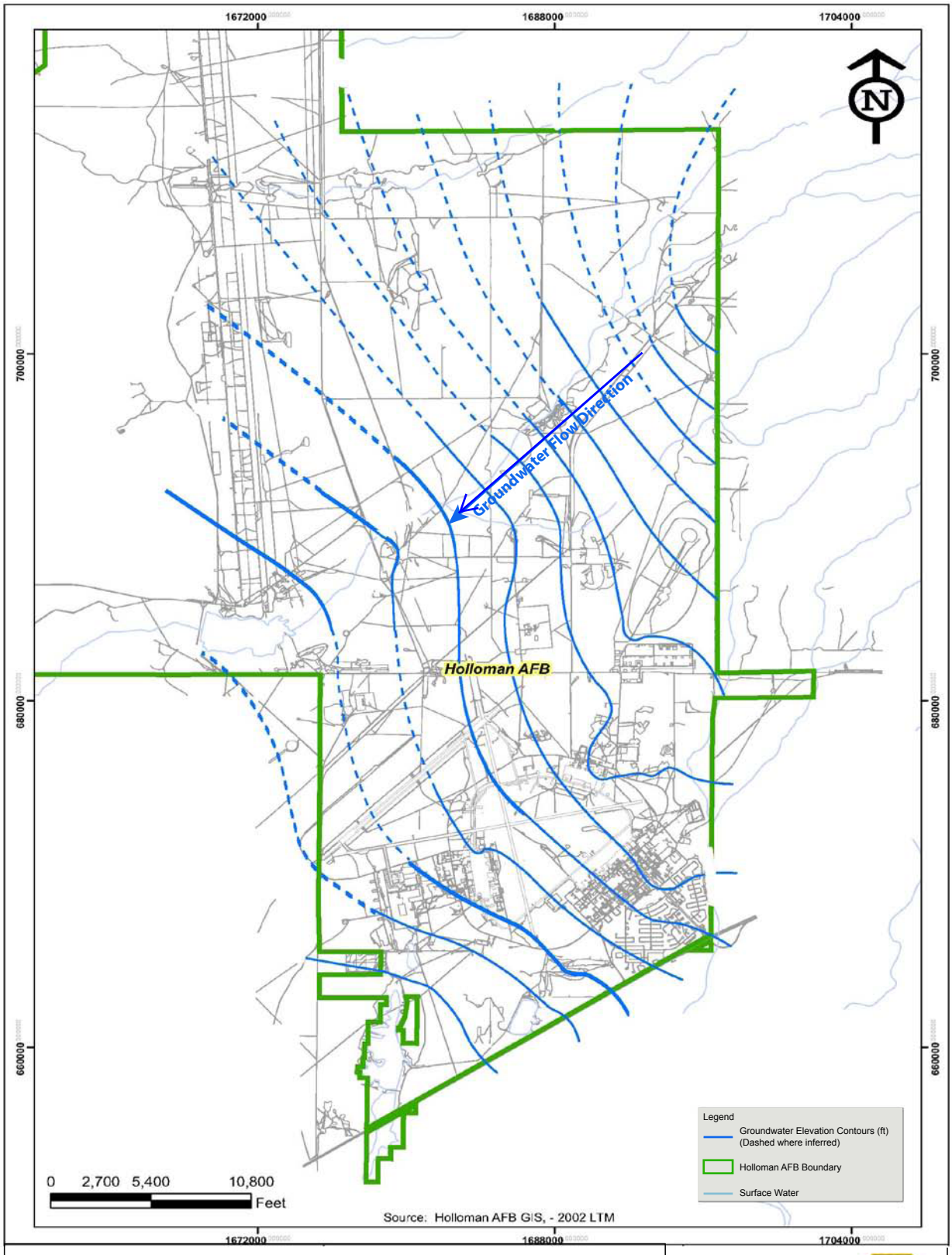
Shaw™ Shaw Environmental, Inc.

Date: 26-Jan-12

DD: 31-Dec-11

Finish: 30-Dec-13

-



Note: Groundwater contour map showing groundwater elevation contours across Holloman Air Force Base, New Mexico, are based on 2002 measurements taken from the shallow aquifer.

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Figure 2-3

Groundwater Contour Map

Holloman Air Force Base (AFB)
New Mexico

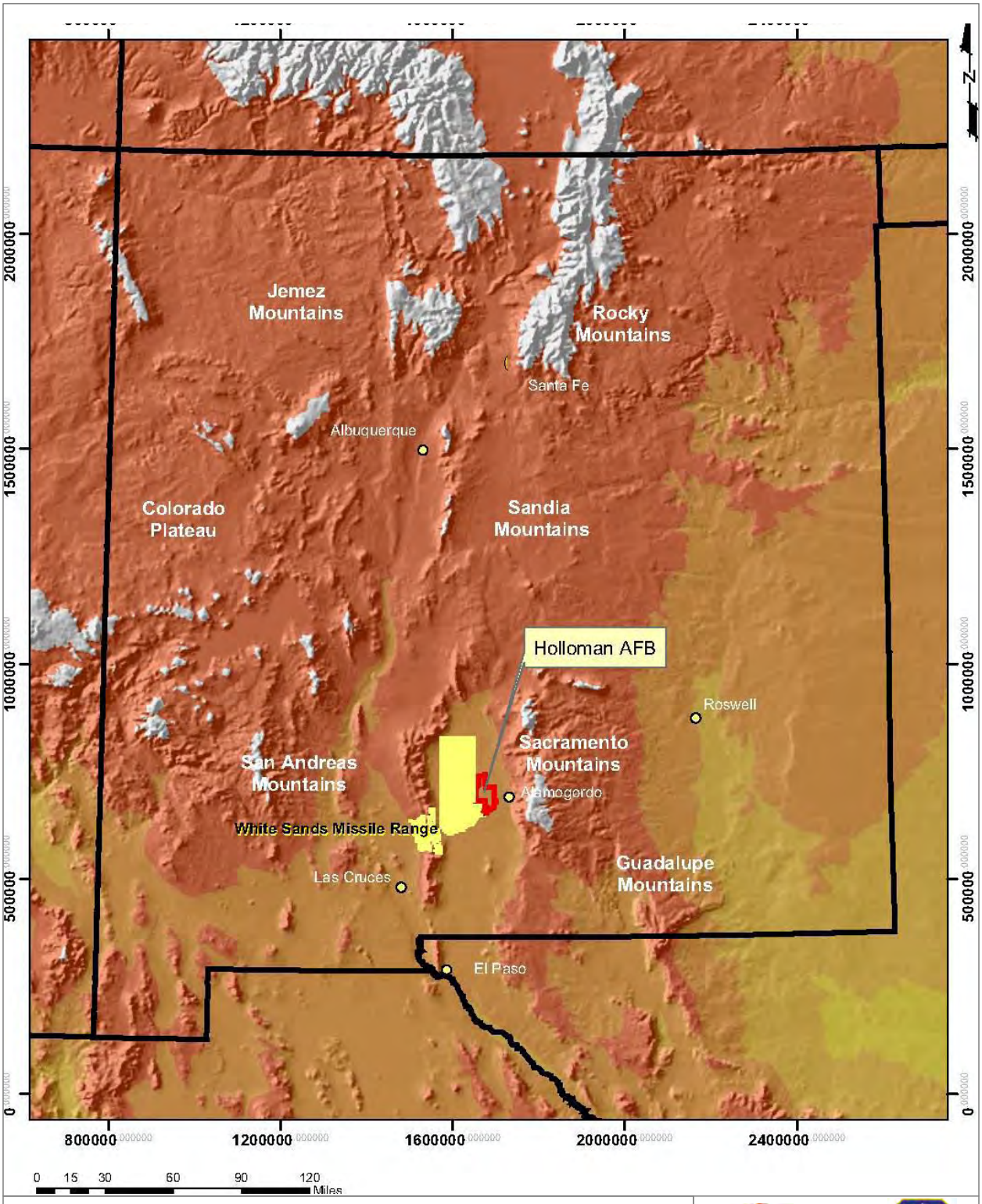
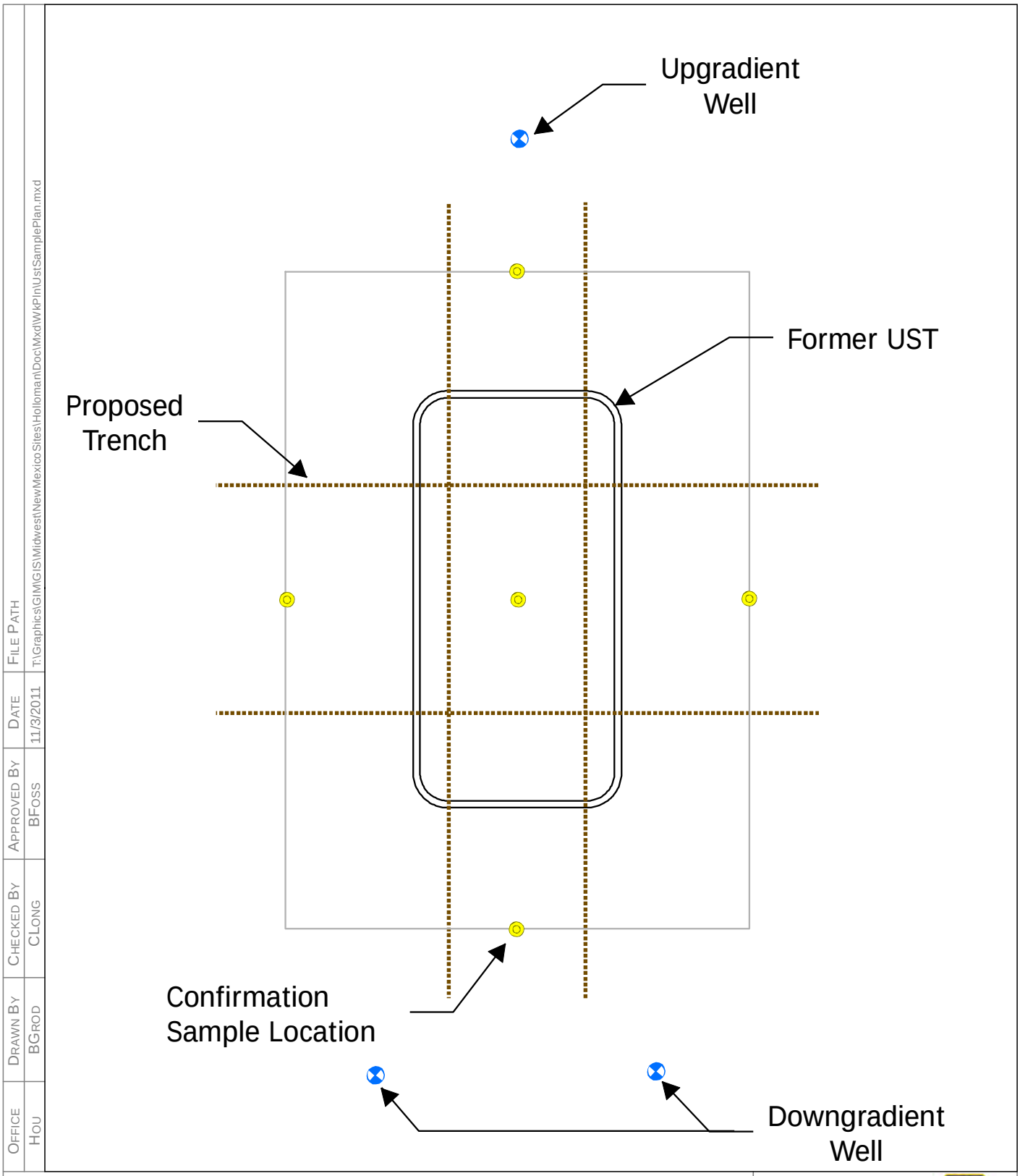


Figure 2-1

Physiographic Map

Holloman Air Force Base (AFB)
New Mexico



Office	Drawn By	Checked By	Approved By	Date	File Path
Hou	BGrod	CLong	BFoss	11/3/2011	T:\Graphics\GIMGIS\MidwestNewMexicoSites\HollomanDoc\Mxd\WkPln\UstSamplePlan.mxd

Legend

- Proposed Monitoring Well
- Confirmation Sample Location
- Grid
- Trench Transect
- UST

N

WGS 84 UTM Zone 13N
Meters

0 2.5 5
Meters

0 10 20
Feet

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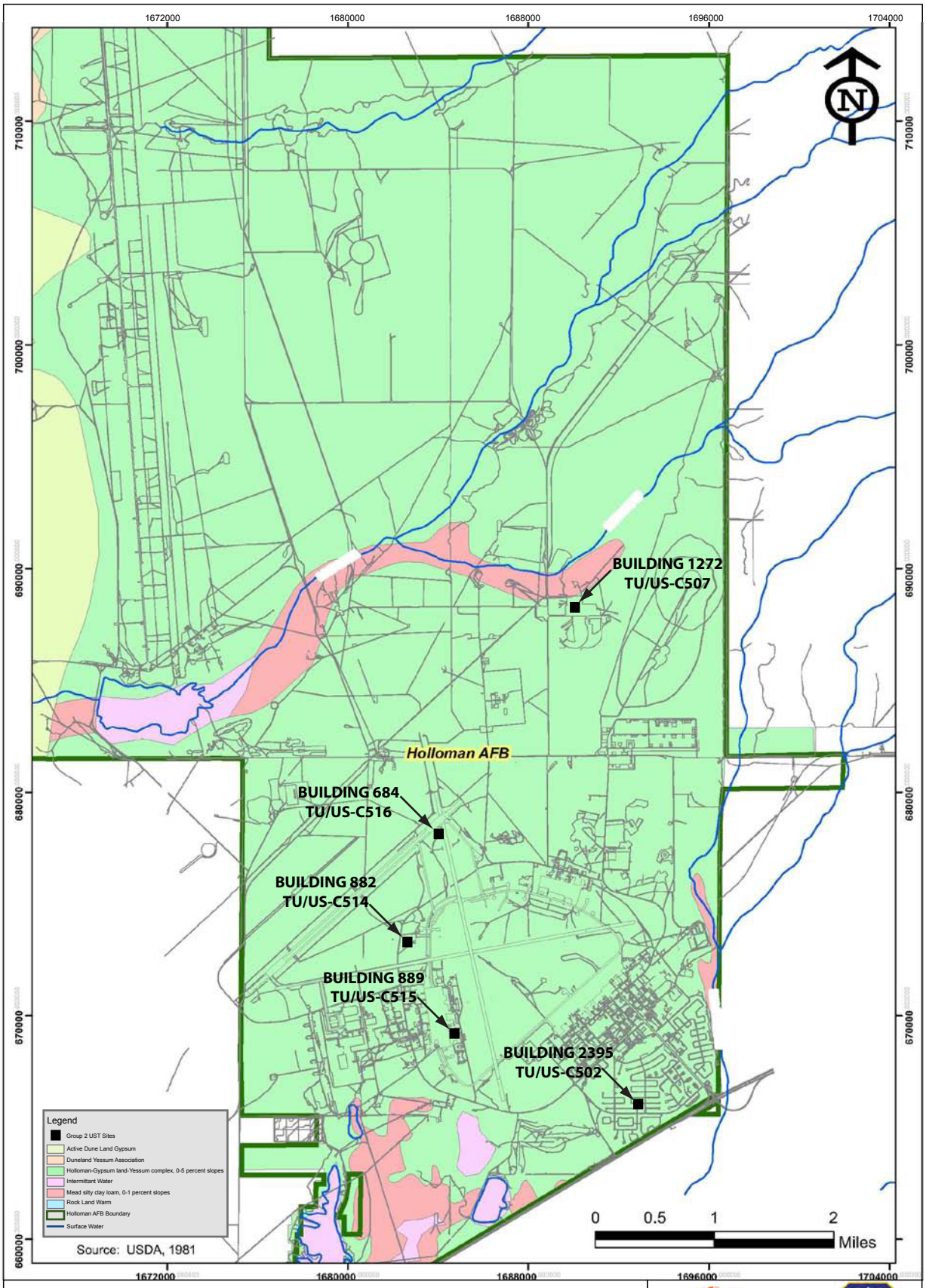
Figure 3-1

General
Underground Storage Tank
Sampling Plan

Holloman AFB, NM



Notes:

1. UST = Underground Storage Tank
2. Soil types at Holloman Air Force Base, New Mexico, are based on United States Department of Agriculture (USDA) Soil Conservation Service Classifications.

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Figure 2-2

Group 2 UST Sites and Soils Map

Holloman Air Force Base (AFB)
New Mexico

Office	Drawn By	Checked By	Approved By	Date	File Path
Hou	BGrod	CLong	BFoss	1/12/2012	T:\Graphics\GIM\GIS\Midwest\NewMexicoSites\Holloman\Doc\Mxd\WkPln\UstGroup2Locations.mxd

LEGEND

- Holloman AFB
- Group 2 UST Sites

N

WGS 84 UTM Zone 13N
Meters

1 inch = 2,750 feet

0 700 1,400 2,800
Feet

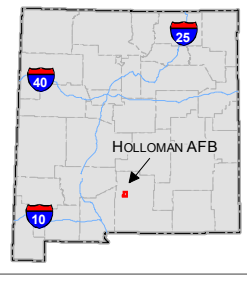

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Figure 1-2

Holloman
Air Force Base (AFB)
Group 2 UST Locations

Holloman AFB, NM