DEPARTMENT OF THE AIR FORCE
27TH CIVIL ENGINEER SQUADRON (ACC)
CANNON AIR FORCE BASE NEW MEXICO

1-24-07

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RECEIVED
JAN 2007
NMED Hazardous Waste Bureau

Mr. James Bearzi
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Dear Mr. Bearzi

Cannon AFB respectfully submits three copies of the Final Work Plan Revision 1 for Site SD-11 Corrective Measures Implementation for your review and records. This document is provided in response to your 21 Nov 06 letter containing NMED review comments on the Site SD-11 Corrective Measures Implementation Work Plan dated Feb 06.

Please inform us of what further action, if any, will need to be taken. If you have any questions, please contact Ms. Kristi L. Doll at (505) 784-1098.

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or person who managed 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.

Sincerely

MICHAEL A. POSTON

Attachment:
Final Work Plan Revision 1 for the Site SD-11 Corrective Measures Implementation dated 20 Dec 06

cc:
NMED (D. Cobrain) w/o atch
EPA Region 6 (Bob Sturdivant) w/1 copy

FINAL—REVISION 1

SITE SD-11
CORRECTIVE MEASURES IMPLEMENTATION WORK PLAN
CANNON AIR FORCE BASE, NEW MEXICO

AFCEE Contract No. FA8903-04-D-8679
Task Order No. 0049

Project No. CZQZ20057001

Prepared for:

United States Air Combat Command

Cannon Air Force Base, New Mexico

Under contract to:

Headquarters Air Force Center for Environmental Excellence
3300 Sidney Brooks
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20 December 2006

URS

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List of Acronyms

27 CES	27th Fighter Wing, Civil Engineering Squadron
27 CES/CEV	27th Fighter Wing, Civil Engineering Squadron, Environmental Flight
AFB	Air Force Base
AFCEE	Air Force Center for Environmental Excellence
bgs	below ground surface
CAD	computer-aided design
CDL	commercial drivers license
CDRL	Contract Data Requirements List
CFR	Code of Federal Regulations
CMI	Corrective Measures Implementation
CMS	Corrective Measures Study
CoC	chain-of-custody
CRQL	Contract-Required Quantification Limit
CRZ	contaminant reduction zone
cy	cubic yard
DQCR	Daily Quality Control Report
DQO	data quality objective
ERP	Environmental Restoration Program
eV	electron Volt
EZ	exclusion zone
FIPS	Federal Information Processing Standard
FSP	Field Sampling Plan
gpm	gallon per minute
HAZWOPER	Hazardous Waste Operations and Emergency Response
HSM	Health and Safety Manager
HSP	Health and Safety Plan
IDW	investigation-derived waste
IRP	Installation Restoration Program

MCL	maximum contaminant level
MDL	master document list
MEK	2-butanone
mg/kg	milligram/kilogram
msl	mean sea level
MS/MSD	matrix spike/matrix spike duplicate
NAD83	North American Datum of 1983
NFA	No Further Action
NMED	New Mexico Environmental Department
NPDES	National Pollutant Discharge Elimination System
OSHA	Occupational Safety and Health Administration
PID	photoionization detector
PM	Project Manager
QAPP	Quality Assurance Project Plan
QA/QC	quality assurance/quality control
QPP	Quality Program Plan
RBC	Risk-Based Concentration
RCRA	Resource Conservation Recovery Act
RFA	RCRA Facility Assessment
RFI	RCRA Facility Investigation
RI	Remedial Investigation
SAP	Sampling and Analysis Plan
SCFS	Sample Collection Field Sheet
SHSO	Site Health and Safety Officer
SMS	Safety Management Standard
SMWU	solid waste management unit
SOP	standard operating procedure
SSL	soil screening level
SVOC	semivolatile organic compound

TAL	Target Analyte List
TCL	Target Compound List
TCLP	Toxicity Characteristic Leaching Procedure
TO	Task Order
TPH	total petroleum hydrocarbon
TPH-DRO	TPH–diesel range organics
TPH-GRO	TPH–gasoline range organics
TRPH	total recoverable petroleum hydrocarbon
URS	URS Group, Inc.
USGS	United States Geological Survey
VOC	volatile organic compound

This Corrective Measures Implementation (CMI) Work Plan addresses the procedures for evaluating risks and identifying and removing contaminated media from Site SD-11 [Solid Waste Management Units (SWMUs) 86 through 90] at Cannon Air Force Base (AFB), New Mexico. This CMI Work Plan has been prepared by URS Group, Inc. (URS) for the Air Force Center for Environmental Excellence (AFCEE) under Task Order (TO) 0049, Contract FA8903-04-D-8679 (Reference project number CZQZ20057001).

1.1 OVERVIEW OF THE PLANNED CORRECTIVE MEASURES

The CMI will be accomplished through five tasks, as follows:

- Respond to the New Mexico Environmental Department (NMED) comments and prepare this CMI Work Plan
- Re-evaluate previous analytical results
- Complete CMI field investigation included in this Work Plan
- Complete CMI construction activities, as necessary
- Prepare Site Closure Report or No Further Action (NFA) proposal

1.2 FORMAT OF THE CMI WORK PLAN

This CMI Work Plan is a stand-alone document for SD-11 and has been prepared in accordance with the requirements for an Environmental Cleanup Plan [Contract Data Requirements List (CDRL) A004]. This CMI Work Plan summarizes and provides details on the planned CMI field investigation and the implementation of the corrective measures at Site SD-11. Since the Work Plan addresses the SD-11 site only, a separate Field Sampling Plan (FSP) was unnecessary. The elements of a FSP are included throughout this Work Plan, particularly in **Section 5**. The Work Plan is organized as follows:

- **Section 1** – Introduction
- **Section 2** – Project Background and Corrective Measure Objectives: Presents a site description, summarizes previous environmental investigation results, and describes the corrective measures objectives
- **Section 3** –Project Roles: Summarizes the roles each organization will have in the CMI
- **Section 4** – Data Quality Objectives: Specifies the quality of data and defines the level of certainty required to support corrective measure decisions
- **Section 5** – CMI Investigation Procedures: Discusses the scope of the CMI investigation, including activities and procedures for site access and digging permit, data collection, sample handling and identification, surveying, and decontamination and investigation-derived waste (IDW)

- **Section 6** – CMI Removal Action Scope of Work: Discusses the scope of the potential CMI construction activities, including pre-mobilization and mobilization activities, excavation limits and activities, confirmatory sampling and analysis, backfill and restoration, final inspection, and demobilization
- **Section 7** – Waste Management, Transportation, and Disposal Plan: Describes the anticipated wastes and management procedures, waste characterization sampling, storage, transportation and disposal, and documentation requirements
- **Section 8** – Project Documentation and Reporting: Summarizes project monitoring and reporting requirements
- **Section 9** – Anticipated Project Schedule: Presents a preliminary schedule for the CMI
- **Section 10** – References: Summarizes the documents referenced in this work plan

Space for the following appendices, which may be developed as part of future updates to this work plan, is also included in this CMI Work Plan:

- **Appendix A** – Health and Safety Plan (HSP) [CDRL A005]
- **Appendix B** – Quality Assurance Project Plan (QAPP)
- **Appendix C** – Standard Operating Procedures (SOPs)

The Quality Program Plan (QPP) for this project will be comprised of this CMI Work Plan, together with the HSP (included as **Appendix A**) and the QAPP (included as **Appendix B**).

2.1 SITE DESCRIPTION

Site SD-11 occupies approximately 1.1 acres located about 5,000 feet east and 2,000 feet south of the intersection of the two main runways at Cannon AFB (see **Figure 2-1**). The site consists of five SWMUs: a former engine test cell (SWMU 86), a former overflow pit (SWMU 87), a former leach field (SWMU 88) which was later converted to an evaporation pond (SWMU 89), and a former oil/water separator and associated 100-gallon collection tank (SWMU 90).

The former engine test cell was enclosed with a 100-foot by 20-foot building set on a concrete slab. Both the test cell structure and a small, associated pumphouse building have been removed, leaving only a bare concrete slab. The oil/water separator system has also been removed. Asphalt, gravel, and weeds cover most of the area surrounding the former engine test cell. Topography is generally flat, with an approximate elevation of 4,268 feet above mean sea level (msl).

2.2 SITE GEOLOGY AND GROUNDWATER

2.2.1 Generalized Geology

In the vicinity of Cannon AFB, Late Miocene to Late Pliocene Ogallala Formation sediments overlie Early Triassic Dockum Group sedimentary rocks. The upper part of the Dockum Group consists mostly of red shale interbedded with minor sandstone. The top of the Dockum Group is marked by an erosional unconformity that has several hundred feet of relief.

The Ogallala Formation is 360 to 415 feet thick near Cannon AFB and consists of poorly sorted (well graded) gravel, sand, silt, and clay. The base of the Ogallala Formation generally consists of gravel, cobbles, and boulders. In many places, the Ogallala sediments are loose and friable; however, caliche is a major feature of the Ogallala Formation. Caliche is a hard, white to pale tan accumulation of calcium carbonate cement in the pore spaces of the Ogallala sediments. There are numerous continuous and discontinuous caliche layers throughout the Ogallala Formation (Lee Wan 1990).

2.2.2 Groundwater

The lower part of the Ogallala Formation is saturated and forms a regional, unconfined aquifer that is used for domestic and irrigation water. The depth to groundwater is more than 200 feet near Cannon AFB, and the saturated thickness varies from 90 to 140 feet. The regional hydraulic gradient slopes to the southeast at about 13 feet per mile (0.0025 feet per foot). Well yields vary from less than 1 gallon per minute (gpm) in thinly bedded silts and fine sands to 1,600 gpm in sand and gravel.

Groundwater is the primary water source in eastern New Mexico. Water table declines of between 50 and 100 feet were observed in the area near Clovis, New Mexico for the period from about 1930 to 1980 (Lee Wan 1990).

2.3 SITE HISTORY

Site SD-11 was active from 1965 to 1988. The site received potential contaminants from a single operation, the steam cleaning and testing of jet aircraft engines. Contaminants that may have been released at the site include lubricating and synthetic oils, residual JP-4 fuel, and solvents.

During the life span of the facility, effluent was handled in several ways. Initially, effluent was discharged to an overflow pit (SWMU 87). An oil/water separator system (SWMU 90) which discharged to a leach field (SWMU 88) was later installed. Finally, the effluent was routed through the oil/water separator to an evaporation pond (SWMU 89). The evaporation pond was constructed in the area of the former leach field (SWMU 88).

2.4 SITE INVESTIGATIONS

Site SD-11 has been the subject of several site investigations, which are summarized below:

- A Phase I Installation Restoration Program (IRP) Records Search was completed to identify and evaluate suspected problems associated with past hazardous material disposal sites and spill sites at Cannon AFB (CH2M Hill 1983).
- A Phase II IRP investigation included drilling two boreholes to depths of 35 and 50 feet below ground surface (bgs) at the site. Five soil samples were analyzed for purgeable halocarbons and aromatics, oil and grease, and lead. Analytical results indicated no soil contamination at the site (Radian 1986).
- A Preliminary Review/Visual Site Inspection, Resource Conservation and Recovery Act (RCRA) Facility Assessment (RFA) was conducted at Cannon AFB. The RFA identified the SD-11 sites as possible SWMUs and recommended soil sampling to determine if contaminants had been released from the unit (A.T. Kearney 1987).
- A Remedial Investigation (RI) included five soil borings in the area of SD-11 that were sampled and analyzed for volatile organic compounds (VOCs), xylene, base/neutral organics, and total metals. Analytical results indicated very low levels of 2,2'-methylenebis(4-ethyl-6-tert-butylphenol) (known as antioxidant 425) in Boreholes B1 and B4. Silver was the only metal detected at levels exceeding background (Walk, Haydel and Associates 1990).
- An RI for 18 IRP/SWMU sites at Cannon AFB further evaluated the nature and extent of potential hazardous contaminants at SD-11. Six soil borings were located near the Engine Test Pad and the old oil/water separator. All soil samples were analyzed for Target Compound List (TCL) VOCs and Target Analyte List (TAL) metals. No VOCs, except acetone and toluene, were detected above the Contract-Required Quantitation Limits (CRQLs) in surface and subsurface soil samples at the SWMUs. Metals detected at elevated levels were antimony, barium, cadmium, chromium, cobalt, copper, lead, manganese, nickel, vanadium, and zinc (W-C 1992).

- The oil/water separator system and surrounding petroleum-contaminated soils were excavated during a removal action in 1994. Reportedly, the oil/water separator was not sealed along the bottom or at the edges, and petroleum contamination was visible after removing approximately 1 foot of soil. An area measuring approximately 60 feet long by 30 feet wide and up to 25 feet deep was excavated. Soil samples were taken from the excavated soil and analyzed for total petroleum hydrocarbons (TPH), VOCs, semivolatile organic compounds (SVOCs), and TAL metals. Approximately 186 tons of excavated soil was transported to an off-site facility for disposal. The remaining stockpiled soil was mixed with off-site soil to backfill the excavation (RSI 1994).
- Following the removal activity, a Phase III RCRA Facility Investigation (RFI) was completed at SD-11 to assess the vertical and horizontal extent of contamination and to complete a screening-level risk evaluation. Soil boring locations are shown on **Figure 2-2**. Soil samples were analyzed for VOCs, SVOCs, total recoverable petroleum hydrocarbons (TRPH), and TAL metals. Moderate to high concentrations of TRPH (i.e., greater than 1,000 milligrams per kilogram [mg/kg]) and some VOCs and SVOCs were detected in soils below the zone of backfill. Bromoform, arsenic, barium, copper, and vanadium were detected in a groundwater sample; all of these chemicals were below their respective published maximum contaminant levels (MCLs), or Risk-Based Concentration (RBCs) for tap water (W-C 1997b).
- Three soil borings were drilled and sampled to depths of 40 feet bgs at the evaporation pond as part of a Corrective Measures Study (CMS) investigation. Five soil samples were collected from each boring and analyzed for VOCs, SVOCs, TPH – diesel range organics (TPH-DRO), and TRPH. The CMS included human health and ecological risk assessments, a contaminant fate and transport evaluation, and an evaluation of corrective measures alternatives. The CMS recommended alternative was NFA (URS 1999).
- The United States Geological Survey (USGS) completed one boring at the site in June 2000. Four samples were collected and analyzed for TPH–gasoline range organics (TPH-GRO) and VOCs. TPH–GRO was present in the deepest sample (collected from 25 feet bgs) at a concentration of 120 mg/kg, so a second boring was completed approximately 25 feet west of the first USGS boring location in February 2001. Five samples were collected and analyzed for TPH–GRO and VOCs; results for all parameters for all samples from this boring were either nondetect or below detection limits. Soil boring locations are shown on **Figure 2-2** (USGS 2001).
- NMED issued comments on the CMS in July 2005 requiring additional investigation activities to address potential risks to human health and the environment (NMED 2005a).

2.5 CORRECTIVE MEASURES OBJECTIVES

The objectives of the corrective measures for Site SD-11 are to ensure that the site does not pose unacceptable risks to human health or the environment and, once this has been verified, to obtain NFA approval for the site from NMED. To achieve these objectives, a phased approach was

designed with re-assessment of existing data and an additional field investigation being the first steps. The historic data re-assessment and description of planned investigation activities are discussed in **Sections 2.5.1** and **2.5.2**, respectively. Based on the results of the planned field investigation, additional activities may be required, (i.e., second removal action and/or site closure report) as described in **Section 2.5.3**.

2.5.1 Existing Data Re-Assessment

In the first phase of the CMI field investigation, analytical results from previous investigations at Site SD-11 were reevaluated. Data from eleven soil borings drilled and sampled during previous studies in the vicinity of the former excavation (CAN086-8611 through CAN086-8619, USGS Borings A and B, and SD11A through SD11C) were screened against the current generic NMED soil screening levels (SSLs) and background concentrations for metals. The results are summarized below.

Surface Soil Chemicals of Concern

Concentrations of arsenic, iron, and manganese were detected in surface soil samples collected from the eleven soil borings as shown on **Table 2-1**. However, the maximum concentration for each of these compounds was less than the respective background concentration established for Cannon AFB. Therefore, concentrations for the three metals are considered to be within the naturally occurring range and no chemicals of concern were identified.

Subsurface Soil Chemicals of Concern

Elevated concentrations of TRPH, 2-butanone (MEK), xylenes, 2-methylnapthalene, naphthalene, arsenic, iron, and manganese were detected in subsurface soil samples collected at Site SD-11 as shown on **Table 2-2**. However, as with the surface soil, the metals were below background and are not considered chemicals of concern. The remaining chemicals were detected in samples collected at depths below 10 feet, where direct contact with soil is an incomplete exposure pathway. Therefore, following risk assessment guidelines, no chemicals are considered chemicals of concern.

Extent of Elevated TPH Concentrations

Based on historical data, elevated TPH concentrations greater than NMED's TPH Screening Guideline of 2,350 mg/kg for kerosene and jet fuel under industrial direct exposure scenarios (NMED 2005b) have been detected in samples collected from the following three borings at depths ranging from 9 to 16 feet bgs: CAN086-8611 located in the center of the excavation; CAN086-8612 located near the east edge of the excavation; and CAN086-8613 located near the west edge of the excavation. TPH concentrations associated with previous sampling locations are shown on **Figure 2-2**; in addition, simplified boring logs for Borings CAN086-8611, CAN086-8612, CAN086-8613, and CAN086-8616 showing sample locations and associated TPH concentrations are shown on **Figure 2-3**. The CMI Investigation sampling activities

described in **Section 5** of this CMI Work Plan are designed to refine the horizontal and vertical extents of elevated TPH concentrations so that the excavation limits described in **Section 6** may be better defined.

Re-Assessment Conclusion

The existing data indicate that the horizontal and vertical extents of contaminants could be refined in several areas. Therefore, the existing data were used to design the CMI Field Investigation activities described in **Section 5** of this Work Plan.

2.5.2 CMI Investigation

The CMI field investigation will be completed as the next phase of the SD-11 CMI. This phase will include collecting samples for TPH and other chemical analyses and evaluating the results by comparing them to NMED's TPH Screening Guideline (i.e., 2,350 mg/kg for SD-11) and the current NMED SSLs (both generic and site-specific SSLs, as appropriate) to identify any additional chemicals of concern. The results of this investigation will be used in combination with previous results to further delineate the horizontal and vertical limits of contaminated media requiring removal.

2.5.3 CMI Removal Action

The corrective measures will be implemented as the third phase of the SD-11 CMI. The corrective measures will include excavating TPH-contaminated media above 2,350 mg/kg to the limits delineated based on the CMI investigation results, transporting the excavated materials off site for disposal, and backfilling and restoring the site to pre-existing grades.

2.5.4 Site Closure Report

A site closure report will be prepared to document all work completed for Site SD-11. The site closure report will be prepared to meet the requirements of both a final report (i.e., CDRL A001C) and a closure report (i.e., CDRL A001D) and will include the following:

- An analytical data management report (CDRL A001B) (if samples are collected)
- A hazardous material and/or hazardous waste disposal report (CDRL A001E) (if contaminated media requires disposal)
- A hazardous materials survey report (CDRL A012) (if contaminated media requires disposal)
- A master document list (MDL) (CDRL B008)
- Digital photographs (CDRL B010) and computer-aided design (CAD) drawings (if field work is required)

E 2-1
COMPARISON OF SITE SD-11 MAXIMUM SURFACE SOIL CONCENTRATIONS TO NMED SSLs
CANNON AFB, NEW MEXICO

Chemical	Frequency Detected	Maximum Detected Concentration (mg/kg)[1]	Qual	Background Concentration[2] (mg/kg)	Daily Intake from the Site[3] (Essential Nutrients)	Recommended Daily Allowance[4] (Essential Nutrients)	Residential Soil SSL Concentration[5] (mg/kg)	Industrial Soil SSL Concentration[6] (mg/kg)	Construction Worker Soil SSL Concentration[7] (mg/kg)		Soil to Groundwater DAF = 20 [8]	Exceeds Background ?	COPC[9] (Yes or No)/Basis[10]
TOTAL PETROLEUM HYDROCARBONS (TPH)[11]													
Petroleum Hydrocarbons, Total Recoverable (TRPH)	9/12	553	J				940 [12]	2,350 [12]	1,810				NO / A
TPH - Diesel Range Organics (DRO)	1/3	68					940 [12]	2,350 [12]	1,120				NO / A
VOLATILE ORGANICS													
Toluene	1/12	0.003	J				252	252	252	sat	6.93		NO / A
Xylene (total)	1/12	1.1	J				102	133	133	sat	3.34		NO / A
SEMIVOLATILE ORGANICS													
Benzo(a)anthracene	3/12	0.2	J				6.21	23.4	212		10.9		NO / A
Benzo(a)pyrene	3/12	0.27	J				0.621	2.34	21.2		2.78		NO / A
Benzo(b)fluoranthene	3/12	0.44					6.21	23.4	212		33.5		NO / A
Benzo(g,h,i)perylene[S]	2/12	0.11	J				25.2	92.5	82.5		0.394		NO / A
Chrysene	3/12	0.26	J				0.955	0.955	0.955	sat	348		NO / A
Fluoranthene	4/12	0.21	J				2,290	24,400	8,730		4,690		NO / A
Indeno(1,2,3)pyrene	2/12	0.089	J				6.21	23.4	212		94.6		NO / A
Phenanthrene	1/12	0.057	J				1,830	20,500	6,990		464		NO / A
Pyrene	2/12	0.11	J				21.3	21.3	21.3	sat	576		NO / A
METALS													
Aluminum	9/9	12,500		12,214			77,800	100,000	14,400		1,100,000	YES	NO / A
Arsenic	9/9	3		4.3			3.9	17.7	85.2		0.292	NO	NO / A,F
Barium	9/9	410	J	890			5,450	78,300	1,440		2,110	NO	NO / A,F
Beryllium	9/9	0.62		0.73			156	2,250	56.2		1,150	NO	NO / A,F
Calcium	9/9	75,100		237,498	7.51	1,200	NA	NA	NA		NA	NO	NO / C,F
Chromium*	8/9	13.6		13.3			100,000	100,000	100,000	max	1,970,000,000	YES	NO / A
Cobalt	9/9	4.9		4.7			1,520	20,500	61		661	YES	NO / A
Copper	9/9	9.2		8.3			3,130	45,400	12,400		1,030	YES	NO / A
Iron	9/9	11,800		13,148			23,500	100,000	92,900	max	5,540	NO	NO / A, F
Lead	9/9	10.1		8.7			400	800	800			YES	NO / A
Magnesium	9/9	2,900		19,300	0.29	400	NA	NA	NA		NA	NO	NO / C,F
Manganese	9/9	214		333			10,200	100,000	151	max	6,670	NO	NO / F
Nickel	9/9	10.5		15			1,560	22,500	561		953	NO	NO / A,F
Potassium	9/9	2,030		2,512	0.203	390-780	NA	NA	NA		NA	NO	NO / C,F
Thallium	4/9	0.18	J	2.7			5.16	74.9	20.4		3.43	NO	NO / A,F
Vanadium	9/9	24.2		32.8			78	1,140	310		730	NO	NO / A,F
Zinc	9/9	38.3		30.6			23,500	100,000	92,900		13,600	YES	NO / A

[S] Napthalene was used as a surrogate for noncarcinogenic PAHs.
* One sample was rejected for chromium results.
mg/kg = Milligrams per Kilogram
sat = chemical specific soil saturation limit.
max = a non risk-based maximum concentration was used when the risk-based SSL exceeded 100,000 mg/kg for low toxicity chemicals.
(1) Maximum detected concentration from all investigations at Site SD-11.
(2) Site-specific background is the 95% upper tolerance limit (UTL) [W-C 1997].
(3) Daily intake from site soil (mg/day) = maximum detected concentration (mg/kg) * ingestion rate of 100 mg/day for construction workers * conversion factor of 1×10^{-6} kg/mg
(4) National Research Council 1989. RDAs have not been established for potassium and sodium. These numbers are based on recommendations for a 2,000 calorie diet.
(5) NMED Soil Screening Levels for Residential Soil (NMED 2005a).
(6) NMED Soil Screening Levels for Industrial Soil (NMED 2005a).
(7) NMED Soil Screening Levels for the Construction Worker (NMED 2005a).
(8) NMED Soil-to-Groundwater Screening Levels (NMED 2005a) with a dilution attenuation factor (DAF) of 20.
(9) For this site, a chemical is only considered a contaminant of potential concern(COPC) if the maximum concentration exceeds background and the industrial or construction worker SSL.
(10) See A-F footnotes.
(11) NMED TPH Screening Guidelines for Potable Water (NMED 2005a)

A = Does not exceed the applicable screening level.
B = Exceeds the applicable screening value.
C = The chemical is an essential nutrient; the calculated daily intake did not exceed the recommended daily allowance.
D = Daily Intake exceeds the RDA.
E = No toxicity value available to quantify risk. Chemical will be evaluated qualitatively in the risk assessment.
F = Concentration is below background concentration.

Shading indicates the maximum concentration exceeds the designated SSL.

E 2-2
COMPARISON OF SITE SD-11 MAXIMUM DEEP SOIL (>10 FEET) CONCENTRATIONS TO NMED SSLs
CANNON AFB, NEW MEXICO

Chemical	Frequency Detected	Maximum Detected Concentration (mg/kg)[1]	Qual	Background Concentration[2] (mg/kg)	Daily Intake from the Site[3] (Essential Nutrients)	Recommended Daily Allowance[4] (Essential Nutrients)	Residential Soil SSL Concentration[5] (mg/kg)	Industrial Soil SSL Concentration[6] (mg/kg)	Construction Worker Soil SSL Concentration[7] (mg/kg)		Soil to Groundwater DAF = 20 [8]	Exceeds Background ?	COPC[9] (Yes or No)/Basis[10]
TOTAL PETROLEUM HYDROCARBONS (TPH)[11]													
Petroleum Hydrocarbons, Total Recoverable (TRPH)	18/41	5,270	J				940 [12]	2,350 [12]	1,810				NO / G
TPH - Diesel Range Organics (DRO)	0/9						940 [12]	2,350 [12]					
TPH - Gasoline Range Organics (GRO)	1/6	120					NA	NA	NA				NO / A
VOLATILE ORGANICS													
Acetone	3/41	0.59	J				12,600	53,000	42,600		19.1		NO / A,G
2-Butanone (MEK)	6/41	0.52	J				0.00486	0.00486	0.00486	sat	25.4		NO / G
Ethylbenzene	5/41	18					128	128	128	sat	20.3		NO / A,G
Methylene Chloride	4/41	0.069	J				65	161	2,630	sat	0.171		NO / A,G
Toluene	3/41	0.0046	J				252	252	252	sat	6.93		NO / A,G
Xylene (total)	6/41	33					102	133	133		3.34	sat	NO / G
SEMIVOLATILE ORGANICS													
Dibenzofuran	1/35	0.15	J				36.6	36.6	36.6		2.87		NO / A,G
Isophorone	1/35	0.93	J				5,120	20,200	46,600		3.4		NO / A,G
2-Methylnapthalene[S]	7/35	18					25.2	92.5	82.5		0.394		NO / A,G
Napthalene	7/35	11					25.2	92.5	82.5		0.394		NO / A,G
METALS													
Aluminum	26/26	8,080		12,214			77,800	100,000	14,400		1,100,000	NO	NO / A,F,G
Arsenic	24/26	1.6		4.3			3.9	17.7	85.2		0.292	NO	NO / A,F,G
Barium	26/26	1,260	J	890			5,450	78,300	1,440		2,110	YES	NO / A,G
Beryllium	20/26	0.71	J	0.73			156	2,250	56.2		1,150	NO	NO / A,F,G
Calcium	26/26	246,000		237,498	24.6	1200	NA	NA	NA		NA	YES	NO / C,G
Chromium*	24/26	10.5		13.3			100,000	100,000	100,000	max	1,970,000,000	NO	NO / A,F,G
Cobalt	16/26	2.4		4.7			1,520	20,500	61		661	NO	NO / A,F,G
Copper	23/26	9.6		8.3			3,130	45,400	12,400		1,030	YES	NO / A,G
Iron	26/26	5,800		13,148			23,500	100,000	92,900	max	5,540	NO	NO / A,F,G
Lead	26/26	5.5		8.7			400	800	800			NO	NO / A,F,G
Magnesium	26/26	13,400		19,300	1.34	400	NA	NA	NA		NA	NO	NO / C,F,G
Manganese	26/26	160		333			10,200	100,000	151	max	6,670	NO	NO / F,G
Nickel	26/26	8.4		15			1,560	22,500	561		953	NO	NO / A,F,G
Potassium	26/26	1,970		2,512	0.197	390-780	NA	NA	NA		NA	NO	NO / C,F,G
Sodium	2/26	172		1,227	0.0172	1,000	NA	NA	NA		NA	NO	NO / C,F,G
Thallium	2/26	0.12	J	2.7			5.16	74.9	20.4		3.43	NO	NO / A,F,G
Vanadium	26/26	19.1		32.8			78	1,140	310		730	NO	NO / A,F,G
Zinc	26/26	16.2		30.6			23,500	100,000	92,900		13,600	NO	NO / A,F,G

[S] Napthalene was used as a surrogate for noncarcinogenic PAHs.
* Two samples were rejected for chromium results.
mg/kg = Milligrams per Kilogram
sat = chemical specific soil saturation limit.
max = a non risk-based maximum concentration was used when the risk-based SSL exceeded 100,000 mg/kg for low toxicity chemicals.
(1) Maximum detected concentration from all investigations at SD-11.
(2) Site-specific background is the 95% upper tolerance limit (UTL) [W-C 1997].
(3) Daily intake from site soil (mg/day) = maximum detected concentration (mg/kg) * ingestion rate of 100 mg/day for construction workers * conversion factor of $1x\ 10^{-6}$ kg/mg
(4) National Research Council 1989. RDAs have not been established for potassium and sodium. These numbers are based on recommendations for a 2,000 calorie diet.
(5) NMED Soil Screening Levels for Residential Soil (NMED 2005a).
(6) NMED Soil Screening Levels for Industrial Soil (NMED 2005a).
(7) NMED Soil Screening Levels for the Construction Worker (NMED 2005a).
(8) NMED Soil-to-Groundwater Screening Levels (NMED 2005a) with a dilution attenuation factor (DAF) of 20.
(9) For this site, a chemical is only considered a contaminant of potential concern(COPC) if the maximum concentration exceeds background and the industrial or construction worker SSL.
(10) See A-H footnotes.
(11) NMED TPH Screening Guidelines for Potable Water (NMED 2005a)

A = Does not exceed the applicable screening level.
B = Exceeds the applicable screening value.
C = The chemical is an essential nutrient; the calculated daily intake did not exceed the recommended daily allowance.
D = Daily Intake exceeds the RDA.
E = No toxicity value available to quantify risk. Chemical will be evaluated qualitatively in the risk assessment.
F = Concentration is below background concentration.
G = All subsurface samples were collected at depths below 10 feet where direct contact with soil is an incomplete exposure pathwa
H = SSL is based on soil saturation limit rather than a risk-based value.

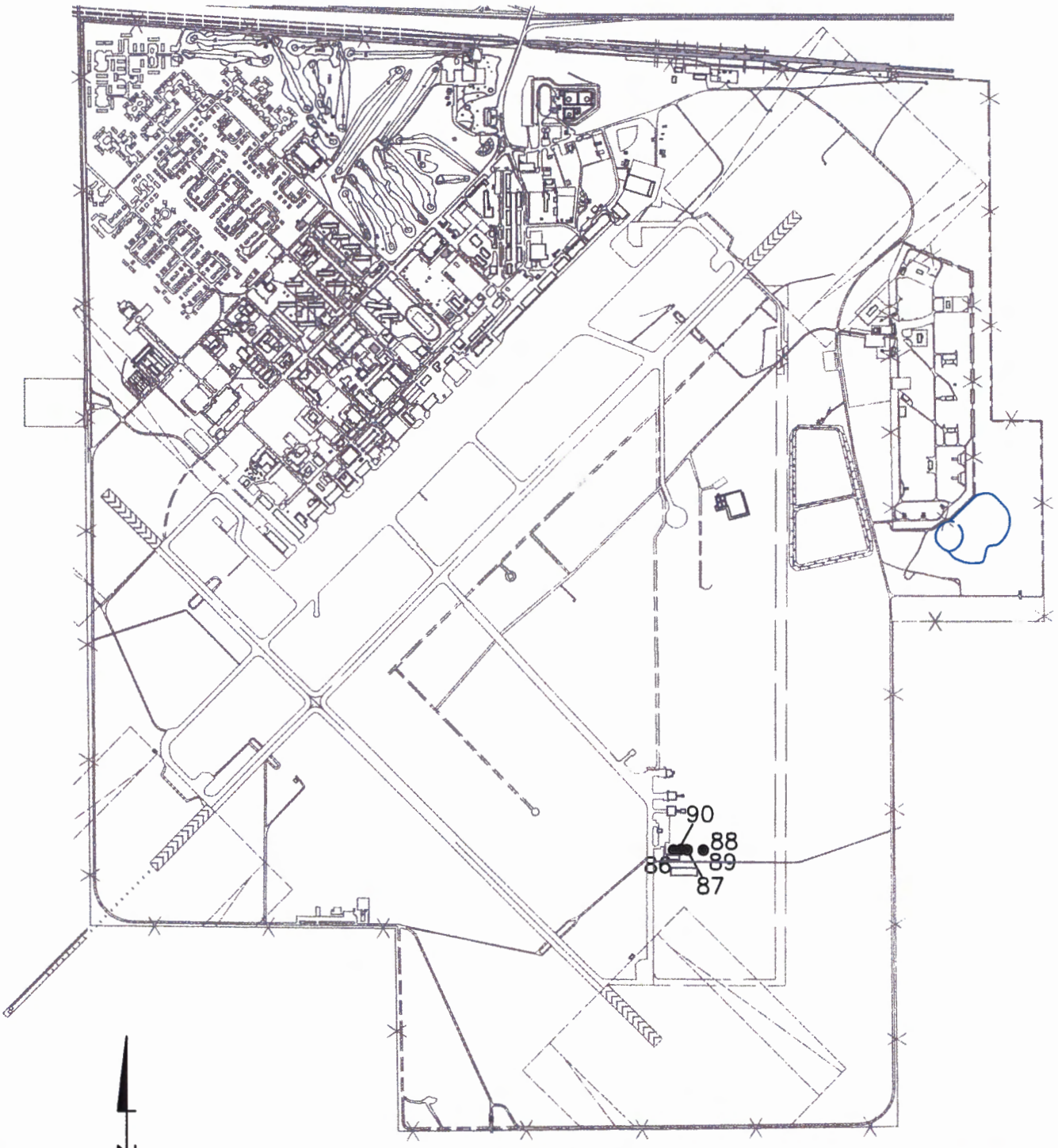
Shading indicates the maximum concentration exceeds the designated SSL.

URS

LEGEND

3 ● SOILD WASTE MANAGEMENT UNIT (SWMU) LOCATION AND NUMBER

SWMU No.	DESIGNATED AREA
86	SD-11 ENGINE TEST CELL
87	SD-11 FORMER OVERFLOW PIT
88	SD-11 FORMER LEACHING FIELD
89	SD-11 EVAPORATION POND
90	SD-11 OIL/WATER SEPARATOR No. 5114



N

2000 1000 0 2000

SCALE IN FEET

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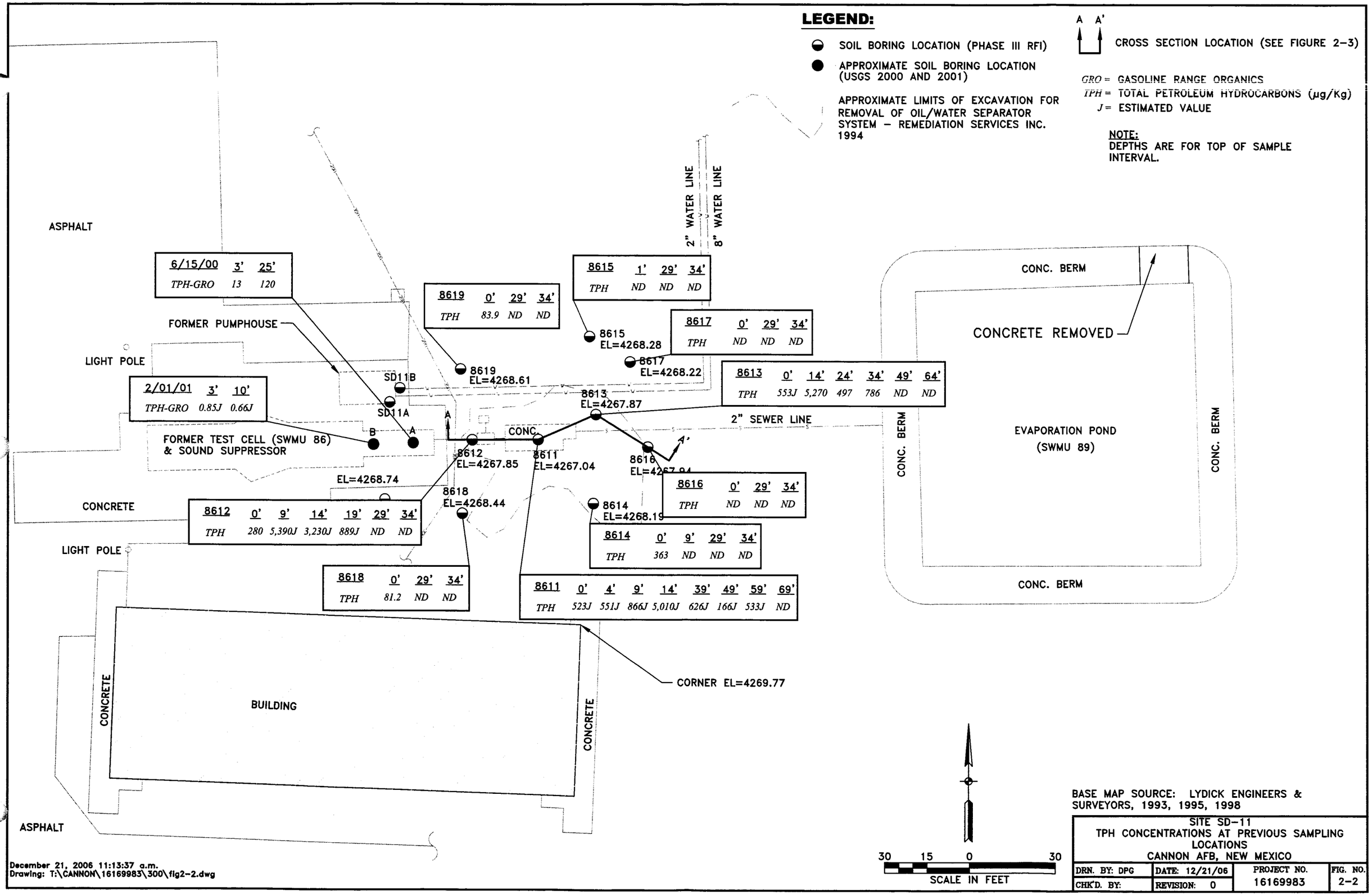
SITE SD-11
LOCATION PLAN
CANNON AIR FORCE BASE, NEW MEXICO

DRN. BY: DPG	DATE: 01/27/06	PROJECT NO.	FIG. NO.
CHK'D. BY: .	REVISION: 0	16169983	2-1


LEGEND:
SOIL BORING LOCATION (PHASE III RFI)
APPROXIMATE SOIL BORING LOCATION (USGS 2000 AND 2001)
APPROXIMATE LIMITS OF EXCAVATION FOR REMOVAL OF OIL/WATER SEPARATOR SYSTEM – REMEDIATION SERVICES INC. 1994
A A'
CROSS SECTION LOCATION (SEE FIGURE 2-3)
GRO = GASOLINE RANGE ORGANICS
TPH = TOTAL PETROLEUM HYDROCARBONS (µg/Kg)
J = ESTIMATED VALUE
NOTE:
DEPTHS ARE FOR TOP OF SAMPLE INTERVAL.
ASPHALT
6/15/00 3' 25'
TPH-GRO 13 120
FORMER PUMPHOUSE
LIGHT POLE
2/01/01 3' 10'
TPH-GRO 0.85J 0.66J
SD11B
SD11A
FORMER TEST CELL (SWMU 86) & SOUND SUPPRESSOR
B
A
8619 0' 29' 34'
TPH 83.9 ND ND
8619 EL=4268.61
8615 1' 29' 34'
TPH ND ND ND
8615 EL=4268.28
8617 0' 29' 34'
TPH ND ND ND
8617 EL=4268.22
8613 0' 14' 24' 34' 49' 64'
TPH 553J 5,270 497 786 ND ND
8613 EL=4267.87
2" SEWER LINE
2" WATER LINE
8" WATER LINE
CONC.
8612 EL=4267.85
8611 EL=4267.04
8616 EL=4267.94
A'
EL=4268.74
8618 EL=4268.44
8614 EL=4268.19
CONCRETE
8612 0' 9' 14' 19' 29' 34'
TPH 280 5,390J 3,230J 889J ND ND
8616 0' 29' 34'
TPH ND ND ND
8614 0' 9' 29' 34'
TPH 363 ND ND ND
LIGHT POLE
8618 0' 29' 34'
TPH 81.2 ND ND
8611 0' 4' 9' 14' 39' 49' 59' 69'
TPH 523J 551J 866J 5,010J 626J 166J 533J ND
CONC. BERM
CONCRETE REMOVED
EVAPORATION POND (SWMU 89)
CONC. BERM
CONC. BERM
CONC. BERM
CORNER EL=4269.77
BUILDING
CONCRETE
CONCRETE
ASPHALT
30 15 0 30
SCALE IN FEET
BASE MAP SOURCE: LYDICK ENGINEERS & SURVEYORS, 1993, 1995, 1998
SITE SD-11
TPH CONCENTRATIONS AT PREVIOUS SAMPLING LOCATIONS
CANNON AFB, NEW MEXICO
DRN. BY: DPG
DATE: 12/21/06
PROJECT NO. 16169983
FIG. NO. 2-2
CHK'D. BY:
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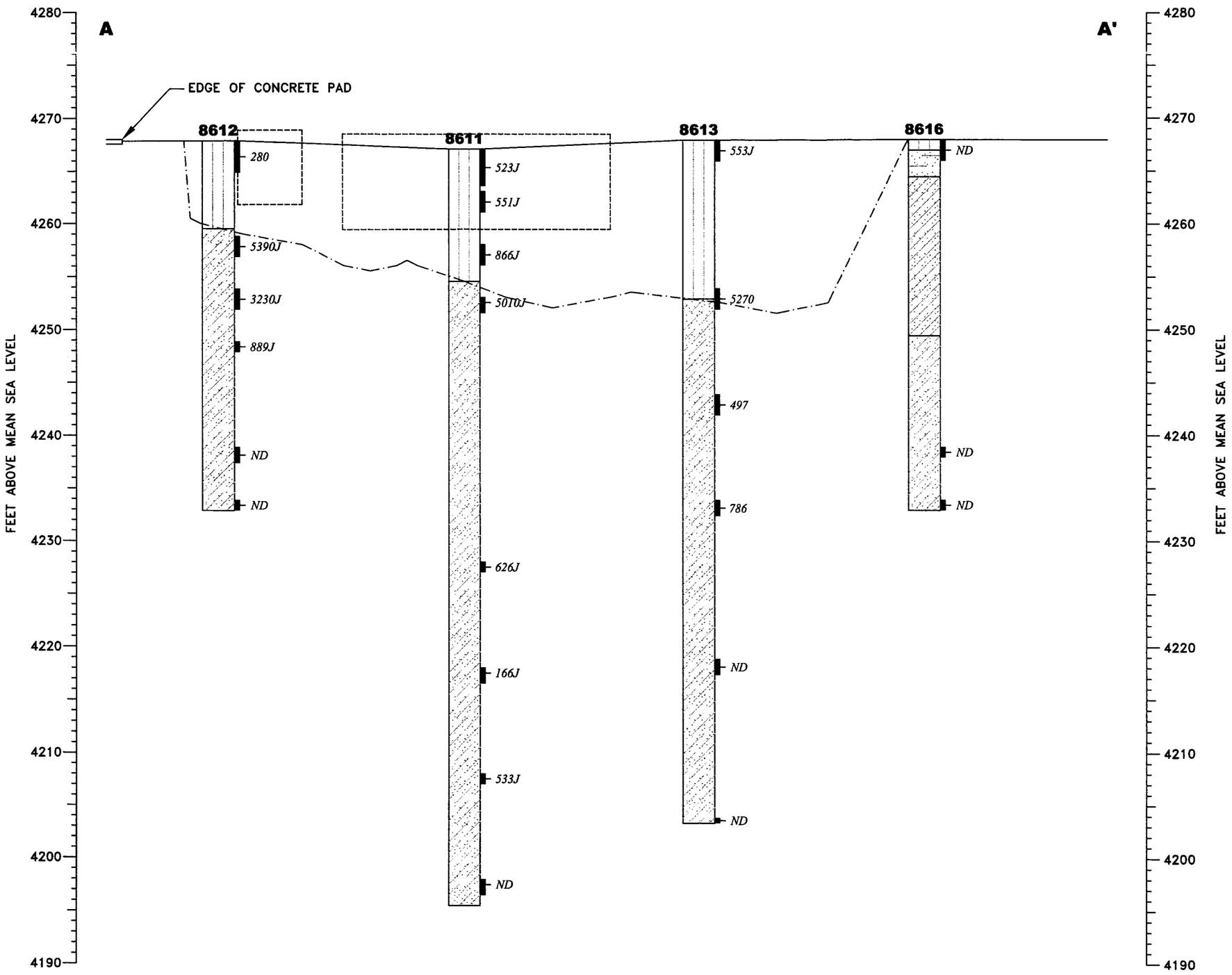

LEGEND:

- ASPHALT
- SILTY CLAY FILL WITH FINE SSAND AND OCCASIONAL FINE GRAVEL (CL)
- SILTY CLAY WITH FINE SAND (CL)
- CLAYEY SILT WITH FINE SAND, SANDY SILT, OR SILTY SAND (ML, SM)
- FINE SAND WITH SILT (SM, SP–SM)
- APPROXIMATE LOCATION OF FORMER OIL/WATER SEPARATOR UNIT
- APPROXIMATE LIMITES OF EXCAVATION FOR REMOVAL OF OIL/WATER SEPARATOR SYSTEM
- *ND* = SOIL SAMPLE INTERVAL SELECTED FOR TPH ANALYSIS AND ASSOCIATED TPH CONCENTRATION

ND = NON DETECT
J = ESTIMATED VALUE
TPH = TOTAL PETROLEUM HYDROCARBONS (mg/Kg)

10 5 0 10
HORIZONTAL IN FEET

10 5 0 10
VERTICAL IN FEET

SITE SD–11
TPH CONCENTRATIONS ALONG GEOLOGIC CROSS–SECTION
A –A'
CANNON AIR FORCE BASE, NEW MEXICO

DRN. BY: DPG	DATE: 12/21/06	PROJECT NO.	FIG. NO.
CHK'D. BY:	REVISION: 0	16169983	2–3

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The project organization and roles of the project team are described below.

3.1 CANNON AIR FORCE BASE

The Cannon AFB Environmental Restoration Program (ERP) Manager has the overall responsibility of all phases of the investigation as it pertains to Cannon AFB.

3.2 AFCEE

The AFCEE Project Manager (PM) will oversee all aspects of the work and serve as a point of contact who will communicate directly with the Cannon AFB ERP Manager and the URS PM. In addition, the AFCEE PM will maintain approval authority for all subcontractors and suppliers used to complete the CMI. The AFCEE PM has the authority, with Cannon AFB and NMED approval, to modify the CMI activities specified in this CMI Work Plan. The AFCEE PM is also responsible for project quality, as well as budget and schedule control. The AFCEE PM will coordinate with Cannon AFB representatives, AFCEE staff, NMED, and URS to ensure that the CMI field work meets quality objectives, budget, and schedule.

3.3 NMED

The NMED PM has overall responsibility to ensure the environmental program at Cannon AFB, including this CMI, complies with the State of New Mexico's environmental program. NMED is the lead regulatory agency for this CMI. The NMED PM will coordinate NMED's involvement and receive all notices, reports, plans, and other documents prior to, during, and following the project. Where necessary, NMED will be responsible for coordinating efforts of other regulatory agencies. In addition to the NMED PM, other NMED personnel may be involved in this project and may be on site during all or part of the CMI field work.

3.4 URS

URS will complete or provide for the completion of all field work and other tasks described in this CMI Work Plan. URS will provide or procure all labor, materials, equipment, and services necessary to complete the CMI in accordance with this CMI Work Plan. Additionally, URS will participate in progress meetings as required by AFCEE and Cannon AFB to address the project status, schedule, test results, observations and findings, technical issues, design changes, and upcoming activities. In addition to overseeing the preparation of this CMI Work Plan, the URS PM will serve as a single point of contact and fulfill the following responsibilities:

- Coordinate CMI activities with the Cannon AFB and the AFCEE PM.
- Monitor daily progress of the project and submit updated progress reports to AFCEE on a monthly basis.
- Communicate proposed modifications to the CMI Work Plan with the AFCEE PM.

- Ensure that all URS and subcontractor personnel are appropriately trained for the work they are assigned.

URS will also designate field team leader(s) to monitor the CMI field investigation and all construction activities and to verify that all work is completed in accordance with the CMI Work Plan and other applicable project documents. The field team leader will observe and record all sampling activities associated with the project, including material characterization testing and confirmatory testing.

This section describes the data quality objectives (DQOs) for the CMI at Site SD-11 at Cannon AFB. The objectives presented in this section are project-specific and will be applied to all phases of the CMI.

4.1 ELEMENTS OF THE DATA QUALITY OBJECTIVE PROCESS

DQOs are qualitative and quantitative statements that specify the quality of data and define the level of certainty required to support corrective measure decisions. The seven steps of the DQO development process are (USEPA 2000):

1. State the Problem: Concisely describe the problem to be studied. Review prior studies and existing information to gain a sufficient understanding to define the problem.

2. Identify the Decision: Identify what questions the study will attempt to resolve, and what actions may result.

3. Identify Inputs to the Decision: Identify the information that needs to be obtained and the measurements that need to be taken to resolve the decision statement.

4. Define the Study Boundaries: Specify the time periods and spatial area to which decisions will apply. Determine when and where data should be collected.

5. Develop a Decision Rule: Define the statistical parameter of interest, specify the action level, and integrate the previous DQO outputs into a single statement that describes the logical basis for choosing among alternative actions.

6. Specify Limits on Decision Errors: Define the decision maker's tolerable decision error rates based on consideration of the consequences of making an incorrect decision.

7. Optimize the Design: Evaluate information from the previous steps and generate alternative data collection designs. Choose the most resource-effective design that meets all DQOs.

The Cannon AFB project management team will implement the above process to identify the data needed to support decision-making at each phase of the CMI described in this Work Plan. Each of the DQO steps, as it relates to the CMI, is further discussed in the following sections.

4.2 STATE THE PROBLEM

Following several investigations and a removal action (see **Section 2.4**), the CMS for Site SD-11 recommended the NFA alternative based on the results of the Phase III RFI and the CMS investigation, human health and ecological risk evaluations, and fate and transport modeling (URS 1999). A regulatory review (NMED 2005a), concluded that additional remedial actions were required before the site would qualify for NFA status.

4.3 IDENTIFY THE DECISION

Existing site data was re-assessed and screened against the current generic NMED soil screening criteria and human health and ecological risk screening criteria, and site-specific screening to identify any chemicals of concern and to assess the need for further investigation. The results indicated additional investigation activities are required. Therefore, a CMI field investigation will be completed and any data collected during a CMI field investigation will be reviewed, included in the screening process, and added to the risk evaluations. Finally, a decision will be made as to the scope of the CMI construction activities (if required).

4.4 IDENTIFY INPUTS TO THE DECISION

All data from the CMI field investigation that are deemed usable and relevant will be included in the existing data set.

4.5 DEFINE THE STUDY BOUNDARIES

The spatial boundaries of Site SD-11 and descriptions of the five SMWUs (86 through 90) that compose the site are presented in **Section 2.1**. Media of concern are soils.

4.6 DEVELOP A DECISION RULE

The primary decision rule for the CMI is: Do concentrations of chemicals in soils at Site SD-11 exceed NMED screening criteria? More specifically, do TPH concentrations exceed NMED's TPH Screening Guideline of 2,350 mg/kg and thus require removal? Based on the results of the re-assessment of previously collected data, additional samples will be collected and additional corrective measures will be implemented so that these questions may be answered in the negative. Ultimately, a recommendation to remove the Site SD-11 SWMUs from the Cannon AFB RCRA Part B Permit will be made following the successful completion of this CMI project.

4.7 SPECIFY LIMITS ON DECISION ERRORS

For existing data from previous investigations or removal action, quality assurance/quality control (QA/QC) criteria was reviewed to assure that data are usable for site characterization and decision-making purposes. For data gathered as part of this CMI, the probability of making an incorrect decision using the collected data, which may contain sampling design or measurement errors, can be controlled by following standard procedures as described in SOPs of the QAPP. Data quality evaluation procedures and determination of usability will also be defined in the QAPP. The results of QA/QC efforts during sample collection and analysis, in combination with professional judgment, will be used to evaluate the usability of chemical data for making decisions.

4.8 OPTIMIZE THE DESIGN

The project team developed the proposed actions for the SD-11 CMI using the DQO process. The phased approach presented in this work plan allows for the appropriateness of each phase to be reassessed prior to its undertaking. The project team will review and update the CMI Work Plan as part of each phase of the project. The project team will also be provided opportunities for input through regular project updates included during fieldwork, data analysis, and report preparation tasks. In addition, the preliminary excavation limits will be updated based on the CMI Investigation analytical results.

The following sections describe the general investigative approach and protocols that will be followed during the CMI Investigation at SD-11. This section also identifies specific sampling locations and supporting rationale.

5.1 STANDARD OPERATING PROCEDURES

The following is a list of applicable SOPs previously developed for use at Cannon AFB. These SOPs will be used during the CMI investigation and will provide the foundation for all fieldwork execution.

- SOP No. 4 Subsurface Drilling and Soil Sampling
- SOP No. 11 Equipment Decontamination
- SOP No. 13 Sample Handling, Documentation, and Tracking
- SOP No. 15 Headspace Analysis
- SOP No. 16 Boring Abandonment
- SOP No. 17 Permits and Clearances
- SOP No. 19 En Core® and Terra Core™ Sampling Method

Copies of the SOPs are included as **Appendix C**.

5.2 MOBILIZATION

Mobilization of equipment and personnel will be completed prior to the start of field activities. The mobilization activities will include, but are not limited to, the following tasks:

5.2.1 Acquire Base Passes

Field personnel and subcontractors will coordinate with the Cannon AFB PM to acquire passes that will allow entry onto Cannon AFB to complete the planned activities.

5.2.2 Locate Utilities

URS will obtain utility clearances prior to the start of any intrusive activities. Utility locates will be coordinated with the Cannon AFB PM. The utility clearances will requested sufficiently in advance and will be completed by 27th Fighter Wing, Civil Engineering Squadron (27 CES). All underground utilities identified will be marked with flagging, stakes, and/or paint. All utility location tasks will be documented in the field logbook to aid in subsequent work. No intrusive work using heavy equipment will be completed within five feet of an active utility. Clearances and permits will be obtained in accordance with SOP No. 17.

5.3 CMI INVESTIGATION DATA COLLECTION

Eleven soil borings (CAN086-8611 through CAN086-8619, USGS Borings A and B, and SD11A through SD11C) were drilled and sampled during previous studies at Site SD-11. The borings were located in the vicinity of the former excavation and provide information about soil contamination at this location. To further delineate the extent of soils with elevated TPH levels and to address current site conditions, eight additional soil borings will be completed as discussed below.

5.3.1 Subsurface Soil Sampling

Subsurface soil samples will be collected using a continuous sample tube system (e.g., Central Mine Equipment Company's system or the equivalent) (SOP No. 4). Continuous soil samples will be collected in 5-foot increments for lithologic logging purposes and chemical analysis. Discrete samples for chemical analysis will be collected from the soil exhibiting the greatest contamination (e.g., observations of staining, odor, elevated photoionization detector [PID] readings, etc.).

The planned number of subsurface soil samples is listed in **Table 5-1**. If the deepest soil sample planned for a boring appears to have been impacted by Cannon AFB operations, the URS Project Manager will be contacted to discuss collecting additional soil samples from deeper intervals.

Sampling Locations

Soil borings will be drilled and sampled within the former excavation and near the perimeter of the former excavation. A review of data from previous studies determined that the borings will be advanced to depths of about 30 to 35 feet bgs. The locations of the preliminary proposed borings as well as the previous borings are shown on **Figure 5-1**.

Former Excavation Sampling Locations

Two soil borings will be advanced through the former excavation area near boring CAN086-8611 to better define the vertical extent of elevated TPH levels. Elevated TPH concentrations (i.e., soils with TPH concentrations greater than NMED's TPH Screening Guideline of 2,350 mg/kg for kerosene and jet fuel under industrial direct exposure scenarios [NMED 2005b]) were detected at CAN086-8611 to a depth of about 15.8 feet bgs. Because the top of the next sample interval, which contained a TPH concentration significantly below the screening guideline, was located at approximately 39 feet bgs, it is estimated that TPH concentrations at the location of CAN086-8611 drop below the screening guideline between 27 and 30 feet bgs. Based on this, the anticipated depth of the two borings within the former excavation is 35 feet bgs.

Planned Excavation Perimeter Sampling Locations

Six soil borings will be drilled and sampled around the edge of the planned excavation perimeter to further define the lateral and vertical extent of elevated TPH levels. Two borings will be located along the northern perimeter and two borings will be located along the southern perimeter. In addition, one boring each will be located at the east and west ends of the planned excavation area. The preliminary boring locations are shown on **Figure 5-1**. The anticipated depth of these six borings is 30 feet bgs.

Analytical Methods

Initially, soil samples collected as part of the CMI field investigation will be shipped to the laboratory and analyzed for TPH–DRO (Method 8015B/3540C) on an accelerated turn-around time. Once it has been determined that the samples represent the extent of elevated TPH concentrations, these same soil samples will also be analyzed for the following:

- VOCs (Method 8260B/5035)
- SVOCs (Method 8270C/3540C)
- TPH – GRO (Method 8015B/5035)
- TAL Metals (Method 6010B/7471A/3050B)

In general, laboratory analytical results for chemicals other than TPH will be compared to NMED Industrial and Construction Worker SSLs (NMED 2005a). If the sample results indicate that no expansion of the excavation limits is warranted (i.e., the extent of TPH results greater than 2,350 mg/kg has been defined both horizontally and vertically, and no hazardous wastes are suspected of being present), these results together with the boring locations will be used to delineate the extent of the excavation and will serve as the confirmatory sampling results for the excavation. Alternatively, if the analytical results indicate that horizontal expansion of the excavation area is warranted, either additional soil boring(s) will be completed and sampled in accordance with this section of the CMI Work Plan, or confirmatory samples will be collected from the wall(s) of the completed excavation in the area of the expansion in accordance with **Section 6.4**. If the analytical results indicate that vertical expansion of the excavation area is warranted, the next deepest sample interval will be analyzed. If the deepest sample from a boring contains a TPH concentration greater than 2,350 mg/kg (an unlikely scenario), additional deeper soil boring(s) will be completed and sampled, in accordance with this section of the CMI Work Plan.

5.3.2 Field Headspace Analysis and Air Monitoring

An organic vapor analyzer equipped with 10.2-electron volt (eV) or greater PID will be used for soil headspace analysis and health and safety air monitoring. A PID calibrated to "benzene equivalent" will be used during field activities. This process is discussed in detail in SOP No. 15.

5.4 SAMPLE IDENTIFICATION, HANDLING, AND DOCUMENTATION

The following sections briefly describe sample management procedures to be used for the work described in this plan.

5.4.1 Field Documentation

Documentation of observations and data acquired in the field will be of sufficient detail to provide information on the sample acquisition and provide a permanent record of field activities. The observations of data will be recorded with waterproof ink in a permanently bound, weatherproof field logbook with consecutively numbered pages.

Field Logbook Modifications and Signatures

Sufficient information will be recorded to allow the sampling event to be reconstructed without relying on the collector's memory. The person making the entry will sign each page in the field books at the end of the day. Changes or deletions in the field logbook will be lined out with a single strike mark and will remain legible. Changes/entries made in another person's field book will be sign and dated.

Sample Collection Field Sheets

As part of the field documentation, Sample Collection Field Sheets (SCFSs) will be generated. The SCFS will summarize the sample collection data (i.e., parameters), sample identification, time and date collected, container type(s), QA/QC samples, physical description, and name of sampler(s).

Daily Quality Control Reports

To supplement the information reported in the field logbook, daily quality control reports (DQCRs) will be completed for each day of fieldwork activity.

Sample Chain-of-Custody

During field sampling activities, sample tracking will be maintained from the time the samples are collected to when the laboratory data are issued. Initial information concerning collection of the sample(s) will be recorded in the field logbook as described above. Information on the custody, transfer, handling, and shipping of samples to an off-site laboratory will be recorded on a chain-of-custody (CoC) form.

The sampler will be responsible for initiating and filling out the CoC form. The person responsible for packaging samples for delivery to the off-site laboratory will sign the CoC form, retain the last copy of the three-part form, document the method of shipment, and send the original and the second copy of the CoC form with the samples. A custody seal will be placed on each sample cooler prior to transfer of the cooler to the delivery company (e.g., Federal Express)

or a laboratory. Upon receipt at the off-site cooler , the person receiving the samples will sign the CoC form and return the second copy.

5.4.2 Sample Identification

Samples collected during site activities will have discrete sample identification numbers. These numbers are necessary to identify and track each of the samples collected for analysis during this project. In addition, the sample identification numbers will be used to identify and retrieve the analytical results received from the laboratory.

Each sample will be identified by a unique code that generally indicates the site, sampling location, sample type, and either sampling event or sampling depth. The sample designation for each analytical and QA/QC sample is a three-letter and seven-digit/letter unique identification (C##-YYYY-ZZZ). "C-##" is the facility and site identifier, with "C" for Cannon AFB and "##" representing the number identifying this site. The sample designation for SD-11 will start as "C11-."

The next four characters (YYYY) identify the sampling method and specific sampled locations. The first two characters will present the method of sampling. "SB" for soil boring will be used as the first two characters. The last two characters will identify the sample location. Samples from the second soil boring at SD-11 would be identified as "C11-SB02-."

The last set of characters (ZZZ) is the sample identifier. The first number indicates the type of sample:

- 0 for a soil (analytical) sample
- 1 for a soil matrix spike/matrix spike duplicate (MS/MSD)
- 2 for a field duplicate

The MS/MSD should also be labeled the same as the original sample but will have "MS/MSD Extra" written on the label.

The last two numbers correspond to the beginning depth of the sample in feet bgs for all soil samples. Multiple soil samples may be collected from the same boring. The last two digits differentiate among these multiple samples and represent the approximate upper depth at which the sample was collected. Specific procedures for sample handling, packaging, and shipping are discussed in SOP No. 13.

The following is an example of an identification number:

Soil Boring No. 2 — Approximate depth to the top of sample in feet bgs

C11-SB02-018

Cannon AFB, SD-11 — Soil analytical sample

5.4.3 Sample Labeling and Handling

All sample labels will be filled out using waterproof ink, and each label will contain the following information: sampler's initials, project name, sample identification, date and time of sample collection, method of preservation used, and sample matrix. Samples will be thoroughly homogenized (except in the case of VOC analysis) and transferred to the appropriate sampling containers in accordance with SOP No. 13. The analytical laboratory will provide commercially cleaned containers. After collection, samples will be labeled as described above and placed into iced coolers. Coolers will be sealed with a custody seal and shipped to the contract laboratory. CoC forms will be maintained to document sample handling between the filed and the laboratory. **Table 5-1** of the QAPP **(Appendix B)** summarizes the appropriate sample containers, preservation and holding times for the planned samples to be analyzed by the designated laboratory.

5.5 QUALITY ASSURANCE/QUALITY CONTROL SAMPLES

QA/QC samples will be collected according to the following schedule, as presented in the project QAPP:

- QC blind field duplicates will be collected at a frequency of about 5 percent of the total field samples. These samples will be submitted to the contract laboratory.
- Matrix spike/matrix spike duplicate (MS/MSD) field samples will be collected at a frequency of about 5 percent and will be submitted to the contract laboratory.

The anticipated distribution of the QA/QC samples to be collected is listed in **Table 5-1**.

5.6 DECONTAMINATION AND INVESTIGATION-DERIVED WASTE

All sampling equipment will be decontaminated before starting work and between sample intervals. Small tool decontamination will be done at the site. Drill rig and auger decontamination, and drum staging will be completed at locations identified by the 27 CES, Environmental Flight (27 CES/CEV) personnel. Specific decontamination procedures are described in SOP No. 11.

IDW is expected to include soil cuttings, decontamination fluids, and personal protective equipment (PPE). In general, soil cuttings will be containerized and properly disposed of on the base, as long as the analytical results demonstrate the waste is non-hazardous by applying the "20 Times Rule" (i.e., none of the total analytical results exceed the corresponding Toxicity Characteristic Leaching Procedure [TCLP] limit by more than 20 times). Decontamination fluids will be field-screened and discharged either to the ground or to the sanitary sewer system. PPE will be disposed of on the base as a solid waste. Specific procedures for handling IDW are outlined in SOP No. 11.

5.7 SURVEYING

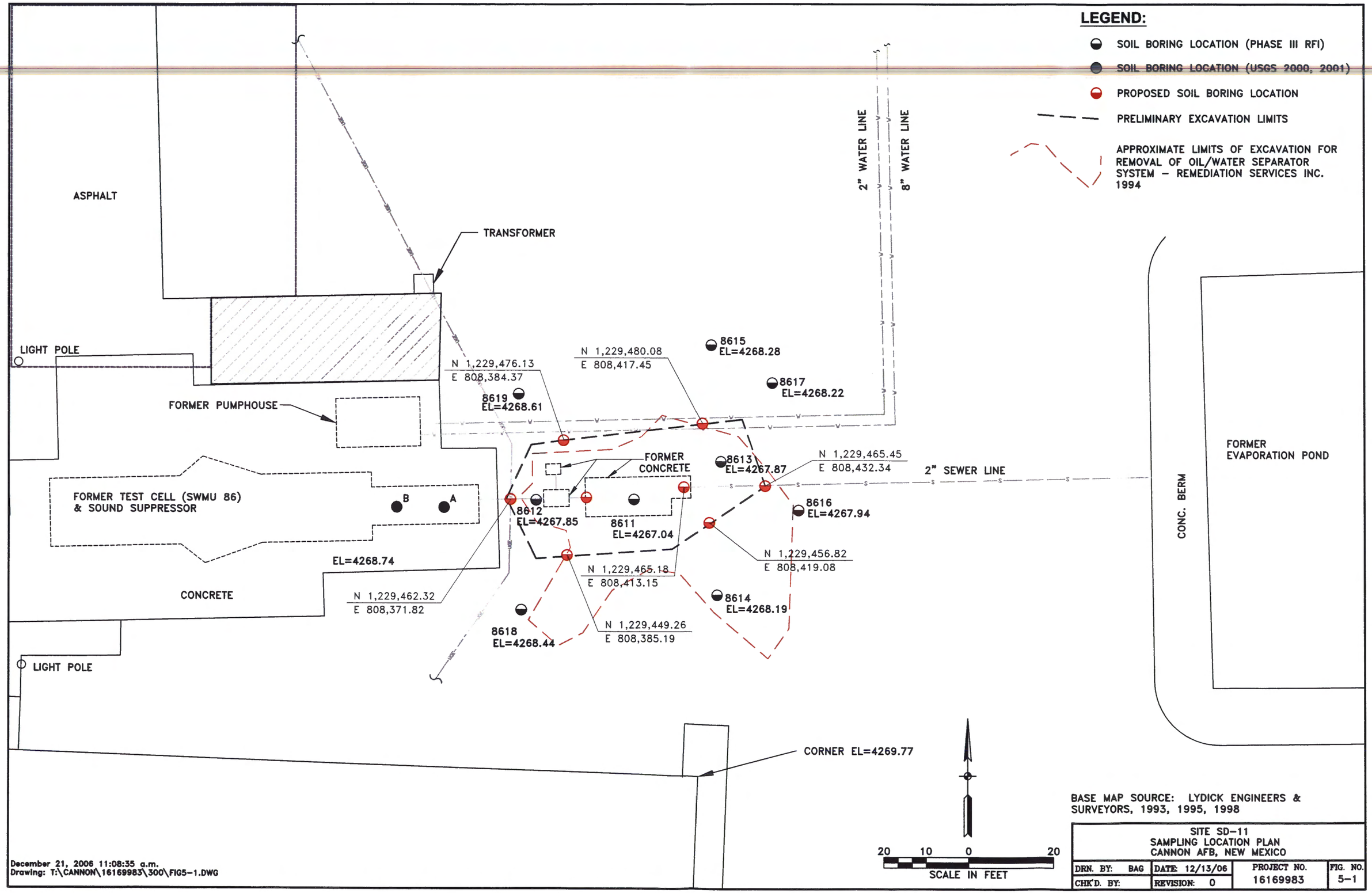
A professional surveyor licensed in the State of New Mexico will complete a coordinate and elevation survey for this site. All soil borings drilled during this investigation will be located. In addition to the sampling locations, horizontal coordinates and elevations will be measured at three permanent site features to the same tolerances as the sampling locations. If no existing permanent control points are located within 1,000 feet of SD-11, a permanent control monument (2-inch aluminum cap in concrete) will be placed in an accessible location.

The CMI surveying will be completed using the following coordinate system: North American Datum of 1983 (NAD83) State Plane New Mexico East, Federal Information Processing Standard (FIPS) 3001 (feet).

TABLE 5-1
SOIL SAMPLING SUMMARY FOR CMI INVESTIGATION
CMI WORK PLAN
CANNON AFB, NEW MEXICO

Soil Parameter (Preparation/Analytical Method)	Field Samples	Field Duplicates	MS/MSD Samples	Total Samples
Soil Borings within Former Excavation				
VOCs (8260B/5035)	6	1	1	8
SVOCs (8270C/3540C)	6	1	1	8
TPH - DRO (8015B/3540C)	6	1	1	8
TPH - GRO (8015B/5035)	6	1	1	8
RCRA Metals (6010B/7471A/3050B)	6	1	1	8
Soil Borings near Planned Excavation Perimeter				
VOCs (8260B/5035)	18	2	1	21
SVOCs (8270C/3540C)	18	2	1	21
TPH - DRO (8015B/3540C)	18	2	1	21
TPH - GRO (8015B/5035)	18	2	1	21
RCRA Metals (6010B/7471A/3050B)	18	2	1	21

Notes:
MS - Matrix Spike
MSD - Matrix Spike Duplicate
QA - Quality Assurance
RCRA - Resource Conservation and Recovery Act
TCL - Target Component List
TPH - Total Petroleum Hydrocarbons
DRO - Diesel Range Organics
GRO - Gasoline Range Organics


LEGEND:
SOIL BORING LOCATION (PHASE III RFI)
SOIL BORING LOCATION (USGS 2000, 2001)
PROPOSED SOIL BORING LOCATION
PRELIMINARY EXCAVATION LIMITS
APPROXIMATE LIMITS OF EXCAVATION FOR REMOVAL OF OIL/WATER SEPARATOR SYSTEM – REMEDIATION SERVICES INC. 1994
ASPHALT
TRANSFORMER
LIGHT POLE
FORMER PUMPHOUSE
FORMER TEST CELL (SWMU 86) & SOUND SUPPRESSOR
B
A
EL=4268.74
CONCRETE
LIGHT POLE
2" WATER LINE
8" WATER LINE
N 1,229,476.13
E 808,384.37
8619
EL=4268.61
N 1,229,480.08
E 808,417.45
8615
EL=4268.28
8617
EL=4268.22
FORMER CONCRETE
8613
EL=4267.87
N 1,229,465.45
E 808,432.34
2" SEWER LINE
8616
EL=4267.94
8612
EL=4267.85
8611
EL=4267.04
N 1,229,456.82
E 808,419.08
N 1,229,465.18
E 808,413.15
N 1,229,462.32
E 808,371.82
8614
EL=4268.19
8618
EL=4268.44
N 1,229,449.26
E 808,385.19
CONC. BERM
FORMER EVAPORATION POND
CORNER EL=4269.77
20 10 0 20
SCALE IN FEET
BASE MAP SOURCE: LYDICK ENGINEERS & SURVEYORS, 1993, 1995, 1998
SITE SD-11
SAMPLING LOCATION PLAN
CANNON AFB, NEW MEXICO
DRN. BY: BAG
DATE: 12/13/06
PROJECT NO. 16169983
FIG. NO. 5-1
CHK'D. BY:
REVISION: 0
December 21, 2006 11:08:35 a.m.
Drawing: T:\CANNON\16169983\300\FIG5-1.DWG

The scope of the CMI removal action is described in this section of the CMI Work Plan. This section addresses all excavation, verification, backfill, and restoration activities to be completed during the removal activities at Cannon AFB. The activities included in this CMI Work Plan will be completed in accordance with AFCEE guidance and with all current federal, state, and local regulations.

6.1 PRE-MOBILIZATION

6.1.1 Pre-Mobilization Submittals

Pre-mobilization activities for the project include the preparation of the plans specified below, all of which are incorporated into this CMI Work Plan:

- Erosion Control Plan (see **Section 6.2.5**)
- Excavation Plan (see **Section 6.3**)
- Waste Transportation and Disposal Plan (see **Section 7.4**)

This CMI Work Plan is being submitted to AFCEE, Cannon AFB, and NMED for concurrent review and approval. Following approval, URS will mobilize to Cannon AFB.

6.1.2 Personnel Requirements

Prior to mobilizing to the field, all training requirements will be reviewed to ensure URS and its subcontractor personnel have appropriate training, licenses, and experience. The relevant personnel requirements for activities at SD-11 will include the following:

- Workers who may be exposed to contaminated media will have completed 40-hour Hazardous Waste Operations and Emergency Response (HAZWOPER) certification, 8-hour HAZWOPER refresher certification as appropriate, and medical monitoring as set forth in 29 Code of Federal Regulations (CFR) 1910.120. Workers who are not in direct contact with contaminated media will be exempt from this requirement. Exempt workers include landfill transportation truck drivers as long as they are protected from exposure to contaminated media by sealed equipment cabs and do not enter the exclusion zone (EZ) where intrusive site activities will occur.
- All on-site supervisors will have successfully completed the Occupational Safety and Health Administration (OSHA) 8-hour HAZWOPER Supervisor Course.
- All URS and subcontractor heavy equipment operators working at Cannon AFB will meet the minimum requirements set forth in the URS Safety Management Standard (SMS) 019 (included in the HSP as **Attachment 4**). The operator will have documented experience on the equipment being operated and previously evaluated practical skills on the task being performed.

- The URS Site Health and Safety Officer (SHSO) has primary responsibility for monitoring the job site with respect to worker safety and health. The SHSO will monitor and maintain copies of certificates of training, medical surveillance, and respirator fit testing for personnel required to enter contaminated areas on the site. The URS Omaha Health and Safety Manager (HSM) will verify certifications and conduct periodic audits of personnel qualifications. All workers will be required to read and understand this CMI Work Plan, including the HSP (**Appendix A**). In addition, regular safety briefings will be scheduled both before work begins and as work progresses.
- An excavation-competent person will be required if personnel are required to enter an excavated area greater than 4 feet in depth. The excavation-competent person will be on site to monitor and inspect activities to ensure adequate sloping, benching, and/or shoring, and to provide daily inspection documentation. If working conditions are found to be unsanitary, hazardous, or dangerous to employees, then the excavation-competent person has authority to take prompt corrective measures to eliminate the unsatisfactory condition(s).

6.1.3 Pre-Mobilization Meeting

The pre-mobilization meeting will be used to determine the level of resources and oversight required for the project. Other topics will include all pre-mobilization activities discussed above. Site mobilization will not begin until all remaining issues raised in this meeting are resolved. All members of the Cannon AFB project management team (i.e., AFCEE, Cannon AFB, NMED, and URS) will be invited to attend the pre-mobilization meeting.

6.2 MOBILIZATION ACTIVITIES

In addition to the mobilization activities described in **Section 5.2**, several site preparation activities are necessary prior to beginning excavation and confirmation activities. The site preparation activities include identifying the project equipment requirements; defining the construction work area; setting up site controls and access; installing temporary facilities; establishing work zones; clearing for utilities; installing erosion control measures; establishing excavation limits; mobilizing the contractor's equipment, personnel, and supplies; and conducting a pre-construction meeting. The scope of each of these activities is provided below.

6.2.1 Construction Work Area

The construction work area will include the excavation areas, haul routes, equipment and material staging area(s), decontamination area(s), and borrow area(s). URS will take necessary precautions to prevent construction-related disturbance to areas outside of the construction work area. The construction work areas for the project at SD-11 are shown on **Figure 6-1**.

6.2.2 Site Controls and Access

Cannon AFB is a secure facility, so all installation access will be coordinated through the Cannon AFB PM. Because the general base population has access to the vicinity of SD-11, access to the immediate project work area will be restricted by the following security measures:

- Warning signs and/or orange construction safety fencing will be placed along public access routes leading to the work area.
- Open excavations and other potentially dangerous areas will be surrounded by orange construction safety fencing.
- Temporary haul routes that are not in use will be blocked with orange construction safety fencing.
- Entrances to the borrow area(s), staging area(s), and decontamination area(s) will be blocked with orange construction safety fence when not in use.
- Equipment will be parked within designated areas each night, and the keys will be removed.
- Tools will be properly stored, and work areas will be maintained in an organized manner.

6.2.3 Installation of Temporary Facilities

URS will establish designated areas for the installation of temporary facilities prior to the start of investigation and excavation activities at SD-11. Temporary facilities will include a construction office, staging areas for equipment and materials, and decontamination areas. These temporary facilities are described below.

Construction Office

A construction office trailer may be mobilized to the site prior to the start of investigation and excavation activities. If used, it is anticipated that the construction office trailer will be a 30-foot by 12-foot mobile office that will be placed in the paved lot to the west of SD-11. Dumpsters will be provided at the construction office site for the collection of uncontaminated trash and debris.

Staging Areas

One or more equipment/materials staging area(s) will be used for loading and unloading equipment and construction materials. This area is anticipated to be located in the vicinity of SD-11.

Decontamination Areas

All vehicles working in the EZ will require decontamination. During excavation activities, procedures will be implemented to minimize the need for decontamination of transport vehicles and excavation equipment. When possible, excavation equipment and transport vehicles will

operate on clean ground. Transport vehicles will be visually inspected after loading and "dry" decontamination procedures will be implemented if necessary. However, if "wet" decontamination is required, equipment will be cleaned in the designated decontamination area. See **Section 7.4.3** for a full description of dry and wet decontamination procedures.

It is anticipated that one or more decontamination area(s) will be set up at SD-11. Each decontamination area will be lined with plastic, and a bermed perimeter will be constructed using soil, railroad ties, and/or hay bales to contain all liquid and residue arising from cleaning operations. Decontamination area(s) will be constructed with access from the contaminant reduction zone (CRZ), which will be located just north of the excavation area (see **Figure 6-1**).

6.2.4 Utility Clearances

Prior to the start of any intrusive activities, URS will obtain utility clearances in accordance with the procedures described in **Section 5.2.2**.

6.2.5 Erosion Control Plan

In accordance with 40 CFR 122.26(b)(15), coverage under a National Pollutant Discharge Elimination System (NPDES) general construction permit is not required for this project because the total area disturbed will be less than 1 acre. However, temporary erosion control measures will be implemented, as necessary, to minimize erosion and off-site soil migration. URS will install and maintain the temporary erosion control measures.

The temporary erosion control measures may include, but are not limited to:

- Silt fences made of geotextile fabric may be used to reduce the velocity of stormwater runoff in drainage channels. The mesh fabric also filters suspended solids out of the runoff.
- Hay bales may be used to reduce runoff velocities and filter suspended solids. Bales are typically stacked and secured with wooden stakes in swales where runoff concentrates.
- Earthen berms may be used around areas such as soil staging/stockpiling areas or excavation areas to contain runoff and to divert run-on.

Spill Prevention and Management Controls

Best management practices including but not limited to good housekeeping, preventive maintenance, stormwater management, employee awareness training, and visual inspections will be used to control the potential release and off-site migration of contaminants during the excavation, backfill, and restoration activities at SD-11.

6.2.6 Mobilization of Equipment and Manpower

URS will mobilize all labor, materials, and equipment necessary to perform the investigation and excavation activities at SD-11. URS plans to mobilize a combination of the following equipment to assist in drilling and excavation activities:

- Construction office trailer (see **Section 6.2.3**)
- Cellular phones and/or portable communication radios
- First aid supplies/kits, eye wash kits, PPE, fire extinguishers
- Warning signs and/or orange construction safety fencing for placement around open excavations, other potential dangerous areas, or work areas not in use
- Material for erosion and sediment control (i.e., silt fencing, hay bales, and wooden stakes)
- Direct push soil sampling rig and associated tools and sampling equipment
- Excavation equipment (see **Section 6.3.3** for the requirements)
- Site vehicles (i.e., pickup trucks, vans, etc.)
- Waste storage containers (i.e., roll-offs, drums, and, if necessary, portable plastic tanks) to segregate hazardous wastes if encountered (see **Section 7**)
- Portable pressure washer with clean decontamination water tank
- Materials for building decontamination stations (i.e., heavy plastic sheeting , railroad ties or hay bales, and portable steps with handrails for decontaminating excavation equipment/ trucks)
- Pumps and hoses for transferring decontamination or waste water
- Various hand tools

6.2.7 Pre-Construction Meeting

Before construction activities commence, URS will hold a pre-construction meeting. The meeting will be held at least one week before scheduled construction. All necessary documents to be used at the site, including this CMI Work Plan, contracts, certificates, licenses, permits, equipment lists, and reference materials will be reviewed. The meeting will be attended by key project personnel, including the URS PM, Field Manager, SHSO, and subcontractor personnel. AFCEE and Cannon AFB personnel will also be invited to participate. URS will notify Cannon AFB and AFCEE one week in advance of the meeting.

6.3 EXCAVATION PLAN

Excavation activities will be completed to remove soil contaminated with TPH concentrations above 2,350 mg/kg (NMED's TPH Screening Guideline for kerosene and jet fuel under industrial

direct exposure scenarios) (NMED 2005b). It is anticipated that an excavation subcontractor will complete excavation activities.

6.3.1 Excavation Limits

Previous soil sampling results combined with CMI investigation TPH results will be used to delineate the preliminary extent of the excavation at SD-11 (i.e., the area of petroleum-related hydrocarbon concentrations above 2,350 mg/kg). With oversight provided by URS personnel, a professional surveyor licensed in the State of New Mexico will survey the EZ and delineate the excavation limits in accordance with the requirements of **Section 5.7**. Preliminary excavation limits are shown on **Figure 6-1**. These limits will be adjusted based on the results of the CMI investigation.

6.3.2 Required Personnel for Excavation Activities

During excavation activities, URS and excavation subcontractor personnel who may be potentially exposed to contaminated media will, at a minimum, meet the HAZWOPER training requirements outlined in **Section 6.1.2**.

During excavation activities, URS will provide a qualified construction manager to serve as Field Manager, who will be responsible for implementing field QC procedures required during excavation activities.

During excavation activities, URS will provide an excavation-competent person who will inspect excavations for proper safe sloping and/or benching requirements. The excavation-competent person will meet the requirements outlined in **Section 6.1.2**.

The excavation subcontractor will provide experienced heavy equipment operators who will meet the requirements outlined in **Section 6.1.2**.

6.3.3 Excavation Heavy Equipment Requirements

Heavy equipment used during excavation activities, including on-site dump trucks, will be provided by the excavation subcontractor. Transport vehicles used convey contaminated media to the disposal facility will be provided by the transportation and disposal subcontractor. (Note: the excavation subcontractor and the transportation and disposal subcontractor may be one and the same.) Transport vehicles will have all required labeling, licensing (including commercial drivers license [CDL]), and insurance for the off-site transport of all IDW. Anticipated heavy equipment and transport vehicles are described below; however, similar equipment may be substituted:

- Excavator/track hoe
- Front-end loader (rubber tired)
- Two 10-yard dump trucks may be used on site to transfer soil to the temporary stockpile

- Transport vehicles for over-the-road hauling (25- or 30-ton end- or side-dump with tarp coverings)
- Water-tank vehicle for dust control

6.3.4 Establishment of Work Zones

Following the removal of overburden materials (see **Section 6.3.7**), site work zones with definite boundaries will be established to minimize exposure to hazards associated with the excavation activities, and to reduce any migration of contaminants from contaminated area. Work zones will be marked out in accordance with the HSP (**Appendix A**) as EZ, CRZ, and support zone (SZ). These zones will be identified during safety briefings and will be clearly marked using orange construction fencing and cones. It is anticipated that the EZ will include much of the area extending from the east end of the concrete pad (where the former test cell was located) east to the western edge of the evaporation pond (see **Figure 6-1**). The CRZ will be located just north of the excavation area and will include the decontamination area. The SZ is anticipated to be adjacent to and west of the CRZ. The final locations of the EZ, CRZ, and SZ at SD-11 may be adjusted based on excavation limits and field conditions.

6.3.5 Clearing and Grubbing

All areas within SD-11 are mostly accessible; however, minimal clearing and grubbing activities may be required. It is anticipated that only herbaceous vegetation (no trees or shrubs) removal will be required in the excavation areas and borrow areas.

6.3.6 Excavation Area Traffic Control

Before the start of excavation activities, transportation roads or haul routes for transport vehicles will be established and marked. Haul routes are discussed and presented in **Section 7**.

All vehicle traffic will use, to the extent possible, existing asphalt roads located in the vicinity of SD-11. This will help limit the amount of vehicle decontamination required and reduce the need for erosion controls. Coordination of field activities and traffic control measures will be confirmed each day at the morning safety meetings. It is anticipated vehicles will enter the site from the east and will follow a counter clockwise path around the site.

6.3.7 Excavation, Material Handling, and Segregation

The excavation activities will be completed in a manner that will minimize the number of times the excavated material is handled. However, since the disposal facility is anticipated to be relatively far from Cannon AFB (greater than 20 miles), it will be more efficient to load the excavated material into on-site trucks and transport it to the temporary stockpile area until sufficient volume is accumulated to warrant off-site transport. All on-site stockpiles of excavated materials will be covered with plastic sheeting to minimize dust, run off and contaminant migration. From this stockpile area, the contaminated material will be loaded into

transport vehicles and transferred to the disposal facility. The disposal facility will be either a landfill or a land treatment facility licensed to accept TPH-containing wastes.

All excavation activities will be completed in a manner that minimizes the risk of accidental release to the environment, minimizes unsafe worker conditions, and minimizes complications and delays to the project implementation. First, approximately 10 vertical feet of overburden will be removed from the excavation area. Areas within the lower portion of this overburden that contain TPH concentrations greater than 2,350 mg/kg will be delineated based on sampling results, segregated, and handled as contaminated media.

The lower extent of the excavation, which may extend up to 30 feet bgs in total depth (i.e., 20 feet below the limit of the overburden removal), will then be completed. Excavated materials will be added to the temporary stockpiles until sufficient material is available for loading transport vehicles or until all excavation activities are complete. Transport vehicles will be loaded in the asphalt-paved area located to the northwest of the site using a front-end loader; all transport vehicles will be decontaminated prior to departure from the site.

The excavation will be backfilled with the stockpiled overburden material. This will be supplemented with locally provided, clean borrow material.

After excavation activities are completed and contaminated materials have been removed from the temporary stockpile area, the ground surface underlying the contaminated materials stockpile area will be over-excavated approximately 6 inches to remove any contaminated media that may remain.

6.3.8 Dust Control

If dust becomes a problem during excavation activities (e.g., sustained visible dust on-site or leaving the site), then dust control measures, such as spraying water, will be implemented at the source of the dust. All haul roads and temporary access roads within the work area will be maintained to reduce dust that may cause federal, state, or local air pollution standards to be exceeded or that may cause hazard conditions (e.g., reduced visibility) or other nuisance.

When temporary stockpiling is required, the stockpiles will be covered with plastic sheeting or tarps to reduce wind dispersion as well as erosion and migration potential. Stockpiles will be covered at the end of each work day or upon completion of the stockpiling activities.

6.3.9 Other Excavation Activities

Other excavation activities including waste management, transportation, and disposal will be completed as part of the excavation operations. These activities are detailed in the Waste Management, Transportation, and Disposal Plan (**Section 7**) and are briefly summarized below.

All excavated materials requiring off-site disposal will be transported to the disposal facility for treatment and/or disposal. The transport and disposal subcontractor will provide transport

vehicles that are properly labeled, licensed, and insured, for the transportation of contaminated materials. Additional transportation and disposal requirements and procedures are provided in the Waste Management, Transportation, and Disposal Plan (**Section 7**).

In addition, field documentation will be completed in accordance with **Section 5.4.1** to ensure that all excavation activities are adequately documented.

6.4 EXCAVATION CONFIRMATORY SAMPLING AND ANALYSIS

It is anticipated that the CMI investigation results will be used to delineate the extent of the excavation and will serve as the confirmatory sampling results for the excavation. However, if the CMI investigation results indicate that a horizontal expansion of the excavation limits beyond the outermost CMI sampling locations is warranted (i.e., the extent of TPH results greater than 2,350 mg/kg has not been defined horizontally), confirmatory samples may be collected from the wall(s) of the completed excavation in the area of the expansion. In this case, the bucket of the excavator will be used to collected the sample(s) from the wall(s) of the excavation. Samples will be collected, managed, and handled in accordance with **Sections 5.3.1 and 5.4**. The area represented by the sample(s) will be clearly delineated and backfilled pending the analytical results. If the results indicate that horizontal expansion of the excavation is warranted, a new cell or series of cells will be excavated in the appropriate direction until field observations (i.e., visual evidence, PID readings, etc.) indicate that contaminated soils have been removed, and the sampling, delineation, and backfill process will be repeated.

6.5 BACKFILL AND RESTORATION

The excavation will likely be backfilled sequentially as the excavation progresses. Initially, the stockpiled overburden soils will be used to backfill the excavation, but these soils will be supplemented by locally provided, clean borrow material.

The fill material will be placed in loose lifts no more than 12 inches in thickness. The backfill material will be compacted to at least 80 to 85 percent modified compaction as determined by American Society for Testing and Materials (ASTM) D1557-02e1 Standard Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (ASTM 2002). Each lift will be compacted to 80 to 85 percent before the overlaying lift is placed.

To ensure placement of materials is within the limits of specified densities, URS will adequately control compaction operations by tests made in accordance with ASTM D2937-04, Standard Test Method for Density of Soil in Place by the Drive-Cylinder Method (ASTM 2004). One test will be made for each 1,000 cubic yards (cy) of placed material. A minimum of one test will be completed if less than 1,000 cy require placement. Tests will be completed in areas that do not require personnel to enter the excavation.

The excavation area will be uniformly graded. The finished surface will be reasonably smooth, compacted, and free from irregular surface changes. The degree of finish will be that ordinarily obtainable from a blade-grader. The final grades will provide positive drainage of surface water across the entire site, with no closed drainage areas that allow surface water to pond, and will match the surrounding surface contours.

6.5.1 Restoration

URS will remove all equipment and leftover construction materials from SD-11 at the time of demobilization. URS will also remove all temporary erosion control measures after final grading has been completed.

6.6 PRE-FINAL AND FINAL INSPECTION

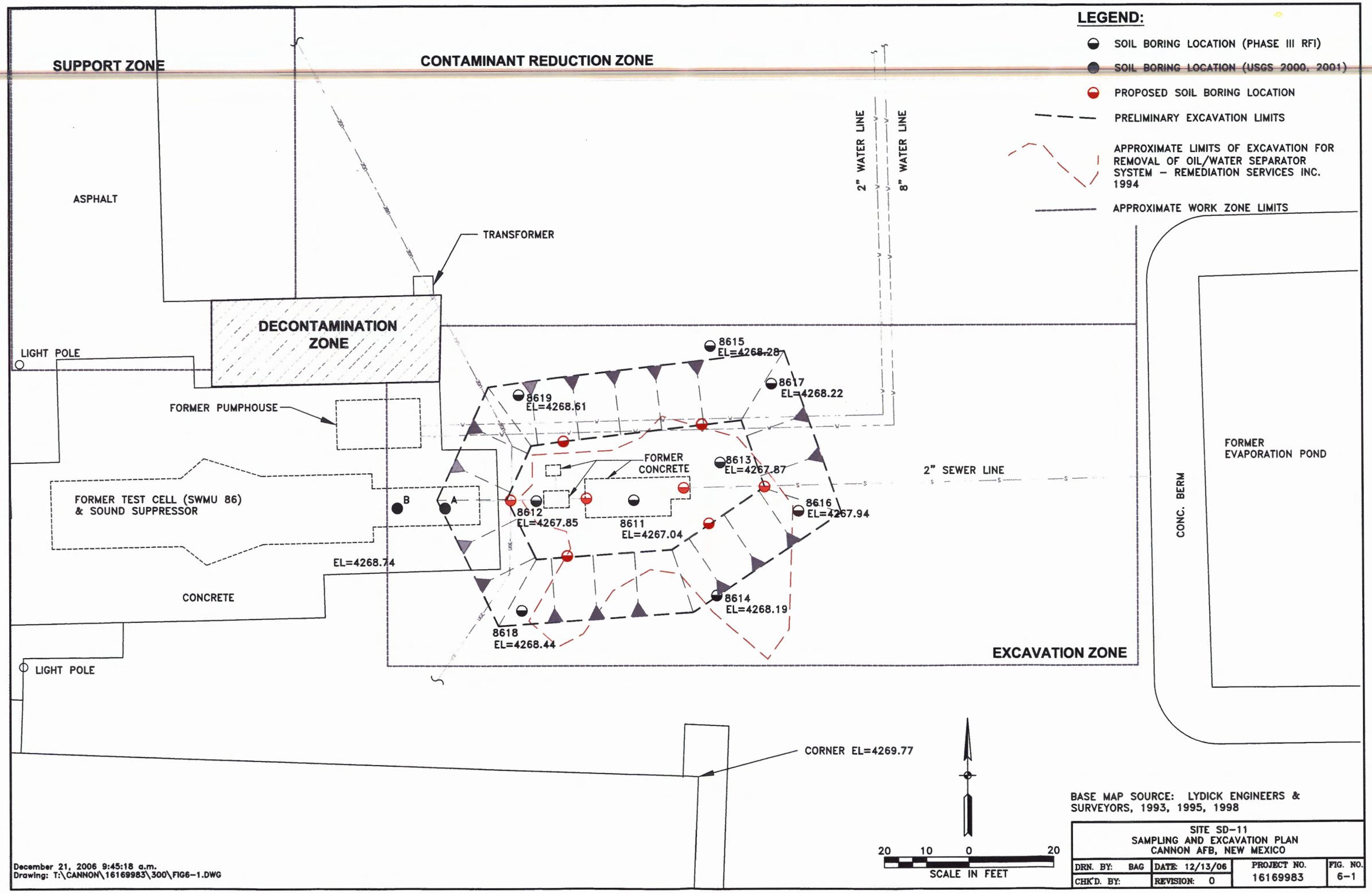
URS will arrange for a pre-final and final inspections of excavation area. The pre-final inspection will take place immediately after final grading. The pre-final inspection is likely to involve Cannon AFB project team members (i.e., AFCEE, Cannon AFB, URS, and NMED) to verify that the completed work conforms to contract requirements. URS will prepare written documentation of compliance with the CMI Work Plan. Any items found to be incomplete during the pre-final inspection site visit will be documented on a punch list prepared by AFCEE. URS will have one month to complete all punch list items.

A final inspection of excavation area will take place the punch list items have been completed. URS will provide written documentation that all punch list items have been corrected.

6.7 DEMOBILIZATION

Demobilization activities will include but will not be limited to the following:

- Support facilities will be removed.
- Temporary stormwater and erosion control measures will be removed.
- Any temporary construction roads, ramps, and decontamination facilities will be removed.
- Any temporary utilities will be disconnected and removed.
- Any permanent fences will be inspected, and any damage will be repaired.
- All unnecessary locks will be removed.


LEGEND:
SOIL BORING LOCATION (PHASE III RFI)
SOIL BORING LOCATION (USGS 2000, 2001)
PROPOSED SOIL BORING LOCATION
PRELIMINARY EXCAVATION LIMITS
APPROXIMATE LIMITS OF EXCAVATION FOR REMOVAL OF OIL/WATER SEPARATOR SYSTEM – REMEDIATION SERVICES INC. 1994
APPROXIMATE WORK ZONE LIMITS
SUPPORT ZONE
CONTAMINANT REDUCTION ZONE
ASPHALT
TRANSFORMER
DECONTAMINATION ZONE
LIGHT POLE
FORMER PUMPHOUSE
FORMER TEST CELL (SWMU 86) & SOUND SUPPRESSOR
B
A
EL=4268.74
CONCRETE
LIGHT POLE
2" WATER LINE
8" WATER LINE
8615 EL=4268.28
8617 EL=4268.22
8619 EL=4268.61
FORMER CONCRETE
8613 EL=4267.87
2" SEWER LINE
8616 EL=4267.94
8612 EL=4267.85
8611 EL=4267.04
8614 EL=4268.19
8618 EL=4268.44
EXCAVATION ZONE
CONC. BERM
FORMER EVAPORATION POND
CORNER EL=4269.77
20 10 0 20
SCALE IN FEET
BASE MAP SOURCE: LYDICK ENGINEERS & SURVEYORS, 1993, 1995, 1998
SITE SD-11
SAMPLING AND EXCAVATION PLAN
CANNON AFB, NEW MEXICO
DRN. BY: BAG
DATE: 12/13/06
PROJECT NO. 16169983
FIG. NO. 6-1
CHK'D. BY:
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December 21, 2006 9:45:18 a.m.
Drawing: T:\CANNON\16169983\300\FIG6-1.DWG

This section addresses procedures to be used to characterize wastes, stage waste materials while awaiting disposal, and transport and dispose of the wastes from SD-11 at Cannon AFB.

7.1 ANTICIPATED WASTES AND MANAGEMENT PROCEDURES

7.1.1 Excavated Media

Excavated media will be managed as described in **Section 6**.

7.1.2 Storm Water

Any stormwater collected during excavation activities where soil contamination exceeds corrective measure levels will be presumed to be contaminated at levels that will exceed discharge criteria until sampling results demonstrate otherwise. Submersible pumps will be used to remove accumulated stormwater from the excavation. The stormwater will be pumped into polyethylene tanks and sampled. If sampling results demonstrate that no discharge criteria are exceeded, the water will be discharged to the stormwater conveyance system. Otherwise, arrangements for pre-treatment will be made.

7.1.3 Decontamination Water

Following excavation equipment (e.g., excavator, front end loader, on-site trucks) decontamination, contained fluids will be pumped to a polyethylene holding tank to allow sediments to settle out, and then the fluids will be sampled. If sampling results demonstrate that no discharge criteria are exceeded, the water will be discharged to the stormwater conveyance system. Otherwise, arrangements for pre-treatment will be made. Remaining sediments will be containerized and sent to the disposal facility.

7.1.4 Miscellaneous Waste

Miscellaneous nonhazardous solid wastes such as trash, used and decontaminated PPE, and miscellaneous office waste will be containerized in dumpsters. Such wastes will be picked up by a subcontracted local waste collector and sent to a state-approved solid waste landfill.

Polyethylene tanks used for storage of contaminated stormwater, groundwater, or decontamination water will be cleaned at the designated decontamination pad. After being emptied of water and sediments, the internal surfaces will be rinsed with clean water. If necessary, tanks may be steam cleaned. Rinse water will be sampled, and if sampling results demonstrate that no discharge criteria are exceeded, the water will be discharged to the stormwater conveyance system. Otherwise, arrangements for pre-treatment will be made. Remaining sediments will be containerized and sent to the disposal facility.

Upon conclusion of all field activities, any temporary decontamination areas will be removed and the site restored to its original condition.

7.2 WASTE CHARACTERIZATION SAMPLING

One composite characterization soil sample will be collected from a representative volume of contaminated media and submitted for chemical analysis. The composite sample will be analyzed for the characteristics of ignitability (40 CFR 261.21), corrosivity (40 CFR 261.22), and toxicity (40 CFR 261.24), and additional characterization analyses will be completed based on the disposal facility's requirements. Characterization sample results will be submitted to the disposal facility for approval prior to beginning transportation and disposal activities.

If visual observation or other evidence indicates that the media may no longer be represented by the previous characterization samples collected (i.e., a change in the waste stream), then additional characterization samples may be required.

7.3 WASTE STORAGE

Excavated media may be temporarily stored in stockpiles at SD-11, near the excavation. If drums, roll-off containers, or polypropylene water tanks are required for material storage (contaminated media, PPE, decontamination water, etc.), then these containers will be stored within the CRZ, near the decontamination area. It is anticipated that no other waste storage will be required during excavation activities.

7.4 WASTE TRANSPORTATION AND DISPOSAL PLAN

Waste transportation and disposal will be completed by the transportation and disposal subcontractor in accordance with the requirements of the CMI Work Plan and federal, state, and local regulations. Prior to starting removal activities, an orientation meeting will be conducted by the Field Manager with all concerned parties to ensure a clear understanding of the transportation and disposal requirements.

7.4.1 Transport Vehicle Requirements

When transporting contaminated media, transport vehicles will be fitted with a tarp or other covering device to prevent wind dispersal of material during transport. To prevent material from spilling from the vehicle, each vehicle will be inspected prior to departure from the site to ensure the material is properly sealed in the vehicle. This will include inspecting around the end-dump gates, belly dump openings, and inspecting the tarp or other covering.

Proper vehicle decontamination procedures will also be followed (see **Section 7.4.3**). Excavated soils will be transported via predetermined haul routes (see **Section 7.4.2**).

7.4.2 Transportation Routes

A preliminary haul route is shown in **Figure 7-1**. The haul route will be approved by Cannon AFB and AFCEE prior to the start of field activities. The haul route will be specified on maps

provided to all equipment operators and truck drivers. Maintenance of the route on Cannon AFB property will be the responsibility of URS throughout the duration of the project. Once the transport vehicles leave Cannon AFB, any spills that occur during transportation will be the responsibility of the transportation subcontractor and will be cleaned up immediately. Haul routes will be maintained during the life of the project and will be restored to their pre-project condition upon completion of field activities.

7.4.3 Excavation Equipment and Transport Vehicle Decontamination

During soil transportation activities, procedures will be implemented to minimize the need for decontamination of excavation equipment and transport vehicles. It is anticipated that all transport vehicle traffic will use, to the extent possible, existing asphalt roads leading to and from SD-11. This will limit the amount of transport vehicle decontamination required. URS personnel will visually inspect transport vehicles after loading, and decontamination procedures will be implemented if necessary.

Dry Decontamination

Prior to leaving the site, each loaded transport vehicles will be "dry" decontaminated to remove visible soil accumulation from the vehicle body and undercarriage so no soil is tracked onto the roadways. To accommodate this, temporary dry decontamination pads will be constructed at the individual sites that require vehicle decontamination. Each pad will be contained in the CRZ, adjacent to the EZ. Dry decontamination may include the use of a broom and scraping device to remove visible contamination. Contaminated material removed from vehicles will be swept up and placed into the transport vehicle.

Wet Decontamination

If transport vehicles become caked with excessive contaminated soil, then a "wet" method of decontamination may be employed. Wet decontamination will include the use of a high-pressure washer and may include the use of stiff-bristled brushes. Personnel performing wet decontamination will don the appropriate PPE (Tyvek®, gloves, goggles, etc.), as specified in the HSP (**Appendix A**). It is anticipated that transport vehicle tires will be the only portion of the vehicle that may require wet decontamination.

In conjunction with site demobilization and following completion of excavation activities, a final wet decontamination of the excavation equipment and transport vehicles will be performed. The excavation subcontractor will complete final decontamination of excavation equipment. URS will inspect and certify all excavation equipment as being clean on exterior surfaces prior to demobilization from the site. The transport and disposal subcontractor will complete the final decontamination of the transport vehicles at the landfill.

7.4.4 Disposal

Prior to transportation and off-site disposal, characterization sampling will be required to verify that the contaminated media sent for disposal meets the landfill's criteria (see **Section 7.2**). Proper documentation (see **Section 7.5**) will accompany each load of contaminated media in accordance with project requirements and federal, state, and local regulations.

7.5 DOCUMENTATION

It is anticipated that the contaminated media will be nonhazardous but will be considered a special waste. Information describing how contaminated media is properly documented for transportation and disposal is presented below.

7.5.1 Analytical Data Package

An analytical data package documenting the results of the waste characterization sampling (described in **Section 7.2**) will be submitted to the disposal facility for approval prior to the start of transportation and disposal activities. The analytical data package will include sample identification records, analytical data, CoC documentation, and QA/QC records. If there is a significant change in the waste stream, then additional characterization sampling will be completed.

7.5.2 Waste Shipment Record

A Waste Shipment Record will be required for transportation of contaminated media to the disposal facility. The purpose of the Waste Shipment Record is to manifest the contaminated media and to certify that the proper transportation procedures are followed.

The Waste Shipment Record will also include the names of the transporter, generator, and landfill, and will include waste type, container type, and an estimate of the volume of material transported. The Waste Shipment Record will include the signature of the Field Manager. A completed Waste Shipment Record will accompany each load of contaminated media being transported to the disposal facility. Each Waste Shipment Record will be signed by the person at the landfill who is responsible for certifying the receipt and proper disposal of the waste.

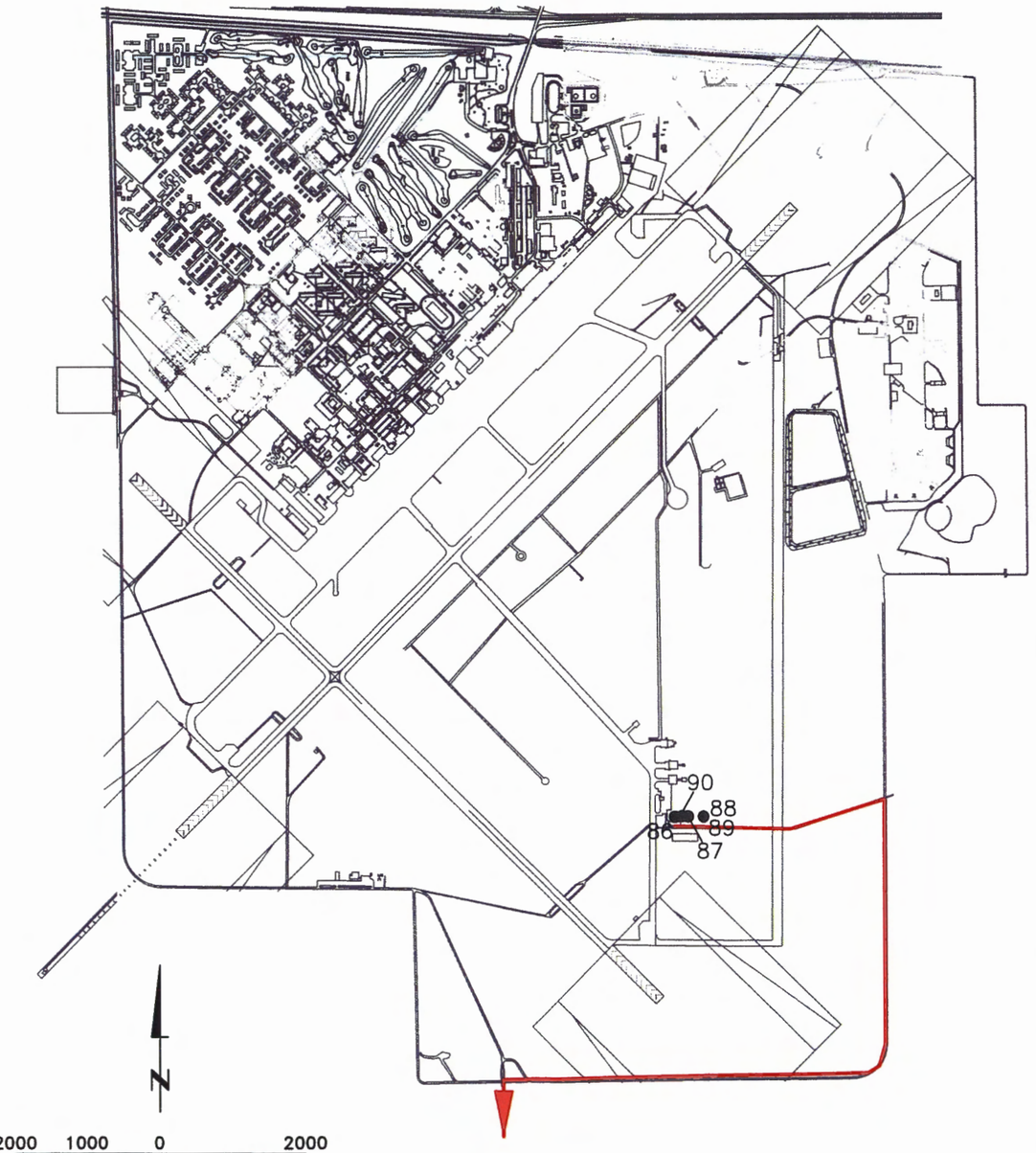
7.5.3 Additional Recordkeeping Requirements

Each load of contaminated media transported off-site will be recorded by the Field Manager and documented. Copies of the completed Waste Shipment Records will be retained by URS. URS will also maintain copies of the weight tickets provided by the disposal facility. Weight ticket information will be summarized in a spreadsheet which will be updated daily during transportation and disposal activities.

LEGEND

86 ● SOILD WASTE MANAGEMENT UNIT (SWMU) LOCATION AND NUMBER

SWMU No.	DESIGNATED AREA
86	SD-11 ENGINE TEST CELL
87	SD-11 FORMER OVERFLOW PIT
88	SD-11 FORMER LEACHING FIELD
89	SD-11 EVAPORATION POND
90	SD-11 OIL/WATER SEPARATOR No. 5114



2000 1000 0 2000

SCALE IN FEET

HAUL ROUTE

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Drawing: T:\CANNON\16169983\300\FIG7-1.DWG

DRN. BY: BAG	DATE: 12/13/06	HAUL ROUTE LOCATION PLAN CANNON AIR FORCE BASE CLOVIS, NEW MEXICO	PROJECT NO.	FIG. NO.
CHK'D. BY:	REVISION: 0		16169983	7-1

8.1 PROJECT MONITORING

The CMI project will be monitored continuously through a variety of mechanisms. URS will maintain open lines of communication with AFCEE to report progress and to quickly and accurately respond to items requiring clarification. URS will prepare regular field progress reports, supplemented with periodic photographic documentation, to document the project status. The field progress reports will identify all testing and other QC activities that occurred during the reporting period, along with the QC test results. Examples include sample collection and CoC forms, laboratory test reports, survey data, and disposal records.

The field progress reports, with attachments, will provide a complete record of all activities completed during the CMI and will be sufficiently detailed to re-create each sampling, analytical testing, and monitoring event. The field progress reports will be made available to the government upon request and will form the basis for the CMI site closure report.

8.2 PROJECT MODIFICATIONS

Some modifications to the project may become necessary as the CMI progresses. Project modifications may include those that enhance efficiency, improve constructability, or those that respond to changing field conditions, weather, or sampling results. Procedures for project modifications will depend on the significance and magnitude of the changes.

Modifications to performance standards or modifications that may impact the overall project objective cannot be made without the written agreement of the AFCEE PM. Minor modifications that relate to the ease of construction, without jeopardizing the performance of the CMI, may be made with notification to the AFCEE PM. Examples of minor modifications include:

- Temporary erosion-control features
- Material-handling procedures
- Sequencing of removal activities for efficiency

Minor modifications shall be communicated to the AFCEE PM as part of general communication practices implemented throughout the project. All other modifications will be made only after URS receives written approval from the AFCEE PM. All modifications will be identified and documented in the site closure report.

8.3 SITE CLOSURE REPORT

Regardless of whether a CMI investigation and/or construction activities were required, a site closure report will be prepared to document all work completed for Site SD-11. The site closure report will be prepared to meet the requirements of both a final report and a closure report. It will summarize all CMI project activities, including fieldwork, and will explain why the site

should warrant NFA status. It will also include other pertinent information necessary to accurately describe and re-create all CMI activities. URS will include a statement in the report certifying that all work was completed in accordance with the CMI Work Plan (as modified, if applicable).

The site closure report will include the following, as applicable:

8.3.1 Analytical Data Management Report

If a CMI investigation or CMI construction activities are completed at Site SD-11, an analytical data management report will be prepared to summarize the analytical results and present the sampling documentation and laboratory reports from the investigative and post-excavation sampling. This report will document that all laboratory deliverables are complete and adequate to support the quality and usability of the data.

8.3.2 Hazardous Material and/or Hazardous Waste Disposal Report

If hazardous waste generated during the CMI investigation or the CMI construction activities requires disposal, the quantities of material removed, the disposition location(s), and the manifests and/or other disposal documentation will be presented in a hazardous material and/or hazardous waste disposal report.

8.3.3 Hazardous Materials Survey Report

If hazardous waste is encountered during the CMI construction activities, its locations on the site prior to removal will be surveyed and documented in a hazardous materials survey report.

8.3.4 Master Document List

An MDL will be prepared to summarize all CMI project documents submitted.

8.3.5 Digital photographs

Digital photographs will be taken to document any fieldwork completed. Photographs, with descriptions, will be included as a component of the site closure report in both color hard copy and JPEG formats.

8.3.6 CAD Drawings

During any fieldwork, URS will maintain one set of CAD drawings at the site on which any scope of work changes will be shown. These drawings will be kept current on a daily basis as work progresses. The following items are examples of the types of changes that may occur and that must be recorded:

- Changes in limits/extent of removal (if any)

- Additions to project activities
- Elimination of a project component
- Unforeseen modifications made necessary by requirements of the work

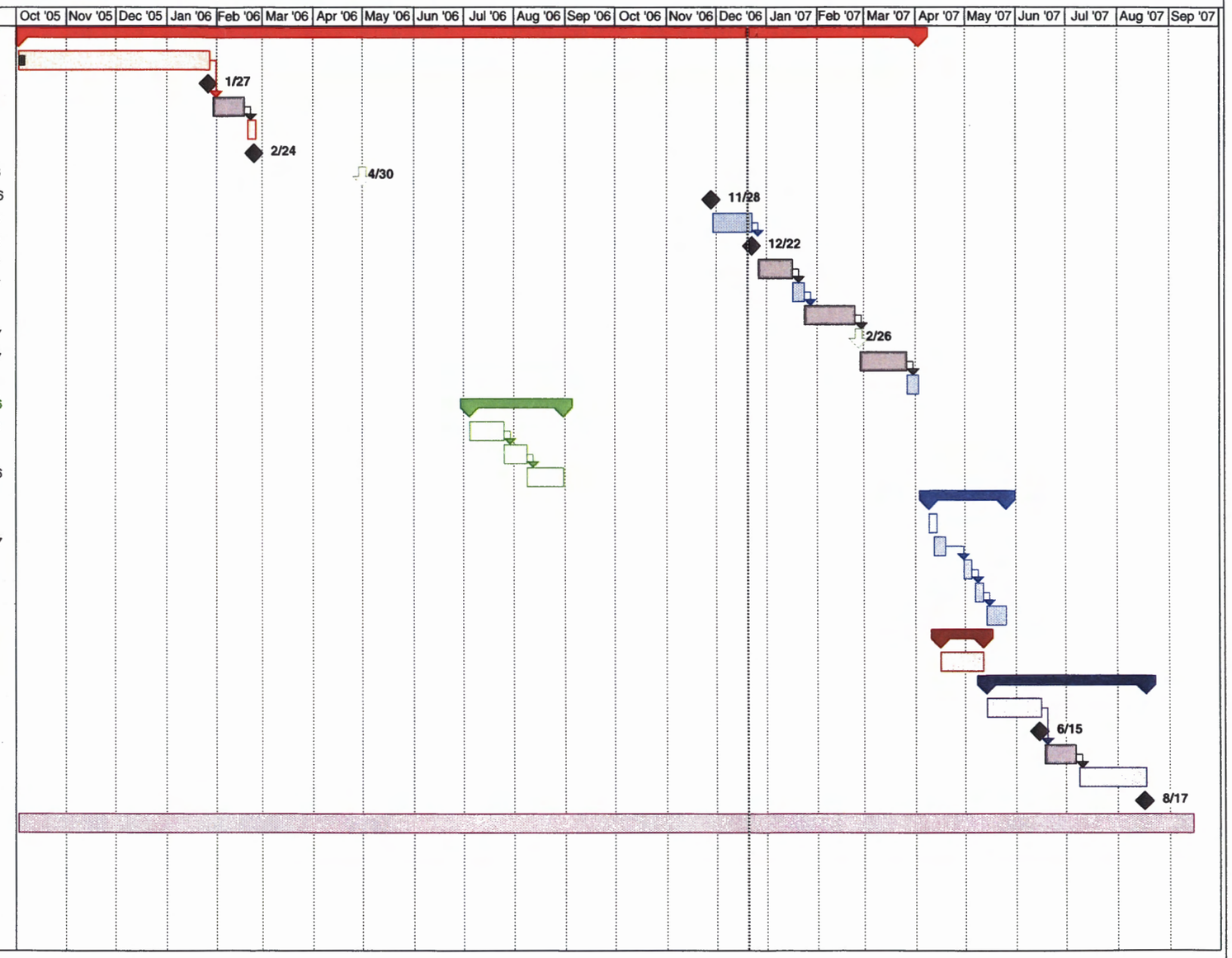
URS will include electronically updated versions of the CAD drawings as a component of the site closure report.

A modified project schedule is included as **Figure 9-1**. The schedule is based on the assumption that NMED's concurrence with the CMI investigation scope of work will be obtained within one month of this Work Plan's submittal, and it accounts for both CMI investigation and CMI removal action activities.

- Reason for the modification: Cannon AFB did not receive the most recent, official communication from NMED regarding Site SD-11 until 28 November 2006 (NMED 2006).
- Descriptions of the alternatives evaluated to increase productivity: This CMI Work Plan has scheduled the investigation phase to be followed immediately by the removal action phase in a single field effort with a single mobilization.
- Methods that will be used to prevent similar delays: Efforts will be made to increase and improve communications with NMED.

FIGURE 9-1
PROJECT SCHEDULE
CORRECTIVE MEASURES IMPLEMENTATION AT SITE SD-11
CANNON AFB, NEW MEXICO

ID	Task Name	Duration	Start	Finish
1	**PLANNING**	**392 days**	**Mon 10/3/05**	**Mon 4/2/07**
2	Prepare Draft Corrective Measures Implementation (CMI) Work Plan	85 days	Mon 10/3/05	Fri 1/27/06
3	Submit Draft CMI Work Plan	0 days	Fri 1/27/06	Fri 1/27/06
4	Review and Comment	15 days	Mon 1/30/06	Fri 2/17/06
5	Prepare Final CMI Work Plan	5 days	Mon 2/20/06	Fri 2/24/06
6	Submit Final CMI Work Plan	0 days	Fri 2/24/06	Fri 2/24/06
7	Note: NMED CMI Work Plan Deadline	0 days	Sun 4/30/06	Sun 4/30/06
8	Received Letter from NMED regarding Final CMI Work Plan	0 days	Tue 11/28/06	Tue 11/28/06
9	Prepare Final CMI Work Plan, Revision 1	18 days	Wed 11/29/06	Fri 12/22/06
10	Submit Final CMI Work Plan, Revision 1	0 days	Fri 12/22/06	Fri 12/22/06
11	Review and Comment	15 days	Wed 12/27/06	Tue 1/16/07
12	Update CMI Work Plan, Revision 1	5 days	Wed 1/17/07	Tue 1/23/07
13	Review and Approval	23 days	Wed 1/24/07	Fri 2/23/07
14	Note: NMED CMI Work, Revision 1 Plan Deadline	0 days	Mon 2/26/07	Mon 2/26/07
15	Review and Comment	20 days	Tue 2/27/07	Mon 3/26/07
16	Prepare Final CMI Work Plan, Revision 2	5 days	Tue 3/27/07	Mon 4/2/07
17	**REEVALUATION OF PREVIOUS ANALYTICAL RESULTS**	**41 days**	**Wed 7/5/06**	**Wed 8/30/06**
18	Review Existing Data	15 days	Wed 7/5/06	Tue 7/25/06
19	Calculate Site-Specific Screening Levels	10 days	Wed 7/26/06	Tue 8/8/06
20	Identify Data Gaps and Scope CMI Field Investigation	16 days	Wed 8/9/06	Wed 8/30/06
21	**CMI FIELD INVESTIGATION**	**35 days**	**Mon 4/9/07**	**Fri 5/25/07**
22	Collect Samples	5 days	Mon 4/9/07	Fri 4/13/07
23	Receive analytical results from 48-hour TPH-DRO samples	5 days	Thu 4/12/07	Wed 4/18/07
24	Validate and Review New Data	5 days	Mon 4/30/07	Fri 5/4/07
25	Screen New Data	5 days	Mon 5/7/07	Fri 5/11/07
26	Delineate Extent of CMI Construction Activities	10 days	Mon 5/14/07	Fri 5/25/07
27	**CMI CONSTRUCTION ACTIVITIES**	**20 days**	**Mon 4/16/07**	**Fri 5/11/07**
28	Complete Excavation and Disposal Activities	20 days	Mon 4/16/07	Fri 5/11/07
29	**SITE CLOSURE REPORT**	**70 days**	**Mon 5/14/07**	**Fri 8/17/07**
30	Prepare Draft Site Closure Report	25 days	Mon 5/14/07	Fri 6/15/07
31	Submit Draft Site Closure Report	0 days	Fri 6/15/07	Fri 6/15/07
32	Review and Comment	15 days	Mon 6/18/07	Fri 7/6/07
33	Prepare Final Site Closure Report	30 days	Mon 7/9/07	Fri 8/17/07
34	Submit Final Site Closure Report	0 days	Fri 8/17/07	Fri 8/17/07
35	**PROJECT MANAGEMENT**	**511 days**	**Mon 10/3/05**	**Fri 9/14/07**



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FINAL—REVISION 1

SITE SD-11
HEALTH AND SAFETY PLAN
CANNON AIR FORCE BASE, NEW MEXICO

AFCEE Contract No. FA8903-04-D-8679
Task Order No. 0049

Project No. CZQZ20057001

Prepared for:

United States Air Combat Command

Cannon Air Force Base, New Mexico

Under contract to:

Headquarters Air Force Center for Environmental Excellence
3300 Sidney Brooks
Brooks City-Base, TX 78235-5112

20 December 2006

URS

URS GROUP, INC.
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HEALTH AND SAFETY PLAN

CMI AT SD-11 – CANNON AIR FORCE BASE

APPROVALS:

Jeff Voelker, URS Project Manager (PM) — Date: 8/30/06

Jeff Hopkins, URS Health and Safety Manager — Date: 8/30/06

Dennis Day, Certified Industrial Hygienist (CIH), URS Regional Health and Safety Manager (RHSM) — Date: 8/30/06

This health and safety plan (HSP) is valid for the SD-11 Corrective Measures Implementation (CMI) activities completed by URS and its subcontractors at Cannon Air Force Base. This HSP must be used in conjunction with any subsequent CMI-related HSP Addenda. Each CMI-related HSP Addendum must include an approval page signed and dated by the URS Project Manager and Certified Industrial Hygienist. **A copy of this plan and any CMI-related HSP Addenda are to be maintained at the site at all times during fieldwork.**

Disclaimer:

This Health and Safety Plan, and each of its provisions, is applicable only to, and for use only by, URS Group, Inc., its affiliates, and its subcontractors. Any use of this Plan by other parties, including, without limitation, third party contractors on projects where URS is providing engineering, construction management or similar services, without the express written permission of URS, will be at that party's sole risk, and URS Group, Inc. shall have no responsibility therefore. The existence and use of this Plan by URS shall not be deemed an admission or evidence of any acceptance of any safety responsibility by URS for other parties unless such responsibility is expressly assumed in writing by URS in a specific project contract.

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Acronyms and Abbreviations

AFB	Air Force Base
AFCEE	Air Force Center for Environmental Excellence
CFR	Code of Federal Regulations
CMI	Corrective Measures Implementation
COR	Contracting Officer's Representative
CPR	cardiopulmonary resuscitation
dBA	decibel(s)
DOT	Department of Transportation
eV	electron volt(s0
HSM	Health and Safety Manager
HSP	Health and Safety Plan
kV	kilovolt
MSDS	material safety data sheet
msl	mean sea level
PID	photoionization detectors
PPE	personal protective equipment
ppm	parts per million
RHSM	Regional Health and Safety Manager
SMS	Safety Management Standard
SSO	Site Safety Officer
SWMU	Solid Waste Management Unit

This document presents the project Health and Safety Plan (HSP) for the Corrective Measures Implementation (CMI), which will include the identification and potential removal of contaminated media from Site SD-11 (Solid Waste Management Units [SWMUs] 86 through 90) at Cannon Air Force Base (AFB), New Mexico.

This HSP establishes guidelines and requirements for the safety of field personnel during the planned field activities. The specific activities addressed by this plan are defined in Section 1.2. All employees and subcontractors of URS involved in this project are required to abide by the provisions of this plan. They are required to read this plan and sign the Compliance Agreement Form (Attachment 2) prior to commencement of work activities.

The health and safety guidelines and requirements presented are based on a review of available information and an evaluation of potential hazards. This plan outlines the health and safety procedures and equipment required for activities at this site to minimize the potential for exposures of field personnel. This plan may be modified by the URS Project Manager with the approval of the URS Omaha Health and Safety Manager (HSM) or the URS Regional Health and Safety Manager (RHSM).

1.1 BACKGROUND

Site SD-11 occupies approximately 1.1 acres located about 5,000 feet east and 2,000 feet south of the intersection of the two main runways at Cannon AFB. The site consists of five SWMUs: a former engine test cell (SWMU 86), a former overflow pit (SWMU 87), a former leach field (SWMU 88), which was later converted to an evaporation pond (SWMU 89), and a former oil/water separator and associated 100-gallon collection tank (SWMU 90).

The former engine test cell was enclosed by a 50-foot by 10-foot building resting on a concrete slab. Both the test cell structure and a small, associated pumphouse building have been removed, leaving only a bare concrete slab. The oil/water separator system has also been removed. Asphalt, gravel, and weeds cover most of the area surrounding the former engine test cell. Topography is generally flat with an approximate elevation of 4,268 feet above mean sea level (msl).

The site geology, and groundwater, site history, previous site investigations and corrective measure objectives are described in the CMI Work Plan, Sections 2.2 through 2.5.

1.2 ACTIVITIES

Activities covered by this work plan include field investigations are listed below and a summary hazards analysis is presented in Table 1. The activities to be included in the corrective measure implementation, if required will be included in an addendum to this Health and Safety Plan.

Activities included as a part of this Remedial Investigation include:

1. Mobilization
2. Surveying and Inspection
3. Soil Boring/Direct Push
4. Excavation
5. Demobilization

Table 1
Hazard Analysis

	Task	1.	2.	3.	4.	5.
Hazards	**Heat/Cold Stress**	Low	Low	Low	Low	Low
	Slips/Trips/Falls	Low	Low	Low	Low	Low
	Chemical	Low	Low	Med	Med	Low
	Hazardous Waste	Low	Low	Med	Med	Low
	Vehicle Traffic	Low	Low	Low	Low	Low
	Buried Utilities	Low	n/a	Low	Low	Low
	Overhead Utilities	Low	n/a	Low	Low	Low
	Noise	Low	n/a	High	High	Low
	Heavy Equipment	Low	n/a	High	High	Low
	Working Over Water	n/a	n/a	n/a	n/a	n/a
	Confined Space	n/a	n/a	n/a	n/a	n/a

High - Exposure likely more than 50% of the time
Med - Exposure likely 10 to 50% of the time
Low - Exposure likely less than 10% of the time
n/a – Exposure not anticipated

Additional information concerning project hazards and their control can be found in Section 5.0 and in Activity Hazard Analysis found in Attachment 1.

2.1 PROJECT ORGANIZATION

The organizational structure and responsibilities of key personnel are designed to assure adequate protection of the health and safety of the on-site personnel from potential hazards during the field activities. Health and safety responsibilities and authorities are detailed in this HSP.

For each phase of work, URS will assign a site safety officer (SSO) whose responsibilities will include evaluation of health and safety procedures and monitoring during all intrusive activities. Air Force Center for Environmental Excellence (AFCEE) will review all health and safety procedures.

2.2 KEY PERSONNEL

The following key personnel have been identified for the implementation of this HSP.

AFCEE Contracting Officer's Representative (COR):	Julio Roldan, (210) 536-6375
Cannon AFB Project Manager:	Kristi Doll, (505) 784-1098
URS Project Manager:	Jeff Voelker, (402) 952-2558
URS Regional Health and Safety Manager:	Dennis Day, CIH, (402) 952-2525
URS Omaha Health and Safety Manager:	Jeff Hopkins, (402) 952-2531
URS Site Safety Officer:	To Be Determined

2.3 RESPONSIBILITIES

For this project, the URS Project Manager has the following responsibilities:

- Assure that projects are performed in a manner consistent with the URS Health and Safety Program
- Assure that the project HSP is prepared, approved, and properly implemented when required
- Implement the project HSP
- Assure that adequate funds are allocated to fully implement project health and safety
- Coordinate with the HSM on health and safety matters

The URS Project Manager has the authority to take the following actions:

- Assign an HSM-approved SSO to the project and, if necessary, assign a suitably qualified replacement
- Suspend field activities, if health and safety of personnel are endangered, pending an evaluation by the HSM and/or RHSM
- Suspend an individual from field activities for infractions of the HSP, pending an evaluation by the HSM or RHSM.

For this project, the URS RHSM has the following responsibilities:

- Direct the implementation of the Health and Safety Program in their responsibility area
- Coordinate health and safety activities of the Operating units
- Determine the components of the project HSP
- Maintain a high level of understanding regarding health and safety regulations affecting URS
- Review and approve the HSP
- Monitor implementation of the HSP
- Investigate reports of incidents or accidents and report to the HSM
- Provide employee health and safety training, particularly refresher training
- Determine whether an accidental exposure or injury merits a change in the affected individual's work assignments and whether changes in work practices are required
- Coordinate Operating Units with regard to health and safety equipment needs
- Supervise the HSM through a matrix management system, in cooperation with the Operating Unit Managers

The URS RHSM has the authority to take the following actions:

- Approve or disapprove HSPs
- Direct Operating Unit HSM to prepare project HSPs
- Access and review project files
- Direct changes in personnel work practices to improve health and safety of employees
- Remove individuals from projects, if their conduct jeopardizes their health and safety or that of co-workers
- Suspend work on any project that jeopardizes the health and safety of personnel involved

For this project the HSM has the following responsibilities:

- Administer the Health and Safety Program within the Operating Unit
- Maintain a working understanding of key government health and safety regulations and URS health and safety policies
- Interface with the project manager on matters of health and safety
- Report to RHSM on health and safety matters
- Develop or review, approve or disapprove the project HSP prior to submittal to the RHSM for review
- Conduct staff training and orientation on health and safely-related activities
- Appoint or approve site safety officers
- Monitor compliance with the HSP and conduct site audits
- Assist personnel to work on hazardous waste management projects with regard to medical examinations and health and safety training
- Answer employee questions and concerns regarding health and safety

The URS HSM has the authority to take the following actions:

- Suspend work or otherwise limit exposures to personnel, if health and safety risks are unacceptable
- Direct personnel to change work practices, if existing practices are deemed to be hazardous to health and safety of personnel
- Remove personnel from projects, if their actions or conditions endanger their health and safety or the health and safety of co-workers

For this project, the SSO has the following responsibilities:

- Implement the HSP
- Interface with the HSM and project managers in matters of health and safety
- Conduct site safety briefings
- Monitor compliance with the HSP

The URS SSO has the authority to take the following actions:

- Suspend work or otherwise limit exposures to personnel, if health and safety risks are unacceptable
- Direct personnel to change work practices, if existing practices are deemed to be hazardous to health and safety of personnel

3.1 CHEMICAL HAZARDS

The URS Corp. Hazard Communication Program provides personnel with information and training about safety and health hazards associated with the chemicals they might encounter in the workplace. The following Safety Management Standards (SMSs) related to hazard communication and hazardous waste operations are included in Attachment 3:

- SMS 002 Hazard Communication
- SMS 017 Hazardous Waste Operations

Exposure to chemical hazards can present a risk of serious injury. This HSP provides the basis to avoid occupational exposure to chemical hazards by using personal protective equipment (PPE) and work zone monitoring. The SSO will take any additional measures necessary to avoid exposure to chemical hazards.

The greatest risk of chemical exposure is likely to occur during drilling or direct-push operations, soil sampling, and excavation activities. The potential routes of exposure include inhalation, dermal contact and ingestion. Inhalation and dermal contact are expected to be the significant exposure routes, and appropriate PPE and monitoring will be used to help minimize the exposure through these routes. The potential for exposure by ingestion is expected to be low. Personnel will be expected to use utilize good personal hygiene practices and appropriate PPE to minimize the potential for incidental ingestion of environmental media and associated chemicals.

3.1.1 Investigative Chemicals of Concern

Petroleum hydrocarbons may be encountered in the soil, air, or groundwater during the SD-11 fieldwork at Cannon AFB.

Table 2 lists the chemicals that were detected during the most recent sampling events completed at SD-11, the December 1998 Corrective Measures Study Investigation and the additional sampling completed in 2000.

Table 2
Chemicals Previously Detected at SD-11

Chemical List		
TPH-DRO*	Di-n-butyl phthalate	2-Butanone (MEK)
TRPH**	Phenol	Methylene chloride

* Total petroleum hydrocarbons, diesel range organics

** Total recoverable petroleum hydrocarbons, by Method 418.1

Several of the compounds may be encountered during drilling, direct push, sampling activities, especially when working in source areas. In general however, the airborne concentration of these

contaminants should decrease quickly after exiting the source area (borehole, well casing, or floor penetration). Frequent monitoring of the source area and breathing zone of workers nearest the source area will be utilized to help protect personnel from these hazards.

3.1.2 Chemicals Brought on Site

A variety of chemicals may be brought on site and used during the various activities covered under this HSP. Attachment 4 contains Material Safety Data Sheets (MSDSs) for many of the chemicals that will be brought on site. MSDSs will accompany any additional chemicals brought on site. The proper handling, use, and personal protective clothing requirements will discussed during the site safety briefing prior to the use of any chemicals.

3.1.3 Corrosive and Reactive Materials

Workers may be exposed to corrosive and/or reactive materials while on the job site. If corrosive or reactive materials will be present on site, refer to Attachment 3:

- SMS 09 Corrosive and Reactive Materials

3.1.4 Flammable, Combustible Liquids, and Gases

Workers may be exposed to flammable, combustible liquids, and gases while on the job site. If flammable, combustible liquids, and gases will be present on site, refer to Attachment 3:

- SMS 015 Flammable, Combustible Liquids and Gases

3.2 PHYSICAL HAZARDS

There is a risk of physical injury from physical hazards at the site. Personnel should be aware of the fact that when PPE such as respirators, gloves, and protective clothing are worn: visibility, hearing, and manual dexterity are impaired. Slips, trips, and falls are the most common causes of on-site injuries.

3.2.1 Biological Hazards

During fieldwork at this site, personnel may encounter a wide variety of biological hazards including ticks, poisonous plants, mosquitoes, snakes, Valley Fever, and water-born pathogenic agents. Information related to biological hazard background information, precautionary measures, and medical follow-up are presented in Attachment 3:

- SMS 047 Biological Hazards

3.2.2 Blood-Borne Pathogens

URS employees who may incur exposure to blood and/or other potentially infectious body fluids as a result of performing their assigned job duties will be trained annually following 29 Code of Federal Regulations (CFR) 1910.1030 and 8 CCR 5193. Exposure to blood borne pathogens is

prevented through universal precautions, engineering and work practice controls, and personal protective equipment. Personnel working in the field and providing cardiopulmonary resuscitation (CPR) or first aid shall have immediate access to a first aid kit supplemented by a blood borne pathogen exposure control kit. Personnel will follow appropriate decontamination and disposal procedures in case of potential exposure to body fluids potentially infected with blood borne pathogens. All incidents must be immediately reported to the HSM. Information related to blood-borne pathogens is presented in Attachment 3:

- SMS 051 Blood-borne Pathogens

3.2.3 Cold Stress

Cold stress hazards consist of temperatures below 50°F (10°C) for personnel working outdoors in damp and cool conditions, or anytime temperatures are below 32 °F (0°C). Hazards associated with cold stress include Hypothermia and Frostbite. Procedures to protect personnel from cold related hazards are presented in Attachment 3:

- SMS 059 Cold Stress

3.2.4 Confined Space Entry

Workers may be exposed to confined space entry. Confined space entry is defined as an area large enough for personnel entry, has limited or restricted means for entry or exit, and is not designed for continuous occupancy. Confined spaces include non-permit spaces and permit-required spaces. Examples of permit required confined spaces include, but are not limited to, sewers, utility vaults, tanks, sump pits, and excavations where there is the potential for atmospheric hazards. Specific safety requirements for confined space entry can be found in Attachment 3:

- SMS 010 Confined Space Entry

3.2.5 Electrical Hazards

During work activities, the potential for exposure to electrical hazards exists both below and above ground, wherever electricity is used, where electrical systems are installed and/or maintained, and where live electrical circuits are accessed. The primary hazards associated with electrical hazards are shock, burns, arc-blast, fire, and explosion. The procedures to reduce worker risk to electrical hazards are presented in Attachment 3:

- SMS 012 Electrical Equipment

Lockout/Tagout procedures must be used when working on any electrical equipment that has the potential to be energized. The procedures for Lockout/Tagout are presented in Attachment 3:

- SMS 023 Lockout/Tagout

3.2.6 Excavation Safety

URS employees may be exposed to hazards associated with trenching and excavation activities (Including boring/sampling) during the course of fieldwork. Hazards associated with excavation areas include, but are not limited to, stability of adjacent structures, electrical hazards, underground utilities, slip/trip/fall hazards, and hazardous atmospheres. In the field, approaches that do not require personnel to enter an excavation are preferred. In the case that entrance into an excavated area is required, protective systems (sloping, benching, shoring) should be in place. Specific requirements for excavation safety are included in Attachment 3:

- SMS 013 Excavation Safety

3.2.7 Fall Protection

Workers should exercise caution when working on the site to avoid fall hazards. Recognized fall hazards include, but are not limited to, fall hazards in excess of 6 feet or greater and working on surface angles greater then 30 degrees horizontal. The RHSM must approve all fall protection plans before work commences. Personnel that must enter an excavation should be in compliance with the following SMS included in Attachment 3:

- SMS 040 Fall Protection

Workers who are required to use portable ladders should at all times operate the ladders in a safe fashion. Ladders should only be used when safe access to the desired elevation is not available. Defective ladders should be withdrawn from service immediately. The procedures for properly using portable ladders are included in Attachment 3:

- SMS 028 Portable Ladders

3.2.8 Flight Line Hazards

The flight line is defined as anywhere aircraft are parked, towed, or taxied. The flight line perimeter is identified by the use of red striping. When you cross the red striping you are considered to be on the flight line. Hazards associated with the flight line include:

- Aircraft inlets
- Hot engine exhaust
- Jet blasts
- Collisions with aircraft, either personnel or vehicle
- Hearing impairment

Project personnel will only be allowed on the flight line with a pass and when escorted by Cannon Personnel that have a Flight Line Badge. The Restoration Chief will coordinate escort personnel.

Any project personnel driving a vehicle on the flight line will be required to attend flight line driver training. The Restoration Chief and Base Operations Airfield Manager will coordinate Driver Training Coordination.

Larger aircraft could be parked on or near ST-11. In order to ensure that there are no conflicts with the site work and aircraft, the site work schedule will need to be coordinated by Base Operations. Details of the coordination will be determined during the Kickoff Meeting.

Delineation of the work zones will be determined in coordination with Base Operations to ensure aircraft traffic and potential jet blasts are a safe distance from project personnel.

Hearing protection will be required in areas affected by active aircraft.

3.2.9 Hand Safety

Use of hand tools, moving a rig, and conducting repairs can increase physical risks. Specific hand safety guidance is included in Attachment 3:

- SMS 064 Hand Safety

3.2.10 Behavior Based Safety

Most accidents are due to unsafe behavior, and behavior changes may be made that significantly reduce accident risk. URS employees and URS subcontractors are expected to value safety and be responsible for their safety as well as the safety of others. The SSO is expected to provide clear safety expectations and provide positive and negative feed back for safe and unsafe behavior. Peers are expected to intervene upon an unsafe behavior and provide positive feedback for safe behavior.

The SSO will maintain Safety Observation Checklists 72-1 or similar form modified for task-specific operations. Safety Observations will be performed by URS employees and subcontractors at the rate of one per 200 hours worked and a minimum of one per week of field work conducted. Each URS employee working on the project is to complete a minimum of one Safety Observation. Details for SMS 072 may be found in Attachment 3.

3.2.11 Heat Stress

Heat stress hazards consist of temperatures exceeding 70°F (21°C) for personnel wearing chemical protective clothing, including Tyvek coveralls, and 90°F (32°C) for personnel wearing normal work clothes. Procedures to protect personnel from the effects of heat related illnesses are presented in Attachment 3:

- SMS 018 Heat Stress

3.2.12 Heavy Equipment Hazards

There is a risk of physical injury from the misuse of heavy equipment at the site. The hazards involved with the use of drill rigs, direct push rigs, backhoes, and other earth moving equipment are significant and include the hazards of pinch points; entrapment in machinery; impact from moving parts; electrocution from lightning, overhead wires, or buried utilities; improper operations. Specific safety requirements for subsurface work including drilling and direct push activities can be found in Attachment 3 in the following SMSs:

- SMS 056 Drilling Safety Guidelines
- SMS 034 Utility Clearance and Isolation

Excessive noise is typically generated from many types of heavy equipment. Guidance on hearing conservation is provided in Attachment 3:

- SMS 026 Noise and Hearing Conservation

3.2.13 Hot Work

Before using any spark or heat producing operations (torch cutting, welding, grinding), the SSO must be contacted. In general, workers are responsible for utilizing personal protective equipment, conducting a detailed inspection of the work area for potential fire sources, covering or removing fire sources from the work area, and providing fire watch up to 30 minutes after the completion of the work. Specific requirements for Hot Work can be found in Attachment 3:

- SMS 020 Hot Work

3.2.14 Noise Hazards

Previous surveys indicate that heavy equipment such as drilling equipment, and aircraft may produce continuous and impact noise at or above the action level of 85 decibles (dBA). All URS personnel within 25 feet of operating equipment, or near an operation that creates noise levels high enough to impair conversation, shall wear hearing protective devices (either muffs or plugs). URS personnel who are in the Medical Surveillance Program are automatically enrolled in the URS Hearing Conservation Program and have had baseline and, where appropriate, annual audiograms. Personnel will wash their hands with soap and water prior to inserting earplugs to avoid initiating ear infections. Additional information regarding the URS Hearing Conservation Program is located in Safety Management Standard 26 in Attachment 3, a copy of which shall be maintained on site.

- SMS 026 Noise and Hearing conservation

3.2.15 Powered Industrial Trucks

Workers that operate powered industrial trucks onsite should be trained and authorized to use the specific type of truck to which they are assigned. Training should be up to date. A powered industrial truck is defined as a mobile, power-propelled truck used to carry, push, pull, lift, stack,

or tier materials. Forklifts, pallet trucks, rider trucks, fork trucks, lift trucks, pallet jacks, motorized hand trucks, and skid steer loaders are all types of powered industrial trucks. Safe operation of powered industrial trucks and requirements for operators are presented in Attachment 3:

- SMS 070 Powered Industrial Trucks

3.2.16 Slip/Trip/Fall Hazards

Workers should exercise caution when walking around the site to avoid slip/trip/fall hazards. If there are holes or uneven terrain in the work area that could cause site personnel to slip, trip, or fall, they must be covered, flagged or marked to warn workers. Workers should exercise caution around open excavations, such as test pits, and avoid getting closer than two feet to the edge of an unsloped excavation unless a guardrail or fall protection is provided. If conditions become slippery, workers should take small steps with their feet pointed slightly outward to decrease the probability of slipping. Gravel or sand should be spread in muddy areas to reduce the chance of slipping. Workers should watch where they are walking and walk only in areas of good stability.

Proper housekeeping is essential to prevent fires as well as injuries resulting from slips, trips, and falls. Housekeeping consists of, but is not limited to maintaining walkways, properly storing chemicals, disposing of debris, and maintaining tools and supply storage. All efforts should be taken to keep the work area in a clean and orderly condition.

3.2.17 Vehicle Safety

To avoid injuries related to vehicle use, URS employees should be familiar with the URS Vehicle Safety Program and in compliance with its requirements. The Vehicle Safety Program applies to employees operating motor vehicles that are owned, rented, or leased by the Company, and the use of personal vehicles while on company business. Procedures for the Vehicle Safety Program are presented in Attachment 3:

- SMS 057 Vehicle Safety

3.2.18 Underground and Aboveground Utilities

The Site Manager or SSO is responsible locating that underground utilities prior to the commencement of any subsurface (> 0.3 meters [1 ft.]) activities. Resources include site plans, utility companies, and regional utility locating services. The proper utility company personnel shall certify in writing to the Site Manager or SSO the deactivation of underground utilities, and the certification retained in the project files. Procedures for activities proximal to utility locations are presented in Attachment 3.

- SMS 034 Underground and Above Ground Utilities

Excavation, drilling, crane, or similar operations adjacent to overhead lines shall not be initiated until operations are coordinated with the utility officials. Operations adjacent to overhead lines are prohibited unless one of the following conditions is satisfied:

Power has been shut off and positive means (e.g., lockout/tagout) have been taken to prevent lines from being energized. Wherever possible, the URS SSO will observe power shutoff and place a lock and tag on the switch. In all cases utility company personnel shall certify in writing to the Site Manager or SSO the deactivation of overhead utilities, and the certification retained in the project files. The Site Manager or SSO must also attempt to verify power shut off by checking that power is no longer available to the affected building or equipment.

Equipment, or any part of the equipment, cannot come within the following minimum clearance from energized overhead lines:

Power Lines Nominal System (kilovolts [kV])	Minimum Required Clearance
0 – 50	10 feet
51 – 200	15 feet
201 – 300	20 feet
301 – 500	25 feet
501 – 750	35 feet
751 – 1000	45 feet

3.2.19 Hand Tool and Portable Equipment

Field personnel may use hand tools and portable equipment in the activities specified in this HSP. To prevent possible injury to the body, some general guidelines should be applied.

- Keep hand and power tools in good repair and used only for the task for which they were designed.
- Remove damaged or defective tools from service.
- Keep surfaces and handles clean and free of excess oil to prevent slipping.
- Do not carry sharp tools in pockets.
- Clean tools and return to the toolbox or storage area upon completion of a job.
- Wrenches must have a good bite before pressure is applied.
- When working with tools overhead, place tools in a holding receptacle or secure when not in use.
- Do not throw tools from place to place, from person to person, or drop from heights.
- Use non-sparking tools in atmospheres with fire or explosive characteristics.
- Inspect all tools prior to start-up or use to identify any defects.
- Powered hand tools should not be capable of being locked in the on position.
- Require that all power-fastening devices be equipped with a safety interlock capable of activation only when in contact with the work surface.

- Do not allow loose clothing, long hair, loose jewelry, rings and chains to be worn while working with power tools.
- Do not use cheater pipes.
- Make provisions to prevent machines from automatically restarting upon restoration of power.
- SMS 016 Hand Tools and Power Tools

3.2.20 Work Area Protection

As the project operations may be undertaken in a roadway or parking lot, motor vehicles may be a hazard. Consideration should be given to parking a work vehicle within the coned area between the work area and oncoming traffic. Procedures for work zone traffic control are located in Safety Management Standard 32 in Attachment 3, a copy of which is to be maintained on site.

- SMS 032 Work Zone Safety

3.3 BIOLOGICAL HAZARDS

In addition to the following sections, guidance on identification and avoidance of biological hazards is located in Safety Management Standard 47 in Attachment 3, a copy of which shall be maintained on site.

- SMS 047 Biological Hazards

3.3.1 Insects

During fieldwork at this site, personnel may encounter a wide variety of insects including bees, mosquitoes, ticks, and spiders. Field personnel are encouraged to use insect repellent when present.

Stings of bees and wasps may cause serious allergic reactions in certain individuals. The SSO should identify all personnel with known insect allergies or sensitivities before fieldwork begins.

If an allergic reaction occurs, a physician's advice should be sought. Personnel with known allergies should carry appropriate medication.

Spider bites can be extremely serious; e.g., those of the black widow or brown recluse. Others are unpleasant or uncomfortable, resulting in rashes, itching, and possible infection. The possibility of allergies greatly increases the danger since people are not usually aware of such allergies until they have been bitten. Therefore, spiders should be regarded as a serious potential hazard.

Ticks are parasites that feed on the blood of an animal/human host and can carry severe diseases, at the least bringing several days of fever and pain and at the worst causing brain damage.

3.3.2 Other Animals

Chipmunks, ground squirrels, rats, and other mammals have been known to harbor fleas carrying bubonic plague. Their bites can also transmit rabies and other infections. Chipmunk-like animals pose a special problem because people tend to try to feed them or pet them; the increased contact brings a greater possibility of danger. Avoid wildlife when possible.

Poisonous snakes may also be encountered on site. Personnel should check for snakes before walking through grassy or debris-strewn areas. Care should be taken when lifting possible habitats of snakes and spiders such as debris and cover.

3.3.3 Plants

Poisonous plants (i.e., poison ivy, poison oak, poison sumac) and a variety of cacti euphorbs and nettles may be encountered during field activities. Contact with these plants may cause skin irritation and should be avoided. If one has come in contact with a poisonous plant, the affected skin area should be washed thoroughly with soap and water. If an allergic reaction occurs, a physician's advice should be sought.

3.4 ACTIVITY HAZARD ANALYSIS AND DAILY SAFETY TASK ANALYSIS

Activity Specific (or Job) Hazard Analyses have been prepared for site-specific activities based on anticipated hazards. The Activity Hazard Analyses are included in Attachment 1 of this HSP. If additional activities are to be performed that have not been anticipated an Activity Hazard Analysis must be completed and approved by URS Health and Safety Representative or the RHSM.

Prior to initiating work for each day the SSO will perform a Daily Safety Task Analysis, recording the results on the Daily Safety Task Analysis Worksheet, found in Attachment 2. The current conditions will be evaluated compared to condition anticipated and hazards found in the applicable Activity Hazard Analysis for the Activity (e.i., Job or Task) to be performed that day. If the current Activity Hazard Analysis does not adequately address unanticipated hazards the Activity Hazard Analysis must be updated and approved by the URS HSM or the URS RHSM.

4.1 SITE CONTROL AND WORK ZONES

Site control is necessary to control the activities and movement of people and equipment to minimize the potential for worker exposure to hazardous substances. Site control provides for delineating work zones, establishing site security, maintaining communications, monitoring weather conditions, and enforcing safe work practices.

4.1.1 Work Zones

The three work zones listed below will be used during all site work covered in this HSP, but physical delineation of the work zones will not be required at most locations. The work zones as defined by the EPA include:

- Exclusion Zone (EZ), the area where contamination does or could occur.
- Contamination Reduction Zone (CRZ), the area where decontamination takes place.
- Support Zone, the uncontaminated area where workers should not be exposed to hazardous conditions.

During activities where free product or heavily contaminated materials may be encountered during other intrusive activities, the work zones will be physically delineated to minimize contaminant migration. At the discretion of the SSO, the work zones will be delineated in the following manner:

- Mark the outer boundary of the EZ with caution tape, rope or appropriate markers. In place barriers such as walls or fences may serve as a boundary marker. Clearly mark all entry and exit points to and from the EZ.
- Establish a CRZ with appropriate personnel and equipment decontamination materials, next to the EZ exit point. The CRZ will provide a transition zone between the EZ and Support Zone.
- An area outside the CRZ, and as far away from the EZ as practical should be used as the support zone. Administrative and other activities that need not or cannot be performed in a potentially hazardous area should be performed in the support zone. Support vehicles and clean equipment should be kept in the support zone.

4.1.2 Pedestrian Traffic

A key aspect of site control is keeping unauthorized personnel from possible areas of exposure to chemical or physical hazards. If heavy equipment is being used or contaminant exposure is likely in an area where pedestrians may be present, the EZ shall be clearly marked with caution tape or other markings. If unauthorized persons enter the EZ, work shall stop immediately.

4.2 DECONTAMINATION PROCEDURES

4.2.1 Personnel Decontamination

Adequate personnel decontamination equipment will be available to remove contaminants from the field crew's personal protective equipment or hands. Personnel decontamination equipment should be located upwind of the work area. Depending on the specific type of work being done, the following items may be used for personnel decontamination:

- Boot wash equipment
  - Water/Alconox solution container
  - Rinse water container
  - Long-handled plastic brush
- Waste container (for disposable personnel protective equipment)
- Hand wash equipment
  - Water/Alconox solution container
  - Rinse water container
  - Paper towels

4.2.2 Sampling Equipment Decontamination

All non-disposable sampling equipment will be cleaned immediately after use by washing the equipment in a water/Alconox solution and rinsing with clean deionized water. Specific equipment decontamination procedures are described in the 2005 QAPP for Cannon Air Force Base.

4.3 MEDICAL EXAMINATION

Before commencing any of the field activities defined in Section 1.0, all personnel must be enrolled in a medical surveillance program as specified in 29 CFR 1910.120.

4.4 COMPLIANCE AGREEMENT

The URS SSO shall hold meetings with all field personnel before work commences. During the meeting, all personnel shall be provided with a copy of this health and safety plan; the plan shall be reviewed and discussed and questions answered. Signed Compliance Agreement Forms shall be collected by the URS Project Manager and filed by the Health and Safety Manager. Individuals refusing to sign the form will not be allowed to work on the site. A copy of the Compliance Agreement Form is presented in Attachment 2 of this HSP.

4.5 DAILY SITE SAFETY MEETING

During field operations, a daily site safety meeting will be held by the URS SSO to review and plan the specific health and safety aspects of scheduled work. The Daily Safety Task Analysis Sheet will be utilized to record the meeting. The Daily Safety Task Analysis Form is found in Attachment 2.

4.6 PROJECT MANAGER NOTIFICATION

All URS field personnel must inform the URS Project Manager or his designated representative before entering the site. At least two members of the field crew must be on site whenever work is performed.

4.7 TRAINING

Prior to commencing any of the intrusive field activities defined in Section 1, all URS personnel and subcontractor personnel working on site will supply certificate or equivalent, attesting to completing training as required by OSHA in 29 CFR 1910.120, to the SSO. Site supervisors will be required to supply documentation indicating that an additional 8 hours of training has been completed. Escorted visitors who have not acquired the 29 CFR 1910.120 training may be allowed in a defined area only if there is no risk of exposure or health hazards in the area. This decision will be at the discretion of the URS SSO.

Subcontractor personnel completing non-intrusive activities such as mowing, herbicide application and surveying are not required to meet the training requirements of 29 CFR 1910.120.

Documentation concerning respirator fit testing, in accordance with OSHA, 29 CFR 1910.134 shall be required of any URS employee or subcontractor employee wearing a respirator.

Site-specific training will address:

- General site safety (slips, trips, falls)
- Description of site activities
- Required personal protective equipment
- Decontamination
- Work zone procedures (if necessary)
- Emergency procedures
- Route to hospital directions

4.8 GENERAL SAFE WORK PRACTICES

1. Eating, drinking, chewing gum or tobacco, and smoking are prohibited in the contaminated or potentially contaminated area or where the possibility for the transfer of contamination exists.
2. All personnel will enter designated work areas only through the contamination reduction zone (CRZ). All personnel leaving an exclusion/work zone must exit through the CRZ and pass through the decontamination station.
3. Personnel will wash their hands and face thoroughly with soap and water prior to eating, drinking or smoking.
4. Avoid contact with potentially contaminated substances. Do not walk through puddles, pools, mud, etc. Avoid, whenever possible, kneeling, leaning or sitting on contaminated surfaces. Do not place monitoring equipment on potentially contaminated surfaces (i.e., ground, etc.)
5. All field crew members should make use of their senses to alert them to potentially dangerous situations in which they should not become involved (i.e., presence of strong, irritating or nauseating odors).
6. Only those vehicles and equipment required to complete work tasks should be permitted within the exclusion/work zone (drill rigs, excavators, and similar items). All non-essential vehicles should remain within the support zone.
7. Containers, such as drums, will be moved only with the proper equipment and will be secured to prevent dropping or loss of control during transport.
8. Field survey instruments, such as photoionization detectors (PIDs), should be covered with plastic or similar covering to minimize the potential for contamination.
9. No matches or lighters will be permitted in the work area/exclusion zone or contamination reduction zone.
10. Contaminated protective equipment, such as respirators, hoses, boots, and disposable protective clothing, will not be removed from the work area/exclusion zone or decontamination area until it has been cleaned, or properly packaged and labeled.
11. Prevent, to the extent possible, spills. In the event that a spill occurs, contain liquid if possible.
12. Prevent splashing of the contaminated materials.
13. The number of personnel and equipment in the exclusion zone should be minimized but only to the extent consistent with workforce requirements of safe site operations.
14. Field crewmembers shall be familiar with the physical characteristics of the site operations including:
    - Wind direction in relation to the contaminated area;
    - Accessibility to equipment and vehicles;
    - Areas of known or suspected contamination;
    - Site access; and
    - Nearest water sources.

15. All wastes generated by URS activities at the site will be disposed of as directed by the PM.
16. All personal protective equipment will be used as specified and required.
17. The buddy system will be used at all times when performing sampling for hazardous material when the first action level criteria has been exceeded or when working in remote areas.
18. Personnel are to immediately notify the SSO or Site Manager if any indications of potential explosions or unusual conditions are observed.

4.9 BEHAVIOR BASED SAFETY

Most accidents are due to unsafe behavior, and behavior changes may be made that significantly reduce accident risk. URS employees and URS subcontractors are expected to value safety and be responsible for their safety as well as the safety of others. The SSO is expected to provide clear safety expectations and provide positive and negative feedback for safe and unsafe behavior. Peers are expected to intervene upon an unsafe behavior and provide positive feedback for safe behavior.

The SSO will maintain Safety Observation Checklists 72-1 (Attachment 2) or similar form modified for task specific operations. Safety Observations will be performed by URS employees and subcontractor at the rate of 1 per 200 hours worked and a minimum of 1 per week of field work conducted. Each URS employee working on the project is to complete a minimum of one Safety Observation. Details for SMS 72 Behavior Based Safety can be found in Attachment 3.

4.10 SAMPLING PRACTICES

For all sampling activities, the following standard safety procedures shall be employed:

1. All sampling equipment should be cleaned before proceeding to the site.
2. At the sampling site, sampling equipment should be cleaned after each use.
3. Work in "cleaner" areas should be conducted first where practical.
4. All unauthorized personnel will remain outside exclusion zones at all times.

4.11 SAMPLE SHIPMENT AND HAZARDOUS MATERIAL SHIPMENT

If samples to be collected during the course of this project fall under the criteria that defines them as hazardous materials under Department of Transportation (DOT) regulations 49 CFR Parts 171-177 (see URS guidelines for determination), then they must be shipped in accordance with those regulations by an individual who is certified as having been Function-Specific trained as required under the DOT regulations.

5.1 TRAINING AND MEDICAL SURVEILLANCE

All URS site personnel will have met the requirements of 29 CFR 1910.120(e), including:

- Forty hours of initial off-site training or its recognized equivalent
- Eight hours of annual refresher training for all personnel (as required);
- Eight hours of supervisor training for personnel serving as Site Safety Officers
- Three days of work activity under the supervision of a trained and experienced supervisor

All URS site personnel are participating in medical surveillance programs that meet the requirements of 29 CFR 1910.120(f). Current copies of training certificates and statements of medical program participation for all URS personnel are maintained by the local office.

In addition, all URS site personnel will review this HSP and sign a copy of the Safety Plan Compliance Agreement, which is found in Attachment 2. The PM will maintain these agreements at the site, and place them in the project file at the conclusion of the operation.

Prior to the start of operations at the site, the SSO will conduct a site safety briefing, which will include all personnel involved in site operations. At this meeting, the SSO will discuss:

- Contents of this HSP
- Types of hazards at the site and means for minimizing exposure to them
- The type of monitoring that will be performed
- Action levels for upgrade and downgrade of personal protective equipment
- Personal protective equipment that will be used
- Site-specific respiratory protection requirements
- Decontamination protocol
- Site control measures, including safe operating practices and communication
- Location and use of emergency equipment
- Evacuation signals and procedures

All site personnel, including subcontractor personnel, are to attend the briefings and sign the briefing form.

Subsequent site safety briefings will be conducted at least daily, or whenever there is a change in task or significant change in task location. Briefings will also be conducted whenever new personnel report to the site.

5.2 SITE INSPECTIONS

The URS Site Manager or Site Safety Officer is to conduct a daily site inspection prior to the start of each shift. It is the responsibility of the Project Manager or Site Manager to resolve discrepancies immediately, contacting the Regional Health and Safety Manager if necessary for assistance. Inspections are to be documented and maintained on site until the completion of the project, at which time they are placed in the project files.

This section outlines the general usage guidelines for personal protective equipment. All initial site work will be done in PPE Level D. If the action levels for petroleum hydrocarbons or chlorinated solvents are exceeded, all personnel will cease current activities, move upwind of the source area, and contact the HSM.

6.1 HEAD PROTECTION

Hard hats must be worn if heavy equipment or overhead hazards exist.

6.2 EYE PROTECTION

Safety glasses with side shields or goggles must be worn by all personnel performing activities where potential for eye or face exposure exists due to splash, dust, or vapor, etc.

6.3 SKIN PROTECTION

All personnel shall wear chemical resistant gloves when handling potentially contaminated environmental media and during all sampling activities. All personnel handling hazardous materials shall also wear chemical resistant gloves. These gloves will be disposed of in a designated container after each use or when they become worn or punctured.

Uncoated Tyvek coveralls or other protective clothing should be worn when bulk chemicals are being used for well rehabilitation.

6.4 FOOT PROTECTION

All personnel engaged in the field activities covered in this HSP shall wear boots or shoes with steel toes and shanks. Chemical resistant booties may be used in situations where gross contamination may be encountered.

6.5 RESPIRATORY PROTECTION

It is not anticipated that respiratory protection will be required during this investigation. If hazardous environments are encountered, the HSM may specify an upgrade in PPE to include respiratory protection. The HSM or designee will perform the fit testing prior to providing the respirators and appropriate cartridges to field personnel. The following SMSs, pertain to respiratory protection and are attached in Attachment 3:

- SMS 024 Medical Surveillance Requirements
- SMS 042 Respiratory Protection

The SSO will be responsible for enforcing the air monitoring action levels specified in this section. Organic vapor readings will be taken in the breathing zone (1-foot radius around breathing passages) of the personnel performing field activities continuously. The sampling frequency will be at the discretion of the SSO, but time intervals will not exceed 15 minutes. A PID with a minimum of a 10.2 electron volts (eV) lamp will be used to measure organic vapors. The following action levels are specified:

7.1 PETROLEUM HYDROCARBONS

The PID must be calibrated following the manufacture's specifications. The calibrations must use clean air to "zero" the instrument, and a 100 parts per million (ppm) isobutylene standard to set an additional point. Refer to the manufactures specifications to determine the **"benzene equivalent"** response factor for use at petroleum hydrocarbon sites. The PID should be periodically exposed to a magic marker to check response. These "response checks" are key to providing confidence to the user that the instrument is at least functioning and responding to contaminants. The following action levels must be used at sites where petroleum hydrocarbons are the main chemicals of concern:

If PID readings are greater than 5 ppm above ambient air background:

- Stop Work, and move all personnel upwind of site
- Contact HSM for further instructions

7.2 CHLORINATED SOLVENTS

The PID must be calibrated following the manufacture's specifications. The calibrations must use clean air to "zero" the instrument, and a 100-ppm isobutylene standard to set an additional point. Refer to the manufactures specifications to determine the **"trichloroethylene equivalent"** response factor for use at chlorinated solvent sites. The PID should be periodically exposed to a magic marker to check response. These "response checks" are key to providing confidence to the user that the instrument is at least functioning and responding to contaminants. The following action levels must be used at sites where chlorinated solvents are the main chemicals of concern:

If PID readings are greater than 5 ppm above ambient air background:

- Use colorimetric tube to determine if vinyl chloride is present
- If vinyl chloride is not present, continue work with frequent air monitoring

If PID readings are greater than 10 ppm above ambient air background, or vinyl chloride is present above 0.5 ppm.

- Stop work, and move all personnel upwind of site
- Contact HSM for further instructions

Calibration of all monitoring equipment must be done on a daily basis, prior to fieldwork. Results of equipment calibration, air monitoring, and any corresponding upgrades shall be documented in the Project Log Book.

Illnesses, injuries, and accidents occurring on site must be attended to immediately. The URS Health and Safety Incident Report Form, as included in SMS 049 (Incident Reporting) in Attachment 3, must be completed and submitted to the Omaha Health and Safety Manager within 24 hours of the reported incident for medical treatment cases and within 5 days for other incidents.

The emergency service telephone number for this project is:

Plains Regional Medical Center
2100 North Martin Luther King Boulevard
Clovis, New Mexico 88101
(505) 769-2141

The route to the hospital is shown in Figure 1.

9.1 DAILY LOG CONTENTS

The Project Manager and the SSO will establish a system appropriate to the investigation site that will record, at a minimum, the following information:

1. URS personnel and other personnel conducting the site activities, their arrival and departure times, and their destination at the site
2. Incidents and unusual activities that occur on the site such as, but not limited to, accidents, breaches of security, injuries, equipment failures, and weather related problems
3. Changes to the Work Plan and the HSP
4. Daily information such as:
   - Work accomplished and the current site status
   - Equipment calibrations, repairs, and results.
   - Site work zones.

9.2 SAFETY AND HEALTH RECORDS

The PM and SSO are responsible for site recordkeeping. Prior to the start of work, they will review this plan; if there are no changes to be made, they will sign the approval form (PM) or acceptance form (SSO) and forward a copy to the Regional Health and Safety Manager.

All URS personnel and Contractor Site Personnel will review the HSP and sign the Safety Plan Compliance Agreement in Attachment 2; copies of these forms will be maintained in the project file.

The SSO will conduct a Site Safety Briefing in accordance with Section 4.4 and have all attendees sign the form in Attachment 2; copies will be maintained in the project file.

The SSO will maintain Safety Observation Checklists 72-1 (Attachment 2) or similar form modified for task specific operations. Copies are to be maintained in the project file. Safety Observations will be performed by URS employees and subcontractor at the rate of 1 per 200 hours worked and a minimum of 1 per week of field work conducted. Each URS employee working on the project is to complete a minimum of one Safety Observation.

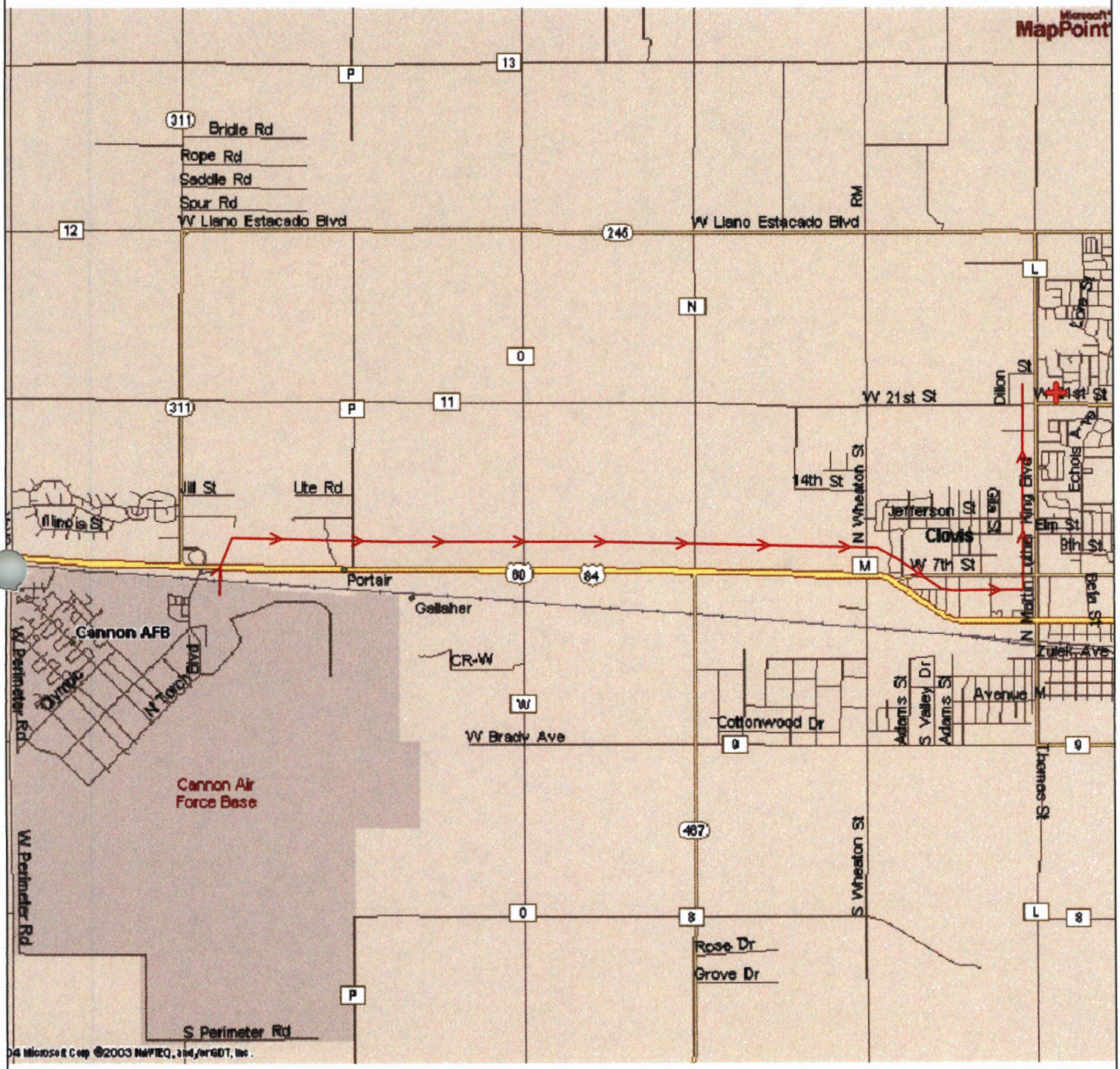
Any incident or exposure incident will be investigated and the Incident Report form (SMS 49) will be completed and forwarded to the Office Administrative Manager and the Regional Health and Safety Manager.

All instrument readings and calibrations, PPE use and changes, health and safety-related issues, and deviations from or problems with this HSP will be recorded in the field log and communicated to the Regional Health and Safety Manager.

9.3 SAFETY PROJECT FILE CONTENTS

The Project File should include the following folders – Blank Forms are found in Attachment 2.

- Initial Safety Briefing and Compliance Agreement Forms
- Training and Medical Documentation
- Air Monitoring Log
- Daily Safety Task Analysis
- Safety Observation Checklists
- Drilling Equipment Checklist – Completed Daily
- Incident Reports (if any)



PLAINS REGIONAL MEDICAL CENTER
2100 N. MARTIN LUTHER KING BLVD. CLOVIS, NM 88101
(505) 769-2141
DISTANCE: 6.7 MILES
ESTIMATED TRAVEL TIME 12 MINS.

ROUTE TO HOSPITAL
CANNON AIR FORCE BASE
CLOVIS, NEW MEXICO

DRN. BY: DPG	DATE: 08/30/06	PROJECT NO.	FIG. NO.
CHK'D. BY:	REVISION: 0	16169983	1

August 30, 2006 10:28:38 a.m.
Drawing: T:\CANNON\16169983\hosp.dwg

TASK 1
MOBILIZATION
ACTIVITY HAZARD ANALYSIS

Date Prepared: 19-Dec-06

Project: **Cannon AFB, SD-11 CMI** Job: **Mobilization**

Risk Assessment Code (RAC): **L**

Prepared By: Jeff Hopkins: Reviewed By:

Recommended Protective Clothing and Equipment:
PPE Level D General work clothes, traffic vest, safety glasses, hard hat, steel-toed boots, hearing protection and work gloves

E = Extremely High Risk
H = High Risk
M = Moderate Risk
L = Low Risk

SEVERITY	PROBABILITY: Frequent	Likely	Occasional	Seldom	Unlikely
Catastrophic	E	E	H	H	M
Critical	E	H	H	M	L
Marginal	H	M	M	L	L
Negligible	M	L	L	L	L

JOB STEPS	HAZARDS	ACTIONS TO ELIMINATE OR MINIMIZE HAZARDS
Installation of temporary facilities and utilities, to include: Ground preparation for trailer pad, dumpster, and sanitary Electricity connection to trailer Laydown area construction Decontamination area construction Field engineering (survey of preliminary conditions)	Driving/vehicle movement (including trucks, heavy equipment)	1. Obey traffic rules. 2. 15 miles per hour is the maximum speed allowed in the work area. 3. Use caution when entering roadways. 4. Do not operate vehicles in unsafe conditions (e.g., on steep slopes, in deep mud). 5. Do not use cell phones when operating vehicles. 6. Secure all loads, including equipment within the cab. 7. Wear seat belts, including those provided in cabs of heavy equipment. 8. Use caution and wear orange vests if working near active roads or around heavy equipment. 9. Leave enough time to get to your destination without hurrying. 10. Be aware of heavy equipment and do not park or conduct work in the blind spot of the equipment operator; "blind spots" of some equipment can be very large. 11. Verify back-up alarms are functional for all heavy equipment for pick-ups or SUVs with obstructed rear view, use a back-up alarm or a spotter when backing up. 12. Refer to SMS 57, Vehicle Safety Program. 13. Rollover protective structures (ROPS) are required on all heavy equipment, with the exception of trucks used for over-the-road hauling. 14. Drilling equipment shall be inspected and maintained according to the manufacturer's recommendations.

TASK 1
MOBILIZATION
ACTIVITY HAZARD ANALYSIS

Date Prepared: 19-Dec-06

Project: **Cannon AFB, SD-11 CMI** Job: **Mobilization** Risk Assessment Code (RAC): **L**

JOB STEPS	HAZARDS	ACTIONS TO ELIMINATE OR MINIMIZE HAZARDS
	Overhead/underground utilities	1. If overhead utilities are present in work areas, place warning signs at ground level. 2. Always check for overhead utilities before using extendable equipment. 3. Maintain at least one mast length or 20 feet (whichever is greater) from all power lines. 4. Contact the RHSM if high voltage lines are present. 5. Complete utility locates prior to intrusive work in areas where utilities have not been cleared through institutional knowledge by calling One Call: (800) 321-ALERT and/or coordinating with site personnel. 6. Observe the area for indications of utilities.
	Dust	7. Minimize generation of dust. 8. Stay out of visible dust clouds. 9. Wet soil if necessary to eliminate visible dust.
	Noise	1. Wear hearing protection when operating or working near heavy equipment. 2. Refer to SMS 26, Hearing Conservation.
	Electricity	1. Electrical work shall be performed by qualified personnel with verifiable credentials who are familiar with applicable code requirements.
	Slips, trips, and falls	1. Make sure you have good solid footing and that walking/working surfaces are as clean and dry as possible. 2. Work areas should be inspected daily and findings shall be recorded on daily inspection reports.
	Hand tools	1. Inspect tools prior to use. 2. Use tools for their intended use only. 3. Don't use damaged tools. 4. Push, don't pull wrenches.
	Biological hazards	1. Repellents and proper clothing should be used for protection against insects including ticks and mosquitoes. 2. Protective clothing, including long pants and sturdy boots, should be used for protection against snakes and spiders. 3. See SMS 047.
	Material handling	1. Employees should use safe lifting techniques, bending at the knees and lifting with the legs. 2. Employees should use caution and not twist the back when carrying a load. 3. Mechanical devices should used to move loads when possible. 4. Protective gloves should be worn when handling materials. 5. See SMS 069.

TASK 1
MOBILIZATION
ACTIVITY HAZARD ANALYSIS

Date Prepared: 19-Dec-06

Project: **Cannon AFB, SD-11 CMI** Job: **Mobilization** Risk Assessment Code (RAC): **L**

JOB STEPS	HAZARDS	ACTIONS TO ELIMINATE OR MINIMIZE HAZARDS
	Cold stress	1. Cold weather clothing and shelter should be provided as needed based on site conditions. 2. Air temperature monitoring should be done when temperatures fall below 45°F. 3. See SMS 059.
	Heat stress	1. Drinking water should be made available to all workers and workers should be encouraged to drink small amounts frequently. 2. Work/rest regimens shall be adjusted during hot weather. 3. See SMS 018.
	Extreme weather	1. When there are warnings or indications of severe weather, conditions should be monitored and precautions taken to protect personnel.
	Fire	1. Portable fire extinguishers shall be present in all equipment and in the field trailer. 2. Fire extinguishers shall be inspected monthly. 3. Hot work permits must be obtained prior to any welding or torch cutting activities.
	Temporary facilities	1. Trailers shall be anchored with rods and cables or by steel straps to ground anchors designed to withstand winds and meet applicable standards. 2. Signs warning of the presence of construction hazards and requirements should be posted on the fencing every 300 feet. 3. One portable toilet with adequate ventilation and (natural) light shall be on site. 4. Washing facilities shall be provided at the portable toilet location to maintain sanitary conditions. 5. Type II 16-unit first aid kits shall be present and accessible at the site.
	Powered machine tools	1. Power tools shall be used, inspected, and maintained according to manufacturer's recommendations. 2. Power tools designed to accommodate guards shall be equipped with such guards. 3. The electrical power control shall be provided on each power tool to make it possible for the operator to cut off the power without leaving the point of operation. 4. All electrical power tools should be connected to an in-line GFCI.
	Temporary haul roads	1. Haul roads shall be constructed with suitable width for safe operation at the speed anticipated. 2. Speed limits shall be posted on the haul roads.

TASK 2
SURVEY AND INSPECTION
ACTIVITY HAZARD ANALYSIS

Date Prepared: 19-Dec-06

Project: **Cannon AFB, SD-11 CMI** Job: **Survey and Inspection**

Risk Assessment Code (RAC): **L**

Prepared By: Jeff Hopkins: Reviewed By:

Recommended Protective Clothing and Equipment:
PPE Level D: General work clothes and safety-toed boots.

E = Extremely High Risk
H = High Risk
M = Moderate Risk
L = Low Risk

SEVERITY	PROBABILITY: Frequent	Likely	Occasional	Seldom	Unlikely
Catastrophic	E	E	H	H	M
Critical	E	H	H	M	L
Marginal	H	M	M	L	L
Negligible	M	L	L	L	L

JOB STEPS	HAZARDS	ACTIONS TO ELIMINATE OR MINIMIZE HAZARDS
Land and geophysical surveying and site inspections	Ergonomics	1. Do not strain when collecting the sample. 2. Use arms and shoulders; do not twist your back.
	Hand tools	1. Inspect tools prior to use. 2. Use tools for their intended use only. 3. Don't use damaged tools.

TASK 3
SOIL BORING/DIRECT PUSH
ACTIVITY HAZARD ANALYSIS

Date Prepared: 19-Dec-06

Project: **Cannon AFB SD-11 CMI** Job: **Soil Boring and Direct Push Activities**

Risk Assessment Code (RAC): **M**

Prepared By: Jeff Hopkins: Reviewed By:

Recommended Protective Clothing and Equipment:
PPE Level D: General work clothes, safety glasses, hard hat (when overhead hazards exist), steel-toed boots, chemically resistant gloves (when handling potentially contaminated materials)

E = Extremely High Risk
H = High Risk
M = Moderate Risk
L = Low Risk

SEVERITY	PROBABILITY: Frequent	Likely	Occasional	Seldom	Unlikely
Catastrophic	E	E	H	H	M
Critical	E	H	H	M	L
Marginal	H	M	M	L	L
Negligible	M	L	L	L	L

JOB STEPS	HAZARDS	ACTIONS TO ELIMINATE OR MINIMIZE HAZARDS
Raise mast	Rig stability	1. Situate the rig on a flat surface. 2. Use outriggers as necessary. 3. Never move the rig with the mast up.
	Overhead utilities	1. If over head utilities are present in work areas, place warning signs at ground level. 2. Always check for overhead utilities before raising the mast. 3. Maintain at least one mast length or 20 feet, whichever is greater, from all power lines. 4. Contact the HSO if high voltage lines are present. 5. refer to SMS 34, Utility Clearance and Isolation
Attach/detach rods and augers	Lifting	1. Use the winch to lift auger flights
	Hand tools	1. Inspect tools prior to use. 2. Use tools for their intended use only. 3. Don't use damaged tools. 4. Push, don't pull wrenches.
	Pinch points	1. Never place your hand or other body parts under auger.

TASK 3
SOIL BORING/DIRECT PUSH
ACTIVITY HAZARD ANALYSIS

Date Prepared: 19-Dec-06

Project: **Cannon AFB SD-11 CMI** Job: **Soil Boring and Direct Push Activities** Risk Assessment Code (RAC): **M**

JOB STEPS	HAZARDS	ACTIONS TO ELIMINATE OR MINIMIZE HAZARDS
Advance the boring	Rotating equipment	1. All team members should know the location of the kill switch. 2. At least two persons must be present when advancing the auger. 3. Stand clear, if possible. 4. Do not wear loose clothing, jewelry, hair, or equipment near the auger. 5. Remove cuttings with a shovel, not your hand or foot.
	Underground utilities	1. Complete utility locates prior to drilling (One Call: 800-892-0123 and/or coordinate with site personnel. 2. Mark locations in white. 3. Field verify utility locations. 4. Document all utility locates. 5. Observe the area for indications of utilities. 6. Refer to SMS 34, Utility Clearance and Isolation.
	Environmental contamination (if applicable)	1. Contain cuttings in drums or plastic sheeting. 2. Wear proper PPE and minimize contact with soil, sediment, groundwater, etc. 3. Work upwind of the boring. 4. If unusual soil discoloration or odors are encountered, stop work, evacuate the area, and contact the SSO. The approach will need to be reevaluated, and Level C PPE may be required.
	Dust (respirable silica)	1. Minimize generation of dust. 2. Stay out of visible dust clouds. 3. Wet soil if necessary to eliminate visible dust.
	Noise	1. Wear hearing protection when operating or working near the rig. 2. Refer to SMS 26, Hearing Conservation.
Rig Maintenance	Falls	1. Fall protection is required when working at heights of greater than 6 feet (e.g., guard rails or a personal fall arrest system); refer to SMS 40, Fall Protection. 2. Make sure you have a good solid footing and that walking/working surfaces are as clean and dry as possible.
	Equipment energizing	1. Lockout and tagout is required if accidentally energizing the rig could cause injury. 2. Refer to SMS 23, Lockout and Tagout Safety.

TASK 3
SOIL BORING/DIRECT PUSH
ACTIVITY HAZARD ANALYSIS

Date Prepared: 19-Dec-06

Project: **Cannon AFB SD-11 CMI** Job: **Soil Boring and Direct Push Activities** Risk Assessment Code (RAC): M

JOB STEPS	HAZARDS	ACTIONS TO ELIMINATE OR MINIMIZE HAZARDS
	Hot work	1. Clear all combustibles away from the work area. 2. A fire extinguisher must be available. 3. Notify the site superintendent of all hot work. 4. Observe work areas for 30 minutes after hot work ("fire watch").
	Chemical hazards	1. Review MSDSs. 2. Follow manufacturer's instructions for use, handling, and storage. 3. Use recommended protective equipment. 4. Label all containers.
All		1. Wear proper PPE: hardhat, safety glasses with side shields, and steel-toed boots as a minimum. 2. Refer to SMS 56, Drilling Safety Guidelines.

TASK 4
EXCAVATION ACTIVITIES
ACTIVITY HAZARD ANALYSIS

Date Prepared: 19-Dec-06

Project: **Cannon AFB SD-11 CMI** Job: **Excavation Activities**

Risk Assessment Code (RAC): **M**

Prepared By: Jeff Hopkins: Reviewed By:

Recommended Protective Clothing and Equipment:
PPE Level D: General work clothes, traffic vest, safety glasses, hard hat, steel-toed boots, hearing protection, work gloves as needed.

E = Extremely High Risk
H = High Risk
M = Moderate Risk
L = Low Risk

SEVERITY	PROBABILITY: Frequent	Likely	Occasional	Seldom	Unlikely
Catastrophic	E	E	H	H	M
Critical	E	H	H	M	L
Marginal	H	M	M	L	L
Negligible	M	L	L	L	L

JOB STEPS	HAZARDS	ACTIONS TO ELIMINATE OR MINIMIZE HAZARDS
Mobilize crew and equipment. Construct access roads as needed. Excavate soil and place in inspection area. Load soil into trucks and transport to landfill Decontaminate equipment	Driving/vehicle movement (including trucks, heavy equipment)	1. Obey traffic rules. 2. 15 miles per hour is the maximum speed allowed in the work area. 3. Use caution when entering roadways. 4. Do not operate vehicles in unsafe conditions (e.g., on steep slopes, in deep mud). 5. Do not use cell phones when operating vehicles. 6. Secure all loads, including equipment within the cab. 7. Wear seat belts, including those provided in cabs of heavy equipment. 8. Use caution and wear orange vests if working near active roads or around heavy equipment. 9. Leave enough time to get to your destination without hurrying. 10. Be aware of heavy equipment and do not park or conduct work in the blind spot of the equipment operator; "blind spots" of some equipment can be very large. 11. Verify back-up alarms are functional for all heavy equipment for pick-ups or SUVs with obstructed rear view, use a back-up alarm or a spotter when backing up. 12. Refer to SMS 57, Vehicle Safety Program. 13. Rollover protective structures (ROPS) are required on all heavy equipment, with the exception of trucks used for over-the-road hauling. 14. Drilling equipment shall be inspected and maintained according to the manufacturer's recommendations.

TASK 4
EXCAVATION ACTIVITIES
ACTIVITY HAZARD ANALYSIS

Date Prepared: 19-Dec-06

Project: **Cannon AFB SD-11 CMI** Job: **Excavation Activities** Risk Assessment Code (RAC): **M**

JOB STEPS	HAZARDS	ACTIONS TO ELIMINATE OR MINIMIZE HAZARDS
	Overhead/underground utilities	1. If overhead utilities are present in work areas, place warning signs at ground level. 2. Always check for overhead utilities before using extendable equipment. 3. Maintain at least one mast length or 20 feet (whichever is greater) from all power lines. 4. Contact the RHSM if high voltage lines are present. 5. Complete utility locates prior to intrusive work in areas where utilities have not been cleared through institutional knowledge by calling One Call: (800) 321-ALERT and/or coordinate with site personnel. 6. Observe the area for indications of utilities.
	Dust	1. Minimize generation of dust. 2. Stay out of visible dust clouds. 3. Wet soil if necessary to eliminate visible dust.
	Noise	1. Wear hearing protection when operating or working near heavy equipment. 2. Refer to SMS 26, Hearing Conservation.
	Slips, trips, and falls	1. Make sure you have good solid footing and that walking/working surfaces are as clean and dry as possible. 2. Work areas should be inspected daily and findings shall be recorded on daily inspection reports.
	Hand tools	1. Inspect tools prior to use. 2. Use tools for their intended use only. 3. Don't use damaged tools. 4. Push, don't pull wrenches.
	Biological hazards	1. Repellents and proper clothing should be used for protection against insects including ticks and mosquitoes. 2. Protective clothing should be used in areas where poison oak and poison ivy are present. 3. Protective clothing, including long pants and sturdy boots, should be used for protection against snakes and spiders. 4. See SMS 047.
	Material handling	1. Employees should use safe lifting techniques, bending at the knees and lifting with the legs. 2. Employees should use caution and not twist the back when carrying a load. 3. Mechanical devices should used to move loads when possible. 4. Protective gloves should be worn when handling materials. 5. See SMS 069.

TASK 4
EXCAVATION ACTIVITIES
ACTIVITY HAZARD ANALYSIS

Date Prepared: 19-Dec-06

Project: **Cannon AFB SD-11 CMI** Job: **Excavation Activities** Risk Assessment Code (RAC): M

JOB STEPS	HAZARDS	ACTIONS TO ELIMINATE OR MINIMIZE HAZARDS
	Cold stress	1. Cold weather clothing and shelter should be provided as needed based on site conditions. 2. Air temperature monitoring should be done when temperatures fall below 45°F. 3. See SMS 059.
	Heat stress	1. Drinking water should be made available to all workers and workers should be encouraged to drink small amounts frequently. 2. Work/rest regimens shall be adjusted during hot weather. 3. See SMS 018.
	Extreme weather	1. When there are warnings or indications of severe weather, conditions should be monitored and precautions taken to protect personnel.
	Fire	1. Portable fire extinguishers shall be present in all equipment and in the field trailer. 2. Fire extinguishers shall be inspected monthly. 3. Hot work permits must be obtained prior to any welding or torch cutting activities.
	Powered machine tools	1. Power tools shall be used, inspected, and maintained according to manufacturer's recommendations. 2. Power tools designed to accommodate guards shall be equipped with such guards. 3. The electrical power control shall be provided on each power tool to make it possible for the operator to cut off the power without leaving the point of operation. 4. All electrical power tools should be connected to an in-line GFCI.
	Excavations	1. Excavations shall be backfilled as soon as possible after testing is complete. 2. Personnel shall not enter the excavations greater than 4 feet in depth. 3. An Excavation Competent Person shall inspect the excavations daily.
	Chemical hazards	1. All personnel must be have current HAZWOPER training in accordance with 29 CFR 1910.120. 2. MSDSs must be available for all chemicals brought to the site, including fuels.

EQUIPMENT TO BE USED	INSPECTION REQUIREMENTS	TRAINING REQUIREMENTS

TASK 4
EXCAVATION ACTIVITIES
ACTIVITY HAZARD ANALYSIS

Date Prepared: 19-Dec-06

Project: **Cannon AFB SD-11 CMI** Job: **Excavation Activities** Risk Assessment Code (RAC): M

EQUIPMENT TO BE USED	INSPECTION REQUIREMENTS	TRAINING REQUIREMENTS
Wheel loaders/bulldozers/excavators	Prior to initial use on site, all mechanized equipment shall be inspected and tested in accordance with the manufactures recommendations and the requirements of EM 385-1-1 and shall be certified in writing. Daily inspections shall be done to verify that the brakes are in working and operating systems are in working condition and that all required safety devices including Roll-Over Protective Structures (ROPS) are in place and functional.	Equipment shall be operated only by a designated qualified person. All personnel shall attend the site safety briefings and sign the Safety Compliance Agreement Form. All personnel shall review the SSHP.
Various tandem- and triple-axle dump trucks	Prior to initial use on site, all mechanized equipment shall be inspected and tested in accordance with the manufactures recommendations and the requirements of EM 385-1-1 and shall be certified in writing. Daily inspections shall be done to verify that the brakes are in working and operating systems are in working condition and that all required safety devices are in place and functional.	CDL required for over-the-road hauling. Equipment shall be operated only by a designated qualified person. All personnel shall attend the site safety briefings and sign the Safety Compliance Agreement Form. All personnel shall review the SSHP.

TASK 5
DEMOBILIZATION
ACTIVITY HAZARD ANALYSIS

Date Prepared: 19-Dec-06

Project: **Cannon AFB, SD-11 CMI** Job: **Demobilization**

Risk Assessment Code (RAC): **L**

Prepared By: Jeff Hopkins: Reviewed By:

Recommended Protective Clothing and Equipment:
PPE Level D (outside exclusion zone): General work clothes, traffic vest, safety glasses, hard hat, steel-toed boots, hearing protection, work gloves, respiratory protection.

E = Extremely High Risk
H = High Risk
M = Moderate Risk
L = Low Risk

SEVERITY	PROBABILITY: Frequent	Likely	Occasional	Seldom	Unlikely
Catastrophic	E	E	H	H	M
Critical	E	H	H	M	L
Marginal	H	M	M	L	L
Negligible	M	L	L	L	L

JOB STEPS	HAZARDS	ACTIONS TO ELIMINATE OR MINIMIZE HAZARDS
Removal of temporary facilities and utilities, to include: Disconnect electricity from trailer Remove trailer, dumpster, and sanitary Restore trailer, dumpster, and sanitary pads Restore laydown area Restore decontamination area Field engineering (survey of final conditions)	Driving/vehicle movement (including trucks, heavy equipment)	1. Obey traffic rules. 2. 15 miles per hour is the maximum speed allowed in the work area. 3. Use caution when entering roadways. 4. Do not operate vehicles in unsafe conditions (e.g., on steep slopes, in deep mud). 5. Do not use cell phones when operating vehicles. 6. Secure all loads, including equipment within the cab. 7. Wear seat belts, including those provided in cabs of heavy equipment. 8. Use caution and wear orange vests if working near active roads or around heavy equipment. 9. Leave enough time to get to your destination without hurrying. 10. Be aware of heavy equipment and do not park or conduct work in the blind spot of the equipment operator; "blind spots" of some equipment can be very large. 11. Verify back-up alarms are functional for all heavy equipment for pick-ups or SUVs with obstructed rear view, use a back-up alarm or a spotter when backing up. 12. Refer to SMS 57, Vehicle Safety Program. 13. Rollover protective structures (ROPS) are required on all heavy equipment, with the exception of trucks used for over-the-road hauling.

TASK 5
DEMOBILIZATION
ACTIVITY HAZARD ANALYSIS

Date Prepared: 19-Dec-06

Project: **Cannon AFB, SD-11 CMI** Job: **Demobilization** Risk Assessment Code (RAC): **L**

JOB STEPS	HAZARDS	ACTIONS TO ELIMINATE OR MINIMIZE HAZARDS
	Overhead/underground utilities	1. If overhead utilities are present in work areas, place warning signs at ground level. 2. Always check for overhead utilities before using extendable equipment. 3. Maintain at least one mast length or 20 feet (whichever is greater) from all power lines. 4. Contact the RHSM if high voltage lines are present. 5. Complete utility locates prior to intrusive work in areas where utilities have not been cleared through institutional knowledge by calling One Call: (800) 321-ALERT and/or coordinating with site personnel. 6. Observe the area for indications of utilities.
	Dust	7. Minimize generation of dust. 8. Stay out of visible dust clouds. 9. Wet soil if necessary to eliminate visible dust.
	Noise	1. Wear hearing protection when operating or working near heavy equipment. 2. Refer to SMS 26, Hearing Conservation.
	Electricity	1. Electrical work shall be performed by qualified personnel with verifiable credentials who are familiar with applicable code requirements.
	Slips, trips, and falls	1. Make sure you have good solid footing and that walking/working surfaces are as clean and dry as possible. 2. Work areas should be inspected daily and findings shall be recorded on daily inspection reports.
	Hand tools	1. Inspect tools prior to use. 2. Use tools for their intended use only. 3. Don't use damaged tools. 4. Push, don't pull wrenches.
	Biological hazards	1. Repellents and proper clothing should be used for protection against insects including ticks and mosquitoes. 2. Protective clothing should be used in areas where poison oak and poison ivy are present. 3. Protective clothing, including long pants and sturdy boots, should be used for protection against snakes and spiders. 4. See SMS 047.

TASK 5
DEMOBILIZATION
ACTIVITY HAZARD ANALYSIS

Date Prepared: 19-Dec-06

Project: **Cannon AFB, SD-11 CMI** Job: **Demobilization** Risk Assessment Code (RAC): **L**

JOB STEPS	HAZARDS	ACTIONS TO ELIMINATE OR MINIMIZE HAZARDS
	Material handling	1. Employees should use safe lifting techniques, bending at the knees and lifting with the legs. 2. Employees should use caution and not twist the back when carrying a load. 3. Mechanical devices should used to move loads when possible. 4. Protective gloves should be worn when handling materials. 5. See SMS 069.
	Cold stress	1. Cold weather clothing and shelter should be provided as needed based on site conditions. 2. Air temperature monitoring should be done when temperatures fall below 45°F. 3. See SMS 059.
	Heat stress	1. Drinking water should be made available to all workers and workers should be encouraged to drink frequently. 2. Work/rest regimens shall be adjusted during hot weather. 3. See SMS 018.
	Extreme weather	1. When there are warnings or indications of severe weather, conditions should be monitored and precautions taken to protect personnel.
	Fire	1. Portable fire extinguishers shall be present in all equipment and in the field trailer. 2. Fire extinguishers shall be inspected monthly. 3. Hot work permits must be obtained prior to any welding or torch cutting activities.
	Temporary facilities	1. Trailers shall be anchored with rods and cables or by steel straps to ground anchors designed to withstand winds and meet applicable standards. 2. Signs warning of the presence of construction hazards and requirements should be posted on the fencing every 300 feet. 3. One portable toilet with adequate ventilation and (natural) light shall be on site. 4. Washing facilities shall be provided at the portable toilet location to maintain sanitary conditions. 5. Type II 16-unit first aid kits shall be present and accessible at the site.
	Powered machine tools	1. Power tools shall be used, inspected, and maintained according to manufacturer's recommendations. 2. Power tools designed to accommodate guards shall be equipped with such guards. 3. The electrical power control shall be provided on each power tool to make it possible for the operator to cut off the power without leaving the point of operation. 4. All electrical power tools should be connected to an in-line GFCI.

SAFETY COMPLIANCE AGREEMENT AND
DOCUMENTATION OF SITE SAFETY BRIEFING

DATE _____ TIME _____

SITE LOCATION _____ PROJECT NUMBER _____

SITE SAFETY OFFICER _____ PROJECT MANAGER _____

TOPICS COVERED DURING BRIEFING:
__ EXTENT AND CONCENTRATION OF CHEMICAL HAZARDS ON SITE
__ HEALTH EFFECTS OF CHEMICALS HAZARDS
__ PHYSICAL HAZARDS ON SITE
__ LEVELS OF PROTECTION REQUIRED
__ LOCATION OF EMERGENCY EQUIPMENT(FIRST AID, FIRE FIGHTING EQUIPMENT...)
__ VERICATION THAT HEALTH AND SAFETY PLAN HAS BEEN RECEIVED AND READ
__ MONITORING PROCEDURES
__ ACTION LEVELS
__ DECONTAMINATION PROCEDURES
__ LOCATION OF EMERGENCY NUMBERS
__ ROUTE TO THE HOSPITAL

_____

_____

I, the undersigned, have received a copy of the safety plan for the referenced project. I have read the plan, understand it, and agree to comply with all of the health and safety requirements. I understand that I may be prohibited from working on the project for violating any of the requirements. In addition I have been verbally briefed on the topics noted above.

DOCUMENTION (SSO MUST SEE VERIFICATION BEFORE INITIALLING COLUMN)

ATTENDEES:

NAME	COMPANY	40 HR	FIT	MEDICAL
1.(print) _____				
(signature) _____				
2.(print) _____				
(signature) _____				
3.(print) _____				
(signature) _____				

SAFETY COMPLIANCE AGREEMENT AND DOCUMENTION OF SITE SAFETY BRIEFING - Page 2

I, the undersigned, have received a copy of the safety plan for the referenced project. I have read the plan, understand it, and agree to comply with all of the health and safety requirements. I understand that I may be prohibited from working on the project for violating any of the requirements. In addition I have been verbally briefed on the topics noted above.

DOCUMENTION (SSO MUST SEE VERIFICATION BEFORE INITIALLING COLUMN)

ATTENDEES:

NAME	COMPANY	40 HR	FIT	MEDICAL
4.(print) _____ (signature) _____				
5.(print) _____ (signature) _____				
6.(print) _____ (signature) _____				
7.(print) _____ (signature) _____				
8.(print) _____ (signature) _____				
9.(print) _____ (signature) _____				
10.(print) _____ (signature) _____				
11.(print) _____ (signature) _____				
12.(print) _____ (signature) _____				

Pre-Mobilization Checklist

Check When Completed	Checklist of Items
	Participate in boring, utility, locate and walk site
	Verify equipment needs
	Verify equipment staging area(s)
	Verify sequence of onsite mobilizations
	Service brakes, including trailer brake connections
	Service Parking (hand) brake
	Service Steering mechanism.
	Service Lighting devices and reflectors
	Service Tires
	Service Horn
	Service Windshield wiper or wipers
	Service Rear-vision mirror or mirrors.
	Service Coupling devices
	Inspect the windshield for cracks, repair or replace as necessary
	Verify that an appropriate, permitted fire extinguisher is within the driver's grasp and that the extinguisher is properly secured.
	Verify supply of sufficient flares or reflectors which can be used in the event of a breakdown while on the highway.
	Verify that seat belts are in good working condition.
	Verify all windows function properly. Repair or replace as necessary
	Verify all doors lock and function properly. Repair or replace as necessary.
	Verify back-up alarms are installed and function properly. Repair or replace as necessary.
	Verify that all lug nuts are properly tightened and that the wheels appear to be in good condition. While performing this task, the driver should make certain that the spare tire is in good condition, properly inflated, and that a suitable jack and lug wrench are available.
	Verify the mast, jacks, deck (s), and tools are completely secured prior to moving the vehicle.
	Verify all tool boxes are closed and properly secured.
	Inspect all spools containing wire rope (cable) and verify they are secured and that the cables will not unwind while driving down the road.

URS	Health, Safety, and Environment **DAILY HEAVY EQUIPMENT SAFETY INSPECTION CHECKLIST**	Attachment 19-1

Equipment Id No. _____ Inspector's Name _____

Equipment Name _____ Employee No. _____

Beg. Hours _____ End Hours _____ Date _____

INSTRUCTIONS: Each shift shall inspect all applicable items indicated. If an unsatisfactory condition is observed, suspend operation of the equipment and report the unsatisfactory condition to the site supervisor immediately.

ITEM INSPECTED	CHECK IF SATISFACTORY	COMMENTS
Falling Object Protective Structure (FOP)		
Roll-Over Protection Structure (ROP)		
Seat Belts		
Operator Seat Bar(s)		
Side Shields, Screens or Cab		
Lift Arm Device		
Grab Handles		
Back-up Alarm – Working		
Lights		
Guards		
Horn		
Windshield Wipers		
Glass, Mirrors		
Anti-Skid Tread Clear of Mud		
Safety Signs (i.e., counterbalance swing area)		
Fire Extinguisher		
General Condition		
Fuel Connection		
Oil (fuel and no leaks)		
Clear of Extra Materials		
Controls Function Properly		
Hydraulic System (full and no leaks)		
Parking Brake		
Lift Arm and Bucket		
Tires/Tracks		
Steering		
Breathing Air System		
Blast Shields		
Gallons of Fuel Added		
Quarts of Oil Added		

Operator Signature _____

Drill/Direct Push Type Rig Inspection Checklist

SITE/PROJECT NAME: Cannon AFB SD-11 CMI
RIG INSPECTOR (NAME/CO.): _____
RIG INFORMATION:

Rig Type: Rotary/Auger Drilling Rig ☐ Direct Push Type (DPT) ☐
Owner: _____
Yr/Make: _____
Model: _____
VIN #: _____
Mileage: _____
Drill Hrs: _____

Inspector to initial columns below as appropriate

CATEGORY	INSPECTION ITEMS	PASS	FAIL	N/A	ACTION NEEDED
Emergency Switches	Kill switches are located and accessible to workers on both sides of the rotating stem. **NOTE:** Location and number of switches depend on the rig manufacturer, please refer to owner's manual (DPT typically has one switch on control panel).				
	Kill switches installed by the manufacturer are verified to be in operable condition and all workers are familiar with the location and operation of these switches. **NEVER BYPASS, DISABLE, OR REMOVE KILL DEVICES.**				
Protective Guards	Drive shafts, belts, chain drives, and universal joints are guarded to prevent accidental insertion of hands, fingers, or tools.				
Cables	Cables on drill rig are free of kinks, frayed wires, birdcages, flat spots, grease, and worn or missing sections.				
	Cables are terminated at the working end with a proper eye splice; either swaged, coupled, or using cable clamps.				
	Cable clamps are installed with the saddle on the live or load side. Clamps are not alternated and are of the correct size and number for the cable size.				
	Wire ropes are not allowed to bend around sharp edges without cushion material.				
Pulleys	Pulleys are not to be bent, cracked, or broken.				
	Pulleys operate smoothly and freely, without resistance.				
Cable Winches	Motor is mounted in correct location and tightly secured to drill rig.				
	Winch is capable of being placed in the free spool (unwind smoothly) and locked position correctly, demonstrating that the cable is suitable for lifting during drilling operations.				
Safety Latches	Hooks installed on hoist cables are the safety type with a functional latch to prevent accidental separation.				
	Safety latches are functional and completely span the entire throat of the hook and have positive action to close the throat except when manually displaced for connecting or disconnecting a load.				
Flights/Augers	Flights/Augers should not be bent, cracked, or broken. **NOTE:** Flights/Augers failing inspection must be removed from jobsite.				
	Flights should be blunt to prevent the risks of cuts.				
	Auger keys should not be bent, have any cracks/fractures, be excessively worn, or otherwise damaged.				
	Auger bolt holes and threads should not be damaged.				

Drill/Direct Push Type Rig Inspection Checklist

CATEGORY	INSPECTION ITEMS	PASS	FAIL	N/A	ACTION NEEDED
Flights/Augers (cont.)	Inspect flights/augers for metal burrs. **NOTE:** Burrs must be filed to flat surface.				
	Avoid stacking augers; all should lay flat on ground.				
	Avoid manually lifting/moving augers. Should be lifted/moved with cable lines, or, at a minimum, by two persons.				
Drill String	Drill string should not be bent or have any cracks/fractures.				
	Drill string connecting pins should not be bent, have any cracks/fractures, or be excessively worn.				
Mast	Mast is free of bends, cracks, or broken sections.				
	All mounting hardware (pins, bolts, etc.) should be in place.				
	No moving of drill rig while mast is in vertical position.				
	Maintenance/repairs to be performed on mast only in horizontal position.				
Hammering Device	Hammer free of cracks, fatigue, or other signs of excessive wear.				
	Hammer connections are secure.				
Leveling Devices	Outriggers move in/out and up/down smoothly and freely while using controls on drill rig, with no hydraulic leaks.				
	Outriggers are extended prior to and whenever the mast is raised off its cradle. Outriggers must maintain pressure to continuously support and stabilize the drill rig (even while unattended).				
	Outriggers are properly supported on the ground surface to prevent settling into the soil (use of outrigger support pads).				
Controls	Controls are intact, properly labeled, have freedom of movement, and have no loose wiring or connections.				
	Controls are not blocked or locked into an operating position.				
	Installed lights, signals, gauges, and alarms operate properly.				
Lifting Devices	Slings, chokers, and lifting devices are inspected before using and are in proper working order. **NOTE:** Damaged units are to be labeled and removed from jobsite.				
	Shackles/Clevises are in proper working order with pins/ screws in place that is to be used while lifting.				
	Cables and lifting devices are not operated erratically or with a jerking action to overcome resistance.				
Hydraulic System	Hydraulic lines are secure, in good condition with no signs of excessive wear, and not leaking. **NOTE:** Check while pressurized.				
	Hydraulic lines are not in a bent or pinched position causing additional fluid restrictions/pressures.				
	Hydraulic oil reservoir has appropriate amount of oil and not leaking.				
	Documentation available to confirm that pressure relief valve was checked during shop maintenance activity and noted on maintenance log.				
Pump Lines (water, grout, etc.)	Suction/Discharge hoses, pipes, valves, and fittings are secured and not leaking.				
	High pressure hoses have a safety chain, cable, or strap at each end to prevent whipping in the event of a failure.				
Fire Prevention	A fire extinguisher of appropriate size is located on drill rig and readily available/accessible for drilling crew (recommended 20 lb.).				
	Documentation available to confirm that the drilling crew has received training on proper use of fire extinguishers.				
Ladders	Drill rig has a permanently attached or proper portable ladder to be used for access to drilling platform.				
Tracks	Tracks on rig are not excessively worn and free of any debris or foreign material.				

Drill/Direct Push Type Rig Inspection Checklist

CATEGORY	INSPECTION ITEMS	PASS	FAIL	N/A	ACTION NEEDED
General	Drill rig meets regulations for transport on state/federal highways (inspection sticker, license plate, etc.).				
	Documentation available to verify that rig was inspected prior to arriving at ExxonMobil job sites.				
	Does the rig size meet job requirements?				
	Maintenance log available for previous 3 months to confirm proper maintenance/inspection.				
Exhaust	Exhaust system should be free from defect and routes engine exhaust away from drill rig workers.				
Fuels	Fuel stored in an approved and properly labeled container.				
	Fuel transfer lines free from signs of excessive wear and not leaking.				
	Refueling and transferring of fuel is performed in an approved area with sufficient containment to prevent spillage.				
Exclusion/ Work Zones	The exclusion/work zone is centered over the borehole and the radius equal to or greater than the height of the mast (measured from ground level).				
	The exclusion/work zone should be clear of tripping hazards.				
Overhead Obstructions	Except where electrical distribution and transmission lines have been de-energized and visibly grounded, drill rigs will be operated proximate to under, by, or near power lines in accordance with the following: * 50 KV or less - minimum clearance of 10 feet * 50 KV or greater - add 0.4 inches for every KV over 50 KV * If voltage is unknown, maintain at least 20 feet of clearance.				
	While the rig is in transit, clearance from energized power lines will be maintained as follows: * Less than 50 KV - 4 feet * 50 thru 365 KV - 10 feet * 366 thru 720 KV - 16 feet				
Rig Repairs	Repairs, when possible, are conducted offsite to reduce the risk of any onsite incidents.				
Specialized PPE	When working at elevated heights, workers are to wear a fall restraining device attached in a manner to restrict fall to less than six feet.				
	When working in wet/slippery conditions, all workers have a lug-type sole or similar slip resistant sole, on their safety footwear to prevent slipping.				

RECOMMENDED SPARE PARTS OR ITEMS TO BE SENT WITH DRILL CREW

DRILL RIG

Emergency Switch
Drive Coupling
Shear pins/keys (for drive coupling)
Pump Packing
Pump Hoses
Auger Bolts
Rod to cap pins
Cutter Head

Safety Latches, Hooks, Clamps
Split Spoon Cutter Head
Spill Kit (5 gal. bucket with oil dry and absorbent pads)

DPT RIG

Emergency Switch
Drive Caps
Cutter Head
Pull Cap
Liner Cutter
Rod to Cap Pins
Liner Holder (used while cutting)
Spill Kit (5 gal. Bucket with oil dry and absorbent pads)

DAILY INSTRUMENT CALIBRATION CHECK SHEET

DATE	INSTRUMENT	BATTERY CHECK OK?	ZERO ADJUST OK?	CALIBRATI ON GAS(PPM)	READING (PPM)	CALIBRATED BY

FIELD MONITORING ACTIVITY LOG

DATE	ACTIVITY MONITORED	TIME	LOCATION	READING	ACTION	READING BY

DAILY SAFETY TASK ANALYSIS FORMS

Daily Safet ask Analysis

JOB/TASK _____ **DATE** _____

Work Area _____ **Permits(s) Required and attached** ☐ **YES** ☐ **NO**

Major Steps of Task:	Recognized/Unanticipated Hazards:	Safe Plan:	Tools *Required* to do the job safely:

Other Items discussed during the Safety Briefing:

_____

_____

_____

_____

Adjacent Work/Processes and/or co-occupancy ☐ **Yes** ☐ **No** ☐ **Other workers adjacent, above, below**

☐ **Notified them of our presence** ☐ **Coordinated with adjacent work supervisor/customer operator** ☐ **Can work safely**

TEAM MEMBERS SIGNATURES

_____ _____ _____ _____

_____ _____ _____ _____

_____ _____ _____ _____

The signature of the Supervisor certifies the completion of the Hazard Assessment and Safe Plan of Action by the crew.

Supervisor's Signature: _____ Date _____

Instructions: 1. Write the name of the job or task in the space provided. 2. Conduct a walk-through survey of work area. 3. Write the steps of the task in a safe sequence. 4. List all possible hazards involved in each step as well as reaction to failure. 5. In the Safe Plan column, provide the corrective actions that will be taken to keep the hazard from becoming an accident or injury. 6. In Tools column list tools needed to do the job, additional safety equipment, etc. 7. Have each team member that helped develop and will use this STA sign in the spaces provided at the bottom. 8. Review the STA at the end of the task for improvements. **(NOTE:** THE WORK SHALL STOP IF CONDITIONS CHANGE, JOB CHANGES, OR DEFICIENCY IN PLAN IS NOTED.)

Safe Plan of Action Checklist (Check the items that apply)

Permits/Clearances	Hazards	Safe Plan	
☐ Utility Clearance Obtained			
☐ Confined Space	☐ Overhead Utilities	☐ Power de-energization required ☐ Required clearance distance = _____ ft.	☐ Insulation blankets required ☐ Wire watcher required ☐ Safe work zone marked
☐ Critical Lift			
☐ Hoisting & Rigging Safety Review	☐ Crane or other Lifting Equipment	☐ Signalman assigned ☐ Tag lines in use ☐ Lifting equipment inspected	☐ Area around crane barricaded ☐ Personnel protected from overhead load
☐ Boom Assembly and Breakdown			
☐ Boom Proximity	☐ Underground Utilities	☐ Reviewed as-builts ☐ Required clearance distance = _____ ft.	☐ Subsurface surveys ☐ Received dig permit ☐ Safe work zone marked
☐ Concrete Structure Penetration			
☐ Soil Excavation	☐ Electrical	☐ Lock Out/Tag Out/Try Out? ☐ Reviewed electrical safety procedures	☐ Permit required ☐ Confirm that equipment is de-energized ☐ Additional info below
☐ Pneumatic Test			
☐ Hot Work	☐ Excavations	☐ Permits ☐ Inspected prior to entering ☐ Barricades provided ☐ Access/egress provided	☐ Proper sloping/shoring ☐ Protection from accumulated water
☐ Scaffolding Erection Plan			
☐ Steel Erection/Decking/Flooring/ Grating Checklist	☐ Fire Hazard	☐ Permit ☐ Fire Extinguishers ☐ Unnecessary flammable material removed	☐ Fire watch ☐ Adjacent area protected ☐ Additional info below
☐ Request for Shutdown			
☐ Electrically Hazardous Work	☐ Vehicular Traffic or Heavy Equipment	☐ Traffic Barricades ☐ Cones ☐ Signs ☐ Communication with equipment operator	☐ Flagmen ☐ Lane closure ☐ Additional information below
☐ Radiation Work Permit for Visitors			
Required PPE	☐ Noise > 85 dB	Hearing protection is required: ☐ Ear plugs ☐ Ear muffs	☐ Both ☐ Additional info below
☐ Hard Hat	☐ Hand & Power Tools:	☐ Inspect general condition ☐ GFCI in use ☐ Reviewed safety requirements in operators manual(s)	☐ Identified PEP required for each tool ☐ Guarding OK ☐ Additional info below
☐ Ear Plugs/Ear Muffs			
Eye Protection	☐ Hand Hazards	☐ List sharp tools, material, equipment ☐ PPE gloves, etc. ☐ Protected sharp edges as necessary	☐ Additional info below
☐ Safety Glasses			
☐ Face Shield			
☐ Chemical Goggles	☐ Manual Lifting	☐ Reviewed proper lifting tech. ☐ Hand protection required ☐ Back support belts	☐ Identified material requiring lifting equipment ☐ Additional information below
☐ Welding Hood			
Hand Protection	☐ Ladders	☐ Inspect general condition before use ☐ Ladder tied off ☐ Proper angle and placement	☐ Ladder inspected within last quarter ☐ Reviewed ladder safety
☐ Cut Resistant Gloves			
☐ Welders Gloves	☐ Scaffolds	☐ Inspect general condition before use ☐ Toe boards used ☐ Footings adequate	☐ Tags in place ☐ Properly secured ☐ Materials properly stored on scaffold
☐ Nitrile Gloves			
☐ Surgical Gloves	☐ Slips, Trips, Falls	☐ Inspect for trip hazards ☐ Hazards marked ☐ Extension cords properly secured ☐ Work zone free of debris	☐ Tools & material properly stored ☐ Additional information below
☐ Rubber Gloves			
☐ Electrical Insulated Gloves	☐ Pinch Points	List potential pinch points: ☐ Working near operating equipment ☐ Hand/Body positioning	☐ Additional information below
☐ Arm Sleeves			
Foot Protection	☐ Working w/Chemicals	☐ The task creates potential for direct contact with hazardous chemicals. ☐ Reviewed MSDS hazards and precautions ☐ Have identified proper PPE (respirators, clothing, gloves, etc.	☐ Have proper containers and labels
☐ Safety Toe Boots			
☐ Rubber Boots			
☐ Rubber Boot Covers			
☐ Dielectric Footware	☐ Heat Stress Potential	☐ Heat stress monitoring (>85° F; 29.4° C) ☐ Liquids available ☐ Sun Screen ☐ Reviewed Heat Stress symptoms	☐ Cool down periods ☐ Additional info below
Respiratory Protection			
☐ Dust Mask (NIOSH)	☐ Cold Stress Potential	☐ Proper clothing (i.e., gloves, coat, coveralls) ☐ Reviewed Cold Stress symptoms ☐ Warm up periods	☐ Wind chill (<32° F; 0° C) ☐ Additional information below
☐ Air Purifying Respirator			
☐ Supplied Air Respirator	☐ Environmental	☐ Air emissions ☐ Water discharge ☐ Pollution prevention	☐ Hazardous wastes ☐ Other wastes ☐ Waste minimization
☐ SCBA			
☐ Emergency Escape Respirator	☐ Natural or Site Hazards	☐ Weather ☐ Terrain ☐ Animals/reptiles/insects hazards	☐ Adjacent operations or processes ☐ Biological hazards
Special Clothing			
☐ Tyvek®	☐ Overhead Work	☐ Caution barricade tape required ☐ Rigid railing required ☐ Covers over opening	☐ Danger barricade tape required ☐ Warming signs required
☐ Poly Coated Tyvek®			
☐ NOMEX®	**Additional Information**		
☐ Rain Suit			
Fall Protection			
☐ Harness			
☐ Double Lanyard Required			
☐ Anchorage Point Available			

URS	Health and Safety Program **BEHAVIOR BASED SAFETY CHECKLIST**	Attachment 72-1 Issue Date: Sept 2003

Observer	Location	Date

	Critical Behaviors	Safe	Comments *
1.0	**Personal Protective Equipment**		
	Head	❑	
	Hand	❑	
	Feet	❑	
	Eyes/Face	❑	
	Skin	❑	
	Hearing	❑	
	Fall Protection	❑	
2.0	**Equipment/Tools**		
	Proper tool for the job	❑	
	Condition	❑	
	Proper Use	❑	
3.0	**Body Use / Position**		
	Lifting	❑	
	Pinch Point	❑	
	Ladder / stairs	❑	
	Hand placement	❑	
	Travel path / speed	❑	
	Body position	❑	
4.0	**Work Practices**		
	Follow Safety Plan / Procedures	❑	
	Housekeeping	❑	
5.0	**Other**		
		❑	
		❑	
		❑	

* Use comment column when unsafe behavior / conditions were observed. Describe what was observed and why this occurred.

URS	Health and Safety Program **INCIDENT REPORT FORM**	Attachment 49-1 Revision 2: May 2004

ADMINISTRATIVE INFORMATION:

URS Division/Company: _____

Project or Office: _____

Project Number: _____

Date/Time of Incident: _____ _____

Location/Client Name: _____ _____

TYPE OF INCIDENT
(Check all applicable items)

☐ Illness	☐ Injury	☐ Fire, Explosion, Flash	☐ Unexpected Exposure
☐ Property Damage	☐ Vehicular Accident	☐ Other (describe):	

FOR INJURIES/ILLNESS ONLY

Name of Injured Employee _____ Phone No. _____

Describe Injury _____

Medical Treatment / First Aid _____

EMPLOYEES' DESCRIPTION OF INCIDENT: (Describe the facts contributing to the incident. Identify individuals involved, witnesses, and their affiliations. Attach additional sheets, drawings, or photographs as needed.)

_____

_____

_____

_____

_____

_____

_____

_____

Employee Name _____

Employee Signature _____ Date _____

URS	Health and Safety Program **INCIDENT REPORT FORM**	Attachment 49-1 Revision 2: May 2004

SUPERVISORS' DESCRIPTION OF INCIDENT: (Provide any additional/different details than provided by employee. Attach additional sheets, drawings, or photographs as needed.) Use additional sheets if necessary.

_____

_____

_____

_____

_____

CORRECTIVE ACTIONS (*For Internal Use Only*):

_____

_____

_____

_____

_____

REVIEWED BY:

Supervisor or Project Manager _____ Date _____

Office Manager _____ Date _____

Health and Safety Representative _____ Date _____

Supervisor must deliver this report to the office or project health and safety representative within 24 hours of the reported incident.

DISTRIBUTION: The Office or Project Health and Safety Representative distributes to:

- Office Manager
- Project Manager
- Project / Office file
- Regional Health and Safety Manager
- URS Occupational Health Nurses

  Fax: 512.419.6413

  URS Phone: 866.326.7321

  EG&G Phone: 866.344.1415

(For URS Asia/Pacific and Europe Operations – distribute this form in accordance with the directions in SMS 49.)

Note: The Regional Health and Safety Manager will distribute this Incident Report to other appropriate URS line managers as appropriate.

List of Safety Management Standards

SMS 002	Worker Right-to-Know (Hazard Communication)
SMS 009	Corrosive and Reactive Materials
SMS 010	Confined Space Entry
SMS 012	Electrical Safety
SMS 013	Excavation Safety
SMS 015	Flammable, Combustible Liquids and Gases
SMS 016	Hand Tools and Portable Equipment
SMS 017	Hazardous Waste Operations
SMS 018	Heat Stress
SMS 019	Heavy Equipment Ops
SMS 020	Hot Work
SMS 021	Housekeeping
SMS 023	Lockout/Tagout (Control of Hazardous Energy)
SMS 024	Medical Screening & Surveillance
SMS 026	Noise and Hearing Conservation
SMS 028	Portable Ladders
SMS 032	Work Zone Safety
SMS 034	Utility Clearances and Isolation
SMS 040	Fall Protection
SMS 042	Respiratory Protection
SMS 046	Subcontractor H&S Requirements
SMS 047	Biological Hazards
SMS 049	Injury/Illness/Incident Reporting and Notification
SMS 051	Blood-borne Pathogens
SMS 056	Drilling Safety Guidelines
SMS 057	Vehicle Safety
SMS 059	Cold Stress
SMS 064	Hand Safety
SMS 065	Injury Management
SMS 069	Manual Material Handling
SMS 070	Powered Industrial Trucks
SMS 072	Behavior Based Safety

1. Applicability

This standard applies to the operations of URS Corporation and its subsidiary companies.

2. Purpose and Scope

The worker right-to-know program provides URS personnel with information and training about safety and health hazards associated with the chemicals they might encounter in the workplace. This procedure describes how chemical safety hazards are communicated to URS personnel and how information is to be provided to employees of other employers working at the location. The requirements include steps to acquire this information, maintain it, and train personnel in the hazard communication program.

3. Implementation

Implementation of this procedure is the responsibility of the manager directing activities of the facility or site.

A Corporate, Regional, or Strategic Business Unit (SBU) HSE Manager must approve deviations from this procedure.

4. Requirements

A. Hazardous Material Inventory:

Maintain a hazardous material inventory that lists all of the hazardous materials used at each workplace (i.e., office/field location). Use chemical names consistent with the applicable material safety data sheet (MSDS).

B. Material Safety Data Sheets (MSDS)

1. Obtain a MSDS for each chemical before it is used.
2. Review each MSDS when it is received to evaluate whether the information is complete and to determine if existing protective measures are adequate.
3. Maintain a collection of all applicable and relevant MSDS where they are accessible by all employees at all times.
4. Replace MSDS when updated sheets are received. Communicate any significant changes to those who work with the chemical.

5. MSDS are required for all hazardous materials used on site by project personnel.

C. Labels

Unless each container has appropriate labeling, label all chemical containers with:

1. Identity of the hazardous chemical(s),
2. Appropriate hazard warnings, and
3. Name and address of the chemical manufacturer, importer, or other responsible party.

D. Hazardous Nonroutine Tasks

Periodically, employees are required to perform hazardous non-routine tasks. Prior to starting work on such projects, provide each employee with information about hazards to which they may be exposed during such an activity.

This information will include:

1. Specific chemical hazards.
2. Protective/safety measures which must be utilized; and
3. Measures that have been taken to lessen the hazards including ventilation, respirators, presence of another employee and emergency procedures.

E. Informing Contractors/Subcontractors

Provide contractors/subcontractors the following information on chemicals used by or provided to URS personnel:

1. Names of hazardous chemicals to which they may be exposed while on the jobsite.
2. Precautions the employees may take to lessen the possibility of exposure by usage of appropriate protective measures.
3. Location of MSDS.

F. Training

1. Conduct training of all employees potentially exposed to hazardous materials on the following schedule:
    a. Before new employees begin their jobs.
    b. Whenever new chemicals are introduced into the workplace, or
    c. Annually thereafter.
2. This training will include:
    a. Applicable regulatory requirements.
    b. Names of those responsible for implementing this program.
    c. Location of the program, inventory and MSDS.
    d. Chemicals used and their hazards (chemical, physical and health).
    e. How to detect the presence or release of chemicals.
    f. Safe work practices.
    g. How to read an MSDS.
3. Document the training.
4. Where non-English speaking workers are employed, provisions for training in the appropriate language shall be arranged.

5. Documentation Summary

A. File these records:

1. Chemical Inventory.
2. Location of the MSDS inventory.
3. Training records.
4. Contractor/Subcontractor notifications.

6. Resources

A. U.S. OSHA Technical Links - Hazard Communication

B. U.K. - Control of Substance Hazardous to Health - Regulations

References to the UK legislation listed above can be found at the link provided:

www.tionestop.com
username: Thorburn
password: Dames
enter search criteria – (see underlined text)
select the checkbox for Construction Information Service (CIS)

C. National Paint and Coatings Association (NPCA) Hazardous Materials Identification System (HMIS) Version III

D. National Fire Protection Association (NFPA) Standard 704 (Standard System for the Identification of Hazardous Materials for Emergency Response)

1. Applicability

This program applies to URS office and field operations where corrosive or reactive materials are stored or used.

2. Purpose and Scope

This program provides information regarding the proper methods to store, handle and work with corrosive and reactive materials. This procedure considers a corrosive material as one that has a pH less than 2.0 (acid), or greater than 12.5 (base). A reactive material is a chemical that may be sensitive to shock, or may react with air or water depending upon its makeup.

3. Implementation

Office Locations -Implementation of this program is the responsibility of the Office Manager.

Field Activities - Implementation of this program is the responsibility of the Project Manager.

4. Requirements

A. Appoint a responsible person who will:

1. Inspect storage areas periodically.
2. Monitor the quantity of corrosive and reactive materials on site as well as those incoming materials.
3. Review work practices utilizing corrosive and reactive materials.

B. Require that all employees working with corrosive or reactive materials, or who are working in close proximity to where such materials are being used or handled, are trained in accordance with SMS 002, "Worker Right to Know".

C. Control the use of corrosive and reactive materials by URS personnel.

1. Order only those materials and quantities that are needed to complete a job.
2. Check incoming corrosive and reactive materials for proper labeling.

a. Label materials if needed upon arrival on site.
b. Mark reactive materials containers with the date of receipt of the chemical.

3. Check incoming corrosive and reactive materials for material safety data sheets (MSDS). If MSDS are not already on file, order them from the manufacturer, distributor or vendor.
4. Add incoming corrosive and reactive chemicals to the hazardous materials inventory, if not already on the inventory, following procedures set forth in SMS 002, "Worker Right to Know".
5. Do not store any quantity of corrosive or reactive materials except consumer products in an office. These materials are to be stored off-site or at an on-site laboratory or storage area.

D. Store corrosive and reactive materials appropriately.

1. Store corrosives and reactive materials as indicated on the MSDS. In general, store these materials:

a. In a cool, dry environment, free from extremes of temperature and humidity.
b. In a manner that separates them from other materials (including flammables and oxidizers) and from each other.

1. Separate acids and bases.
2. Separate reactive materials from acids and bases, and protect from contact with water.

c. On materials that are acid resistant (Teflon-coated, plastic, etc.) for small containers.
d. Covered, not stacked on one another on acid resistant material for carboys (approximately 5 gallons/22 liters).
e. On individual racks or securely blocked on skids with closure (plug) facing upward to prevent leakage for drums.

E. Require that labeling and signage are in place.

Label containers with the appropriate warning word to indicate the hazard: DANGER; WARNING; CAUTION; CORROSIVE; OXIDIZER.

F. Use corrosive and reactive materials appropriately.

1. Safe-handling procedures will vary with each operation and type and concentration of the chemical, in all cases review the MSDS and product information before use.

2. Use SMS 029, "Personal Protective Equipment," when working with or around corrosive and reactive materials.

   a. Review the MSDS for the chemical used to determine the type of PPE needed.

   b. Wear the following PPE as a minimum when working with corrosives and reactive materials:

      1. Chemical splash goggles.

      2. Chemical resistant gloves.

      3. Chemical resistant apron.

3. Obtain medical care immediately in the event of:

   a. Skin or eye exposure (e.g., splash) to corrosive liquids.

   b. Inhalation of vapors of corrosive liquids that cause respiratory discomfort.

4. Require an eyewash to be located in all areas where acids or bases are used. Safety showers should be nearby if significant acid or base quantities are involved.

   a. Place emergency eyewashes and showers in accessible locations that require no more than 10 seconds to reach and are in a travel distance no greater than 25 feet (7.5 meters) from the hazard.

   b. Mark emergency eyewashes and showers with a highly visible sign.

   c. Require the area around emergency eyewashes and showers to be well lighted and visible.

   d. Require emergency showers to deliver a minimum 20 gallons (85 liters) per minute for 15 minutes.

   e. Require emergency eyewashes to be capable of delivering to the eyes not less than 1.5 liters per minute for 15 minutes.

G. Be prepared to clean up spills of corrosive and reactive materials.

1. Have a written spill response plan in place before materials are stored on site.

2. Have commercial spill kits available for clean up of small quantities of materials.

3. Clean up or respond to spills promptly.

4. Do not use combustible organic materials (sawdust, excelsior, wood chips and shavings, paper, rags or burlap bags) to absorb or clean up spills.

H. Dispose of corrosive and reactive materials appropriately.

1. Segregate organic acids, inorganic acids, and basic wastes.

2. Contract hazardous waste disposal services should be obtained to dispose of waste materials. All waste must be appropriately packaged for off-site transportation.

I. Inspect corrosive and reactive storage and use areas periodically.

1. Inspect office settings quarterly.

2. Inspect field related project sites monthly.

3. Use the inspection sheet provided as Attachment 9-1 to inspect sites.

5. Documentation Summary

A. File these records in the Office Safety Filing System:

1. Completed Corrosive and Reactive Material Inspection Sheets.

2. Worker Right to Know training documentation.

3. Written Spill Response Plan.

B. For field operations, file these records in the Project Safety File.

1. Completed Corrosive and Reactive Material Inspection Sheets.
2. Worker Right to Know training documentation.
3. Written Spill Response Plan.

6. Resources

A. ANSI Z358.1-1990 American National Standard for Emergency Eyewash and Shower Equipment

B. U.S. OSHA Technical Links - Personal Protective Equipment

C. U.S. OSHA Technical Links - Hazard Communication

D. Australian Standards AS 3780 - 1994. The Storage and Handling of Corrosive Substances

E. Attachment 9-1 - Inspection Sheet

URS	Health, Safety, and Environment **CORROSIVE AND REACTIVE MATERIALS INSPECTION SHEET**	Attachment 9-1 Revision 1: March 2005

Location: _____

Name of Inspector: _____ **Date Inspected:** _____

	"NO" answers indicate an unsafe situation or problem	Yes	No	N/A
	Labeling			
1.	Containers are labeled with: • Name of chemical • Signal word (DANGER; WARNING; CAUTION, etc.) • Manufacturer			
	Pre-Job Activities			
2.	Corrosives are stored in a cool, dry environment, free from temperature extremes.			
3.	Corrosives are stored in their properly labeled original containers and cushioned against shock.			
4.	Corrosives are not stored in the vicinity of oxidizers.			
5.	Hydrofluoric acid is stored only in acid-proof polyethylene or ceresin lined containers.			
6.	Corrosives are stored on acid resistant material (Teflon-coated, metal, plastic, etc.).			
7.	Chromic acid, nitric acid, perchloric acid, potassium permanganate (all oxidizers) are stored separately from other corrosives and flammables.			
	Handling			
8.	The minimum required PPE issued when working with corrosives: • Chemical splash goggles. • Chemical resistant gloves. • Chemical resistant apron.			
9.	Bottles or carboys are opened slowly to guard from splashes.			
10.	The outside of the container is washed off with water after use to clean off any droplets of material.			
11.	An eyewash is located in all areas where corrosives are used.			
12.	An eyewash is: • Within 25 feet or 10 seconds travel; • Marked with a highly visible sign; • Well lit and visible; • Working and delivering a minimum of 1.5 liters of water/min. for 15 min.			
	Waste Disposal			
13.	Organic acid, inorganic acid and basic waste is kept segregated.			
14.	Only minor amounts of acid or base (less than 3 oz. or 100 ml) are flushed down the drain into the sanitary sewer.			
15.	Corrosive waste is disposed of by a contract hazardous waste disposal company.			

Comments:

_____

_____

_____

_____

_____

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1. Applicability

This standard applies to the operations of URS Corporation and its subsidiary companies.

2. Purpose and Scope

This procedure is intended to protect personnel from the hazards associated with confined space entry.

A confined space is:

1. Large enough for personnel entry,
2. Has limited or restricted means for entry or exit, and
3. Is not designed for continuous occupancy.

A Non-Permit space is a confined space that does not present any potential hazards, nor will the work performed therein create a hazardous condition.

A Permit-Required space is a confined space that may present one or more potential hazards including hazardous atmospheres, fire/explosion, engulfment, entrapment, electrical, mechanical, or any other serious hazard. (Note: For Australian operations, all confined space entries require a permit.)

Permit required confined space hazards include risks of asphyxiation, fire or explosion, chemical exposure, engulfment or drowning, electrocution, or dismemberment. Examples include, but are not limited to, sewers, utility vaults, tanks, sump pits, and excavations where there is the potential for atmospheric hazards.

This procedure applies to all permit required confined space entry activities performed by URS or any contractor and/or subcontractor.

Entry into either a non-permit or permit confined space occurs whenever any body part crosses the plane of entry of the space.

3. Implementation

Implementation of this procedure is the responsibility of the manager directing activities of the facility or site.

A Corporate, Regional, or Strategic Business Unit (SBU) HSE Manager must approve deviations from this procedure.

4. Requirements

A. Entry Supervisor:

1. Determines whether a space is a "permit required" or non permit space.
2. Is responsible for onsite verification of acceptable entry conditions prior to entry.
3. Is responsible for assigning appropriately trained personnel to the project.
4. Has knowledge of required confined space entry equipment.
5. Has the ability to recognize and test hazardous atmospheres.
6. Is capable of performing a thorough hazard evaluation of the space and of the work that will be performed therein.
7. Understands how to execute a Confined Space Permit as well as any other required permit, such as a Hot Work permit.
8. Has authority to stop work and take corrective actions when conditions change.
9. Has had formal, documented training as a confined space Entry Supervisor.

B. Permit System

1. Utilize the "Confined Space Entry Permit and Procedures" form, Attachment 10-1, for permit space entry evaluation and establishment of required entry parameters.
2. Require confined space entry permits to be issued at least each shift by the Entry Supervisor.

C. Planning for Confined Space Entry

1. The Entry Supervisor:

a. Contacts the facility representative to gather information about the confined space and to determine if the facility has any entry requirements that must be followed.

b. Performs a Hazard Evaluation using the Confined Space Permit and Procedures for Entry Form, Attachment 10-1.

c. Determines whether the space is a "permit required confined space" or a non-permit required confined space.

d. Assesses whether those hazards that create the "permit required confined space" can be eliminated without employee entry into the space. By eliminating hazards that are immediately dangerous to life or health, administrative and rescue requirements are lessened and risk to workers is reduced.

e. Determines rescue requirements for the space - if so designated as a "permit required confined space".

f. Arranges for qualified Entrants and Attendants.

g. Identifies all equipment, including personal protective equipment, needed for the job.

h. Obtains all equipment and verifies that it is functional.

i. Coordinates confined space entry activities with other contractors on site that may be affected by the entry and provide them with a copy of this written program.

D. Site Confined Space Preparation

1. Space Isolation

a. Verify the confined space is drained and cleaned.

b. Isolate the confined space as described on the Hazard Evaluation form or other applicable written procedures.

c. Isolate all forms of potential energy inside the confined space, including:

1. Electrical

2. Mechanical

3. Thermal

4. Pneumatic

5. Hydraulic

d. Isolate all lines carrying fuels, liquids or gases into the space.

e. Develop alternate procedures for protection of entrants for lines which may not be controlled (e.g., lines through storm water or sewer vaults).

f. Open the entry point to the confined space.

g. Provide barricades and post the entrance of the space with a sign stating "Danger Confined Space Do Not Enter" or equivalent wording.

2. Electrical Equipment

a. Provide electrical equipment that meets the electrical classification of the area. See SMS 012, "Electrical Safety".

b. Route all portable electrical equipment through ground fault circuit interruption (GFCI) devices.

3. Atmospheric Tests

a. Calibrate monitoring equipment before and after sampling and record information on the Daily Instrument Calibration Form.

b. Make initial atmospheric tests of the space with ventilation OFF.

c. Attach extension probes to the monitoring equipment, or lengths of silicone or similarly inert tubing material, to reach the bottom of the space. For horizontal spaces, the probe may need to be attached to a pole.

d. Take atmospheric measurements in several locations (bottom, middle, top, corners) allowing extra response time

from the instrumentation to register, especially if a tubing extension is used.

Consult the monitoring equipment's operating manual to determine the additional response time required.

e. Obtain reading for oxygen first, followed by %LEL, then for other contaminants of concern (if applicable).

f. Record all results on the permit and sign and initial where indicated.

g. Determine if acceptable entry conditions exist with respect to oxygen, %LEL, other hazardous atmospheres.

h. If unacceptable entry conditions are indicated, correct the limiting condition.

i. If acceptable entry conditions exist, determine times that the monitoring will be repeated or if continuous monitoring will be needed.

j. Monitor continuously for oxygen and %LEL if hot work will be performed in the space.

4. Ventilation

a. Open as many openings as possible in the space to aid in cross ventilation.

b. Never ventilate confined spaces with oxygen.

c. Provide five (5) air changes per hour, or at least 10,000 cfm for large spaces.

d. If a generator is used to provide power, be sure that the exhaust does not enter the space. Carbon monoxide monitoring may be required.

e. Place blower ductwork such that it does not create a hazard by impairing the line of vision of attendants to observe space entrants, or by blowing contaminants to other workers.

f. Provide at least 2,000 cfm of active exhaust ventilation for each welder or torch operating under a Hot Work Permit within the space.

g. Use fire/explosive proof ventilating equipment that is properly grounded when exhausting flammable gases, vapors and dusts from confined spaces.

5. Authorizing the Permit

a. The Entry Supervisor personally inspects the work area and signs the permit after confirming that all necessary precautions have been taken and all relevant information concerning the entry parameters are documented on the permit.

b. Conduct a briefing informing all entrants and attendants of space conditions.

c. Require entrant(s) and attendant(s) to each print their names and sign the permit.

d. Affix the permit to a location near the space entrance.

E. Entry Operations

1. Prohibit entry when oxygen deficient or flammable atmospheres are present in the space.

2. Limit entry to qualified entrants listed on the permit and only for the purpose stated on the permit.

3. Require entrants to follow all requirements listed on permit.

4. Attach body harness, if required, to a lifeline, and the other end of the life line is attached to a fixed point or to a mechanical lifting device outside the space at all times the entrant(s) are in the space.

5. Require that the attendant(s) remain at the entrance whenever an entrant is inside the confined space. The attendant may not be assigned other duties that may distract him/her from maintaining uninterrupted contact with the entrant(s). The attendant may only attend to one confined space entry at any one time. Each space must have its own attendant.

F. Exiting the Confined Space

1. Attendant will order entrant(s) out of space whenever:

   a. A prohibited condition on the entry permit develops.

   b. The surrounding work area becomes unsafe.

   c. Any monitoring instrumentation, rescue equipment, ventilation, etc. becomes compromised.

   d. Possible symptoms of exposure are noted in the entrant(s).

   e. Entrant(s) express any type of concern regarding the safety of the entry.

G. Rescue

1. Require non-entry rescue procedures to be used for every entry. Typically, non-entry rescue will require the use of a tripod and winch, lanyard, and full body harness.

2. When local emergency services are not available for rescue, contract for qualified entry rescue services. Entry rescue must be staged on site adjacent to the space for the duration of the entry.

H. When the Entry Work is Complete

Cancel the permit by obtaining the signature of the entry supervisor and recording the time and date on the permit. This should be accomplished after the space is resealed and signs and barricades removed. If the space cannot be closed until a later time, provisions must be maintained (barricades, warning signs) to discourage persons from entering the space.

I. Audits of the Confined Space Entry Program

Annual audits of this Safety Management Standard will be conducted in accordance with the procedures set forth in the URS SMS 68 – Health and Safety Compliance Assurance.

The Project Manager will require compliance with this SMS by reviewing Entry Permits on a weekly basis and document this review by notation on the permits.

J. Training

Require Entry Supervisors, Entrants, and Attendants to be trained prior to initial assignment, prior to change in assigned duties, if a new hazard has been created or special deviations have occurred.

5. Documentation Summary

Records required in the Project Safety File

A. Entry supervisor, Entrant and Attendant qualifications.

B. Confined Space Entry Permits plus Hot Work Permits (if issued).

C. Monitoring equipment calibration logs.

D. Lock-out/Tag-out records (if used).

E. Daily worker briefing documentation.

6. Resources

A. U.S. OSHA Standard 29 CFR 1910.146 - Permit Required Confined Spaces

B. U.S. OSHA Technical Links - Confined Spaces

C. U.K. - Factories Act

D. Australian Standards AS 2865-1995 - Safeworking in a Confined Space

E. Worksafe Australia - Working in Confined Spaces

F. US Army Corp of Engineers - EM 385-1-1, Section 06.I.

G. Attachment 10-1 - Confined Space Permit and Procedures for Entry

URS Corporation

CONFINED SPACE PERMIT & PROCEDURES FOR ENTRY

Confined Space Name:		**No.**
Confined Space Location:		**Date:**
Entry Authorized By:	**Time Issued:**	**Time expires:**

Reason(s) for Entry	Hazards

ISOLATION

Equipment to Lock/Tag/Test (including blocking, blanking, and/or disconnecting electrical, hydraulic, pneumatic, kinetic, thermal, steam, chemical, springs):

Equipment Name:	Isolated by:	Location:	Done

ENTRY REQUIREMENTS:	Required	Checked		Required	Checked
Eye Protection			Hot Work Permit		
- Safety Glasses			Communications		
- Goggles			Air Mover(s)		
- Face Shield			Rescue Hoist and Other Related Equipment		
Hearing Protection			Rescue Lanyard		
Fall Protection			GFCI Protected Electrical		
Respiratory Protection			Explosion Proof Lighting/Electrical		
- 1/2 Face Disposable			Non-sparking Tools		
- 1/2 Face Cartridge			Ladders		
- Full Face			Blocking/Blanking Equipment		
- Powered Air Purifying			Air Monitoring		
- Supplied Air			- Oxygen		
Gloves Type			- Combustibles		
Boots Type			- Carbon monoxide		
Clothing Type			- Hydrogen sulfide		
Hard Hat			- Dust		
Other			- Other		

Comments:

Atmospheric Testing	Pre-Entry Needed	Pre-Entry Time: Results/Initials	Continuous Needed	Continuous Time: Results/Initials	Time: Results/Initials	Time: Results/Initials	Time: Results/Initials
Oxygen (19.5-23.5%)							
Combustibles(<10%LEL)							
Carbon Monoxide (<35 ppm)							
Hydrogen Sulfide (<2 ppm)							
Dust (visibility > 10')							
Other							
Other							

Record readings every 30 minutes (minimum)

Note: Sign the permit and authorize entry only when the atmospheric conditions meet the permissible entry levels shown for a minimum period of 30 minutes prior to entry.

Name of Tester: Signature:

Testing Equipment Used	Type	Model	I.D. Number

Emergency Action Plan:

Authorization	Signature	Time/Date
Entry Supervisor: (print) I certify that the requirements of this confined space entry permit have been met and I authorize entry into the confined space to which this permit applies.		
Relief Entry Supervisor: (print) I certify that the requirements of this confined space entry permit have been met and I authorize entry into the confined space to which this permit applies.		
Entrants(s): (print)		
Attendant(s): (print)		

Permit Canceled by: _____ Date: _____ Time: _____

Permit was cancelled because (check one): (i) Work has been completed _____ (ii) The permit has expired _____ (iii) Emergency (specify) _____

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1. Applicability

This standard applies to the operations of URS Corporation and its subsidiary companies, where electricity is used, electrical systems are installed or maintained, or where live electrical circuits are accessed. For work around overhead or underground utilities, see SMS 34, "Utility Clearances".

2. Purpose and Scope

This procedure describes requirements for working on electrical circuits with voltage greater than 50 volts. The primary hazards related to electricity are shock, burns, arc-blast, fire and explosions. This procedure is intended to reduce worker risk to electrical hazards.

3. Implementation

Implementation of this procedure is the responsibility of the manager directing activities of the facility or site.

A Corporate, Regional, or Strategic Business Unit (SBU) HSE Manager must approve deviations from this procedure.

4. Requirements

A. Any work performed on live electrical systems must be done by a licensed or journeyman electrician.

B. Follow established lockout/tagout procedures. Refer to SMS 23, "Lockout and Tagout Safety".

1. Consider all electrical systems as live until verified de-energized and grounded.

2. Do not work on or in close proximity to electrical circuits unless the circuit is de-energized, grounded or guarded.

C. Hazardous Locations

Determine if electric equipment and wiring will be installed in locations that are classified depending on:

1. The properties of flammable vapors, liquids or gases, or combustible dusts or fibers that may be present; as well as the likelihood that a flammable or combustible concentration or quantity

is present. Refer to Attachment 12-1 for definitions of hazardous locations.

2. Consult Resources A, B, F, and G for information on working in classified locations.

D. Ground Fault Circuit Interrupters and Grounding

1. Ground Fault Circuit Interrupters

a. Provide approved ground-fault circuit interrupters for all 120-volt, single phase, 15- and 20-ampere receptacle outlets on construction sites.

b. Provide ground-fault circuit interrupters for all 120-volt, single phase, 15-and 20-ampere receptacle outlets within garages, bathrooms, kitchens and shops.

2. Grounding/Earthing

Effectively ground all wiring, electrical circuits, and equipment, except portable tools & appliances protected by an UL-approved system of double insulation. Examples of equipment requiring grounding include:

a. Portable and vehicle or trailer mounted generators.

b. Electrically powered arc welders.

c. Switches.

d. Motor controller cases.

e. Fuse boxes.

f. Distribution cabinets.

g. Frames.

h. Non-current-carrying rails used for travel and motors of electrically operated cranes.

i. Electric elevators.

j. Metal frames of non-electric elevators to which electric conductors are attached.

E. Circuits

1. Require that there are no missing blanks.
2. Close doors to circuit and fuse boxes when not in use.
3. Label every circuit located on a circuit breaker/fuse box and/or motor control center (MCC).

F. Temporary Wiring, Electrical Tools and Extension Cords

1. Require that temporary wiring is installed and used in accordance with references. Specifically:
   a. Guard, bury or isolate by elevation temporary wiring to prevent accidental contact by workers and equipment.
   b. Require that vertical clearance above walkways is not less than 10 feet (3 metres) from circuits carrying 600 volts or less.
   c. Support all exposed temporary wiring on insulators.
   d. Protect temporary wiring from accidental damage.
   e. Guard live parts of wiring.
   f. Mark temporary power lines, switch boxes, receptacle boxes, metal cabinets and enclosures around equipment to indicate the maximum operating voltage.
2. Require that lighting strings are installed and used in accordance with Resources A and B. Specifically:
   a. Use nonconductive lamp sockets and connections permanently molded to the conductor insulation.
   b. Require that lighting strings have lamp guards.
   c. Replace all broken or defective bulbs promptly.

   d. Protect all lights used for illumination from accidental contact or breakage.
   e. Ground metal-case sockets.
3. Require that extension cords are installed and used in accordance with Resources A and B. Specifically:
   a. Use only 3-wire grounded type extension cords designated for hard service or extra hard service and listed by Underwriters Laboratories, Inc.
   b. Check cords for damage before use and daily thereafter.
   c. Do not exceed the rated load.
   d. Do not use spliced cords.
   e. Destroy and discard worn or frayed cords.
   f. Do not fasten extension cords with staples, hang them by nails or suspend them by wire.
   g. Do not wrap cords or cables around any conductive materials.
4. Require that portable electric tools brought onto the site are in good condition. Before use on any shift, visually inspect portable cord and plug connected equipment for external defects and evidence of possible internal damage.

G. Report to supervision potential electrical hazards or unexpected occurrences while electrical renovation or construction occurs.

H. Tests shall be performed on cord sets and receptacles before each use, or before return to service following repair or thereafter at intervals not to exceed 3 months in accordance with 1926.404 (b)(1)(iii)(D) and 1926.404 (b)(1).

I. Keep accurate records of all pertinent work performed on a project.

1. Keep as-built designs updated.
2. Share information on modifications with contractors on site.

J. Use of equipment that does not meet the requirements of this standard is not permitted.

K. Isolation of live electrical components

Isolate all live, unprotected electrical components through the use of barricades, fencing or other means to protect employees from contact.

L. Briefing

1. Brief workers on electrical hazards at the beginning of the job. Utilize Attachment 12-2 as a guide for proper PPE as applicable.
2. Brief new workers entering the site.
3. Brief workers when electrical conditions change or when hazards exist.

M. Inspection

Inspect the job site periodically using Attachment 12-3 to evaluate compliance with this standard.

5. Documentation Summary

Project Safety Files

A. Licensed/journeyman electrician for project (as necessary).

B. Attachment 12-3,"Audits."

C. Documented communications between URS, contractors, licensed/journeyman electricians, or others.

6. Resources

A. U.S. OSHA Standard - General Industry Electrical Safety - 29 CFR 1910, Subpart S

B. U.S. OSHA Standard - Construction Electrical Safety - 29 CFR 1926, Subpart K

C. U.S. OSHA Standard - Design Safety Standards for Electrical Systems - 29 CFR 1910, Subpart S

D. U.S. OSHA Standard - The Control of Hazardous Energy (Lockout/Tagout) - 29 CFR 1910.147

E. Australian Standards SAA HB94-1997 - Electrical Safety in the Workplace

F. American National Standards Institute/Institute of Electrical and Electronics Engineers - National Electrical Safety Code (NESC), ANSI/IEEE C2-2002

G. National Fire Protection Association, National Electric Code, NFPA-70

The following documents are PDF files requiring the use of Adobe Acrobat reader.

H. Attachment 12-1 - Hazardous Locations

I. Attachment 12-2 - PPE, Tools and Equipment

J. Attachment 12-3 - Electrical Hazard Check Sheet

"Class I Locations"

Class I locations are those in which flammable gases or vapors are or may be present in the air in quantities sufficient to produce explosive or ignitable mixtures. Class I locations include the following:

A. Class I, Division 1 location is a location:

1. In which ignitable concentrations of flammable gases or vapors may exist under normal operating conditions; or
2. In which ignitable concentrations of such gases or vapors may exist frequently because of repair or maintenance operations or because of leakage; or
3. In which breakdown or faulty operation of equipment or processes might release ignitable concentrations of flammable gases or vapors, and might also cause simultaneous failure of electric equipment.

B. Class I, Division 2 location is a location:

1. In which volatile flammable liquids or flammable gases are handled, processed, or used, but in which the hazardous liquids, vapors, or gases will normally be confined within closed containers or closed systems from which they can escape only in case of accidental rupture or breakdown of such containers or systems, or in case of abnormal operation of equipment; or
2. In which ignitable concentrations of gases or vapors are normally prevented by positive mechanical ventilation, and which might become hazardous through failure or abnormal operations of the ventilating equipment; or
3. That is adjacent to a Class I, Division 1 location, and to which ignitable concentrations of gases or vapors might occasionally be communicated unless such communication is prevented by adequate positive-pressure ventilation from a source of clean air, and effective safeguards against ventilation failure are provided.

"Class II Locations"

Class II locations are those that are hazardous because of the presence of combustible dust. Class II locations include the following:

URS | Health, Safety, and Environment | Attachment 12-1
HAZARDOUS LOCATIONS

A. Class II, Division 1 location is a location:

1. In which combustible dust is or may be in suspension in the air under normal operating conditions, in quantities sufficient to produce explosive or ignitable mixtures; or
2. Where mechanical failure or abnormal operation of machinery or equipment might cause such explosive or ignitable mixtures to be produced, and might also provide a source of ignition through simultaneous failure of electric equipment, operation of protection devices, or from other causes, or
3. In which combustible dusts of an electrically conductive nature may be present.

B. Class II, Division 2 location is a location in which:

1. Combustible dust will not normally be in suspension in the air in quantities sufficient to produce explosive or ignitable mixtures, and dust accumulations are normally insufficient to interfere with the normal operation of electrical equipment or other apparatus; or
2. Dust may be in suspension in the air as a result of infrequent malfunction of handling or processing equipment, and dust accumulations resulting therefrom may be ignitable by abnormal operation or failure of electrical equipment or other apparatus.

"Class III Locations"

Class III locations are those that are hazardous because of the presence of easily ignitable fibers or flyings but in which such fibers or flyings are not likely to be in suspension in the air in quantities sufficient to produce ignitable mixtures. Class III locations include the following:

A. Class III, Division 1 location is a location in which easily ignitable fibers or materials producing combustible flyings are handled, manufactured, or used.

B. Class III, Division 2 location is a location in which easily ignitable fibers are stored or handled, except in process of manufacture.

URS	Health, Safety, and Environment PPE, TOOLS AND EQUIPMENT NEEDED DURING ELECTRICAL WORK	Attachment 12-2 Revision 1: March 2005

If there is a danger of:	Then use the following:
Head injury from electric shock, or Burns due to contact with exposed energized parts	Nonconductive head protection – Class II nonconductive hard hat
Injury to the eyes or face from: Electric arcs or flashes; or Flying objectives resulting from electrical explosion	Protective equipment for the eyes and face – face shield and safety glasses
Shock to hands while handling energized wires	Lineman's rubber insulated gloves rated for the voltage exposed to. Leather overgloves may be needed if exposure to abrasive surfaces is possible.
Shock while working in areas where high voltage electrical systems are present, or Shock when performing electrical repairs	Non-conductive protective foot wear
Exposure to electric arcing or flashing from: Opening or closing 2400 volt oil cutout switching devices; Removing or installing links in high voltage able tap boxes; or Removing or installing fuses in high voltage circuits.	Protective coveralls made of Nomex or other suitable flash-proof material.

IF	THEN
Energized parts are exposed.	Use nonconductive ropes and handlines near the exposed energized part.
Working near exposed energized conductors or circuit parts.	Use insulated tools or handling equipment if the tools or handling equipment might make contact with such conducts or parts.
The insulating capability of insulated tools or handling equipment is subject to damage.	Protect the insulating material.
Removing or installing fuses when the fuse terminals are energized.	Use fuse-handling equipment insulated for the circuit voltage.
Working near exposed energized parts that might be accidentally contacted or where dangerous electric heating or arcing might occur.	Use protective shields, protective barriers, or insulating materials to protect from shock, burns, or other electrically related injuries.
Normally enclosed live parts are exposed for maintenance or repair.	Guard the parts to protect unqualified persons from contact with the live parts.

URS	Health, Safety, and Environment ELECTRICAL HAZARD CHECKLIST	Attachment 12-3 Revision 1: March 2005

Location Inspected: _____ **Job No.:** _____

Date Inspected: _____ **Name of Inspector:** _____

Check Yes, No or N/A for Not Applicable. If comment is required, circle the number and see Page 3.

		Yes	No	N/A
	Electrical Equipment Markings			
1.	Disconnecting switches and circuit breakers are labeled to indicate their use or equipment served.			
2.	The necessary voltage, wattage, or current ratings are labeled.			
3.	Circuit breakers clearly indicate whether they are in the "on" or "off" position.			
	Electrical Grounding			
4.	Extension cords used have a grounding conductor (third plug).			
5.	Ground fault circuit interrupters are installed as required.			
6.	Portable electrical tools and equipment are of the double insulated type.			
7.	Ground fault circuit interrupters open the circuit on a ground current of 5 milliamperes or greater and are equipped with an integral push button test circuit.			
8.	Ground fault circuit interrupters are installed in accordance with the manufacturer's instructions.			
9.	Ground fault circuit interrupters are tested prior to initial use and periodically thereafter.			
10.	Grounding rods are at least 5/8-inch diameter steel or iron rods, ½-inch diameter copper clad steel, or ¾-inch diameter galvanized pipe.			
11.	Grounding rods are in eight-foot lengths and driven to full depth.			
	The path from circuits, equipment, structures, and conduits or enclosures to ground are:			
12.	• Permanent and continuous.			
13.	• Have ample carrying capacity for the current likely to be imposed on it.			
14.	• Have resistance sufficiently low to permit current flow to operate circuit breakers and similar overcurrent devices on the circuit.			
15.	Driven ground rod electrodes have a resistance to ground not exceeding 25 ohms.			
16.	Upon installation of the driven ground rod electrode, the resistance was tested and recorded.			
17.	Conductors, used for bonding and grounding circuits, are of sufficient size to carry the anticipated current.			
18.	Grounds are not removed until all work is complete.			

		Yes	No	N/A
	Electrical Guarding			
19.	Switches, receptacles, etc. are provided with tight-fitting covers or plates.			
20.	All energized parts of electrical circuits and equipment are guarded against accidental contact by approved cabinets or enclosure.			
21.	All unused openings (including conduit knockouts) in electrical enclosures and fittings are enclosed with appropriate covers, plugs or plates.			
22.	Ground-fault circuit interrupters are installed on each temporary 15 or 20 ampere, 120 volt AC circuit at locations where construction, demolition, modifications, alterations or excavations are being performed.			
23.	Electrical switches and breakers (rated 440 volts or greater) are provided with a means for locking them out in the OFF position.			
	Electrical Systems			
24.	Circuit breakers accessible to personnel are protected from physical damage, and located away from ignitable material.			
25.	Weatherproof cabinets or enclosures are used when switches, circuit breakers, fuse panels and motor controllers are in a wet or outside location.			
26.	A readily accessible, manually operated switch is provided for each incoming service or supply circuit rated less than 5 kilovolts.			
27.	Electrical raceways and enclosures are securely fastened in place.			
28.	Overcurrent protection is provided for fuses or circuit breakers for each feeder and branch circuit.			
29.	Insulting fuse tongs or extractors are used when removing fuses from circuits rated 50-600 volts.			
30.	Fuse cabinets have close-fitting doors that can be locked.			
	Extension Cords			
31.	Clamps or other securing means are provided on flexible cords or cables at plug receptacles, tools, equipment, etc. and the cord jacket is securely held in place.			
32.	Flexible cords and cables are free of splices and taps.			
33.	Only 3-wire grounded type extension cords, designated for hard or extra hard service, are used.			
34.	Extension cords are listed by Underwriters Laboratories, Inc.			
35.	Extension cords are checked for damage before use.			
36.	The rated load on extension cords is not exceeded.			
37.	Extension cords are not fastened with staples, hung by nails or suspended by wire.			
	Temporary Wiring			
38.	Temporary wiring is guarded, buried or isolated by elevation to prevent accidental contact by workers and equipment.			

URS | Health, Safety, and Environment | Attachment 12-3
ELECTRICAL HAZARD CHECKLIST | Revision 1: March 2005

		Yes	No	N/A
39.	A vertical clearance above walkways for temporary wiring is not less than ten feet from circuits carrying 600 volts or less.			
40.	All exposed temporary wiring is supported on insulators.			
41.	Temporary wiring is protected from accidental damage.			
42.	Nonconductive lamp sockets and connections are permanently molded to the conductor insulation on lighting strings.			
43.	Lighting strings have lamp guards.			
44.	Broken or defective bulbs are replaced promptly.			
45.	Lights are protected from accidental contact or breakage.			
46.	Wiring installed in conduit is equipped with bushings at outlets and terminals.			
47.	Receptacles are of the grounding type, and electrically connected to the equipment-grounding conductor.			
	Worker Practices			
48.	Personnel performing electrical repairs are properly trained and "qualified".			
49.	Workers de-energize, ground or guard electric circuits before working in close proximity.			
50.	Workers consider all electrical systems as live until verified de-energized and grounded.			
51.	Proper lockout tag-out procedures are used for de-energizing electric circuits.			
	Equipment			
52.	Only fiberglass or wood ladders are used when working near electrical hazards.			
53.	Insulation mats are placed on floors and on frames of equipment when working on energized equipment.			
	Personal Protective Equipment			
54.	Rubber matting, blankets, insulated sleeves, and rubber gloves are inspected before use.			
55.	Workers use safety glasses and face shields during work activities where there is a reasonable probability of eye injury.			

COMMENTS:

1. Applicability

This standard applies to projects where URS controls trenching and excavation activities and/or where URS employees are exposed to hazards associated with trenching and excavation activities.

2. Purpose and Scope

This standard is intended to protect personnel from the hazards associated with excavation entry activities.

3. Implementation

Implementation of this procedure is the responsibility of the manager directing activities of the facility or site.

A Corporate, Regional, or Strategic Business Unit (SBU) HSE Manager must approve deviations from this procedure

4. Requirements

A. Competent Person

Appoint an Excavation Competent Person when URS controls excavation activities. The Excavation Competent Person:

1. Is responsible for conducting daily inspections of excavations, adjacent areas, and protective systems prior to each shift.
2. Is responsible for inspection after every rainstorm or other hazard.
3. Must have knowledge of soils and soil classification.
4. Understands design and use of protective systems.
5. Has authority to stop work and take corrective actions when conditions change.
6. Has the ability to recognize and test hazardous atmospheres.
7. Has formal documentation of training as an Excavation Competent Person.
8. Is physically located at the excavation while work is in progress.

B. Access/Egress

Trench excavations will have ramps or ladders within 25 feet (8 meters) of the entrants.

C. Soil Classification

Soil classifications must be conducted in accordance with Attachment 13-1, if a sloping or benching system is issued. For the purposes of this standard all soils will be classified by a person meeting the qualifications of a competent person as described in 29 CFR 1929 Subpart P. The competent person shall consult with a Registered Professional Engineer in the event the soil classification requires additional technical expertise.

D. Protective Systems

Protect employees in excavations deeper than 4 feet (1.2 meters) by means of properly designed protective systems. All protective systems must comply with 29 CFR 1926 Subpart P Appendices B, C, D, and E.

1. Sloping and Benching

   See Attachment 13-2.

2. Timber Shoring for Trenches

   Timber shoring for trenches must be designed and stamped by a Registered Professional Engineer in accordance with 29CFR Subpart P, Appendix C.

3. Aluminum Hydraulic Shoring for Trenches

   Aluminum hydraulic shoring for trenches must be approved by a Registered Professional Engineer in accordance with 29CFR 1926 Subpart P, Appendix D.

4. Alternatives to Timber Shoring

   Trench shields and boxes must be either be pre-manufactured with listed load ratings or designed, stamped and constructed under the direction of a Registered Professional Engineer. See 29 CFR 1926 Subpart C, Appendix E for examples.

5. Protective systems designed to protect employees in excavations deeper than 20 feet (6.1 meters) must be designed and stamped by a Registered Professional Engineer.

6. Excavations will be clearly identified and barricaded to keep unauthorized individuals out.

E. Permit Authorization and Inspections

1. Use the Excavation Authorization Form (Attachment 13-3) of this procedure that requires the following issues to be addressed:

   a. Employee training/briefings.

   b. Electrical safety.

   c. Surface encumbrances.

   d. Underground installations and utilities.

   e. Protective systems.

   f. Access and egress.

   g. Exposure to vehicular traffic.

   h. Exposure to falling loads.

   i. Warning systems for mobile equipment.

   j. Testing for hazardous atmospheres.

   k. Emergency rescue equipment.

   l. Protection from hazards associated with water accumulation.

   m. Stability of adjacent structures.

   n. Protection of employees from loose rock.

   o. Inspections.

   p. Fall protection.

2. Require daily inspections of excavations to be conducted by Competent Person using Attachment 13-4.

F. Excavating at Potential MEX/UXO Sites

If the project site is suspected of munitions and explosives of concern (MEC) or unexploded ordinance (UXO) contamination, the UXO team will conduct a reconnaissance and MEC/UXO avoidance to provide clear access routes to each site prior to excavation crews entering the area.

MEC/UXO sites with planned excavation activities will not be conducted until a complete plan for the site is prepared and/or approved by URS UXO Safety Officer. MEC/UXO avoidance must be conducted during excavation operations on known or suspect MEC/UXO sites (SMS 039)

G. Training/Briefings

Conduct daily safety briefings for all employees associated with excavation activities and document on Attachment 13-3. Discuss excavation hazards, protective measures, and work practices that will be applicable to the day's activities.

5. Documentation Summary

Records required for the Project Safety File:

A. Competent person qualifications.

B. Excavation Authorization Form.

C. Daily Competent Person inspections.

D. Daily worker briefing documentation.

E. Daily inspection records.

6. Resources

A. U.S. OSHA Standard - Excavations - 29 CFR 1926, Subpart P

1. Appendix B, Sloping and Benching

2. Appendix C, Timber Shoring

3. Appendix D, Aluminum Hydraulic Shoring

4. Appendix E, Alternatives to Timber Shoring

B. U.S. OSHA Technical Links - Trenching and Excavation

C. US Army Corp of Engineers projects, the requirements of EM 385-1-1, Section 25 (PDF file)

D. Queensland Workplace Health and Safety – Workplace Health and Safety Regulation Part 17 (Excavations)

E. Attachment 13-1 - Soils Classification

F. Attachment 13-2 - Simple Slopes

G. Attachment 13-3 - Excavation Authorization Form

H. Attachment 13-4 - Daily Excavation/Trench Inspection Form

"Type A" soils

Cohesive soils with an unconfined, compressive strength of 1.5 ton per square foot (tsf) (144kPa) or greater. Examples of cohesive soils are clay, silty clay, sandy clay, clay loam and, in some cases, silty clay loam and sandy clay loam. Cemented soils such as caliche and hardpan are also considered Type A.

However, no soil is Type A if:
1. The soil is fissured;
2. The soil is subject to vibration from heavy traffic, pile driving, or similar effects;
3. The soil has been previously disturbed;
4. The soil is part of a sloped, layered system where the layers dip into the excavation on a slope of four horizontal to one vertical (4H:1V)or greater; or
5. The material is subject to other factors that would require it to be classified as a less stable material.

"Type B" soils

1. Cohesive soil with an unconfined compressive strength greater than 0.5 tsf (48 kPa) but less than 1.5 tsf (144 kPa); or
2. Granular cohesionless soils including angular gravel (similar to crushed rock), silt, silt loam, sandy loam and, in some cases, silty clay loam and sandy clay loam.
3. Previously disturbed soils except those which would otherwise be classed as Type C soil.
   a. Soil that Dry rock that is not stable; or
   b. Material that is part of a sloped, layered system where the layers dip into the excavation on a slope less steep than four horizontal to one vertical (4H:1V), but only if the material would otherwise be classified as Type B.

"Type C" soils

1. Cohesive soil with an unconfined compressive strength of 0.5 tsf (48 kPa) or less;
2. Granular soils including gravel, sand, and loamy sand;
3. Submerged soil or soil from which water is freely seeping;
4. Submerged rock that is not stable, or
5. Material in a sloped, layered system where the layers dip into the excavation or a slope of four horizontal to one vertical (4H:1V) or steeper.

MAXIMUM ALLOWABLE SLOPES
SOIL OR ROCK TYPE
MAXIMUM ALLOWABLE SLOPES (H:V)[1]
FOR
EXCAVATIONS LESS THAN 20 FEET DEEP[3]

STABLE ROCK	VERTICAL (90 Deg.)
TYPE A[2]	¾:1 (53 Deg.)
TYPE B	1:1 (45 Deg.)
TYPE C	1 ½:1 (34 Deg.)

[1] *Numbers shown in parentheses next to maximum allowable slopes are angles expressed in degrees from the horizontal. Angles have been rounded off.*

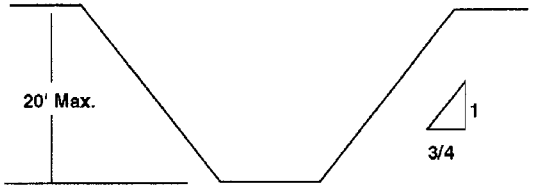
[2] *A short-term maximum allowable slope of 1/2H:1V (63 degrees) is allowed in excavation in Type A soil that are 12 feet (3.67 m) or less in depth. Short-term maximum allowable slopes for excavations greater than 12 feet (3.67 m) in depth shall be 3/4H:1V (53 degrees).*

[3] *Sloping or benching for excavations greater than 20 feet deep shall be designed by a registered professional engineer.*

Slope Configurations (All slopes stated below are in the horizontal to vertical ratio)

Excavations Made in Type A Soil

All simple slope excavation 20 feet or less in depth shall have a maximum allowable slope of ¾:1.



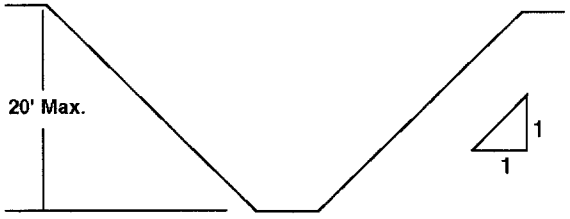
SIMPLE SLOPE - GENERAL

Exception: Simple slope excavations which are open 24 hours or less (short term) and which are 12 feet or less in depth shall have a maximum allowable slope of ½:1.

URS | Health, Safety and Environment | Attachment 13-2
SIMPLE SLOPES

Excavations Made in Type B Soil

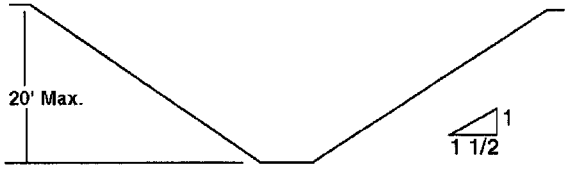
All simple slope excavations 20 feet or less in depth shall have a maximum allowable slope of 1:1.



SIMPLE SLOPE

Excavations Made in Type C Soil

All simple slope excavations 20 feet or less in depth shall have a maximum allowable slope of 1½:1.



SIMPLE SLOPE

URS	Health, Safety and Environment **EXCAVATION / TRENCHING AUTHORIZATION**	Attachment 13-3

POST AT LOCATION
(GOOD FOR ONE WEEK ONLY)

Authorization No.	Authorization From
Competent Person:	TO:
Project Name:	Project Location:
Description or Job Special Procedures:	

Check Yes, No, or N/A for Not Applicable

EMPLOYEE TRAINING AND PRE-EXCAVATION BRIEFING

1. Safe Excavation and Rescue Training Conducted on: Date:			
2. Mandatory pre-excavation briefing conducted on: Date:			
	Yes	No	N/A
3. Does this job require special training?			

ELECTRICAL SAFETY

	Yes	No	N/A
1. Are all electrical devices grounded, double insulated, or GFCI protected?			
2. Have all power cords and tools been visually inspected?			

SURFACE ENCUMBRANCES

1. Have all surface encumbrances that are located so as to create a hazard to employees been removed or supported, as necessary, to safeguard employees?			

UNDERGROUND INSTALLATIONS

1. Have the estimated locations of all underground installation been determined prior to excavation?			
2. Have utility companies been contacted and advised of proposed work?			
3. Are underground installations protected, supported or removed while excavations are open?			

PROTECTIVE SYSTEMS

1. Excavation slopes comply with Type C Soil Classification?			
2. If no to question 1, has soil been examined and been determined to be other than Type			

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	Yes	No	N/A
C soil by a Competent Person?			
3. If protective measures beyond sloping are required, do they meet OSHA Appendix standards?			
4. If no to question 3, has the protective system been designed and stamped by a Registered Professional Engineer?			

MEANS OF EGRESS FOR TRENCHES DEEPER THAN 4 FEET

1. Are stairways, ladders, or ramps provided every 25 feet?			

ACCESS AND EGRESS

1. Are structural ramps that are used solely by personnel as a means of access or egress from excavations designed by a competent person?			
2. Are ramps and runways constructed so structural members are connected to prevent displacement?			
3. Are structural ramps that are used for access and egress of equipment designed by a competent person qualified in structural design and constructed in accordance with the design?			
4. Are structural members used for ramps and runways of uniform thickness?			
5. Are cleats used in connecting runway structural members attached in a manner to prevent tripping?			
6. Are structural ramps used in lieu of steps provided with cleats or other surface treatment to prevent slipping?			

EXPOSURE TO VEHICULAR TRAFFIC

1. Are personnel exposed to public vehicular traffic wearing reflectorized or high visibility vests?			

EXPOSURE TO FALLING LOADS

1. Are employees prohibited from standing underneath loads handled by lifting or digging equipment?			
2. Are employees prohibited from standing next to vehicles being loaded or unloaded?			

WARNING SYSTEMS FOR MOBILE EQUIPMENT

1. Are warning systems such as barricades, hand or mechanical signals, or stop logs utilized when mobile equipment is operated adjacent to or at the edge of an excavation?			

TESTING FOR HAZARDOUS ATMOSPHERES

1. Are the atmospheric hazards that can be reasonably expected to exist in excavations greater then 4 feet deep tested and controlled?				
	READING:		TIME:	INITIAL:
2. Test of Oxygen Content:	_____	% 02 (19.5% Minimum)	_____	_____
3. Test for Flammable Concentrations:	_____	% LEL (10% Maximum)	_____	_____

EXCAVATION / TRENCHING AUTHORIZATION

	Yes	No	N/A
4. Test for Toxic Concentration: _____ %PPM of _____			
5. Is testing conducted as often as necessary to ensure safety personnel?			

EMERGENCY RESCUE EQUIPMENT

1. Is emergency rescue equipment such as SCBA, safety harness and line, or basket stretcher readily available and attended when hazardous atmospheric conditions exist?			
2. Are employees who enter bell-bottom pier holes or other similar deep and confining excavations wearing a body harness with a life-line?			

PROTECTION FROM HAZARDS ASSOCIATED WITH WATER ACCUMULATION

1. Are employees prohibited from entering excavations that have accumulated water?			
2. Is water being controlled or prevented from accumulating in excavation by the use of water removal equipment?			
3. Is water control equipment operation being monitored by a competent person?			
4. Are diversion ditches, dikes, or other suitable means used to prevent surface water from entering excavation?			
5. Are excavations subjected to run-off from heavy rain immediately re-inspected by a competent person?			

PROTECTION OF EMPLOYEES FROM LOOSE ROCK OR SOIL

1. Is adequate protection provided to protect employees from loose rock or soil that could pose a hazard by falling or rolling from an excavation face?			
2. Are employees protected from excavated or other material and equipment by placing this material a minimum of two (2) feet from the edge of excavations or by the use of retraining devices?			

STABILITY OF ADJACENT STRUCTURES

1. Are support systems such as shoring, bracing, or underpinning provided to ensure stability of adjoining structures (i.e., buildings, walls) endangered by excavation activities?			
2. Has any excavation below the level of the base or footing of foundations or retaining walls been:			
Provided with a support system such as under pinning to ensure the safety of employees and stability of the structure?			
Performed in stable rock?			
Determined by a registered professional engineer that the structure is sufficiently removed from the excavation so as to be unaffected by the excavation activity?			
Determined by a registered professional that the excavation work will not pose a hazard to employees?			
3. Is the undermining of sidewalks and pavement structures prohibited?			

INSPECTIONS

1. Are daily inspections of excavations where employee exposure can be reasonably anticipated being done by the competent person?			
2. Are inspections being performed by a competent person after every rainstorm or other hazard increasing occurrence?			

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EXCAVATION / TRENCHING AUTHORIZATION

	Yes	No	N/A
3. Are employees removed from the excavation if the competent person finds evidence at any time of a situation that could result in a possible cave-in, protective system failure, hazardous atmosphere or other hazardous condition?			

FALL PROTECTION

1. Are standard guardrails provided on walkways and bridges that cross over excavations?			
2. Are all remotely located excavations adequately barricaded or covered?			
3. Are temporary wells, pits, shafts and similar exploratory operations backfilled upon completion?			

I have inspected the excavation described in this authorization:

Signature of Competent Person _____ Date _____

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Competent Person:		Date:	
Project Name:		Weather Conditions:	
Projection Location:		Rainfall Amounts 24 Hours Previous:	

"I hereby attest that the following conditions existed and that the following items were checked or reviewed during this inspection".

Check Yes, No or N/A for Not Applicable. If comment is required, circle the number and see Page 2.

		Yes	No	N/A
1.	Are barricades or covers in place and in good condition?			
2.	Have tension cracks been observed along the top on any slopes?			
3.	Is excavated material at least 2' from the edge of the excavation?			
4.	Are slopes cut at design angle of repose?			
5.	Is any water seepage noted in trench walls or bottom?			
6.	Are pumps in place or available if needed?			
7.	Is bracing system installed in accordance with design?			
8.	Is there evidence of significant fracture planes in soil or rock?			
9.	Is there any evidence of caving or sloughing of soil since the last inspection?			
10.	Are there any zones of unusually weak soils or materials not anticipated?			
11.	Are there any noted dramatic dips or bedrock?			
12.	Are all short-term trench(s) covered within 24 hours?			
13.	Have non-compliance items been photographed?			
14.	Are hydraulic shores pumped to design pressure?			
15.	Is shoring being used secure?			
16.	Does plan include adequate safety factor for equipment being used?			
17.	Is traffic adequately away from trenching operation?			
18.	Are barricades up and secure?			
19.	Are there trees, boulders or other hazards in area?			
20.	Is vibration from equipment or traffic to close to trenching operation?			
21.	Are trench box(s) certified?			
22.	Are GFCIs used on ALL temporary electrical cords?			
23.	Is access and egress located within 25 feet of entrants?			
24.	Is hazardous testing done on a regular basis?			
25.	Has rescue procedure been established and is equipment immediately available?			

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Comments: Place question number in front of applicable comment.

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URS SAFETY MANAGEMENT STANDARD
Flammable and Combustible Liquids and Gases

1. Applicability

This procedure applies to URS office and field operations where flammable and combustible liquids and gases are stored or used.

2. Purpose and Scope

The purpose of this procedure is to provide information regarding the proper storage, handling and work practices associated with flammable and combustible liquids and gases.

3. Implementation

Office Locations- Implementation of this program is the responsibility of the Office Manager.

Field Activities- Implementation of this program is the responsibility of the Project Manager.

4. Requirements

A. Appoint a Responsible Person who will:

1. Inspect storage areas periodically.
2. Monitor the quantity of flammable and combustible liquids and gases on the site.
3. Review work practices.

B. Control flammables, combustibles, and flammable gases entering the site.

1. Order only those materials and quantities that are needed to complete a job.
2. Check compliance with SMS 2, "Worker Right to Know".

C. Storage

1. Store flammable and combustible materials in appropriate tanks and containers. See Attachment 15-1.
2. Limit building storage outside of a flammable storage cabinet or storage room per Attachment 15-1.

URS SAFETY MANAGEMENT STANDARD
Flammable and Combustible Liquids and Gases

3. Store oxidizers separately from flammables.
4. Segregate gas cylinders for storage based on their hazard. Keep oxygen and acetylene cylinders stored separately.

D. Labeling and Signage

1. Post a "NO SMOKING OR OPEN FLAME" sign in all areas where flammable and combustible materials are stored, handled, and processed.
2. Require all containers and cylinders to be labeled with the contents and hazard-warning label per SMS 002.

E. Use of Materials on Site

1. Use flammable, combustible, and compressed gases in a manner that is consistent with the label and material safety data sheet for the product.
2. Use only those amounts of materials needed for the job. Transfer of flammables, combustibles, oxidizers to ready use containers is encouraged.
3. Use personal protective equipment stated on the product label and material safety data sheet.

F. Spill Control

1. Have a written spill response plan in place before materials are stored on site.
2. Clean up or respond to spills promptly.

G. Disposal

1. Keep solvent waste and flammable liquids in fire resistant, covered containers until they are removed from the worksite.
2. Do not place flammable or combustible waste in municipal garbage.
3. Dispose of flammable hazardous materials with a licensed hazardous material disposal company.

H. Inspection

1. Periodically inspect flammable and combustible storage and use areas, gas storage areas and oxidizer storage areas:

    a. Office settings inspect quarterly.

    b. Field-related projects inspect monthly.

2. Use the inspection sheet provided as Attachment 15-2 to inspect the storage areas.

I. Training

Require that Hazard Communication training includes specific hazard information for the flammables, combustibles and oxidizers used.

5. Documentation Summary

A. File these records in the Office Safety Filing System:

1. Location of the MSDS inventory.

2. Completed Flammable and Combustibles Inspection Checklist.

B. File these records in the Project Safety Filing System:

1. Attach program to Project Health and Safety or Safe Work Plan.

2. File these records in the Project Safety File.

    a. Location of the MSDS inventory

    b. Completed Flammable and Combustibles Inspection Checklist.

6. Resources

A. National Fire Protection Association - Standard 58

B. Regulations of the U.S. Coast Guard

C. U.S. OSHA Standard - Flammable and Combustible Liquids - 29 CFR 1910.106

D. U.K. "Dangerous Substances and Explosive Atmospheres Regulations 2002"

E. Australian Standards AS 1940-2004. The Storage and Handling of Flammable and Combustible Liquid

F. Attachment 15-1 - Flammable and Combustible Liquid Classifications

G. Attachment 15-2 - Flammable, Combustible, Oxidizer & Compressed Gas Inspection Sheet.

URS	Health, Safety and Environment **FLAMMABLE AND COMBUSTIBLE LIQUID CLASSIFICATIONS**	Attachment 15-1

Flammable Liquid	Flash Point	Boiling Point
Class 1A	< 73° F	< 100° F
Class 1B	< 73° F	> 100° F
Class 1C	> 73° F < 100° F	
Combustible Liquid		
Class 2	> 100° F < 140° F	
Class 3	140° F	

Maximum Allowable Size of Containers and Portable Tanks

	Flammable Liquids			Combustible Liquids	
Container Type	Class 1A	Class 1B	Class 1C	Class II	Class III
Glass or approved plastic	1 pt	1 qt	1 gal	1 gal	1 gal
Metal (other than DOT drums)	1 gal	5 gal	5 gal	5 gal	5 gal
Safety cans	2 gal	5 gal	5 gal	5 gal	5 gal
Metal drums (DOT specifications)	60	60	60	60	60
Approved portable tanks	660 gal	660 gal	660 gal	660 gal	660 gal

Maximum Storage in Buildings Outside of Storage Cabinet or Storage Room

Type	Amount
Class 1A	25 gallons
Class 1B (containerized)	120 gallons
Class 1B (single portable tank)	660 gallons
Class 1C (Containerized)	120 gallons
Class 1C (single portable tank)	660 gallons
Class 2 (containerized)	120 gallons

URS	Health, Safety, and Environment **FLAMMABLE, COMBUSTIBLE, OXIDIZER & COMPRESSED GAS INSPECTION CHECKLIST**	Attachment 15-2

Location Inspected: _____ **Job No.:** _____

Date Inspected: _____ **Name of Inspector:** _____

		Yes	No	N/A
	Storage Cabinets			
1.	Flammable cabinets do not obstruct room exits.			
2.	No more than 60 gallons of flammable or 120 gallons of combustible liquid is stored in a cabinet.			
3.	No more than three cabinets are located in a storage area.			
4.	Metal storage cabinets have self-closing doors.			
5.	Cabinets are labeled "FLAMMABLE-KEEP FIRE AWAY"			
	Safety Cans			
6.	Safety cans are constructed of stainless steel, Monel or tin.			
7.	Safety cans have a flame arrestor and spring-loaded cap on both the filling and pouring spouts.			
	Drum & Drum Storage Areas			
8.	Drums are stored in a vertical position.			
9.	Bungs are closed when liquid is not being transferred.			
10.	Drums are shielded from the sun.			
11.	Funnels with installed flash arrestor are used when transferring flammable liquids into drums.			
12.	A minimum distance of 25 feet between a drum storage area and buildings is present.			
13.	A "NO SMOKING" sign is posted in the area.			
14.	An emergency spill kit is near the drum storage area.			
15.	A 20 lb. dry-chemical fire extinguisher is no less than 10 feet or more than 50 feet from the storage area.			
	Waste Cans			
16.	Combustible scrap, debris and waste materials (oily rags, etc.) are stored in covered metal cans.			
17.	Waste cans are removed from the work area daily.			
18.	Waste cans have spring-loaded self-closing lids.			
	Storage Rooms Designed Specifically For Flammable Materials			
19.	Room construction meets NFPA fire-resistance requirements.			
20.	Rooms with automatic extinguishing systems have the following:			
	• Noncombustible liquid-tight raised sills or ramps at least four inches in			

		Yes	No	N/A
	height.			
	• Flooring at least four inches below the surrounding floor, or an open grated trench that drains to a safe location.			
	• Openings with approved self-closing fire doors.			
	• Liquid-tight construction where the walls join the floors.			
	• Shelving, racks, dunnage floor overlay and other interiors with one inch wood.			
21.	Rooms are ventilated by a gravity or mechanical exhaust system that:			
	Commences not more than 12 inches above the floor.			
	• Is designed to provide for a complete change of air within the room at least six times per hour.			
	• Is controlled by a switch located outside the door, with ventilating equipment and any light fixtures operated form the same switch.			
	Flammable & Combustible Storage Areas Within Buildings			
22.	At least one portable fire extinguisher rated not less than 20-B is located outside of but not more than 10 feet from the door opening into any room used for the storage of more than 60 gallons of flammable or combustible liquids.			
23.	Buildings or rooms are locked when not occupied.			
24.	Exits, stairways or passageways are not used for storing flammables and combustibles.			
25.	No more than 25 gallons of Class IA or 60 gallons of Class IB, II or III liquids is located in a room outside of a flammable storage locker or flammable storeroom.			
26.	An isle at least three feet wide is maintained in storage areas.			
27.	No more than those amounts needed for one day's use are stored in buildings under construction.			
	Outside Storage of Flammable and Combustible Liquids			
28.	At least one portable fire extinguisher having a rating of not less than 20-B is located not less than 25 feet or more than 75 feet from any outside flammable liquid storage area.			
29.	For containers not more than 60 gallons each, no more than 1,100 gallons in any one group are stored.			
30.	Groups of containers are separated by five-foot clearances.			
31.	Groups of containers are more than 50 feet from buildings.			
32.	Portable tanks (not exceeding 660 gallons in capacity) are provided with emergency venting devices as specified by NFPA 30.			
33.	Storage areas are free of accumulation of weeds, debris, and other combustible materials not necessary to the storage.			

		Yes	No	N/A
	Storage Tanks			
34.	Tanks have relief vents.			
35.	Tank vents are not close to open flames, stacks, heating apparatus, or any other source of ignition.			
36.	A dike or curb or other suitable means to prevent the spread of leakage from tanks.			
37.	Diked areas have a capacity equal in volume to at least that of the largest tank plus 10% of all other tanks in the enclosure.			
38.	Provisions to drain off accumulations of ground or rainwater or spills in diked areas.			
	Dispensing of Flammable and Combustible Liquids			
39.	Dispensing outlets for above ground tanks with nationally listed automatic-closing valve, without a latch-open device.			
40.	Dispensing systems are electrically bonded and grounded.			
41.	Tanks, hoses and containers of five gallons or less in metallic contact while transferring flammable liquids.			
42.	Electrically bonded systems are used for transferring flammable liquids in containers in excess of five gallons.			
43.	Closed piping systems are used for drawing flammable liquids during transfer.			
44.	Flammables and combustibles are drawn from a container or portable tank by use of gravity or through a pump suing an approved self-closing valve.			
	Liquefied Petroleum Gas – Refueling			
45.	Equipment is shut down during refueling operations.			
46.	Leather gloves and safety glasses are worn during refueling operations.			
47.	Smoking and hot work is prohibited during refueling.			
48.	Refueling occurs at least 25 feet from buildings.			
	Compressed Gases - Storage			
49.	Cylinders must be capped when regulators are removed.			
50.	Oxygen and fuel cylinders are stowed in designated well-ventilated areas.			
51.	Storage areas have temperatures less than 130 degrees.			
52.	Cylinders are stored upright and secured from falling over.			
53.	Cylinders are in segregated groups by gas type and not intermingled with other cylinders.			
54.	Oxygen cylinders are stored at least 20 feet away from flammables. (A fire resistive partition of at least one-hour fire resistance rating of at least five-foot height may also be used.)			
55.	Flammable or combustible materials are kept at least 20 feet away from stored cylinders.			

		Yes	No	N/A
56.	Gas cylinder valves are protected from snow and ice during winter months.			
57.	Oxygen cylinders are kept free from oil and grease.			
58.	Welding cylinders are securely fastened to ready-use racks.			
59.	Smoking or open flames are not permitted in areas where cylinders are stored.			
60.	Cylinder storage areas are posted with the following sing: "DANGER – NO SMOKING OR OPEN FLAME"			
61.	Cylinders are labeled with gas contents and warning statement.			
62.	Empty cylinders are segregated from full cylinders.			
	Oxidizers			
63.	Oxidizers are stored separately from flammables.			
64.	When oxidizers are shifted to a second container, the container is labeled with the appropriate warning labels.			
65.	Secondary containers are compatible with oxidizers.			
66.	Oxidizers are stored away from heat sources where the maximum temperature exceeds 100 degrees F.			
67.	Chromic acid, nitric acid, perchloric acid, potassium permanganate (all oxidizers) are stored separately from other corrosives and flammables.			

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1. Applicability

This standard applies to URS operations involving the use of hand tools and/or power equipment, including chain saws, brush cutters, powder-actuated tools, and similar high-hazard implements.

2. Purpose and Scope

The purpose of this standard is to provide procedures for the safe use and handling of hand tools and power equipment.

Also refer to SMS 064, Hand Safety.

3. Implementation

Implementation of this procedure is the responsibility of the manager directing activities of the facility or site.

A Corporate, Regional, or Strategic Business Unit (SBU) HSE Manager must approve deviations from this procedure.

4. Requirements

A. General

1. Keep hand and power tools in good repair and used only for the task for which they were designed.
2. Remove damaged or defective tools from service.
3. Keep surfaces and handles clean and free of excess oil to prevent slipping.
4. Do not carry sharp tools in pockets.
5. Clean tools and return to the toolbox or storage area upon completion of a job.
6. Wrenches must have a good bite before pressure is applied.
   a. Brace yourself by placing your body in the proper position so that that you will not fall in case the tool slips.
   b. Make sure hands and fingers have sufficient clearance in the event the tool slips.

   c. Always pull on a wrench, never push.
7. When working with tools overhead, place tools in a holding receptacle or secure when not in use.
8. Do not throw tools from place to place, from person to person, or drop from heights.
9. Use non-sparking tools in atmospheres with fire or explosive characteristics.
10. Inspect all tools prior to start-up or use to identify any defects.
11. Powered hand tools should not be capable of being locked in the on position.
12. Require that all power fastening devices be equipped with a safety interlock capable of activation only when in contact with the work surface.
13. Do not allow loose clothing, long hair, loose jewelry, rings and chains to be worn while working with power tools.
14. Do not use cheater pipes.
15. Make provisions to prevent machines from automatically restarting upon restoration of power (see SMS 023).

B. Grinding Tools

1. Inspect work rests and tongue guards for grinders.
   a. Work rest gaps should not exceed 1/8 inch (3 mm).
   b. Tongue guards gap should not exceed ¼ inch (6 mm).
2. Do not adjust work or tool rests while the grinding wheel is moving.
3. Inspect the grinding wheel for cracks, chips or defects. Remove from service if any defects are found.
4. Wear goggles when grinding. A clear full face shield may be worn with the goggles.

5. Do not use the side of a grinding wheel unless the wheel is designed for side grinding.
6. Always stand to the side of the blade, never directly behind it.
7. Use grinding wheels only at their rated speed.
8. Grinding aluminum is prohibited.
9. For U.K. operations:
    a. No grinding wheels exceeding 55mm are to be used.
    b. All wheels are to be marked with their safe maximum speed.
    c. Abrasive wheels will only be operated by personnel who have been specifically trained and specified competent by URS.
    d. Abrasive wheels will only be operated by persons specified as competent, under the 'Abrasive Wheels" Regulations.
    e. Abrasive wheels must only be operated if the manufacturer's guard is fitted and they are in good working order.

C. Power Saws

1. Require that circular saws are fitted with blade guards.
2. Remove damaged, bent or cracked saw blades from service immediately.
3. Require that table saws are fitted with blade guards and a splitter to prevent the work from squeezing the blade and kicking back on the operator.
4. Require guards that cover the blade to the depth of the teeth on hand held circular saws. The guard should freely return to the fully closed position when withdrawn from the work surface.

D. Wood Working Machinery

1. Do not use compressed air to remove dust and chips from wood working machinery.
2. Locate the on-off switch to prevent accidental start up. The operator must be able to shut off the machine without leaving the work station.
3. Guard planers and joiners to prevent contact with the blades.
4. Use a push stick when:
    a. The cutting operation requires the hands of the operator to come close to the blade.
    b. Small pieces are being machined.
5. Adjust saw blades so they only clear the top of the cut.
6. Automatic feed devices should be used whenever feasible.

E. Pneumatic Tools and Equipment

1. Require that pneumatic tools have:
    a. Tool retainers to prevent the tool from being ejected from the barrel during use.
    b. Safety clips or tie wires to secure connections between tool/hose/compressor if they are of the quick connection (Chicago fittings) type.
2. Do not lay hose in walkways, on ladders or in any manner that presents a tripping hazard.
3. Never use compressed air to blow dirt from hands, face or clothing.
4. Compressed air exhausted through a chip guarded nozzle shall be reduced to less than 30 psi. Proper respiratory, hand, eye and ear protection must be worn.
5. Never raise or lower a tool by the air hose.

F. Powder Actuated Fastener Tools

1. Use powder actuated tools that comply with the requirements of the American National Standards Institute (ANSI)/American Society of Safety Engineers(ASSE) Standard A10.3 - 1995.
2. Use only individuals that have been trained by a manufacturer's representative and possess the proper license to operate, repair, service and handle powder actuated tools.
3. Never use a powder actuated tool in a flammable or explosive atmosphere.
4. Require the use of goggles or a full face shield as well as safety glasses during operation of powder actuated tools.
5. Powder actuated tools must not be able to be fired unless the tool is pressed against the work surface.
6. The tool must not be able to fire if the tool is dropped when loaded.
7. Firing the tool should require two separate operations, with the firing movement being separate from the motion of bringing the tool to the firing position.
8. Never fire into soft substrate where there is potential for the fastener to penetrate and pass through, creating a flying projectile hazard.
9. Do not use powder actuated tools in reinforced concrete if there is the possibility of striking the re-bar.
10. Do not use on cast iron, glazed tile, surface hardened steel, glass block, live rock or face brick.
11. Never load and leave a powder actuated tool unattended. It should only be loaded prior to intended firing.
12. Test tools each day prior to loading by testing safety devices according to manufacturer's recommended procedure.

G. Chain Saws

1. Approval by the HSE Representative is required for all use of chain saws.
2. Inspect the saw prior to each use and periodically during daily use.
3. Never cut above chest height.
4. Require that the idle is correctly adjusted on the chain saw. The chain should not move when the saw is in the idle mode.
5. Start cutting only after a clear escape path has been made.
6. Shut the saw off when carrying through brush or on slippery surfaces. The saw may be carried no more than 50 feet (15 meters) while idling.
7. Require applicable protective gear. This will include, but is not limited to:
   a. Logger's safety hat.
   b. Safety glasses or face shield.
   c. Steel-toed boots.
   d. Protective leggings.
   e. Hearing protection.
8. Inspect saws to require that they are fitted with an inertia break and hand guard.
9. *Never* operate a chain saw when fatigued.
10. Do not allow others in the area when chain saws are operated.
11. Make sure there are no nails, wire or other imbedded material that can cause flying particles.

12. Do not operate a chain saw that is damaged, improperly adjusted, or is not completely and securely assembled. Always keep the teeth sharp and the chain tight. Worn chains should immediately be replaced.

13. Keep all parts of your body away from the saw chain when engine is running.

14. For all operations, only personnel specifically trained and certified as competent by URS may operate chain saws.

H. Hand Operated Pressure Equipment

1. Pressure equipment such as grease guns, paint and garden sprayers shall be directed away from the body and other personnel in the area. The person operating any equipment such as this, which has a potential for eye injury, must wear protective goggles.

2. The noise produced when using certain types of pressure equipment may require the use of hearing protection.

3. Never allow the nozzle of a pressurized tool to come in contact with any body parts while operating. There is potential for injection of a chemical directly into the user's body, resulting in severe injury or death.

I. Gasoline Powered Tools

1. Never pour gasoline on hot surfaces.

2. Never fuel around open flame or while smoking.

3. Shut down the engine before fueling.

4. Provide adequate ventilation when using in enclosed spaces.

5. Use only approved safety cans to transport flammable liquids.

J. Inspection

Inspect all hand tools on a regular basis. Defective tools shall be immediately removed from service and tagged or destroyed to prevent further use.

5. Documentation Summary

Place in the Project Safety File:

A. Site briefings regarding tool use.

B. Records of tools removed from service.

C. Copies of powder actuated tool licenses (as applicable).

D. Tool inspection documentation.

6. Resources

A. U.S. OSHA Standard - Hand and Portable Power Tools - 29 CFR 1910, Subpart P

B. U.S. OSHA Standard - Construction Tools - Hand and Power - 29 CFR 1926, Subpart I

C. ANSI/ASSE A10.3 – 1995

D. National Association of Demolition Contractors

E. U.K. - 'Provision and Use of Work Equipment' Regulations 1998

F. Australia/New Zealand Standards – Powder-Actuated Handheld Fastening Tools - AS/NZS 1873.1:2003

G. Australian/New Zealand Standards – Hand-held Motor-operated Electric Tools – AS/NZS 60745.1:2003

1. Applicability

This standard applies to URS field operations involving the investigation or remediation of sites impacted with hazardous wastes or hazardous materials including those associated with underground storage tanks.

Investigation projects for real estate transactions conducted to confirm that a site is "clean" are not covered under this standard. Reference related Safety Management Standards for such operations.

2. Purpose and Scope

The purpose of this standard is to provide guidance designed to minimize hazardous chemical exposures to URS personnel while URS is conducting hazardous waste field operations.

Investigation techniques included under this standard include, but are not limited to, hand auger, soil gas evaluation, test pits, and all types of power drilling, including direct push. Remediation techniques included under this standard include, but are not limited to, excavation, groundwater treatment, soil gas treatment, containment, and landfarming and similar in-situ methods.

3. Implementation

Field Activities - Implementation of this procedure is the responsibility of the Project Manager or Superintendent.

4. Requirements

A. Project Evaluation

Assess the technical and field aspects of every hazardous waste site project to evaluate:

1. Risk of exposure to hazardous chemicals, with particular attention to suspected or known human carcinogens.
2. Personal protective equipment requirements.
3. Air monitoring requirements.
4. Emergency services requirements.
5. Hazards addressed by other URS Safety Management Standards.

6. Logistical considerations, such as access and distance from population centers.
7. Other safety and health hazards associated with site operations.

B. Client/Contract Evaluation

1. Review contract documents to determine whether the client has any special internal or regulatory requirements for hazardous waste site operations.
2. Implement client requirements in addition to those of this standard. Those requirements that are the most protective (e.g., most stringent) will be used.

C. Site-specific Health and Safety Plan

1. Prepare a site-specific Health and Safety Plan (HSP) for every project under this standard. An HSP tool is available from the URS HSE website.
2. HSPs must be written or reviewed by a URS Regional Health, Safety, and Environment Manager (RHSEM) or a safety professional specifically approved by the RHSEM.
3. Evaluate client and agency requirements prior to preparing the HSP, particularly if the client or an agency will approve the HSP prior to implementation.

D. Training

Verify that each assigned URS employee has completed required training.

For operations outside of North America, the normal requirement is 24 hours of initial training and annual refresher training of 4 to 8 hours.

In general, the following are required for operations within North America:

1. 40-hours of initial training from an approved training provider.
2. 3-days of on-the-job training.

3. 8-hours of refresher training completed within 12 months of the initial or subsequent refresher training.
4. 8-hours of Site Safety Officer (Supervisor) training for directing the activities of any other URS employee.
5. Additional training for the Site Safety Officer as described below.

E. Site Safety Officer

1. Appoint a Site Safety Officer (SSO) with appropriate qualifications for the specific hazardous waste project.
2. Assure that the SSO for complex projects, such as those with complicated remediation activities, has no duties other than site safety and health.
3. Verify that the SSO has completed basic supervisor training, and has additional required training and experience as applicable:
   a. Advanced respiratory protection training is required for projects where supplied air respirators may be used.
   b. Heavy equipment/construction safety.
   c. Personal air monitoring.

F. Exposure Monitoring

Require that exposure monitoring is conducted in accordance with the HSP on all hazardous waste projects.

G. Project Equipment

1. Provide all health and safety equipment as described by the project HSP.
2. Provide all personal protective equipment as described by the project HSP.

H. Medical Surveillance

Verify that each URS employee assigned to the project meets the minimum requirements of the URS Medical Surveillance Program (refer to SMS 024). This typically includes:

1. Baseline examination.
2. Annual examination.
3. Appropriate clearance for respirator use.

I. Attachment 68-3, Hazardous Waste Site Evaluation is a tool for use in determining the effectiveness and compliance of a waste site operation.

5. Documentation Summary

In the Project Safety File:

A. Completed Health and Safety Plan.

B. Completed and signed HSP approval form.

C. Signed HSP acceptance form.

D. Completed H&S field forms that are included in each HSP.

E. Training and Medical Surveillance Clearance documentation for project personnel.

6. Resources

A. U.S. OSHA Technical Links - Hazardous Waste Operations

B. Attachment 68-3, Hazardous Waste Site Evaluation

C. European Agency for Safety and Health at Work, Dangerous Substances http://europe.osha.eu.int/good_practice/risks/dangerous_substances/

D. Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities - NIOSH 85-115

E. USACE EM 385-1-1 – Hazardous Waste Operations and Emergency Response (HAZWOPER)

1. Applicability

This procedure applies to URS field projects where ambient (not adjusted) temperatures exceed 70°F (21°C) for personnel wearing chemical protective clothing, including Tyvek coveralls, and 90°F (32°C) for personnel wearing normal work clothes.

2. Purpose and Scope

The purpose of this procedure is to protect project personnel from the effects of heat related illnesses.

3. Implementation

Field Activities - Implementation of this procedure is the responsibility of the Project Manager.

4. Requirements

A. Monitor ambient temperatures and conduct heat stress monitoring when threshold temperatures (see Section 1) are reached.

B. Conduct initial monitoring to determine first rest break.

1. Measure the air temperature with a standard thermometer with the bulb shielded from radiant heat; this yields T (actual).

2. Estimate the fraction of sunshine by judging what percent time the sun is not shielded by clouds that are thick enough to produce a shadow, as follows:

   a. 100 percent sunshine (e.g., no cloud cover) = 1.0

   b. 50 percent sunshine (e.g., 50 percent cloud cover) = 0.5

   c. 0 percent sunshine (e.g., full cloud cover) = 0.0

3. Plug these variables into the following equation to determine the adjusted temperature:

   T (adjusted) = T (actual) + (13 x fraction sunshine)

C. Body Temperature Monitoring

1. Monitor oral body temperature to determine if employees are adequately dissipating heat buildup. Ear probe thermometers which are adjusted to oral temperature are convenient and the preferred method of measurement. Determine work/rest regimen as follows:

   a. Measure oral body temperature at the end of the work period.

   b. If temperature exceeds 99.6 °F (37.5 °C), shorten the following work period by 1/3 without changing the rest period.

   c. If temperature still exceeds 99.6 °F (37.5 °C), shorten the following work period by 1/3.

   d. Do not allow a worker to wear impermeable PPE when his/her oral temperature exceeds 100.6 °F (38.1°C).

2. Oral body temperatures are to be obtained prior to the employee drinking water or other fluids.

D. Pulse Rate Monitoring

1. Take the radial (wrist) pulse as early as possible in the rest period.

   a. If the heart rate exceeds 110 beats per minute at the beginning of the rest period, shorten the next work cycle by one-third.

   b. If the heart rate still exceeds 110 beats per minute at the next rest cycle, shorten the following work cycle by an additional one-third.

E. Record monitoring results on Heat Stress Monitoring Form (Attachment 18-2).

F. Investigate the use of auxiliary cooling devices in extreme heat conditions.

G. Conduct briefings for employees regarding health hazards and control measures associated with heat stress whenever conditions require the implementation of heat stress monitoring. Review the information provided in Attachment 18-3.

H. Provide water and electrolyte replacement drinks fluids as described in Attachment 18-3.

I. Allow employees who are not accustomed to working in hot environments appropriate time for acclimatization (see Attachment 18-3).

J. Provide break areas as described in Attachment 18-3.

5. Documentation Summary

File these records in the Project Safety File.

A. Heat Stress Monitoring Forms.

B. Employee Safety Briefing Verification Forms.

6. Resources

A. NIOSH - "Working in Hot Environments"

B. AFL-CIO Building Trades Division - "Heat Stress in Construction"

C. Attachment 18-1 - Initial Work Monitoring Cycles

D. Attachment 18-2 - Heat Stress Monitoring Record

E. Attachment 18-3 -Informational Supplement

INITIAL WORK / MONITORING CYCLES

Adjusted Temperature	Normal Work Clothes	Protective Clothing
90 F (32.2 C) or above	After each 45 minutes of work	After each 15 minutes of work
87.5 F - 90 F (30.8 - 32.2 C)	After each 60 minutes of work	After each 30 minutes of work
82.5 F – 87.5 F (28.1 C – 30.8 C)	After each 90 minutes of work	After each 60 minutes of work
77.5 F – 82.5 F (25.3 C – 28.1 C)	After each 120 minutes of work	After each 90 minutes of work
72.5 F – 77.5 F (22.5 C – 25.3 C)	After each 150 minutes of work	After each 120 minutes of work

URS Corporation

URS Corporation Health & Safety Program
EMPLOYEE HEAT STRESS EXPOSURE MONITORING RECORD

DATE: _____ SAFETY REPRESENTATIVE: _____
WORKER'S NAME: _____ SUBCONTRACTOR: _____
WORK ACTIVITY: _____

Time (24 hour)	*Oral Temp (°F)*	*Pulse (BPM)*	*Comments*

DATE: _____ SAFETY REPRESENTATIVE: _____
WORKER'S NAME: _____ SUBCONTRACTOR: _____
WORK ACTIVITY: _____

Time (24 hour)	*Oral Temp (°F)*	*Pulse (BPM)*	*Comments*

DATE: _____ SAFETY REPRESENTATIVE: _____
WORKER'S NAME: _____ SUBCONTRACTOR: _____
WORK ACTIVITY: _____

Time (24 hour)	*Oral Temp (°F)*	*Pulse (BPM)*	*Comments*

URS	Health, Safety, and Environment HEAT STRESS INFORMATIONAL SUPPLEMENT	Attachment 18-3 Revision 1: March 2005

HEAT RASH

Heat rash (prickly heat) may result from continuous exposure to heat or humid air. It appears as red papules (elevated skin lesion), usually in areas where the clothing is restrictive, and gives rise to a prickly sensation, particularly as sweating increases. It occurs in skin that is persistently wetted by un-evaporated sweat. The papules may become infected unless treated.

First Aid for Heat Rash - To prevent heat rash, shower after work, dry off thoroughly, and put on clean, dry underwear and clothes. Try to stay in a cool place after work. If, in spite of this, you develop heat rash, see your physician.

HEAT CRAMPS

Heavy sweating with inadequate electrolyte replacement causes heat cramps. Signs and symptoms include:

Muscle spasms.

Pain in the hands, feet and abdomen.

First Aid for Heat Cramps - Leave the work area, and rest in a cool, shaded place. Drink one or two glasses of electrolyte replacement drink, and try to gently massage the cramped muscle. Once the spasms disappear, you may return to work. Taking adequate breaks and drinking electrolyte replacement drink should prevent the cramps from returning.

HEAT EXHAUSTION

Heat exhaustion occurs from increased stress on various body organs including inadequate blood circulation due to cardiovascular insufficiency or dehydration. Signs and symptoms include:

Pale, cool, moist skin.

Heavy sweating.

Dizziness.

Nausea.

Fainting.

The key here is that the victim is still sweating, so the cooling system is still working; it's just under severe stress. The body core temperature may be elevated. It is important to

recognize and treat these symptoms as soon as possible, as the transition from heat exhaustion to the very hazardous heat stroke can be quite rapid.

First Aid for Heat Exhaustion - Leave the work area immediately. Go through decon and remove all chemical protective clothing. Rest in a cool, shaded place and open your clothing to allow air circulation; lay flat except when taking fluids. Drink plenty of cooled electrolyte replacement drinks. Your work is over for the day; do not attempt to return. Medical assistance in severe cases may be warranted.

HEAT STROKE

Heat stroke is the most serious form of heat stress. Temperature regulation fails and the body temperature rises to critical levels. Immediate action must be taken to cool the body before serious injury and death occurs. Competent medical help must be obtained. Signs and symptoms are:

Red, hot, usually dry skin.

Lack of or reduced perspiration (lack of perspiration may be masked for those wearing chemical protective clothing since perspiration from earlier in the day will be present).

Nausea.

Dizziness and confusion.

Strong, rapid pulse.

Coma.

First Aid for Heat Stroke - THIS IS A MEDICAL EMERGENCY! SUMMON MEDICAL ASSISTANCE IMMEDIATELY! Remove the victim from the work area, perform a gross decon, and remove all PPE. Have the victim lie down in a cool, shady area. Attempt to bring the victim's temperature down by increasing air movement (electric fan) or placing wetted sheets or towels on them. Place an ice bag on the victim's head. The victim must not be sent home or left unattended without a physician's specific order.

HEAT STRESS PREVENTION

The best approach to avoiding heat-related illness is through preventative heat stress management. The site manager and site safety officer are responsible for implementing this program.

Rest areas - A relatively cool, shaded area must be provided for breaks when ambient temperatures exceed 70 °F and workers are wearing chemical protective clothing (including uncoated Tyvek), or if temperatures exceed 90 °F and workers are wearing "Level D"

coveralls or work clothes. A car or van is an oven, not a rest area. For hazardous waste sites, the rest area should be located in the support zone adjacent to the contamination reduction zone, situated so that part of it is in the decon area so workers can take breaks without going through full decon. If shade is not available, build some. Use a plastic "dining canopy", which can be obtained at sporting goods stores. This same type of canopy can be set up to shade personnel performing various types of work in hot weather.

Liquids - Encourage employees to drink plenty of cool plain water and electrolyte replacement drinks. Supplementing water with cool electrolyte replacement drinks, such as Gatorade, Squench or Quik-kick (drink), is helpful to employees who tend to sweat a lot. Do not use "community cups"; use paper cups. Have workers drink 16 ounces of drink before beginning work, such as in the morning and after lunch. At each break, workers should drink 8 to 16 ounces. Don't wait until you are thirsty to drink.

Discourage the use of alcohol during non-working hours, and discourage the intake of coffee during work hours, as these make heat stress control more difficult.

Acclimatization - This is the process by which your body "gets used to" hot work environments. This is achieved by slowly increasing workloads. Start at 50 percent capacity on day one, and increase by 10 percent per day; on day six, you'll be at 100 percent. You don't lose acclimatization over a weekend, but it'll start to decrease after three to four days. If you don't do hot work for a week, it is gone. You don't have to do full shift hot work to achieve or retain acclimatization; a minimum of 100 minutes of continuous hot work exposure per day is adequate.

Auxiliary Cooling - Auxiliary cooling is usually obtained by providing workers with a specially-designed vest, which is worn under the protective clothing, but over any underclothing. These vests typically provide cooling via one of two methods: the use of ice or other frozen media, or the use of a vortex cooler. Each method has its advantages and disadvantages.

The frozen media vest requires a means for freezing the media, and the media (usually water or "blue ice") will melt, requiring replacement.

The vortex cooler tends to cool more uniformly. Instead of frozen media, this vest uses the expansion of compressed air to cool the wearer. The drawback is the compressed air requirement, but this is negated when the wearer is already using an airline respirator supplied by a compressor. A vortex cooler should not be supplied from air cylinders, as this will draw down the cylinders rapidly.

Auxiliary cooling should be considered when the following conditions exist:

Ambient temperature over 80 °F

Workers are wearing impermeable garments (i.e., Tyvek, Saranex, Chemrel, etc.)

It is desirable to have long work shifts with minimum interruption

1. Applicability

This procedure applies to URS field projects where heavy equipment is in operation.

2. Purpose and Scope

The purpose of this procedure is to require that heavy equipment is operated in a safe manner, that the equipment is properly maintained and that ground personnel are protected.

3. Implementation

Field Activities - Implementation of this procedure is the responsibility of the Project Manager.

4. Requirements

A. Authorized Operators

1. Evaluate operators through documentable experience (resume) and a practical evaluation of skills.
2. Allow only qualified operators to operate equipment.
3. Prohibit equipment from being operated by any personnel who have not been specifically authorized to operate it.
4. Maintain a list of operators for the project and the specific equipment that they are authorized to operate.
5. Require operators to use seat belts at all times in all equipment and trucks.
6. Prohibit personnel other than the operator from riding in or on the equipment unless additional seating (with seat belts) is provided by the manufacturer.
7. Operators shall maintain three points of contact whenever entering and exiting a piece of equipment.
8. Brief operators on the following rules of operation:
    a. Operators are in control of their work area.

    b. Equipment will be operated in a safe manner and within the constraints of the manufacturer's Operation Manual.
    c. Operators will stop work whenever unauthorized ground personnel or equipment enter their work area and only resume work when the area has been cleared.

B. Ground Personnel

1. Require that ground personnel on the site have received training and comply with the following rules of engagement:
    a. All ground personnel must wear high visibility protective vests when in work areas with any operating equipment.
    b. Ground personnel will stay outside of the swing zone or work area of any operating equipment.
    c. Ground personnel may only enter the swing or work area of any operating equipment when:
        1. They have attracted the operator's attention and made eye contact.
        2. The operator has idled the equipment down and grounded all extensions.
        3. The operator gives the ground personnel permission to approach.
    d. Ground personnel shall never walk or position themselves between any fixed object and running equipment or between two running pieces of equipment.

C. Equipment

1. Maintain operations manuals at the site for each piece of equipment that is present on the site and in use.
2. Require that operators are familiar with the manual for the equipment and operate the equipment within the parameters of the manual.

3. Require that all equipment is provided with roll-over protection systems (ROPS). Tracked excavators are exempt from ROPS requirements but must have a cab which provides protection from overhead hazards

4. Verify that seatbelts are present and functional in all equipment.

5. Prohibit the use of equipment which has cab glass which is cracked, broken or missing.

6. Require that backup alarms are functional on all trucks and equipment. Tracked excavators must have bidirectional alarms or the operator must be provided with a spotter whenever tracking in either direction.

7. Require all extensions such as buckets, blades, forks, etc. to be grounded when not in use.

8. Require brakes to be set and wheels chocked (when applicable) when not in use.

D. Inspection and Maintenance

1. Require daily inspections of equipment by operators using Attachment 19-1.

2. Prohibit use of equipment deemed to be unsafe as a result of daily inspection until required repairs or maintenance have been completed.

3. Conduct maintenance as prescribed by the manufacturer in the Operations Manuals for each piece of equipment.

4. During maintenance/repair, require that:

   a. Motors are turned off.

   b. All extensions are grounded or securely blocked.

   c. Controls are in a neutral position.

   d. Brakes are set.

5. Documentation Summary

File the following documents in the Project Health and Safety File.

A. List of authorized operators.

B. Operator qualifications.

C. Daily Equipment Inspection Logs.

D. Site briefing documentation for operator rules and ground personnel "rules of engagement".

6. Resources

A. U.S. OSHA Standard - Motorized Vehicles and Mechanized Equipment - 29 CFR 1926, Subpart O

B. National Association of Demolition Contractors – Safety Manual

C. Queensland Workplace Health and Safety - Competency Standard for Users & Operators of Industrial Equipment

D. Attachment 19-1 - Equipment Inspection Form

URS	Health, Safety, and Environment **DAILY HEAVY EQUIPMENT SAFETY INSPECTION CHECKLIST**	Attachment 19-1

Equipment Id No. _____ Inspector's Name _____

Equipment Name _____ Employee No. _____

Beg. Hours _____ End Hours _____ Date _____

INSTRUCTIONS: Each shift shall inspect all applicable items indicated. If an unsatisfactory condition is observed, suspend operation of the equipment and report the unsatisfactory condition to the site supervisor immediately.

ITEM INSPECTED	CHECK IF SATISFACTORY	COMMENTS
Falling Object Protective Structure (FOP)		
Roll-Over Protection Structure (ROP)		
Seat Belts		
Operator Seat Bar(s)		
Side Shields, Screens or Cab		
Lift Arm Device		
Grab Handles		
Back-up Alarm – Working		
Lights		
Guards		
Horn		
Windshield Wipers		
Glass, Mirrors		
Anti-Skid Tread Clear of Mud		
Safety Signs (i.e., counterbalance swing area)		
Fire Extinguisher		
General Condition		
Fuel Connection		
Oil (fuel and no leaks)		
Clear of Extra Materials		
Controls Function Properly		
Hydraulic System (full and no leaks)		
Parking Brake		
Lift Arm and Bucket		
Tires/Tracks		
Steering		
Breathing Air System		
Blast Shields		
Gallons of Fuel Added		
Quarts of Oil Added		

Operator Signature _____

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1. Applicability

This standard applies to the operations of URS Corporation and its subsidiary companies involving welding, torch cutting, grinding, and other spark or heat producing operations.

2. Purpose and Scope

The purpose of this procedure is to establish safe hot work practices to reduce/eliminate personal injury and potential fire and explosion hazards.

3. Implementation

Implementation of this procedure is the responsibility of the manager directing activities of the facility or site.

A Corporate, Regional, or Strategic Business Unit (SBU) HSE Manager must approve deviations from this procedure.

4. Requirements

A. General

1. Verify that planned hot work operations conform to client hot work procedures and permit requirements.
2. Issue Hot Work Permits for all hot work operations where client permits are not provided. See Attachment 20-1.
3. Perform housekeeping in hot work areas to remove or cover all combustible or flammable materials.
4. Cover all wood planking, scaffolds, wooden forms, and other combustible material that cannot be removed with fire blankets or other suitable material.
5. Provide a fire watch when performing hot work in areas where fires might develop including;
   a. Where combustible materials are closer than 35 feet (10.7 m) from the location of hot work;
   b. Where easily ignited combustibles are located more than 35 feet (10.7m) from the hot work;

   c. Where wall or floor openings are within 35 feet (10.7 m) of the hot work and may expose combustible materials; and
   d. Where combustible materials are adjacent to the opposite side of a metal wall, floor, or ceiling and are likely to be exposed to radiant heat from the hot work.
6. Continue the fire watch for 30 minutes after completion of hot work.
7. Contain slag and sparks with fire blankets or sheet metal.
8. Require that at least one 10 pound BC fire extinguisher (U.K. - 7 liter dry powder) is available at each hot work location.
9. Position welding screens or shields to protect workers and passers-by from welding arc rays.
10. Provide metal buckets or containers for disposal of electrode stubs.
11. Check for explosive vapors and, if necessary, purge before welding or cutting closed containers or pipelines.
12. Refer to SMS 10, "Confined Space Entry" for ventilation and other requirements for hot work in confined spaces.

B. Training

1. Personnel performing the duties of fire watch must be trained in the use of fire extinguishing equipment and be familiar with the methods of sounding a fire alarm.
2. Personnel working as cutters, welders and supervisors must have adequate training and experience to perform their duties properly with due regard to safety.
3. Personnel operating arc welding equipment and gas shielded welding equipment must be familiar with the maintenance and operational hazards of the equipment.

C. Personal Protective Equipment

Require the provision and use of the following personal protective equipment for hot work operations:

1. Proper eye protection, e.g. welding hood with proper shade lens; cutting or burning goggles for torch cutting; full faceshields for grinding. See SMS 29, "Personal Protective Equipment," for proper lens shades.
2. Safety glasses must be worn under hoods and faceshields.
3. Appropriate gloves for task being performed.
4. Fire resistant welding jackets or leathers.
5. High top boots.
6. Clothing free of oil and grease, and preferably woven of non-synthetic fiber.

D. Torch Cutting Operations

1. Inspect torches and hoses at the beginning of each shift for leaking shutoff valves, damaged hose and couplings, and tip connections.
2. Tag defective torches and remove from service until properly repaired.
3. Require that oxygen and fuel gas regulators and valves are in proper working order.
4. Light torches with strikers or other approved means, never with matches or lighters.
5. Keep oxygen cylinders and fittings free of oil and grease.
6. Require that oxygen and fuel gas hoses are easily distinguishable from each other and are not interchangeable. Do not use a single hose having more than one gas passage.
7. Provide flashback arrestors/check valves on all oxygen and fuel gas regulators.
8. Remove hose that shows evidence of flashback or damage from service and repair or discard.

9. Do not cover more than 4 inches out of 12 inches (10 cm out of 30 cm) of hose with tape when taping parallel lengths of hose to prevent tangling.
10. Use only hose couplings that cannot be unlocked or disconnected by means of a straight pull.
11. Require that the boxes used to store hose are ventilated.
12. String hoses overhead using non-metallic hangers or otherwise position them to keep clear of walkways, ladders, and stairways.
13. Provide proper ventilation and respiratory equipment when cutting zinc coated, cadmium coated, chromium bearing, mercury bearing, or other toxic material containing metals. See SMS 42, "Respiratory Protection".
14. Shut off cylinder valves and bleed regulators and hoses when leaving cutting rigs unattended and at the end of each shift.

E. Cylinder Handling

1. Secure cylinders in an upright position at all times.
2. Replace and secure valve safety caps when cylinders are not in use.
3. Close valves, remove regulators, and replace valve safety caps before moving cylinders.
4. Move cylinders by tilting and rolling them on their bottom edges; by use of a bottle cart; or with motorized equipment. Never lay cylinders on their sides and roll them.
5. Do not use magnets, chokers, or slings to hoist cylinders. Use a cradle or bottle rack designed and constructed for hoisting purposes.
6. Use only warm, not boiling, water to thaw cylinders and valves.
7. Provide bottle carts, chains, or other steadying devices to keep cylinders from being knocked over while in use.

8. Stencil, stamp, or label cylinders with either the chemical or trade name of the contents.

F. Cylinder Usage and Storage

1. Never use cylinders as rollers or supports, whether empty or full.
2. Do not attempt to refill or mix gases in a cylinder.
3. Require all cylinders to be equipped with a handle or wrench so that they can be turned off immediately if necessary.
4. Stand to the side of the outlet and open valve slightly and close immediately prior to connecting a regulator to a cylinder. Never crack a valve near ignition sources.
5. Position cylinders where they will not be struck by sparks, slag, or flame, and where they cannot become part of an electrical circuit.
6. Never take gas cylinders into confined spaces.
7. Do not strike an electrode against a cylinder to strike an arc.
8. Do not use hammers or wrenches to open cylinders having fixed hand wheels.
9. Do not use acetylene at a pressure in excess of 15 psi gauge pressure, or 30 psi absolute.
10. Store cylinders in a location where they will not be subjected to sources of artificial heat.
11. Separate oxygen cylinders in storage from fuel gas cylinders and combustible materials by at least 20 feet (6 meters), or by a noncombustible barrier at least 5 feet (1.5 meters) high having a fire resistance rating of at least one-half hour.
12. Provide proper signs at storage areas, such as "DANGER – FLAMMABLE; No Smoking or Open Flames".
13. Keep storage areas free of vegetation, trash, and other combustible materials.

14. Remove regulators and replace valve safety caps when storing cylinders or when cylinders will be left unattended.

G. Welding Operations

1. Use only electrode holders that are specifically designed for arc cutting and welding and are of a sufficient capacity to safely handle the maximum rated current required by the electrodes.
2. Require that electrode holders are properly insulated.
3. Remove electrodes from the holders and place holders so they cannot make contact with people or conducting objects when leaving holders unattended.
4. Require that the welding machine frame is properly grounded.
5. Shut off the welding machine at the end of each shift or when the machine is to be moved.
6. Require that the welding/cutting/ground cables meet the following requirements:
   a. Cables must be completely insulated, flexible, and capable of handling the maximum current requirements of the work in progress.
   b. Cables must be free from repair or splices for a minimum distance of 10 feet (3 meters) from the electrode holder, except when standard insulated connectors or splices with insulating value equal to the cable are used.
   c. Insulated connectors of a capacity at least equal to that of the cable should be used for splices. If connecting lugs are used, they must be completely and substantially insulated.
   d. A ground cable must have a safe current carrying capacity at least equal to the maximum output capacity of the unit or units that it services.
   e. Never attach a ground cable to a pipeline containing gases or flammable liquids.

f. String all cables overhead with non-metallic hangers or otherwise position to keep clear of walkways, ladders, and stairways.

g. Immediately remove all damaged and worn cable from service until properly repaired.

5. Documentation Summary

File these documents in the Safety and Health file:

A. Hot Work Permits

6. Resources

A. U.S. OSHA Construction Standard - Welding and Cutting - 29 CFR 1926, Subpart J

B. U.S. OSHA Standard - Welding, Cutting, and Brazing - 29 CFR 1910, Subpart Q

C. ANSI Z49.1-1999, "Safety in Welding, Cutting, and Allied Processes"

D. References to the UK legislations listed below can be found at the link provided:

www.tionestop.com
username: Thorburn
password: Dames
enter search criteria – (see underlined text)
select the checkbox for Construction Information Service (CIS)

- U.K. –Provision and Use of Work Equipment Regulations (PUWER)
- U.K. – Fire Precautions (Workplace) Regulations 1997 (Fire Safety and Employers Guide)
- U.K. - Personal Protective Equipment at Work Regulations 1992 (PPE 1992)

E. Australia Standards - Safety in Welding and Allied Processes – AS 1674-1997

F. Attachment 20-1 - Hot Work Permit

URS	Health, Safety and Environment CUTTING – WELDING - HOT WORK PERMIT	Attachment 20-1

IMPORTANT: Precautions on reverse side must be followed without fail.

Date _____ Time Started _____ Completed _____

Building _____ Floor/Dept./Area _____

Work to be done: _____

_____

_____

Work will be performed by: _____

_____

_____

Items 1, 2, 3, and 4 of the required precautions listed on the reverse side have been completed. Arrangements have been made for Item 5. Permission is therefore granted for this work.

This permit expires _____ **or end of shift, whichever is first.**

If fire occurs, phone _____ **or use alarm box located at:**

_____

Signed: _____ **Title:** _____

File in Project Safety and Health File. **See Page 2**

URS	Health, Safety and Environment **CUTTING – WELDING - HOT WORK PERMIT**	Attachment 20-1

DANGER

Do not cut, weld, or use other open flame or spark producing equipment until the following precautions have been taken.

Check each item:

- ❑ 1. The location where work is to be done has been personally inspected.
- ❑ A. Sprinklers, where provided, are in commission.
- ❑ B. There is no flammable dust, vapors, or liquids, or unpurged tanks or equipment previously containing such materials in the area.
- ❑ C. This work will be confined to the area or equipment specified in the permit.
- ❑ 2. The following safeguards have been provided:
- ❑ A. Floors and surroundings have been swept clean and wet down.
- ❑ B. Ample portable extinguishing equipment has been provided.
- ❑ 3. If the work involves cutting, welding, or other spark producing equipment, the following additional safeguards have been provided:
- ❑ A. All combustibles have been located 30 feet from the operation and the remainder protected with fire blanket, metal guards, or flameproofed covers (not ordinary tarps).
- ❑ B. All floor and wall openings within 40 feet of the operations have been tightly covered.
- ❑ C. Firewatches have been assigned to watch for dangerous sparks in area, as well as floors above and below.
- ❑ 4. Flame or spark producing equipment to be used has been inspected and found in good repair.
- ❑ 5. Arrangements have been made for a patrol of the area, including floors above and below, during any lunch or rest period and for at least one half hour after has been completed

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1. Applicability

This standard applies to the operations of URS Corporation and its subsidiary companies.

2. Purpose and Scope

Proper housekeeping in office locations, on construction sites, and fixed work facilities is essential to prevent cross contamination of hazardous materials, fires and injuries resulting from slips, trips and falls.

3. Implementation

Implementation of this standard is the responsibility of the manager directing activities of the facility or site.

A Corporate, Regional, or Strategic Business Unit (SBU) HSE Manager must approve deviations from this procedure.

4. Requirements

A. Maintain the cleanliness of the site.

1. Require tools and equipment to be stowed at the end of the day.
2. Store supplies in locations away from walkways and in a manner that will not trip workers.
3. Keep weeds and vegetation away from stockpiled materials and walkways.
4. Maintain flooring and walkways in a clean, dry, smooth condition.
5. Dispose of construction debris in a timely manner.

B. Regularly inspect the work area for slip and trip hazards.

1. Office locations - Inspect work areas at least quarterly. Utilize the check-sheet provided as Attachment 21-1.
2. Field sites - Inspect sites at least monthly. Utilize the check- sheet provided as Attachment 21-1.

C. Thoroughly investigate all injuries resulting from slips, trips and falls on site. Correct those housekeeping conditions contributing to injuries.

D. For operations where we are working with hazardous materials (including metals associated with aviation maintenance activities), the Company manager shall assure that:

1. Eating, drinking, and smoking areas are removed from the work areas. Hand washing stations shall be available nearby for employees entering the eating and smoking areas.
2. Resting, eating and smoking areas shall be kept clean.
3. Work areas shall be cleaned to remove accumulated contaminants. Working surfaces including workbenches, desks, and other lateral working surfaces shall be wiped down with an appropriate cleaner (soap, solvent, or oxidizing agent) daily. Walking surfaces shall be cleaned to remove accumulated contaminants weekly or more often.

5. Documentation Summary

A. Site or Operation

File completed Housekeeping Inspection Sheets (Attachment 21-1) in the Safety Filing System.

6. Resources

A. U.S. OSHA Standard - Sanitation - 29 CFR 1910.141

B. U.S. OSHA Standard -Walking and Working Surfaces - 29 CFR 1910.22.

C. U.K. - The Workplace (Health, Safety and Welfare) Regulations

D. U.K. - The Construction (Health, Safety and Welfare) Regulations

E. Attachment 21-1 - Housekeeping Inspection Sheet

Building or Location: _____

Inspection Conducted by: _____ **Date:** _____

		Yes	No must be completed	N/A
	General Site Housekeeping			
1.	No blocking of exits or emergency equipment.			
2.	Equipment or materials are not left lying on the ground.			
3.	Storage areas are free from the accumulation of materials that constitute trip hazards.			
4.	Scrap materials and other debris are removed from work area.			
5.	Combustible scrap and debris is removed by safe means at regular intervals.			
6.	Oily rags are stored in metal cans with tight fitting lids. Oily rags are removed at the end of the day.			
	Visibility			
7.	Halls, stairways and walkways are well lit.			
8.	Well designed light switches are present in areas where walkways are not always lighted.			
9.	Dust, smoke or steam does not create poor visibility.			
10.	Glare from floodlights or windows does not create poor visibility in work areas.			
	Stairs			
11.	Handrails are tight and at the proper level.			
12.	Handrails extend past the top and bottom step.			
13.	White or yellow strips are painted on the first and last step for better visibility. (Not an OSHA requirement – recommendation only).			
14.	Steps are not rough or defective.			
15.	Stair treads are wide enough and risers consistently spaced.			
16.	Stairs are free of obstructions.			
	Floor Conditions			
17.	Floors of every workroom are clean, and so far as possible, in a dry condition.			
18.	Floors are not oily, overly waxed, or polished.			
19.	Where wet floors or processes are present, proper drainage is provided and false floors, mats, or other dry standing places are provided.			
20.	Floor surfaces are finished with non-slip coatings where spills are likely.			
21.	Floors and passageways are free from protruding nails, splinters, holes, or loose boards.			

		Yes	No must be completed	N/A
22.	Floors are free of holes and depressions.			
23.	Aisles or pathways are wide enough for easy passage and for carrying objects (48 inches is recommended).			
24.	Ramps are covered with non-slip surfaces or matting.			
25.	Carpets or rugs do not have loose or frayed edges that may catch boots or shoes.			
26.	Walkways are free from extension cords, air hoses and cables.			
27.	Boxes, containers, machine parts or other tripping hazards do not lie in pathways.			
	Ground Conditions			
28.	Trip hazards are not present.			
29.	Fall hazards are not present.			
30.	Holes or changes in ground elevation are either filled or guarded.			
31.	Muddy walkways are filled with gravel to reduce slipping.			
32.	All employees who work in wet or greasy conditions wear slip resistant footwear.			
	Equipment			
33.	Vehicle steps are of adequate size, surface placement for safe dismounting.			
34.	Hand grips or ladders are adequate for getting into and out of equipment.			
35.	Ladders have been checked for damage and removed from service if found unsafe.			

Identify areas that need attention and describe the corrective actions to be implemented:

_____

_____

_____

_____

_____

I certify that the above inspection was performed to the best of my knowledge and ability, based on the conditions present on: _____

_____

Signature

URS	Health, Safety and Environment **SPECIAL HOUSEKEEPING CHECKLIST** **Sanding/ Drilling/ Grinding/ Painting**	Attachment 21-2

Week Ending: _____

Checklist Completed by: _____

The following checklist will be used as a guide and is considered the minimum housekeeping requirement for work areas where sanding, drilling, and grinding operations on aircraft and vehicles are performed. Dust from sanding/drilling/grinding on aircraft and vehicles contain metals, chemical coatings, and paint-based contaminants that can accumulate on work areas and flat surfaces. Good housekeeping practices throughout the work area are the key to mitigating this hazard.

	Mon	Tues	Wed	Thurs	Fri	Sat	Sun
1. All metal grindings and dust from sanding or grinding areas removed using a vacuum equipped with a HEPA filter.	☐	☐	☐	☐	☐	☐	☐
2. Remove contaminants on top of flat surfaces with HEPA filter equipped vacuum. Do not use fox-tails or low pressure air to blow dust off work benches, work areas or clothes.	☐	☐	☐	☐	☐	☐	☐
3. Wipe down surfaces of workbenches with damp rags using water and a surface-active cleanser. (A weekly requirement, more often if needed)	☐	☐	☐	☐	☐	☐	☐
4. Floor swept daily, without creating dust clouds. Wet mop work area floors. (A weekly requirement using water and a surface-active cleanser).	☐	☐	☐	☐	☐	☐	☐
5. Wipe down all other than workbench surfaces, where dust collects using damp rags. (A bi-weekly requirement).	☐	☐	☐	☐	☐	☐	☐
6. Monitor personnel to ensure no drinking or eating in the industrial work areas.	☐	☐	☐	☐	☐	☐	☐
7. Monitor personnel recognizing the hazards of cross contamination. Ensure all personnel are washing their hands before eating, drinking, or smoking on breaks.	☐	☐	☐	☐	☐	☐	☐

Identify areas that need attention and describe the corrective actions to be implemented:

_____

_____

_____

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1. **Applicability**

   This standard applies to operations of URS Corporation and its subsidiary companies.

   For non U.S. operations, refer to the country/region specific SMS and regulations.

2. **Purpose and Scope**

   This standard outlines the requirements that must be followed to prevent injuries, either direct or indirect, when work is performed near or on an energy source that is unexpectedly operated.

   Some energy sources that should be protected against include:

   A. Electrical circuits.

   B. Fluid systems (water and liquid product).

   C. Pneumatic systems.

   D. Flammable systems (including liquid and gaseous fuels).

   E. Thermal systems (steam).

   F. Gravity systems.

   G. Hazardous material systems.

3. **Implementation**

   Implementation of this procedure is the responsibility of the manager directing activities of the facility or site.

   A Corporate, Regional, or Strategic Business Unit (SBU) HSE Manager must approve deviations from this procedure.

4. **Requirements**

   A. General

      1. "Authorized employee" means a person who locks/tags out machines or equipment in order to perform servicing or

maintenance on that machine or equipment, and who has received the training described in Section C below.

2. "Affected employee" means an employee whose job requires him/her to operate or use a machine or equipment on which servicing or maintenance is being performed under lockout and tagout (LOTO), or whose job requires him/her to work in an area in which such servicing or maintenance is being performed.

3. "Qualified person" means person who is familiar with the construction and operation of the equipment and the hazards involved, and who:

   a. Requests de-energizing of an energy source.

   b. Inspects de-energizing with the authorized employee.

   c. Assures that authorized employee has locked and tagged the source.

   d. Requires that all applicable authorized employees affix lock/tags at the same locations(s).

   e. Operates the equipment controls or otherwise verifies that the equipment cannot be restarted after being locked out.

   f. Coordinates the continuation of LOTO protection through shift or personnel changes.

   g. Controls accountability of locks and tags.

   h. Makes appropriate log entries on Attachment 23-1.

   i. Conducts tests and visual inspections prior to reenergizing to check that circuits and equipment can be safely energized.

4. Employees shall not work on or in equipment, vessels, etc. which are **not** in a "zero energy state".

5. Coordinate all energy control activities with client, owner, contractor, and subcontractor practices and programs.

6. Require that all locks used in a LOTO program are marked in such a way so as to distinguish the locks from locks used for any other

purpose. Typically, locks are color coded red for LOTO program use.

7. Require that all locks are keyed differently and that only one key exists for each lock and remains in the possession of the authorized employee to whom it has been assigned.

B. Procedure

Follow this LOTO procedure whenever the unexpected operation of equipment, switch, valve or other energy sources could injure someone. Only authorized employees may perform jobs requiring LOTO procedures.

1. **Step 1** - Achieving Zero Energy

   a. Identify and locate all sources of energy that could affect individuals involved.

   b. Notify all affected personnel that equipment is going to be de-energized and accessed. This can be done verbally, visually, or by hanging a warning tag on the control panel.

   c. Disconnect the main sources of power by breaking the primary power circuit, valve, pipe, etc. Locking out a low voltage control circuit is not considered breaking a main power source.

   d. Disconnect each separate power source of multiple power systems (e.g., air over hydraulic, electric over hydraulic, etc.).

   e. Release all residual energy remaining behind the power source (e.g., hydraulic or air pressure, etc.).

   f. Secure all power sources in the de-energized position with a lockout device. Use multiple lock devices when more than one lock is required. Each person who is protected by the lockout:

      1. Places a signed lock and tag on source location(s).

      2. Keeps the key to his/her own lock.

      3. Removes his/her own lock (only exception: person not on site and person is contacted).

      4. Works ***only*** on protected source(s).

      5. Removes lock and tag at completion of work shift or transfer.

   g. Block or blank any machinery, device, or piping system that can move on its own or deliver energy with or without the power source.

   h. Test equipment prior to working on it to insure that all sources of energy have been isolated and that it is "safe".

2. **Step 2** - Preparing to Re-Energize

   a. Once the task has been completed, ensure tools are picked up and safety chains, guards, guard rails, warning signs, etc. are replaced. Notify affected personnel that the lockout device is going to be removed.

   b. Remove locks and tags.

   c. Once all lockout devices have been removed, the equipment or process may be restarted.

3. Temporary operation of locked out source

   a. Make sure everyone is clear of the system.

   b. Make sure tools are clear.

   c. Remove lock(s).

   d. Energize the system and conduct check.

   e. Immediately de-energize the system and replace locks.

4. Unauthorized removal of locks and tags is prohibited. Use the following procedure for Supervisor or Qualified Person to remove lock/tag when employee is not available:

   a. Verify authorized employee is not on site and available to remove own tag.

   b. Check that employees are not exposed to hazards.

c. Verify equipment is safe to operate, tools have been removed, and guards have been replaced.

d. Remain with affected equipment so that no one returns while equipment or process is being restarted.

e. Remove lock/tag and energize equipment.

f. Require that affected employee knows the lockout device(s) has been removed before he/she resumes work.

C. Training

1. Authorized employees must receive training prior to conducting LOTO activities.

2. Training must include:

a. Purpose of lockout procedure.

b. Hazards associated with different energy sources.

c. Recognition of when to use LOTO procedures.

d. Electrical lockout procedures.

e. Valve lockout procedures.

f. Compliance with lockout procedures.

g. Discussion of specific procedures.

5. Documentation Summary

File these records:

A. Training records for authorized employees

B. Lockout Log (Attachment 23-1)

6. Resources

A. ANSI 235.2

B. U.S. OSHA Standard 29 CFR 1926.200 - Accident Prevention Signs and Tags

C. U.S. OSHA Standard 29 CFR 1926.417 - Lockout and Tagging of Circuits

D. U.S. OSHA Technical Links - Lockout/Tagout

E. U.K. - 'Management of Health and Safety Work' Regulations

F. Attachment 23-1 - Lock and Tag Log

URS	Health, Safety, and Environment	Attachment 23-1 Revision 1: Sept 2005

Name of Qualified Person: _____ Date: _____

Job Name: _____ Job Location: _____

Date	Lockout Location	Authorized Employee	Activity Initiated	Activity Completed

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1. Applicability

This program applies to employees assigned to work environments where there is a potential for exposure to chemical, biological, and/or physical hazards. Individuals will be selected for medical screening based on regulatory standards, project health and safety plan assessments, the expected use of personal protective equipment, and client contract requirements.

2. Purpose and Scope

The overall goal of this program is to prevent occupational illness and injury by early identification of exposure-related health effects before they result in disease. Medical examinations will be performed in order to determine if employees are capable of safely performing assigned tasks, to verify protective equipment and controls are effectively providing protection, and to comply with governmental regulations. Included are provisions for emergency medical consultation and treatment.

3. Implementation

Office/laboratory locations – Implementation is the responsibility of the Office Manager.

Field activities – Implementation is the responsibility of the Project Manager.

Program Administration – The Occupational Health Manager (OHM) is responsible for development and administration of this program in coordination with the URS Medical Service Provider (MSP). The OHM will maintain current injury and illness data and participate with Corporate Health, Safety, and Environment (HSE) Managers in evaluation of this program. The MSP will provide board certified occupational medicine oversight for the program and will approve medical surveillance protocols.

Locations in the United States and Canada will follow all requirements of this program.

International locations will follow sections B.1, 2, 3, 5, 6, 7, and 8; G.3; and H.1 of this program.

4. Requirements

A. Selection of program participants.

1. The Medical Surveillance Evaluation (MSE) form - SMS 24-2 provides the primary guidance for determining whether medical screening is required for an employee and the frequency of periodic exams. The MSE is to be completed by the employee and their supervisor at time of hire for any employee who may work outside an office environment and is to be reviewed for accuracy at each annual performance review. Other reviews are required whenever there is a change in job tasks.

2. Additional site/project specific biological monitoring or toxicological screening may be required in addition to this program's core exam schedule. These medical tests will be specified by the project-specific health and safety plan and will be authorized by the MSP on the exam appointment protocol. Note: See Section D.2 if employee will have an initial assignment at a HAZWOPER site.

B. Types of medical screening and surveillance exams

1. A baseline or pre-assignment baseline exam will be conducted prior to the start of work assignments requiring medical surveillance.

2. Periodic exam schedules are established by the MSP using the following criteria:

   a. Employees performing the following types of work will receive annual exams: construction activities in the exclusion zone of HAZWOPER sites, field work activities in the exclusion zone of HAZWOPER sites for 30 or more days per year, or projects involving exposure to OSHA-regulated materials at or above established action levels.

   b. Employees performing the following types of work will receive biennial exams: field work activities at HAZWOPER sites less than 30 days per year; waste disposal activities; non-HAZWOPER environmental sampling; chemistry laboratory, pilot plant projects, or bench scale operations for 30 or more days per year.

3. Employees currently participating in an examination program will receive exit exams when they leave their work assignment as identified in the Exit Exam Determination – SMS 24-6. In the event an employee declines the exit exam, the employee will be

requested to sign a Waiver of Exit Medical Surveillance Exam - SMS 24-7.

4. Department of Transportation (DOT) exams will be conducted biennially when an employee is assigned to drive a vehicle with a gross weight rating of more than 10,000 pounds or when driving a placarded vehicle of any size used to transport hazardous chemicals. DOT exam certification can be added to a routine baseline or periodic exam protocol when scheduling with the MSP.

5. When noise levels in the employee's work environment equal or exceed an 8-hour time-weighted average of 85 decibels as measured on the A-scale (dBA), annual audiograms will be performed. For employees involved in construction activities or management of construction, enrollment in this program will be required if more than 50% of their time is spent in an active construction area.

6. Individual radiation dose monitoring will be conducted as required by the site-specific health and safety plan with approval by a Radiation Safety Officer. Personal dosimetry (film badges) is typically required; however, depending on the specific radiation hazard, additional excretory monitoring or thyroid scans may be required.

7. In order to determine an employee's ability to wear a respirator, a medical evaluation will be performed before an employee is fit tested or assigned to wear a respirator.

8. Employees assigned to work environments with airborne concentrations of asbestos fibers at or above the established action level will receive asbestos-specific baseline and annual exams. Exit exams will be performed if an exam has not been performed within the past 6 month period or if an employee has medical complaints related to asbestos exposure.

C. Exam protocols

1. The Medical Screening & Surveillance Exam Protocol – SMS 24-3 identifies the medical exam components of this program.

D. Scheduling of exams

1. The Office or Project Manager, usually with assistance of the local HSE Representative, is responsible for contacting the MSP when baseline, exit, and project specific exams are required. The MSP maintains an employee scheduling database for tracking periodic exams and will contact the employee for scheduling the month their exam is due. These steps are detailed in the Medical Surveillance Exam Process – SMS 24-4.

2. Employees hired with an initial assignment to work at a HAZWOPER site whose work duties require passing a physical exam or who have an essential job function of wearing a respirator, will receive a job offer contingent upon passing a pre-assignment baseline exam. See HAZWOPER & Respirator Pre-assignment Baseline Exam Process – SMS 24-5.

3. In the event of an urgent business need, a temporary clearance to begin work the day of the exam may be requested at the time a baseline exam is scheduled through the MSP. The temporary clearance will be issued by the local physician and will be good for up to 14 days or until the MSP physician's final clearance is received, whichever comes first.

4. If an exam becomes due during an employee's pregnancy, it is advised to defer the exam until after delivery and the employee returns to work from family/medical leave status.

E. Exam Follow Up

1. Following each exam, the MSP will issue a physician's written opinion (Health Status Medical Report) to the local HSE Representative which will include any medical restrictions and address the employee's ability to use personal protective equipment. See Exam Follow Up Procedures - SMS 24-8.

2. The MSP will mail the exam invoice to the local HSE Representative who will approve the charge and forward the invoice to the accounts payable department for payment.

3. The MSP will mail a confidential letter detailing the results of the exam to the employee at their home address within 30 days of the exam date.

F. Emergency Medical Care

1. Pre-planning is essential to a prompt and proper response to a medical emergency. Site specific emergency procedures will be provided in the site Health & Safety Plan. Suggested pre-planning actions are provided in SMS 065 (Injury Case Management). See Field First Aid Kit Supply List for recommended supplies. The contents of the first aid kit shall be checked prior to being sent out to each site/project and periodically thereafter to ensure the expended items are replaced.

2. A MSP occupational physician can be reached 24 hours a day for phone consultation at WorkCare™ (1-800-455-6155).

3. A workers' compensation claim should be filed by the Human Resource Representative with AIG Claim Services (1-877-366-8423) for an injured employee who receives professional medical care or who is disabled from working beyond the initial date of injury.

5. In order to comply with OSHA reporting regulations, immediately notify the OHM or the applicable Corporate HSE Manager if there is a work-related hospitalization or death.

G. Medical Records

1. Medical records are maintained and preserved in confidential, locked files in the custody of the MSP for at least the duration of employment plus 30 years. Only information regarding the employee's ability to perform the job assignment will be provided to company representatives.

2. Upon request, each employee (or designated representative) will have access to the employee's medical record. Prior to the release of health information to the employee (or designated representative), a specific written consent must be signed by the employee.

3. International records (excluding the United States and Canada) will be maintained in country at the local clinic.

H. Program evaluation

1. The OHM and Corporate HSE Managers will evaluate this program annually and as needed. Issues to review include program efficacy and efficiency, employee satisfaction, and cost effectiveness.

2. The MSP will prepare an Annual Medical Trending Report specifying the number and types of exams performed and anonymous statistical exam results in group data format.

3. Each employee is mailed a Post-Exam Evaluation by the MSP. Employee feedback regarding the clinic, medical staff, and exam procedures are reviewed and corrective actions are identified and acted upon as needed.

5. Documentation Summary

The local HSE Representative will file the Medical Surveillance Evaluation and the Health Status Medical Report in the site health & safety records.

6. Resources

A. U.S. OSHA Technical Links - Medical Screening/Surveillance

B. U.S. OSHA Publication 3162 (1999) Screening and Surveillance: A Guide to OSHA Standards

C. Attachment 24-1 WorkCare Medical History Questionnaire

D. Attachment 24-2 Medical Surveillance Evaluation

E. Attachment 24-3 Medical Screening & Surveillance Exam Protocol

F. Attachment 24-4 Medical Surveillance Exam Process

G. Attachment 24-5 HAZWOPER/Respirator Preassignment Baseline Exam Process

H. Attachment 24-6 Exit Exam Determination

I. Attachment 24-7 Waiver of Exit Medical Surveillance Exam

J. Attachment 24-8 Exam Follow Up Procedures

K. Attachment 24-9 Field First Aid Kit Supply List

L. SMS 8 Asbestos Survey and Oversight Operations

M. SMS 17 Hazardous Waste Operations

N. SMS 42 Respiratory Protection

o. SMS 65 Injury Case Management

Medical History Questionnaire

☐ Baseline ☐ Annual/Biennial
☐ Exit ☐ Other _____

Company Name:_____
Office:_____
Date:_____

URS

Medical History Questionnaire

The exam will be at: *Please see Appointment Protocol.*

- Please have your Supervisor or Health & Safety Professional complete the Job Profile on the inside flap of this page if you do not know the responses.

- See your Health & Safety Professional for directions to the clinic. Please bring the completed exam packet and your Authorization.

- Do not eat for 8 hours prior to exam.
  (Water and unsweetened juice or black decaffeinated coffee are allowed)
  (Dry toast if you have an afternoon appointment)

- Avoid all alcohol consumption for 24 hours prior to the exam.

- Avoid loud noise exposure for 14 to 16 hours before the exam.

- If you wear contact lenses, please do not insert them on the day of the exam. Bring a pair of glasses.

- If you use hearing aids, please bring them to the clinic.

- If you have questions, do not read or understand please contact (800) 455-6155.

- The cost of this exam will be borne by your employer. It is important to be on time for your appointment. If you cannot attend your appointment, call (800) 455-6155 to cancel, or your employer may be charged.

Please answer all the questions in this booklet.

Occupational Medicine • Environmental Health • Toxicology

1-(800) 455-6155

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I INSTRUCTIONS

Your supervisor must allow you to answer this questionnaire during normal working hours, or at a time and place that is convenient to you. To maintain your confidentiality, your employer or supervisors must not look at or review your answers, and your employer must tell you how to deliver or send this questionnaire to the healthcare professional who will review it.

Has your employer told you how to contact the healthcare professional who will review this questionnaire? Yes ☐ No ☐

This questionaire is used to gather information about your health and physical condition, both now and in the past. This information will be used to determine if you can safely perform the duties of your job. This exam is not intended to substitute for care provided by a personal physician. Results of the exam will be sent to your home address. The results of the examination are kept confidential.

I. 1. Print the following information:

Last Name: _____ First Name: _____

Home mailing address: _____

_____
(city) (state) (zip)

Social Security Number: _____ Date of Birth: _____ Age: _____

Sex	Position	Site Location	Date Employed
[ ] Male [ ] Female			

Home Phone	Work Phone	Emergency Contact/Phone #
( )	( )	( )

What is the phone number at which you can be reached by the healthcare professional who reviews this questionnaire (include area code:) (____) _____

What is the best time to reach you? From: _____ AM/PM To: _____ AM/PM

E-mail: _____

2. **Read and sign this Consent for Release of Medical Records:**
I hereby authorize WorkCare to release in confidence to _____(company) and/or its subsidiaries medical information, including but not limited to the results of medical evaluations, physical examinations or medical testing, as it specifically pertains to my medical qualification to perform the stated Job Duty consistent with the requirements of OSHA, MSHA.
I further authorize the examining physician and/or clinic to release to WorkCare™ any medical information related to my medical or physical condition. You have a right to receive a copy of this authorization.

Signature:_____ Date: _____

Job Profile

II THIS SECTION IS TO BE COMPLETED

If you have questions about the job, these need to be discussed with the employer.

JOB DUTY / TITLE What is the main job duty (present or proposed) for this individual?
(Example: Driller, Water Treatment, Ground Water Sampling, Engineer, Environmental Scientist, Lab Tech, Heavy Equipment Operator, Maintenance Worker, etc.)

_____

_____

WORK SCHEDULE _____ % Field _____ % Office _____ % Travel

PHYSICAL REQUIREMENTS Yes ☐ No ☐

Are there any specific physical demands of the job that are important? (example: lifting, carrying)
If yes, please specify:

_____

PROTECTIVE EQUIPMENT

Is clearance for the use of respiratory protective equipment needed? Yes ☐ No ☐

Escape only (no rescue) ☐ Emergency rescue only ☐

Is there specific safety equipment (beyond hard hat, gloves, boots, and appropriate clothing) that are used in the safe performance on the job? If yes please specify: Yes ☐ No ☐

_____

1. **THIS EMPLOYEE USES THE FOLLOWING TYPES OF RESPIRATORY PROTECTIVE EQUIPMENT:**

✓		DURATION	FREQUENCY	TEMPERATURE EXTREMES	HUMIDITY
	HALF FACE PIECE AIR PURIFYING RESPIRATOR				
	FULL FACE PIECE AIR PUIRFYING RESPIRATOR				
	POWERED AIR PURIFYING REPIRATOR				
	SELF-CONTAINED BREATHING APPARATUS				
	AIR LINE RESPIRATOR				

Yes No

2. Is it possible that this individual will be required to wear Level A protection at any time? [SCBA, fully encapsulated suit, chemical resistant gloves & boots.] ☐ ☐

3. Is it possible that this individual will be required to wear Level B protection at any time? [SCBA, chemical resistant clothing, chemical resistant gloves & boots.] ☐ ☐

4. List potential chemical exposures

_____

	Yes	No
5. Will you be working under hot conditions (temperatures exceeding 77°F)?	☐	☐
Will you be working under humid conditions?	☐	☐
Will you be working at high altitudes?	☐	☐

Describe the work you'll be doing while you're using your respirator(s).

_____

6. Describe any special or hazardous conditions you might encounter when you're using your respirator(s) (For example, confined spaces, life-threatening gases):

_____

7. During the period you are using the respirator(s), is your work effort:
   a. Light (less than 200 kcal per hour) Yes ☐ No ☐ How long_____hrs per shift
   b. Moderate (200 to 359 kcal per hour) Yes ☐ No ☐ How long_____hrs per shift
   Examples: sitting while mailing or filing; driving a truck or trasferring a moderate load (about 35 lbs) at trunk level; walking on a level surface about 2 mph
   c. Heavy (above 350 kcal per hour) Yes ☐ No ☐ How long_____hrs per shift
   Examples: lifting a heavy load (about 50 lbs.) from the floor to your waist; working on a loading dock; shoveling; standing while bricklaying; climbing stairs with a heavy load (about 50 lbs.)

8. Describe any special responsibilities you'll have while using your respirator(s) that may affect the safety and well-being of other (e.g. rescue, security):

_____

9. Are there any substances which you can not work with? List:

III REVIEW OF SYSTEMS

ANSWER YES IF YOU CURRENTLY HAVE THE SYMPTOM OR HAVE HAD SIGNIFICANTLY IN THE PAST

		YES	NO	DATE
1.	A. Fever			
	B. Chills			
	C. Weight Loss			
	D. Loss of energy/fatigue			
2.	A. Poor Vision			
	B. Color Blindness			
	C. Double vision			
	D. Injury to eye			
	E. Cataract			
	F. Glaucoma			
	G. Do you wear glasses or contacts?			
3.	A. Ear Infection			
	B. Mastoid surgery			
	C. Loss of hearing			
	D. Sore throat			
	E. Frequent hoarseness			
	F. Dental problems			
4.	A. Allergies			
	B. Sinus trouble			
	C. Hay fever			
5.	A. Tuberculosis			
	B. Asthma & breathing difficulties			
	C. Lung collapse			
	D. Pneumonia			
	E. Shortness of breath			
	F. Persistent or severe colds			
	G. Persistent or severe coughs			
	H. Chest surgery			
	I. Wheezing			
	J. Emphysema			
	K. Bronchitis			
6.	A. High blood pressure			
	B. Heart murmur			
	C. Enlarged heart			
	D. Heart disease/failure			
	E. Rheumatic fever			
	F. Heart palpitations			
	G. Irregular heart beat			
	H. Heart attack			
	I. Chest pain			
7.	A. Varicose veins			
	B. Stroke			
	C. Leg ulcers			
	D. Swelling of ankles			
	E. Leg pain on walking			
8.	A. Anemia			
	B. Leukemia			
	C. Sickle Cell Disease			
	D. Other blood disease			
9.	A. Diabetes			
	B. Thyroid problems			
	C. Cancer or tumors			
	D. Heart related illness			
10.	A. Rash/dermatitis			
	B. Bruise easily			
	C. Psoriasis			
	D. Wart/mole change			
	E. Eczema/Acne			

		YES	NO	DATE
11.	A. Headaches			
	B. Head injury			
	C. Neck injury			
12.	A. Birth defect			
	B. Frequent backaches			
	C. Back surgery			
	D. Disc disease			
	E. Back injury or strain			
	F. Back x-rays			
	G. Chiropractic treatments			
	H. Arthritis/Rheumatism			
	I. Knee problems			
	J. Swollen joints			
	K. Amputation			
	L. Broken Bones			
	Type:			
	M. Dislocations			
	N. Carpal Tunnel Syndrome			
	O. Repetitive Strain Extremities			
13.	A. Ulcers			
	B. Colitis			
	C. Diarrhea (frequent)			
	D. Stomach problems			
	E. Vomiting			
	F. Bloody bowel movements			
	G. Hepatitis/Abnormal liver enzymes			
	H. Cirrhosis			
	I. Yellow Jaundice			
	J. Gallbladder trouble			
14.	A. Epilepsy/seizures			
	B. Fainting spells			
	C. Loss of consciousness			
	D. Dizziness or vertigo			
	E. Frequent exhaustion			
	F. Trouble with nerves			
	G. Frequent worry/depression			
15.	A. Kidney trouble/stones			
	B. Bladder trouble			
	C. Kidney/bladder surgery			
	D. Blood in urine			
	E. Difficulty urinating			
16.	A. Venereal disease			
	B. Infertility/difficulty conceiving			
	C. Children with birth defects			
17. Female	A. Irregular period/painful menstruation			
	B. Hysterectomy			
	C. Are you pregnant?			
	D. Have you difficulty becoming pregnant?			
	E. Date of last menstrual period			
	F. Date of past pelvic/pap smear			
	G. Date of last mammogram			
	H. Breast lumps			
	I. Breast discharge			
	J. Repeated miscarriages			
18. Male	A. Inability to have an erection			
	B. Discharge or bleeding from the penis			
	C. Abnormal testicular self examination			
	D. Prostate problems			

Describe fully any "Yes" responses by number: _____

Are you currently unable to perform any type of activity? Yes ☐ No ☐ List: _____

IV SOCIAL HISTORY

	YES	NO
1. Do you now or in the past month smoke cigarettes?	☐	☐
2. Have you ever smoked cigarettes in the past?	☐	☐

3. If you now smoke or smoked in the past, how many years total have you smoked? (Write in number)____

4. If you now smoke or have smoked in the past, how many packs per day do/did you smoke on the average? (Choose the closest number)

☐ Less than one-half(½) ☐ One (1) ☐ One and one-half(1½)
☐ Two (2) ☐ Two and one-half (2½) ☐ Three (3)
☐ More than three

5. Do you use any one of the following tobacco products? ☐ ☐
☐ Pipe Tobacco ☐ Cigars ☐ Snuff ☐ Smokeless Tobacco

6. Do you regularly drink alchoholic beverages? ☐ ☐

FOR QUESTIONS 7-9, CHOOSE THE ANSWER WHICH BEST FITS YOU.

7. If yes, how many drinks, beers or glasses of wine do you drink daily?
☐ Less than 1 ☐ 1-2 ☐ 3-4
☐ 5-6 ☐ 7-8 ☐ More than 8

8. Do you have strenuous exercise for at least 45 min.?
☐ Daily ☐ 3 times a week ☐ 1 time a week
☐ Rarely ☐ Never

9. Do you feel frustated, stressed or uptight?
☐ Daily ☐ 3 times a week ☐ 1 time a week
☐ Rarely ☐ Never

10. Do you eat greasy or fatty foods?
☐ Daily ☐ 3 times a week ☐ 1 time a week
☐ Rarely ☐ Never

11. Do you use street drugs? ☐ Yes ☐ No

V PAST MEDICAL HISTORY

For Annual or Exit Exam - Indicate Change Since Last Exam

1. Are you currently being treated for illness or injury? ☐ Yes ☐ No
2. Have you been treated for persistent illness or injury? ☐ Yes ☐ No
3. Describe fully any "Yes" responses. _____

4. Please list HOSPITAL ADMISSIONS: ☐ If none, check here

YEAR	REASON FOR HOSPITALIZATION
19____	_____
19____	_____
19____	_____

5. Please list allergies to any medication, food, clothing, bee stings or other substances:
_____
_____

	YES	NO
6. How many days of work did you miss in the last 12 months due to your health? _____		
7. Have you ever pursued a compensation claim or received disability payment for occupational injury or disease?	☐	☐
8. Have you ever been turned down for life insurance?	☐	☐
9. Have you had injuries from an auto accident?	☐	☐

VI CURRENT MEDICINES

When was the last year you received a tetanus immunization booster? _____ mo. / _____ day / _____ yr.

Do you currently have presciptions for drugs or medications? ☐ Yes ☐ No Please specify:_____

Have you ever been addicted to or consistently used drugs? ☐ Yes ☐ No Please specify:_____

Do you take any of the following medications on a daily basis.

Heart Medicine	☐ Yes	☐ No	Aspirin	☐ Yes	☐ No
Thyroid medicine	☐ Yes	☐ No	Blood pressure medicine	☐ Yes	☐ No
Oral medicine for Diabetes	☐ Yes	☐ No	Diuretic (Water pill)	☐ Yes	☐ No
Insulin for diabetes	☐ Yes	☐ No	Medicine for seizures	☐ Yes	☐ No
Nerve or sleeping pills	☐ Yes	☐ No	Allergy/Asthma medications	☐ Yes	☐ No
Blood thinner	☐ Yes	☐ No	Other: _____		

VII FAMILY HISTORY

Father:	☐ Living	List Diseases _____	If dead, cause of death_____
Mother:	☐ Living	List Diseases _____	If dead, cause of death_____
Brothers:	☐ Living	List Diseases _____	If dead, cause of death_____
Sisters:	☐ Living	List Diseases _____	If dead, cause of death_____

Has any member of the family had any of the following:

Cancer	☐ Yes	☐ No	Diabetes	☐ Yes	☐ No	Nervousness	☐ Yes	☐ No
Insanity	☐ Yes	☐ No	Tuberculosis	☐ Yes	☐ No	Rheumatism	☐ Yes	☐ No
Kidney Disease	☐ Yes	☐ No	Heart Disease	☐ Yes	☐ No			

FOR INITIAL EXAMS ONLY

THIS PAGE IS TO BE COMPLETED ONLY AS INITIAL OR PRE-JOB EXAMS

VIII PAST JOB HISTORY

LIST ALL JOBS EVER HELD STARTING WITH YOUR FIRST - INCLUDE PART TIME AND VOLUNTEER WORK

NAME OF EMPLOYER	FROM MO/YR	TO MO/YR	# HRS WORKED PER WEEK/SHIFT	DESCRIPTION OF WORK	POTENTIAL HAZARDS (DUST, FUMES, CHEMICALS, HEAT, NOISE, PHYSICAL AGENTS, METALS, RADIATION)

IX TOXIC EXPOSURE HISTORY

At work or at home have you ever been exposed to hazardous solvents, hazardous airborne chemicals (e.g. gases, fumes, dust) or have you come into skin contact with hazardous chemicals?

List _____

Have you worked with any of the materials, or under any of the conditions, listed below:

	YES	NO
Asbestos	☐	☐
Silica (e.g. sandblasting)	☐	☐
Coal (e.g. mining)	☐	☐
Grinding	☐	☐
Welding	☐	☐
Aerosols	☐	☐
Asphalt, pitch or tar	☐	☐
Beryllium	☐	☐
Cadmium	☐	☐
Cotton Dust	☐	☐
Pesticides	☐	☐
Fuel Specify:	☐	☐
Oils	☐	☐
Lead	☐	☐
Nickel/Chrome	☐	☐
Paint	☐	☐
Microwave/Radio Frequency	☐	☐
Nuclear Radiation/X-Ray	☐	☐
Fiberglass	☐	☐
Plastics	☐	☐
Solvents	☐	☐
Compressed Gases	☐	☐
Aluminum	☐	☐
Iron	☐	☐
Tin	☐	☐
Dusty Environments	☐	☐
Have you ever worked around excessive **noise?** Where? _____	☐	☐
Have you ever worked in an excessively **hot or cold environment?** Where? _____	☐	☐

	YES	NO
Have you ever worked around **vibration** or with **vibrating tools?**	☐	☐
Have you ever worked in a doctor's office, clinic or hospital where you might have had exposure to **biohazardous materials?**	☐	☐
Have you ever performed a **site assesment** on any of the above industry groups or materials? List: _____	☐	☐
Any other hazardous exposures If "yes," describe these exposures: _____	☐	☐

	YES	NO
Have you ever lived near large industrial plants or areas of air pollution?	☐	☐
Have you ever received hazardous duty or environmental pay?	☐	☐
Have you ever been in the military service?	☐	☐
If "yes" were you exposed to biological or chemical agents (either in training or combat?)	☐	☐
Have you ever worked on a HAZMAT team?	☐	☐

List any second jobs or side businesses you have: _____

List your current and previous hobbies: _____

RESPIRATOR USERS ONLY

THE FOLLOWING 2 PAGES ONLY NEED TO BE COMPLETED BY THOSE ASSIGNED TO USE REPIRATORS. IF UNCERTAIN ABOUT RESPIRATOR USE, PLEASE COMPLETE

RESPIRATOR USE

	YES	NO
1. Have you ever worn a respirator in the past?	☐	☐

2. What type of respirator did you wear? (mark all that apply) If no go to question 4
   - ☐ Disposable particulate filter mask (non-cartridge dust mask)
   - ☐ Half face cartridge respirator
   - ☐ Full face cartridge respirator
   - ☐ Powered air purifying respirator
   - ☐ Supplied air (airline) respirator
   - ☐ Self contained breathing apparatus (SCBA)
   - ☐ Escape only respirator

3. If you've ever used a respirator, have you ever had any of the following problems?	YES	NO
Eye irritation	☐	☐
Skin allergies or rashes	☐	☐
Anxiety	☐	☐
General weakness or fatigue	☐	☐
Any other problem or difficulty that interfered with your use of a respirator	☐	☐

_____

HEART, LUNGS, AND OTHER BODY SYSTEMS (CONT.)

	YES	NO
4. Have you ever had an abnormal EKG (Electrocardiogram) Explain: _____	☐	☐
5. Have you ever had any of the following cardiovascular or heart problems?		
Heart attack	☐	☐
Stroke	☐	☐
Angina (chest pain)	☐	☐
Heart failure	☐	☐
High blood pressure	☐	☐
Swelling in your legs or feet (not caused by standing or walking)	☐	☐
Heart arrhythmia	☐	☐
Any other heart problem that you have been told about	☐	☐
6. Have you ever had surgery of the arteries, coronary bypass or angioplasty (to correct blocked artery or aneurysm)?(mark only 1 answer)		
Yes, within the past year	☐	☐
Yes, more than 1 year ago	☐	☐
No	☐	☐
6. Have you ever had any of the following pulmonary or lung problems?		
Asbestosis	☐	☐

HEART, LUNGS, AND OTHER BODY SYSTEMS (CONT.)

	YES	NO
Asthma	☐	☐
Chronic bronchitis	☐	☐
Emphysema	☐	☐
Pneumonia	☐	☐
Tuberculosis	☐	☐
Silicosis	☐	☐
Lung cancer	☐	☐
Broken ribs	☐	☐
Pneumothorax (collapsed lung)	☐	☐
Any chest injuries or surgeries	☐	☐
8. Have you ever had seizures (fits)?	☐	☐
9. Have you ever been told you had diabetes (sugar disease)?	☐	☐
10. Have you ever had allergic reactions that interfere with your breathing?	☐	☐
11. Have you ever experienced claustrophobia (fear of closed-in places)?	☐	☐
12. Have you ever had trouble smelling odors?	☐	☐
13. Have you ever had any of the following pulmonary, cadiovascular, lung or heart symptoms?		
Shortness of breath	☐	☐
Shortness of breath when walking fast on level ground or walking up a slight hill or incline	☐	☐
Shortness of breath when walking with other people at an ordinary pace on level ground	☐	☐
Have to stop for breath when walking at your own pace on level ground	☐	☐
Shortness of breath when washing or dressing yourself	☐	☐
Shortness of breath that interferes with your job	☐	☐
14. Do you currently take medication for any of the following problems?		
Breathing	☐	☐
Heart trouble	☐	☐
Blood pressure	☐	☐
Seizure (fits)	☐	☐
15. Have you within the past had any of the the following symptoms of lung illness?		
Coughing that produces phlegm (thick sputum)	☐	☐

HEART, LUNGS, AND OTHER BODY SYSTEMS (CONT.)

	YES	NO
Coughing that occurs mostly when you are lying down	☐	☐
Coughing up blood in the last month	☐	☐
Wheezing	☐	☐
Wheezing that interferes with your job	☐	☐
Chest pain when you breath deeply	☐	☐
Coughing that wakes you early in the morning	☐	☐
Any other symtoms that you think may be related to lung problems	☐	☐

16. Have you ever had any of the following cardiovascular or heart symtoms?

Frequent pain or tightness in your chest	☐	☐
Pain or tightness in your chest during physical activity	☐	☐
Pain or tightness in your chest that interferes with your job	☐	☐
In the past two years, have you noticed your heart skipping or missing a beat?	☐	☐
Heartburn or indigestion that is not related to eating	☐	☐
Any other symtoms that you think might be related to heart or circulation problems	☐	☐

FULL FACE OR SCBA REPIRATOR USER ONLY

The following questions must be answered by every employee who has been selected to use either a full-face piece respirator or Air Supply Respirator (Self-Contained Breathing Apparatus [SCBA] or air line).

	YES	NO
17. Have you ever lost vision in either eye (temporarily or permanently)?	☐	☐
18. Do you currently have any of the following vision problems?		
Wear contact lenses	☐	☐
Wear glasses	☐	☐
Color blind	☐	☐
Any other eye or vision problem	☐	☐

FULL FACE OR SCBA REPIRATOR USER ONLY (CONT.)

	YES	NO
19. Have you ever had an injury to your ears, including a broken ear drum?	☐	☐
20. Do you currently have any of the following hearing problems?		
Diffculty hearing	☐	☐
Wear a hearing aid	☐	☐
Any other hearing or ear problem	☐	☐

Explain: _____

_____

_____

_____

21. Have you ever had a back injury?	☐	☐
22. Do you currently have any of the following muscle or skeletal problems?		
Weakness in any of your arms, hands, legs or feet	☐	☐
Back pain	☐	☐
Difficulty fully moving your arms and legs	☐	☐
Pain or stiffness when you lean forward or backward at the waist	☐	☐
Difficulty fully moving your head up and down	☐	☐
Difficulty fully moving your head side to side	☐	☐
Difficulty bending at your knees	☐	☐
Difficulty squatting to the ground	☐	☐
Difficulty climbing a flight of stairs or a ladder carrying more than 25 lbs.	☐	☐
Any other muscle or skeletal problems that might interfere with using a respirator	☐	☐

Explain: _____

_____

_____

_____

X FOR YEARLY / EXIT EXAMINATIONS ONLY

1. a. Approximately how many days of hazardous field work have you performed since your last examination? _____
   b. Approximately how many days in Level C (using an air-purifying respirator)? _____
   c. Approximately how many days in Level B (self-contained breathing apparatus or air line)? _____
2. Approximately how many different hazardous material sites have you worked on since your last examination? _____
3. What were the chemical or other hazards of concern to which you have potential exposure since your last examination? (e.g. gasoline, arsenic, trichlorethylene, radiation, asbestos)

Chemicals of Concern	Approximate # of Days	Exposure Frequency			Exposure Duration		
		Daily	Weekly	Monthly	< 1 Hr.	1-8 Hrs.	> 8 Hrs.

4. **Since your last exam,** have you had difficulty doing your job because of:

a. Sensitivity to chemicals, dust, sunlight, etc.? (circle one)	**Yes**	**No**	**Don't Know**
b. Inability to perform certain motions? (circle one)	**Yes**	**No**	**Don't Know**
c. Inability to assume certain positions? (circle one)	**Yes**	**No**	**Don't Know**
d. Heat Stress? (circle one)	**Yes**	**No**	**Don't Know**
e. Other medical reasons? (circle one)	**Yes**	**No**	**Don't Know**

5. Have you experienced any health symptoms that may be related to exposures to hazardous materials since your last examination? If so, please describe:

_____

6. **Since your last examination,** have you had any type of illness that resulted in more than 3 consecutive days lost time from work? Yes No List: _____

7. Do you feel that you have and/or had exposure to ticks? [ ] No [ ] Yes When _____
   If "Yes", how would you quantify your potential exposure?
   [ ] Very significant [ ] Significant [ ] Insignificant [ ] None [ ] Unknown
   Have you ever had any symptoms or signs (e.g. rash) which you attribute to tick bites? [ ] No [ ] Yes
   If "Yes", please describe:

_____

8. a. How would you rate the effectiveness of the health and safety procedures used for work?
   Check One [ ] Poor [ ] Fair [ ] Good [ ] Excellent
   b. Comments: _____

	YES	NO
9. Have you ever had an illness, condition or symptom which:		
Occurred only during work?	☐	☐
Occurred only after work, in evening?	☐	☐
Occurred when you begin work after a weekend or holiday?	☐	☐
Disappeared during vacations or weekends?	☐	☐

	YES	NO
10. Have you ever developed illness or symptoms which you think were related to your work?	☐	☐
11. Have you ever worked with a substance which made your nose, chest, or sinuses congested?	☐	☐
12. Have you ever worked with substances that irritated your skin or caused a rash?	☐	☐

	YES	NO
13. Would you like to talk to the healthcare professional who will review this questionnaire about your answers to this questionnaire?	☐	☐

STOP!: PHYSICIANS COMPLETE THE REMAINING SECTIONS.

PHYSICAL EXAMINATION AND SUPPORTING STUDIES

(Please initial on Authorization Form when completed)

HEIGHT	WEIGHT	TEMP.	BLOOD PRESSURE
_____inches	_____lbs.	_____°F	_____/_____

PULSE (Resting) _____ /min.

For D.O.T. only: Pulse immediately after 2/min. exercise:_____

VISION Visual acuity (if applicant wears glasses, test and record both with and without glasses.)

NEAR	Left	Right	Both
Corrected	20/_____	20/_____	20/_____
Uncorrected	20/_____	20/_____	20/_____
FAR	Left	Right	Both
Corrected	20/_____	20/_____	20/_____
Uncorrected	20/_____	20/_____	20/_____

COLOR VISION

- Normal ☐
- Abnormal ☐
- Can recognize Red & Green ☐

PERIPHERAL VISION

- Normal ☐
- Abnormal ☐

URINALYSIS

Specified Gravity _____ Albumin_____ Female: LMP _____

Sugar _____ Blood _____

AUDIOGRAM (If marked YES on Exam Checklist):

	500	1000	2000	3000	4000	6000	8000
Right	_____	_____	_____	_____	_____	_____	_____
Left	_____	_____	_____	_____	_____	_____	_____

Note: Testing documentation must be forwarded to WorkCare

SPIROMETRY (If marked YES on Exam Checklist):

FVC _____ Observed Vol. FEV_1 _____ Observed Vol. $\frac{FEV_1}{FVC}$ _____%

FVC _____ Predicted %_____ FEV_1 _____ Predicted %_____

Note: Testing documentation must be forwarded to WorkCare

EKG (If marked YES on Exam Checklist);

☐ Normal ☐ Abnormal

Note: All EKG strips must be forwarded to WorkCare

CHEST X-RAY (If marked YES on Exam Checklist):

☐ Normal ☐ Abnormal

Comments: _____

SPECIMEN COLLECTION PER EXAM CHECKLIST

All laboratory specimens must be shipped by the day of the exam! If this is a Friday exam, mark Airbill for Saturday delivery. Exam data should be included for shipment in the box with the laboratory specimens.

MEDICAL EXAMINATION

CHECK LIST	NORMAL	ABNORMAL	DETAILED DESCRIPTION OF ABNORMAL FINDINGS
HANDS/SKIN			
HAIR	☐	☐	
SKIN COLOR/TEXTURE	☐	☐	
NAILS	☐	☐	
HEAD/EYES/EARS/NOSE/THROAT/MOUTH			
CONFIGURATION	☐	☐	
LIDS/CONJ/SCLERA	☐	☐	
PUPILS/FUNDI/EOM	☐	☐	
PINNA/CANALS/TM	☐	☐	
NASAL SEPTUM/MUCOSA	☐	☐	
TEETH/GUMS/TONGUE/PALATE	☐	☐	
NERVOUS SYSTEM			
CENTRAL	☐	☐	
MOTOR	☐	☐	
SENSORY	☐	☐	
CEREBELLAR	☐	☐	
REFLEXES	☐	☐	
NECK/NODES			
BRUIT	☐	☐	
ROM	☐	☐	
MUSCLE STRENGTH	☐	☐	
THYROID	☐	☐	
CERVICAL NODES	☐	☐	
INGUINAL/AXILLARY NODES	☐	☐	
CHEST/LUNGS			
SHAPES/SYMMETRY	☐	☐	
DIAPHRAGMATIC EXCURSION	☐	☐	
PERCUSSION	☐	☐	
AUSCULTATION	☐	☐	
CARDIOVASCULAR			
CAROTIDS	☐	☐	
NECK VEINS/PULSES	☐	☐	
HEART SOUNDS (MURMURS)	☐	☐	
HEART SIZE	☐	☐	
GASTRO/INTESTINAL			
LIVER	☐	☐	
SPLEEN	☐	☐	
MASSES	☐	☐	
TENDERNESS	☐	☐	
SCARS	☐	☐	
HERNIA	☐	☐	
MUSCULOSKELETAL/EXTREMITIES			
SPINAL ALIGNMENT	☐	☐	
EXTREMITIES	☐	☐	
(EDEMA, VARICOSITIES)	☐	☐	
JOINTS	☐	☐	
ROM	☐	☐	

COMMENTS:

EXAMINING PHYSICIAN (PRINT)	PHYSICIAN SIGNATURE	DATE

SUMMARY OF FINDINGS AND COMMENTS RELEVANT TO ABNORMAL CONDITIONS

_____

_____

_____

_____

_____

_____

_____

Signature of Licensed Examining Physician: _____

Printed Name: _____

Phone: (____) _____

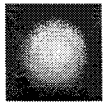
INSTRUCTION FOR PHYSICIAN/CLINICIAN

1. The results of the required testing should be recorded on page 10.
2. Please be sure to note EKG and chest x-ray readings on NORMAL or ABNORMAL on page 10 if **required for this exam.**
3. Please review any YES answers ONLY for questions on pages 4, 5, 7, 8 and 9 of this booklet.

You are not required to review the other history questions.

4. Your physical examination findings should be recorded on page 11.
5. The booklet and any specimens must be shipped to our laboratory **THE DAY OF THE EXAM.**

QUESTIONS? CALL WORKCARE 1-800-455-6155



WORKCARE™

Transforming Occupational Health

1-(800) 455-6155

Rev. 1/2000

URS	Health, Safety, and Environment **MEDICAL SURVEILLANCE EVALUATION**	Attachment 24-2 Revision 1: Sept 2005

This information will be used to determine routine medical screening exams for employees who work outside of an office setting. In addition, Site Health and Safety Plans may specify project related medical surveillance for regulated substances.

Please answer each question.

Date:	
Name:	
Phone # ( )	
SSN#	
Employee #	
Job Title	
Location:	
Division:	
Region/Business Unit:	
Supervisor:	
HSE Representative:	

Choose One:

( ) New Employee	( ) Current employee with job change
( ) Transfer from	OFFICE

The following questions assess federally mandated medical screenings and surveillance requirements:

	Yes	No	
Respirator	❑	❑	Does your job require you to wear a respirator or be certified for respirator use? If yes, how many days per year? ❑ 1-29 ❑ 30+
Hearing	❑	❑	Does your job require you to wear hearing protection because you: a) Work in an environment where noise levels equal or exceed an 8-hour time-weighted average of 85 decibels? b) Perform construction activities or construction management around heavy equipment on a construction project more than 50 percent of the time?
Asbestos	❑	❑	Do you perform intrusive work with asbestos (i.e., sampling, demolition, etc.)?
Lead	❑	❑	Are you currently performing construction work where you may

URS	Health, Safety, and Environment **MEDICAL SURVEILLANCE EVALUATION**	Attachment 24-2 Revision 1: Sept 2005

	Yes	No	
			be exposed to airborne lead concentrations at or above the OSHA action level or are you currently in a job that requires you to be in a medical surveillance program for lead (i.e., removal of lead based paint or other demolition activities)?
Radiation	❑	❑	Are you classified as a radiation worker?
DOT Driver	❑	❑	Do you drive a truck with a gross vehicle weight rating of 10,000 pounds or more during company trips?
Biohazard	❑	❑	Does you job require work with bloodborne pathogens?
Remediation	❑	❑	Do you perform remediation construction activities, field construction sampling, or supervision activities at hazardous waste remediation sites or hazardous waste treatment, storage, or disposal (TSD) facilities which could expose you to hazardous substances above permissible exposure levels (i.e., work in exclusion zones)?. If yes, how many days per year? ❑ 1-29 ❑ 30+
Field and Lab	❑	❑	Answer Yes if you do ANY of the following: a) Work at HAZWOPER sites 1 to 29 days per year b) Perform waste disposal activities c) Perform non-HAZWOPER environmental sampling d) Work in a chemistry laboratory 30 or more days per year e) Work on a pilot plant project 30 or more days per year f) Conduct bench scale operations 30 or more days per year
Other	❑	❑	Site/project specific biological monitoring or toxicological screening as specified by the project-specific health and safety plan.

Distribution:

- ❑ Supervisor
- ❑ Local Health, Safety, and Environment Representative
- ❑ Medical Service Provider, *WorkCare*

Employee Signature _____ Date _____

Supervisor Signature _____ Date _____

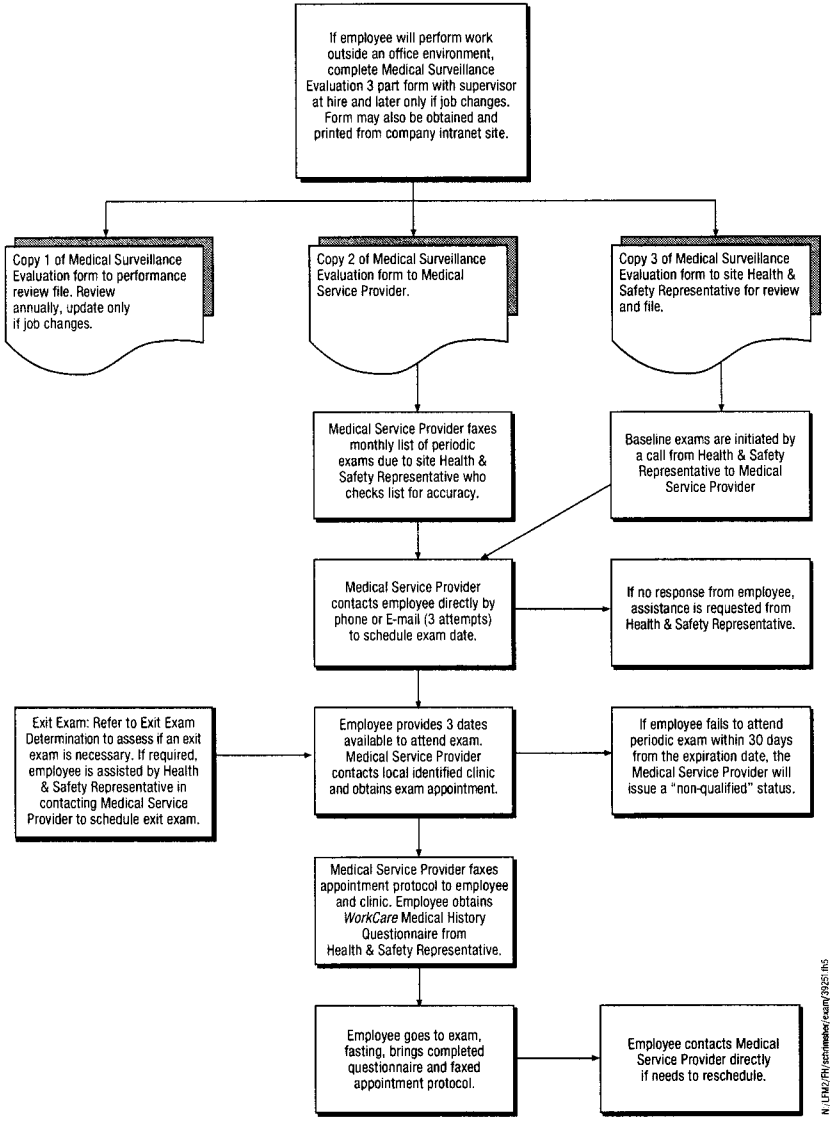
URS	Health, Safety and Environment **Medical Screening and Surveillance Exam Protocol**	Attachment 24-3

PROTOCOL	HAZWOPER Baseline or Preassignment Baseline	HAZWOPER Annual or Biennial	HAZWOPER Exit	DOT Driver Certification (Baseline and Biennial)	ASBESTOS (Baseline, Annual and Exit)	MINI-RESPIRATOR (Baseline and Biennial)
Medical History & Respiratory Questionnaire	X	X	X	X	X	X
OSHA Asbestos Questionnaire (Initial or Periodic)					X	
Medical Exam	X	X	X	X	X	If indicated by questionnaire
Physical Exam (height, weight, pulse, oral temperature, blood pressure)	X	X	X	X	X	
Non-resting pulse				X		
Vision	X	X	X	X	X	
Urinalysis	X	X	X	X		
Audiogram (hearing test)	X	X	X	X	(If indicated by project noise levels)	
Spirometry (pulmonary function test)	X	X	X		X	X
Electro-cardiogram (EKG)						
EKG Age < = 40	X	Every 3 years for annual, every 4 years for biennial				
EKG Age 41-55	X	Every 2 years				
EKG Age 56+	X	Every year for annual, every 2 years for biennial				
Chest x-ray (one view)						
Age < or = 40	X	Every 4 years	If symptomatic or due on periodic		Baseline and every 5 years per OSHA 1910.1001	
Age 41-50	X	Every 3 years for annual, every 4 years for biennial	If symptomatic or due on periodic		Baseline and every 2-5 years per OSHA 1910.1001	
Age 51-54	X	Every 2 years	If symptomatic or due on periodic		Baseline and every 2-5 years per OSHA 1910.1001	
Age 55+	X	Every year for annual, every 2 years for biennial	If symptomatic or due on periodic		Baseline and every 1-5 years per OSHA 1910.1001	
B-reader					X	
Complete Blood Count with White Cell Differential	X	X	X			
Blood Chemistry Panel	X	X	X			

***Note: Additional entry, periodic, and exit biological monitoring or toxicological screening may be indicated in the project-specific health & safety plan. Examples include: blood lead/ZPP, serum/RBC cholinesterase, urine heavy metals (arsenic, cadmium, mercury, chromium, or beryllium), urine radiation (thorium, uranium), biological vaccinations (hepatitis B, hepatitis A), blood benzene, blood beryllium LPT, etc.**

Attachment 24-4

Medical Surveillance Exam Process



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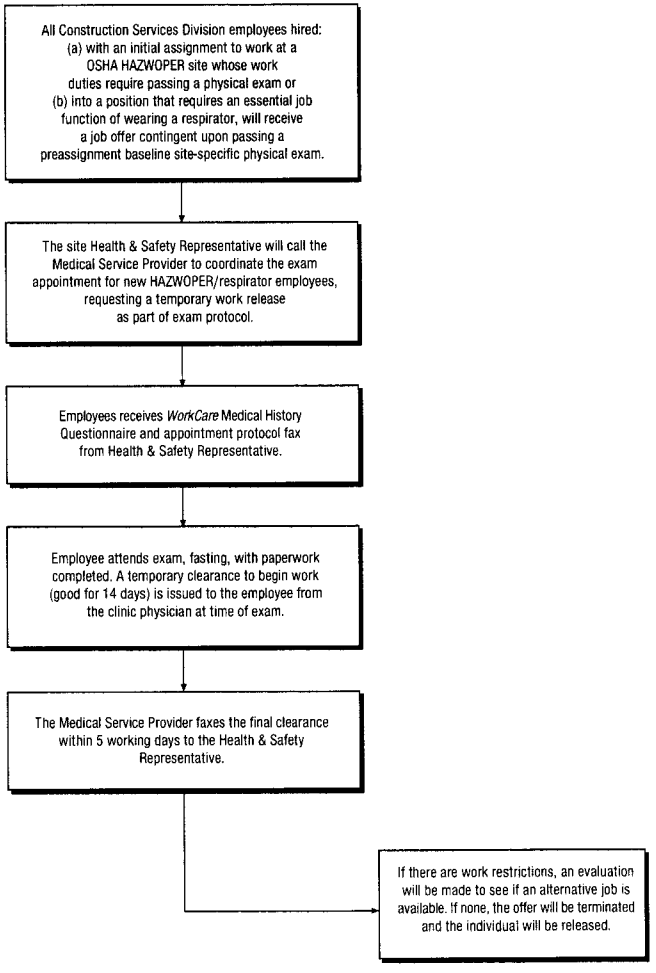
Attachment 24-5

Construction Services Division
HAZWOPER & Respirator Preassignment Baseline Exam Process



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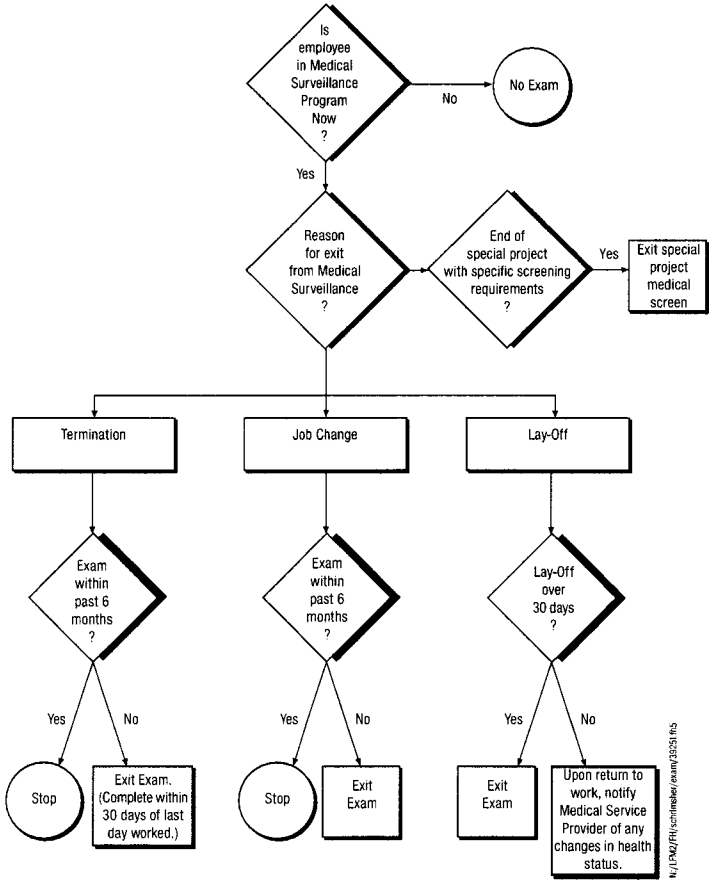
Attachment 24-6

Exit Exam Determination



Note:

Exit exams from Medical Service Provider or previous employer may be used for review as a URS Corporation baseline exam if completed within the past 3 months. A *WorkCare* Medical History Questionnaire is completed by the employee and submitted with a copy of the previous exam for physician review and approval.

URS	Health, Safety, and Environment **WAIVER OF EXIT MEDICAL SURVEILLANCE EXAM**	Attachment 24-7 Revision 1: Sept 2005

I have been a participant in URS' Medical Screening & Surveillance Program, which entitles me to an exit medical surveillance exam upon reassignment to a position that does not require medical clearance or termination of my employment. I understand that URS encourages employees to schedule and complete an exit medical exam; however, I voluntarily relinquish the opportunity to have an exit medical exam.

Name _____

Employee Number _____

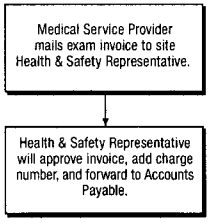
Date _____

Employee Signature: _____

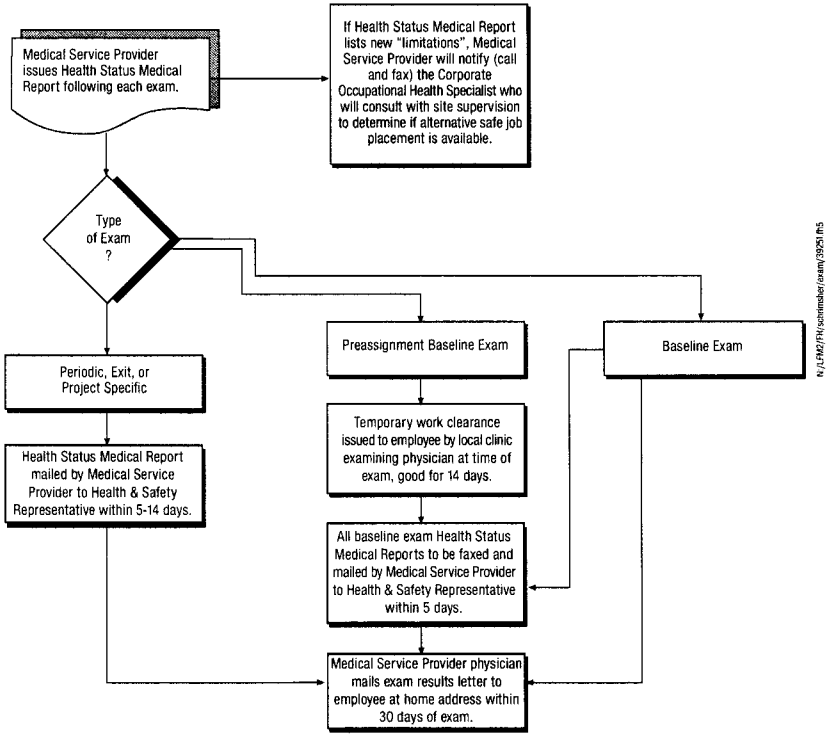
Attachment 24-8

Exam Follow Up Procedures

Billing



Medical Surveillance Exam Clearances



URS

Health, Safety, and Environment

FIELD FIRST AID KIT SUPPLY LIST

Attachment 24-9

- Portable plastic or metal water-resistant first aid kit with handle
- Bloodborne pathogens personal protective equipment kit (minimum requirements are latex gloves and CPR shield)
- First aid manual
- Ace bandage 3"
- Assorted band aids
- Sterile gauze pads 4" x 4"
- Sterile non-stick gauze pads 2" x 3"
- Paper tape (hypo-allergenic)
- Burn ointment (for minor burns; use after cold water soak)
- Antibiotic ointment (Neosporin or generic)
- Alcohol prep pads
- Iodine prep pads (if not allergic to iodine; use after soap and water wash for bloodborne exposure)
- Ice pack
- Gauze roll 2"
- Butterfly strips (wound closure)
- Tweezers (one use, disposable)
- Temperature strips
- Flashlight
- Triangular bandage
- Bandage scissors
- Sterile normal saline eye wash, 4 ounce bottle
- Ammonia inhalant ampoules
- Insect sting relief wipes or spray

1. Applicability

This standard applies to the operations of URS Corporation and its subsidiary companies where personnel may encounter noise exposures that may exceed 85 decibels, measured using an "A" weighted scale (dBA), as an 8-hour time weighted average (TWA).

For non U.S. operations, refer to the country/region specific SMS and regulations.

2. Purpose and Scope

The purpose of this procedure is to protect employees from hazardous noise exposures and to prevent hearing loss.

3. Implementation

Implementation of this procedure is the responsibility of the manager directing activities of the facility or site.

A Corporate, Regional, or Strategic Business Unit (SBU) HSE Manager must approve deviations from this procedure.

4. Requirements

A. General

The use of hearing protectors is required in any location where powered or motorized equipment or any other noise source could reasonably be expected to exceed 85 dBA. Use of hearing protectors may only be discontinued when noise levels are verified to be less than 85 dBA through a properly conducted noise survey. Whenever information indicates that any employee's exposure may equal or exceed an 8-hour TWA of 85 dBA, the project manager or location manager will be responsible to enforce the proper use of hearing protectors.

B. Hearing Protectors

1. Require that at least two (2) types of hearing protectors are available to employees free of charge, preferably a plug and a muff type.

2. Minimum Noise Reduction Ratings (NRR)

Hearing protectors issued must have the following minimum NRR:

Ear Plug	Muffs
29 dBA	27 dBA

3. Require that hearing protectors are used in accordance with manufacturer's specifications and thus effectively protect hearing.

C. Noise Surveys

1. Noise surveys must be conducted in a manner that reasonably reflects the exposure of the affected employees. Surveys must be conducted under the supervision of a URS Health, Safety, and Environment (HSE) Representative.

2. Sound level meters and audio dosimeters used to determine employee exposure to noise sources must be Type II (accurate to within +/- 2 dBA), operated in "slow" response, on the "A" scale, and be calibrated to factory guidelines (including periodic factory recalibration).

D. Noise Controls

Eliminate noise sources to the extent possible. Examples of controls that must be considered include:

1. Addition or replacement of mufflers on motorized equipment.

2. Addition of mufflers to air exhausts on pneumatic equipment.

3. Following equipment maintenance procedures to lubricate dry bearings.

4. Isolation of loud equipment with barriers.

5. Replacement of loud equipment with newer and quieter models.

E. Audiometric Exams

1. Tests

Details on the medical surveillance program (including audiometric testing) are included in SMS 24.

Audiometric tests shall be performed by a person meeting the requirements described in 29 CFR 1910.95(g)(3). Within 6 months of an employee's first exposure at or above the action level, a valid baseline audiogram shall be established against which subsequent audiograms can be compared. Testing to establish a baseline audiogram shall be preceded by 14 hours without exposure to noise. Hearing protectors may be used as a substitute for the requirement that baseline audiogram shall be preceded by 14 hours without exposure to workplace noise. The medical surveillance provider shall notify employees of the need to avoid high levels of non-occupational noise exposure during the 14-hour period immediately preceding the audiometric examination. For multi-year projects, an annual audiogram shall be obtained for each employee exposed at or above an 8-hour time-weighted average of 85 decibels.

Each employee's annual audiogram shall be compared to that employee's baseline audiogram to determine if the audiogram is valid and if there is a standard threshold shift (STS). A standard threshold shift is a change in hearing threshold relative to the baseline audiogram of an average of 10 dB or more at 2000, 3000, and 4000 Hz in either ear. If the annual audiogram shows that an employee has suffered a STS, the employer will obtain a retest within 30 days and consider the results in assessing an STS as the annual audiogram. The audiologist, otolaryngologist, or physician shall review problem audiograms and shall determine whether there is a need for further evaluation. If an STS has occurred, the medical surveillance provider will notify the employee within 21 days of the determination.

2. Standard Threshold Shifts

   If an employee's test results show a confirmed STS, their hearing protection will be evaluated and refitted, and a medical evaluation may be required.

F. Training

Verify that each employee who must work in a noisy environment is current on required Hearing Conservation Training. Training must include the following topics:

1. The effects of noise on hearing.

2. The purpose of hearing protectors.
3. The advantages and disadvantages of various types of hearing protectors.
4. The attenuation of various types of hearing protection.
5. The selection, fitting, care, and use of hearing protectors.
6. The purpose of audiometric testing.
7. An explanation of the audiometric testing procedure.

5. Documentation Summary

A. File these records in the Safety Filing System:

1. Noise surveys, when applicable.
2. Training Records.

6. Resources

A. U.S. OSHA Standard – Occupational noise exposure – 29 CFR 1910.95

B. U.S. OSHA Construction Standard – Occupational noise exposure – 29 CFR 1926.52

C. U.S. OSHA Technical Links - Noise and Hearing Conservation

D. American Industrial Hygiene Association: The Occupational Environment – Its Evaluation and Control, Chapter 20. Fairfax, VA: 1997

E. National Hearing Conservation Association web site

F. URS SMS 24 - Medical Screening and Surveillance

1. Applicability

This procedure applies to URS office and field locations where portable ladders are used.

2. Purpose and Scope

The purpose of this procedure is to require the safe use and proper construction, inspection, and maintenance of ladders at URS office and project locations.

3. Implementation

Field Activities - Implementation of this procedure is the responsibility of the Project Manager.

Office Locations - Implementation of this procedure is the responsibility of the Office Manager.

4. Requirements

A. General

1. Provide ladders for safe access to all elevations where permanent or temporary stairways or suitable ramps or runways are not provided.
2. Never use ladders with broken or missing rungs or steps, broken or split side rails, or other faulty or defective construction. When ladders with such defects are discovered, they shall immediately be withdrawn from service.
3. Place ladder feet on a substantial base and keep the area around the top and bottom of the ladder clear.
4. Do not place ladders in passageways, doorways, driveways, or any location where they may be displaced by other work activities, unless protected by barricades or guards.
5. Tie, block, or otherwise secure ladders while in use to prevent their being displaced.
6. Never use metal ladders for electrical work or where they or the user may contact electrical conductors.

7. Require that ladders are equipped with non-skid safety feet.
8. Use only Type I, IA, or IAA wooden, fiberglass, or metal ladders.

B. Straight and Extension Ladders

1. Position straight and extension ladders at such a pitch that the horizontal distance from the top support to the foot of the ladder is about one-quarter of the working length of the ladder (one foot (30 cm) out for every four feet (1.2 meters) up).
2. Do not use ladders in a horizontal position as platforms, runways, or scaffolds.
3. Extend the side rails at least 36 inches (91 cm) above the landing. When this is not practical, install grab rails at the landing elevation which provide a secure grip.
4. When using two section wood or metal extension ladders, the two sections must have a minimum overlap of 3 feet (91 cm) for working lengths up to 36 feet (11 meters) and 4 feet (1.2 meters) for working lengths up to 48 feet (14.6 meters). When using two section fiberglass extension ladders, the two sections must have a minimum overlap of 3 feet (91 cm) for working lengths up to 32 feet (9.8 meters) and 4 feet (1.2 meters) for working lengths up to 36 feet.
5. Do not permit anyone to stand on the top three rungs of a straight or extension ladder.

C. Stepladders

1. Always fully open and lock side braces when using stepladders.
2. Use straight or extension ladders for access. Stepladders are meant to be used as temporary elevated working platforms only.
3. Do not place planks on the top steps of stepladders.
4. Never stand on the top two steps of a stepladder.
5. Require that all four feet of the ladder have an even, solid footing.

D. Training

Train each employee in the safe and proper use of ladders, including the following:

1. Do not carry materials up or down; use a hand line.
2. Face the ladder when ascending or descending.
3. Position the ladder at the proper pitch.
4. Secure the top and bottom of the ladder to prevent displacement.
5. Require proper extension (3 feet/91 cm) above landing.
6. Never overreach; work only within an arm's length of the ladder.
7. Allow only one person on a ladder at a time.

E. Inspections

1. Conduct thorough periodic inspections of all ladders to identify cracks, broken rungs, and deterioration. Ladders found to be in an unsafe condition must be removed from the workplace immediately. When immediate removal is not possible, the ladder shall be conspicuously tagged "DANGER - DO NOT USE" until such time as removal is possible.
2. Inspect each ladder for unsafe conditions before each use.

5. Documentation Summary

Place in the Project or Office Safety File

1. Site safety briefings regarding ladder use and inspection
2. Records of ladders taken out of service and/or removed from site

6. Resources

A. U.S. OSHA Construction Standard - Ladders - 29 CFR 1926, Subpart X

B. U.S. OSHA Standard – Walking-Working Surfaces - 29 CFR 1910, Subpart D

C. ANSI A.14.1-2000, Wood Ladders Safety Requirements

D. ANSI A.14.2-2000, Portable Metal Ladders Safety Requirements

E. Australian/New Zealand Standard AS/NZS 1892.5:2000, Portable ladders – Selection, safe use and care

1. **Applicability**

   This standard applies to all operations of URS Corporation and its subsidiary companies.

2. **Purpose and Scope**

   This standard provides information on recognizing those conditions that require PPE as well as selecting PPE for hazardous activities.

3. **Implementation**

   Implementation of this procedure is the responsibility of the manager directing activities of the facility or site.

   A Corporate, Regional, or Strategic Business Unit (SBU) HSE Manager must approve deviations from this procedure.

4. **Requirements**

   A. Perform hazard assessments for those work activities that are likely to require the use of PPE.

      1. Use Attachment 29-1 to perform the assessment.

      2. Reevaluate completed hazard assessments when job conditions or duties change.

   B. Eliminate the hazards identified in Attachment 29-1, if possible, through engineering or administrative controls.

   C. Select PPE that will protect employees if hazards cannot be controlled or eliminated.

      1. See Attachment 29-1 for recommended PPE.

      2. Review Material Safety Data Sheets for chemicals used for PPE recommendations.

      3. If needed, consult with the URS Health, Safety, and Environment (HSE) Representative for assistance in selecting PPE.

   D. Provide required PPE to employees free of charge (excluding, in some instances, components of standard work attire such as steel-toed boots),

   assuring proper fit and providing a choice if more than one type of PPE is available.

   E. Whenever a hazard is recognized and PPE is required, the employees will be provided with the appropriate PPE. However, when PPE is not required and the employee elects to wear his or her own PPE, the manager directing activities shall ensure that the employee is properly trained in the fitting, donning, doffing, cleaning, and maintenance of his or her employee owned equipment.

   F. Conduct and document employee training.

      1. Train all employees who are required to wear PPE.

      2. Require that training includes:

         a. When PPE is to be worn.

         b. The type of PPE necessary for the task to be completed.

         c. How to properly don, doff, adjust and wear PPE.

         d. Limitations of PPE.

         e. Proper care, maintenance, useful life and disposal of PPE.

      3. Training must be conducted before PPE is assigned.

      4. Refresher training is needed when:

         a. New types of PPE are assigned to the worker.

         b. The worker cannot demonstrate competency in PPE use.

      5. Keep written records of the employees trained and type of training provided, including the date of training.

   G. Maintain Protective Equipment

      1. Check PPE for damage, cracks, and wear prior to each use. Replace or repair equipment not found in good condition.

      2. Decontaminate non disposable PPE with appropriate cleaner, as necessary, to prevent degradation of the equipment.

H. Periodically inspect worksites where employees are using PPE using Attachment 29-2.

5.0 Documentation Summary

A. Records required in the Safety File:

1. Completed Hazard Assessment Certification Forms (Attachment 29-1)
2. Completed Personal Protective Equipment Inspection Sheet (Attachment 29-2)
3. Documentation of employee training.

B. Records required in the Office/Laboratory Safety Filing System:

1. Completed Hazard Assessment Certification Forms (Attachment 29-1)
2. Completed Personal Protective Equipment Inspection Sheet (Attachment 29-2)
3. Documentation of employee training.

6.0 Resources

A. U.S. OSHA Standards - Personal Protective Equipment -29 CFR 1910, Subpart I

B. U.S. OSHA Construction Standard - Personal Protective Equipment –29 CFR 1926 Subpart E

C. U.S. OSHA Technical Links - Personal Protective Equipment

D. Australian Standards SAA HB9-1994 - Occupational Personal Protection

E. American National Standards Institute, ANSI Z89.1-2003, Protective Headwear

F. American National Standards Institute, ANSI Z87.1 - 1989, Eye and Face Protection

G. American Society for Testing and Materials, ASTM F13-WK4519, Specification for Personal Protective Footwear

H. SMS 40 - Fall Protection

I. Queensland Workplace Health and Safety - Personal Protective Equipment

J. Attachment 29-1 Hazard Assessment Form

K. Attachment 29-2 PPE Inspection Form

L. Attachment 29-3 – Eye and Face Protector Selection Guide

M. Best Manufacturing Co. http://www.chemrest.com/

URS	Health, Safety, and Environment **HAZARD ASSESSMENT CERTIFICATION FORM**	Attachment 29-1 Revision 1: Sept 2005

Location: _____ **Job No.:** _____

Date: _____ **Assessment conducted by:** _____

Specific tasks performed at this location: _____

	Are any of the following hazards present during the task?	Yes	No	Eliminate hazard or use the following PPE
	Overhead Hazards			
1.	Suspended loads that could fall			Hard hat, ANSI Z89, Class A, B or C
2.	Overhead beams or loads that could strike head			Hard hat, ANSI Z89, Class A, B or C
3.	Energized wires or equipment that could strike head			Hard hat, ANZI Z89, Class A or B (dependent on potential voltage)
4.	Employees working beneath an elevated site where objects could be dropped onto them			Hard hat, ANSI Z89, Class A, B or C
5.	Sharp objects or corners at head level			Hard hat, ANSI Z89, Class A, B or C
	Eye Hazards			
6.	Chemical splashes or irritating mists			See Attachment 29-3
7.	Excessive dust			Safety glasses or goggles
8.	Smoke and/or fumes			Safety goggles
9.	Welding operations			See Attachment 29-3 and 29-4
10.	Lasers/optical radiation			Have URS HSE Representative assist you in proper selection
11.	Projectiles			Safety glasses or goggles plus face shield
12.	Sawing, cutting, chipping, and/or grinding			See Attachment 29-3
	Face Hazards			
13.	Chemical splashes or irritating mists			See Attachment 29-3; add face shield is irritating or corrosive
14.	Welding operations			See Attachment 29-3 and 29-4
15.	Projectiles			Safety glasses or goggles plus face shield
	Hand Hazards			
16.	Chemical exposure			Use chemical resistant gloves specific to hazard; consult MSDS, chemical hazard guide, or HSE Representative
17.	Sharp edges, splinters, etc.			Leather or Kevlar gloves
18.	Temperature extremes – heat			Leather gloves, Kevlar gloves, welder's gloves, hot mill gloves

URS | Health, Safety, and Environment **HAZARD ASSESSMENT CERTIFICATION FORM** | Attachment 29-1 Revision 1: Sept 2005

	Are any of the following hazards present during the task?	Yes	No	Eliminate hazard or use the following PPE
19.	Temperature extremes – cold			Insulated gloves
20.	Blood, fungus, biological agents			Nitrile gloves
21.	Exposure to live electrical currents			Electrical gloves; consult HSE representative
22.	Sharp tools, machine parts, etc.			Leather or Kevlar gloves
23.	Material handling			Leather gloves
	Foot Hazards			
24.	Heavy materials (greater than 50 pounds) handled by employees			Safety shoes or boots
25.	Potential to crush whole foot			Safety shoes or boots with metatarsal guard
26.	Sharp edges or points (puncture risk)			Safety shoes or boots
27.	Exposure to electrical wires			Safety shoes or boots with electrically conductive soles
28.	Slippery conditions			Rubber soled boots or grips
29.	Chemical contamination			Rubber, nitrile boots or boot covers
30.	Wet conditions			Rubber boots or boot covers
31.	Construction/demolition			Safety shoes or boots with metatarsal guard if foot crushing hazard exists
	Fall Hazards			
32.	Elevations above 4 feet (general industry) or 6 feet (construction) without guardrails			ANSI A-10.14 Type 1 full body harness
33.	Suspended scaffolds, boatswain's chairs, float scaffolds, or suspended staging			ANSI A-10.14 Type 1 full body harness
34.	Working in trees			ANSI A-10.14 Type 1 full body harness
35.	Working in vehicle-mounted elevating work platforms (e.g., bucket trucks, aerial lifts)			ANSI A-10.14 Type 1 full body harness
	Water Hazards			
36.	Working on or above water where a risk of drowning exist			US Coast Guard approved personal floatation device; Type I, II, or III
	Excessive Heat or Flame			
37.	Full body chemical protective clothing in temperatures greater than 80 F			Cooling vest
38.	Work around molten metal or flame			Nomex or Kevlar clothing
39.	Welding activities			Welding leathers for those areas that are exposed to flame, spark, or molten metal

URS	Health, Safety, and Environment **HAZARD ASSESSMENT CERTIFICATION FORM**	Attachment 29-1 Revision 1: Sept 2005

Are any of the following hazards present during the task?		Yes	No	Eliminate hazard or use the following PPE
Respiratory Hazards				
40.	Refer to SMS 042 for respirator selection guidance			
Excessive Noise				
41.	Exposure to noise			Ear plugs or muffs
Body and Leg Protection				
42.	Chemical exposure			Contact URS HSE Representative for assistance in proper selection
43.	Using chainsaw, cutting brush			Chainsaw chaps

I certify that the above inspection was performed to the best of my knowledge and ability, based on the hazards present on _____

_____
Signature

URS	Health, Safety, and Environment **PERSONAL PROTECTIVE EQUIPMENT INSPECTION SHEET**	Attachment 29-2 Revision 1: Sept 2005

Name of Inspector _____ **Date Inspected** _____

		True	False (= Hazard - Needs to be fixed)
Hard Hats			
1.	The brim or shell does not show signs of exposure and excessive wear, loss of surface gloss, chalking or flaking.		
2.	Suspension system in hard hat does not show signs of deterioration including cracking, tearing or fraying.		
3.	The brim or shell is not cracked, perforated or deformed.		
4.	Employees use hard hats in marked areas.		
5.	Areas requiring hard hat usage are marked.		
Safety Shoes			
6.	Safety shoes used by employees do not show signs of excessive wear.		
7.	Areas requiring safety shoes are marked.		
Work Gloves			
8.	Gloves are worn when needed.		
9.	Gloves do not show signs of excessive wear such as cracks, scrapes, or lacerations, thinning or discoloration or break through to the skin.		
Protective Clothing			
10.	Protective clothing is worn by employees when required.		
Hearing Protection			
11.	Noise hazard areas are posted.		
12.	Employees are using earplugs or muffs when using noise producing equipment or working in posted noise hazard areas.		
Safety Glasses			
13.	Eye hazard areas are marked or posted.		
14.	Employees use safety glasses when working in eye hazard areas or working with equipment which produces an eye hazard.		

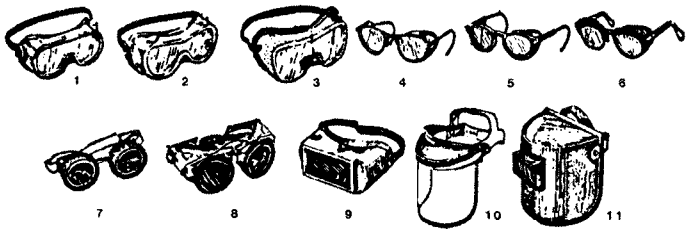
REMARKS

_____
_____
_____
_____
_____

URS Corporation

URS Corporation Health & Safety Program

EYE AND FACE PROTECTOR SELECTION GUIDE



1. **GOGGLES,** Flexible Fitting, Regular Ventilation
2. **GOGGLES,** Flexible Fitting, Hooded Ventilation
3. **GOGGLES,** Cushioned Fitting, Rigid Body
*4. **SPECTACLES,** Metal Frame, with Sideshields
*5. **SPECTACLES,** Plastic Frame, with Sideshields
*6. **SPECTACLES** , Metal-Plastic Frame, with Sideshields
*7. **WELDING GOGGLES,** Eyecup Type, Tinted Lenses (Illustrated)
7A. **CHIPPING GOGGLES,** Eyecup Type, Clear Safety Lenses (Not Illustrated)
*8. **WELDING GOGGLES,** Coverspec Type, Tinted Lenses (Illustrated)
8A. **CHIPPING GOGGLES,** Coverspec Type, Clear Safety Lenses (Not Illustrated)
*9. **WELDING GOGGLES,** Coverspec Type, Tinted plate Plate Lens
10. **FACE SHIELD,** (Available with Plastic or Mesh Window)
11. **WELDING HELMETS**

APPLICATIONS		
OPERATION	HAZARDS	RECOMMENDED PROTECTORS Bold Type Numbers Slightly Preferred Protection
ACETYLENE-BURNING ACETYLENE-CUTTING ACETYLENE-WELDING	SPARKS, HARMFUL RAYS MOLTEN METAL, FLYING PARTICLES	**7,8,9**
CHEMICAL HANDLING	SPLASH, ACID BURNS, FUMES	**2,10** (For severe exposure add 10 over 2)
CHIPPING	FLYING PARTICLES	**1,3,4,5,6,7A,8A**
ELECTRIC (ARC) WELDING	SPARKS, INTENSE RAYS, MOLTEN METAL	**9,11** (11 in combination with 4,5,6 in tinted lenses, advisable)
FURNACE OPERATIONS	GLARE, HEAT, MOLTEN METAL	**7,8,9** (For severe exposure add 10)
GRINDING-LIGHT	FLYING PARTICLES	**1,3,4,5,6,10**
GRINDING -HEAVY	FLYING PAPTICLES	**1,3,7A,8A** (For severe exposure add 10)
LABORATORY	CHEMICAL SPLASH, GLASS BREAKAGE	**2** (10 when in combination with 4,5,6)
MACHINING	FLYING PARTICLES	**1,3,4,5,6,10**
MOLTEN METALS	HEAT, GLARE, SPARKS, SPLASH	**7,8** (10 in combination with 4,5,6 in tinted lenses)
SPOT WELDING	FLYING PARTICLES, SPARKS	**1,3,4,5,6,10**

*Non-side shield spectacles are available for limited hazard use requiring only frontal protection.

URS	Health, Safety, and Environment **WELDING LENS SELECTION**	Attachment 29-4 Revision 1: Sept 2005

Operations	Electrode Size 1/32 inch	Arc Current	Minimum Protective Shade
Shielded metal arc welding (SMAW)	Less than 3	Less than 60	7
SMAW	3 – 5	60 – 160	8
SMAW	5 – 8	160 – 250	10
SMAW	More than 8	250 – 550	11
Gas metal arc welding and flux cored arc welding		Less than 60	7
Gas metal arc welding and flux cored arc welding		60 - 160	10
Gas metal arc welding and flux cored arc welding		160 – 250	10
Gas metal arc welding and flux cored arc welding		250 - 500	10
Gas tungsten arc welding		Less than 50	8
Gas tungsten arc welding		50 – 150	8
Gas tungsten arc welding		150 - 500	10
Air carbon arc cutting	(light)	Less than 500	10
Air carbon arc cutting	(heavy)	500 – 1000	11
Gas tungsten arc welding		Less than 20	8
Gas tungsten arc welding		20 – 100	8
Gas tungsten arc welding		100 – 400	10
Gas tungsten arc welding		400 – 800	11
Plasma arc cutting	(light)	Less than 300	8
Plasma arc cutting	(medium)	300 – 400	9
Plasma arc cutting	(heavy)	400 -800	10
Torch blazing			3
Torch soldering			2
Carbon arc welding			14
Gas welding			5 – 6
Oxygen cutting			3 - 5

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1. **Applicability**

   This procedure applies to URS field operations involving work performed on roads, highways, and similar areas where motor vehicles may be a hazard.

2. **Purpose and Scope**

   This procedure is intended to protect personnel from the hazards associated with work performed on or next to highways and roads.

3. **Implementation**

   Field Activities - Implementation of this program is the responsibility of the Project Manager.

4. **Requirements**

   A. Review the project in the planning phase to determine if any work will be performed on or adjacent to any road that will disrupt normal traffic flow.

   B. Hire a qualified contractor or have an in house Competent Person devise a traffic control plan based on the work to be performed.

      1. Competent persons are those who are knowledgeable about the fundamental principles of temporary traffic control and the work activities to be performed.

      2. Traffic control plans will be designed to meet requirements as set in the Manual on Uniform Traffic Control Devices (MUTCD) as well as those rules set by state, county and cities in which work is performed.

      3. Require that the plan is commensurate with the complexity of the project.

   C. Submit the traffic control plan to the road authority for approval.

      1. Submissions will be made to the state department of transportation or highways if state or federal highways are impacted as well.

      2. Local county representatives.

      3. Local city representatives, if within city limits.

      4. For U.K. operations, submittal is to be made to County Council or local authority.

   D. Decide whether to have qualified in house personnel or contract personnel implement the traffic control plan in the field.

      1. Certified flaggers may set up work zones.

         Flaggers must attend an eight-hour work zone traffic control course as taught by an ATSSA certified instructor (or equivalent).

      2. Obtain appropriate traffic control equipment as described in the MUTCD.

      3. For U.K. operations, all operative must be trained in accordance with 'New Road and Street Works' Act.

   E. Execute the traffic control plan developed for the job site. Require all personnel who work on/or adjacent to the roadway to wear bright orange, strong yellow-green or fluorescent versions of these colors of approved work zone clothing, including:

      1. Vests, at a minimum.

      2. Coveralls, if desired.

      3. Rainwear or other apparel as needed.

   F. Require a Competent Person who is certified as a Worksite Traffic Supervisor supervises flaggers at least once a day.

   G. Develop a plan for the periodic inspection and maintenance of the Traffic Control Zone utilizing Attachment 32-1.

5. **Documentation Summary**

   Records required in the Project Safety File:

   A. Copies of traffic control plans used on site.

   B. Training certificates for URS flaggers and Competent Persons.

   C. Qualifications of contracted flaggers and Competent Persons.

   D. Inspection records.

6. Resources

A. Part VI of the Manual on Uniform Traffic Control Devices (MUTCD)

B. American Traffic Safety Services Association

C. ATTSA Flagger Train the Trainer Program

D. U.K. - 'New Road and Street Works' Act

E. Australian Standards HB81.1-2003 - Field Guide for Traffic Controls at Work on Roads

F. Australian Standards AS1742.3-2002 - Manual of Uniform Traffic Control Devices

G. Australian Standards HB69.13-1995. Guide to Traffic Engineering Practice - Pedestrian

I. Attachment 32-1 - Traffic Control Inspection Checklist

URS	Health, Safety, and Environment TRAFFIC CONTROL INSPECTION CHECKLIST	Attachment 32-1

Project Name: _____

Project Number: _____

	Item	Yes	No	How Many?
1.	**Are any devices missing?**			
	Do any devices need repair?			
	Were all replaced or repaired?			
2.	**Are any lights (flashers, etc.) not functioning?**			
	Were they all replaced or repaired?			
3.	**Are any devices improperly placed?**			
	Were all positions corrected?			
4.	**Do any devices need cleaning?**			
	Were all devices cleaned?			

Additional Comments:

The above check was completed by: _____

Date: _____ Time: _____

1. Applicability

This procedure applies to URS projects where personnel may encounter subsurface or overhead utilities.

2. Purpose and Scope

Many field activities are conducted near aboveground and underground utilities. The primary purpose of this Standard is to establish operating requirements that will permit employees to work safely in the vicinity of electrical, natural gas, fuel, water, and other utility systems and installations. The secondary purpose is to prevent economic damage to utility systems from operations associated with project-related activities.

The term "utility clearance" includes

A. The positive locating of utility systems in or near the work area.

B. A signed statement by an appropriate representative attesting to the location of underground utilities and/or the positive de-energizing (including lockout) and testing of electrical utilities.

Note that in some cases, utility representatives may deem it appropriate or necessary to use insulating blankets to isolate a power line. This is an acceptable alternative to positive de-energizing; however, only utility representatives can make the determination.

"Contact" with overhead power lines is considered to occur when equipment is closer to power lines than permitted by the criteria in the table in Section 4.0.C.2.b below. (See note for U.K. operations).

3. Implementation

Field Operations - Implementation of this procedure is the responsibility of the Project Manager.

4. Requirements

A. Time for Completion

Complete utility clearances prior to the start of any work in the area of the utility that could feasibly result in contact with or damage to that utility.

B. Local Regulations

Research local and state codes and regulations regarding utility locating and isolation requirements. Utility companies and locating services are among the appropriate resources.

C. Overhead Power Lines

1. Proximity to Power Lines

No work is to be conducted within 50 feet (15 meters) of overhead power lines without first contacting the utility company to determine the voltage of the system. No aspect of any piece of equipment is to be operated within 50 feet (15 meters) of overhead power lines without first making this determination.

2. Operations adjacent to overhead power lines are **PROHIBITED** unless one of the following conditions is satisfied:

a. Power has been shut off, positive means (such as lockout) have been taken to prevent the lines from being energized, lines have been tested to confirm the outage, and the utility company has provided a signed certification of the outage.

b. The minimum clearance from energized overhead lines is as shown in the table below, or the equipment will be repositioned and blocked so that no part, including cables, can come within the minimum clearances shown in the table.

MINIMUM DISTANCES FROM POWERLINES	
Nominal System kV	Minimum Required Distance
0-50	10 feet (3 meters)
51-100	12 feet (3.6 meters)
101-200	15 feet (4.6 meters)
201-300	20 feet (6.1 meters)
301-500	25 feet (7.6 meters)
501-750	35 feet (10.7 meters)
751-1000	45 feet (13.7 meters)

Note: For U.K. operations, the specific safe distance is determined by the utility company.

c. The power line(s) has been isolated through the use of insulating blankets which have been properly placed by the utility. If insulating blankets are used, the utility will determine

the minimum safe operating distance; get this determination in writing with the utility representative's signature.

3. All inquiries regarding electric utilities must be made in writing and a written confirmation of the outage/isolation must be received by the Project Manager prior to the start of the task which may impact the utility.

D. Underground Utilities

1. Do not begin subsurface work (e.g., trenching, excavation, drilling, etc.) until a check for underground utilities and similar obstructions has been conducted. The use of as-built drawings must be confirmed with additional geophysical or other surveys.

2. Contact utility companies or the state/regional utility protection service at least two (2) working days prior to excavation activities to advise of the proposed work, and ask them to establish the location of the utility underground installations prior to the start of actual excavation. Where these services are unavailable (e.g., private properties), contract with an independent utility locating service to perform an evaluation of subsurface utilities.

3. Obtain utility clearances for subsurface work on both public and private property. Clearances are to be in writing, signed by the party conducting the clearance.

4. Protect and preserve the markings of approximate locations of facilities until the markings are no longer required for safe and proper excavations. If the markings of utility locations are destroyed or removed before excavation commences or is completed, the Project Manager must notify the utility company, utility protection service, or the utility locating service to inform them that the markings have been destroyed.

5. Do not conduct mechanical-assisted subsurface work (e.g., powered drill rig, mechanical excavator, etc.) within five (5) feet (1.5 meters) of a confirmed or suspected utility or other subsurface structure. Confirm minimum distances for mechanical-assisted subsurface work with the utility owner, as distances beyond this five foot minimum may be required.

6. Subsurface work within five feet (1.5 meters) of a confirmed or suspected utility or other subsurface structure must be done by

hand (e.g., hand auger, shovel) to the point where the obstruction is visually located and exposed. Once the obstruction location is confirmed in this manner, mechanical-assisted work may commence.

7. Reference SMS 013, "Excavation Safety" for additional information regarding subsurface operations.

E. Training

Conduct a briefing for site employees regarding the hazards associated with working near the utilities and the means by which the operation will maintain a safe working environment. Detail the method used to isolate the utility and the hazards presented by breaching the isolation.

5. Documentation Summary

File these records in the Safety Filing System:

1. Documents requesting utility clearance.

2. Documents confirming utility clearance.

3. Training/briefing documentation of each isolation.

6. Resources

A. Utility Locating Services (typically under "Utility" in the Yellow Pages)

B. NIOSH Alert - Preventing Electrocutions from Contact Between Cranes and Power Lines

C. One Call Utility Locating List

D. National Utility Locating Contractor's Association

E. U.K. - Health and Safety Executive GS6

1. Applicability

This standard applies to operations of URS Corporation and its subsidiary companies where personnel could be exposed to fall hazards of 6 feet (2 meters) or greater in the construction and demolition industry, and 4 feet (1.2 meters) or greater in other industries (General Industry). The standard also addresses steep slope work where the work surface angle is greater than 30 degrees from horizontal.

2. Purpose and Scope

The purpose of this standard is to provide criteria for the recognition and control of fall hazards.

3. Implementation

Implementation of this standard is the responsibility of the manager directing activities of the facility or site.

A Corporate, Regional, or Strategic Business Unit (SBU) HSE Manager must approve written fall protection programs.

4. Requirements

A. Fall Protection – General

1. A qualified person will:

   a. Be properly trained by a competent authority.

   b. Ensure that one or more fall protection or prevention systems outlined in this procedure is provided at all locations where fall hazards exist.

   c. Ensure that all personnel working with and around fall hazards and fall protection systems are properly trained.

   d. Ensure that access controls to areas with fall hazards are effective.

   e. Ensure that safety monitoring systems or warning line systems are properly implemented with trained monitors.

2. Fall hazards generally fall into three categories for URS employees;

   a. General Industry – application where fall hazards greater than 4-feet (1.2m) exist, including:

      1. Workers are conducting inspection of existing facilities not under construction

      2. Working in environmental remediation activities where no construction activities are occurring

      3. Working in manufacturing operations

      4. Working in vehicle and aircraft maintenance, and repair operations

      5. Working in warehouses

      6. Working on towers, poles, or other elevated structures.

   b. Construction – These activities require fall protection when fall hazards exceed 6 feet (2 m). Activities include demolition, renovation, and construction support inspections and surveying.

   c. Steep Slope – Fall protection measures must be used whenever the slope angle exceeds 30 degrees from horizontal (note that this excludes roofing applications which are covered under Construction activities). Activities include the inspection of dams, environmental surveys of timbered slopes, or other applications where traditional fall protection systems are impractical.

3. Fall hazards include but are not limited to, excavations, unprotected elevations, ladders, scaffolds, floor holes, wall openings, formwork, rebar tying, inspection of dams, working on top of vehicles or airframes, and all other locations and operations where potential fall hazards exist.

4. Fall hazards must be addressed by one of three means;

   a. An engineering control – including guardrails or other means of segregating the employee from the fall hazard;

   b. Personal Protective Equipment including fall arrest systems, positioning systems, safety nets, or other devices;

c. Administrative procedures including safety observers and boundary markings (i.e., tape, cable, or barricades) located 6 feet or more from an exposed edge.

5. Note that in some places, the standards for fall protection are required at different elevations than specified in this standard. Where this is the case, the more conservative elevation shall be used in defining when fall protection systems are required.

6. In each instance where employees are exposed to fall hazards, the designed fall protection program must define a strategy to protect the employee. ***All fall protection plans must be approved by the appropriate HSE Manager (as defined in Section 3.0)*** before work commences.

B. Training

1. Designate a competent person to provide training in fall hazard recognition to each employee who may be exposed to falls. The competent person must be qualified in the following areas:

   a. The nature of fall hazards in the work area.

   b. The correct procedures for erecting, maintaining, disassembling, and inspecting the fall protection systems to be used.

   c. The use and operation of guardrail, personal fall arrest, safety net, warning line, and safety monitoring systems, controlled access zones, and other protection to be used.

   d. The role of each employee in the safety monitoring system, when used.

   e. The limitations on the use of mechanical equipment during the performance of roofing work on low-sloped roofs.

   f. The correct procedures for the handling and storage of equipment and materials and the erection of overhead protection.

   g. The role of employees in fall protection plans.

   h. The standards contained in 29 CFR 1926 Subpart M.

2. Prepare a written certification record that includes the name of the employee trained, the date(s) of training, and the signature of the person who conducted the training.

3. Provide retraining when one of the following situations occur:

   a. Changes in the workplace render previous training obsolete.

   b. Changes in the types of fall protection systems or equipment to be used render previous training obsolete.

   c. Inadequacies in affected employee's knowledge or use of fall protection systems or equipment indicate that the employee has not retained the requisite understanding or skill.

C. Guardrail Systems

1. Guardrail systems are used both in Construction activities, and General Industry activities. The guardrail requirements apply in these setting at different heights; 6 feet or 2 meters in construction; and 4-feet or 1.2 meters in general industry

2. Provide guardrail systems, when feasible, at all locations where a fall hazard exists. Where guardrail systems are impractical, an alternative form of fall protection as outlined elsewhere in this procedure must be provided.

3. Require that guardrail systems meet the following criteria:

   a. Toprails must be installed 42 inches (1.1 meters) above the walking/working surface and be capable of withstanding, without failure, a minimum force of 200 pounds (91 Kg) in any outward or downward direction with no more than 3 inches (7.6 cm) of deflection.

   b. Midrails must be installed 21 inches (53 cm) above the walking/working surface and be capable of withstanding, without failure, a minimum force of 150 pounds (68 Kg) in any outward or downward direction.

   c. Posts must be spaced not more than 8 feet (2.5 meters) apart on centers.

4. Require that there are no openings more than 19 inches (48 cm) wide in any guardrail system.

5. Do not use plastic or steel banding as toprail or midrail.

6. Provide toprails and midrails of at least one-quarter inch (6 mm) nominal thickness or diameter, and smoothly surfaced to prevent cuts and punctures.

7. Flag the toprail with high-visibility material when using wire rope for toprails.

8. Erect guardrails on all sides when using guardrail systems around holes.

9. When guardrails are used around holes that are used for access, such as ladderways, provide a gate or offset the guardrail so that a person cannot walk directly into the hole.

10. When guardrails are used at hoisting areas, place a chain, gate, or removable guardrail section across the access point when hoisting operations are not taking place.

11. Provide guardrail systems at **all** locations above dangerous equipment, regardless of height above the danger.

12. Provide guardrails at all wall openings where the outside bottom edge of the opening is 6 feet (2 meters) or more above lower levels and the inside bottom edge of the wall opening is less than 39 inches (1 meter) above the walking/working surface.

13. Erect guardrail systems on all unprotected sides or edges of ramps and runways when such systems are used.

D. Personal Fall Arrest Systems (General Industry and Construction)

1. Provide and require the proper use of personal fall arrest systems on all unprotected elevations 6 feet (2 m) of higher for Construction activities, and 4 feet (1.2 meters) of higher for General Industry applications. Where these systems are impractical, an alternative form of fall protection as outlined elsewhere in this procedure must be provided.

2. All aspects of personal fall protections systems must be designed, installed, and used under the supervision of a qualified person.

3. Maintain a safety factor of at least 2 in all components of a personal fall protection system.

4. **Safety belts (body belts) are prohibited.**

5. Use only full body harnesses, shock-absorbing lanyards, lifelines, and anchorage points which meet the following criteria:

   a. Body harness design and construction must meet the specifications set forth in 29 CFR 1926.500-.503.

   b. All snaphooks must be of the locking type.

   c. Ropes and webbing used in lanyards, lifelines, and body harnesses must be made of synthetic fibers.

   d. The attachment point (dee-ring) of a body harness must be located in the center of the wearer's back near shoulder level, or above the wearer's head.

   e. Horizontal lifelines must be designed, installed, and used under the supervision of a qualified person; be capable of supporting at least 5,000 pounds (2,270 Kg) per employee attached; and maintain a safety factor of at least 2.

   f. Lanyards and vertical lifelines must have a minimum breaking strength of 5,000 pounds (2,270 Kg).

   g. Self-retracting lifelines and lanyards which limit free fall to 2 feet (60 cm) or less must be capable of sustaining a minimum tensile load of 3000 pounds (1,360 Kg) in the fully extended position.

   h. Self-retracting lifelines and lanyards which do not limit free fall to 2 feet (60 cm) or less, ripstitch, and other shock-absorbing lanyards must be capable of sustaining a minimum tensile load of 5,000 pounds (2,270 Kg) in the fully extended position.

   i. Anchorage points for personal fall protection systems must be independent of any anchorage point being used to

support or suspend platforms and must be capable of supporting at least 5,000 pounds (2,270 Kg) per employee attached.

6. Inspect all fall protection components for wear, damage, and deterioration prior to each use. The Fall Protection PPE Checklist should be used – see attachment 40-1.

7. Require employees to be familiar with the fitting and donning of body harnesses; proper tie-off techniques, and suitable anchorage points.

8. Instruct employees to rig fall protection such that they can neither free fall more than 6 feet (2 meters), nor contact any lower level.

9. Never tie off to guardrail systems or hoists.

10. Require employees to remain tied off 100% of the time at or above 6 feet (2 m) for Construction applications, or above 4 feet (1.2 m) for General Industry applications, by means of horizontal lifelines, vertical lifelines, a double lanyard system, or other suitable means.

11. Remove from service any component of a personal fall protection system that has been subjected to impact loading and do not use again until inspected by a competent person and determined to be undamaged and suitable for reuse.

12. Make provisions for the prompt rescue of personnel in the event of a fall, or require that employees are capable of self-rescue.

13. Provide separate vertical lifelines for each employee using a vertical lifeline. 5/8-inch (16 mm) nylon rope is recommended for lifeline use.

14. Protect lifelines against cuts and abrasions.

15. Use rope grabs to attach to vertical lifelines – never use knots.

E. Safety Net Systems (Construction Applications)

1. Provide safety net systems at locations where a fall hazard of 6 feet (2 meters) or greater exists, and other forms of fall protection are not feasible. Where safety net systems are impractical, an

alternative form of fall protection as outlined elsewhere in this procedure must be provided.

2. Require that safety net systems meet the criteria set forth in 29 CFR 1926.500 -.503.

3. Install safety nets as close as possible under the walking/working surface on which employees are working, but never more than 30 feet (9 meters) below this level.

4. Require that the potential fall area from the walking/working surface to the net is unobstructed.

5. Install safety nets with enough clearance under them to prevent contact with the surface or structures below when subjected to an impact force equal to the drop test specified below.

6. Extend the outer edge of the net 8 feet (2.5 meters) from the edge of the working surface when the vertical distance from the working level to the net is 5 feet (1.5 meters) or less.

7. Extend the outer edge of the net 10 feet (3 meters) from the edge of the working surface when the vertical distance from the working level to the net is 5 feet to 10 feet (1.5 to 3 meters).

8. Extend the outer edge of the net 13 feet (4 meters) from the edge of the working surface when the vertical distance from the working level to the net is greater than 10 feet (3 meters).

9. Conduct a drop test of the safety net after installation and before being used as a fall protection system; whenever relocated; after major repair; and at 6-month intervals if left in one place.

10. Conduct the drop test by dropping a 400 pound (180 Kg) sandbag, 30 inches (76 cm) in diameter, into the net from at least 42 inches (107 cm) above the highest walking/working level at which employees are exposed to a fall.

11. Inspect safety nets at least once a week, and after any occurrence which could affect the integrity of the system, for wear, damage, and deterioration. Remove defective nets and components from service.

12. Remove all materials, scrap, equipment, and tools which have fallen into the net as soon as possible, but at least before the next work shift.

F. Hole Covers

1. Provide covers in roadways and vehicle aisles that are capable of supporting at least twice the maximum axle load of the largest vehicle expected to cross over the cover.

2. Provide walking/working surface hole covers that are capable of supporting at least twice the weight of employees, equipment, and materials that may be imposed on the cover at any one time.

3. Secure covers at the time of installation to prevent displacement by the wind, equipment, or employees.

4. Color code or mark all hole covers with the word "HOLE" or "COVER" to provide warning of the hazard.

G. Safety Monitoring Systems, Warning Line Systems, and Controlled Access Zones.

The Qualified Person shall approve these control measures prior to performing any roofing, overhand bricklaying, leading edge, or other elevated work that may require the use of one or more of these systems.

H. Protection from Falling Objects (Construction Applications)

1. Install toeboards along the edge of the overhead walking/working surface.

2. Require that toeboards are a minimum of 3 ½ inches (9 cm) in height; that they are capable of withstanding at least 50 pounds (22 Kg) of force applied in any downward or outward direction; and that there is no more than ¼ inch (6 mm) clearance between the toeboard and the walking/working surface.

3. Install paneling or screening from the top of the toeboard to the top rail or midrail when tools, equipment, or materials are piled higher than the top of the toeboard.

4. Provide sidewalk sheds or canopies as appropriate. See SMS 11, "Demolition".

I. Alternative Fall Protection Plans (General Industry)

1. When traditional fall protection systems (engineered or personal protective equipment) are impractical, a HSE Manager may authorize an alternative method of fall protection. Typically, this is intended to include steep slope (>30 degrees for horizontal) work along graded roads, on the face of dams, and in other remote or inaccessible steep work areas. This does not include roofing applications as appropriate equipment and regulatory guidance exists in those cases.

2. The Fall Protection Plan shall address the following areas thoroughly:

- Fall protection strategy and application.
- Protective system and equipment, in detail.
- Methods and procedures including limitations of the system, and the required numbers of trained workers.
- Rescue capability and procedures.
- Training required in detail, for all workers.
- Responsibilities of key personnel, including the supervisor.
- Controlled access zones.

The use of motor vehicles as an anchoring point is prohibited.

5. Documentation Summary

Place in the Project Safety Files:

A. Competent Person Qualifications.

B. Employee Training Documents.

C. Fall Protection Plan (when developed).

6. Resources

A. U.S. OSHA Standard 29 CFR 1926, Subpart M – Fall Protection

B. U.S. OSHA Technical Links - Fall Protection

C. U.K. - Construction (Health, Safety and Welfare) Regulations 1996

D. ANSI A10.11-1989 – Safety Nets Used During Construction, Repair, and Demolition Operations

E. ANSI 1264.1-1995 – Safety Requirements for Workplace Floor and Wall Openings, Stairs and Railing Systems

F. Australian/New Zealand Standards AS/NZS 1891 - Industrial Fall-Arrest Systems and Devices)

G. Attachment 40-1; Fall Protection PPE Checklist

URS	Health, Safety, and Environment FALL PROTECTION PPE CHECKLIST	Attachment 40-1 Issue Date: March 2005

Fall Protection Checklist	Check if OK	Comments
Training - Is each worker exposed to fall hazards properly trained by a competent person in hazard recognition, fall protection processes and equipment, and site specific conditions?		
Harness - Inspect the entire surface of webbing for damage. Beginning at one end, bend the webbing in an inverted "U". Holding the body side of the belt toward you, grasp the belt with your hands six to eight inches apart. This surface tension makes the damaged fibers or cuts easier to see. Watch for frayed edges, broken fibers, pulled stitches, cuts, burns, and chemical damage.		
Buckles - Note any unusual wear, frayed or cut fiber, or distortion of the buckles. Inspect the buckle for distortion. The outer bars and center bars must be straight. Pay special attention to corners and attachment points of the center bar.		
Straps - The tongue receives heavy wear from repeated buckling and unbuckling. Inspect for loose, distorted or broken grommets. The webbing should not have any additional punched holes. Buckle tongues should be free of distortion in shape and motion. They should overlap the buckle frame and move freely back and forth in their socket. The roller should turn freely on the frame. Check for distortion or sharp edges.		
Lanyards - General: **Snaps** - Inspect closely for hook and eye distortions, cracks, corrosion, or pitted surfaces. The keeper (latch) should seat into the nose without binding and should not be distorted or obstructed. The keeper spring should exert sufficient force to firmly close the keeper. Keeper locks must prevent the keeper from opening when the keeper closes.		
Thimbles - The thimble must be firmly seated in the eye of the splice, and splice should have no loose or cut strands. The edges of the thimble must be free of sharp edges, distortion, or cracks.		
Web Lanyard - While bending the webbing over a curved surface such as a pipe, observe each side of the webbed lanyard. This will reveal any cuts or breaks. Examine the webbing for swelling, discoloration, cracks, or burns. Observe closely for any breaks in the stitching.		
Rope Lanyard - Rotation of the rope lanyard while inspecting from end to end will bring to light any fuzzy, worn, broken or cut fibers. Weakened areas from extreme loads will appear as a noticeable change from the original diameter. The rope diameter should be uniform throughout, following a short break-in period. Make sure the rope has no knots tied in it. Knots can reduce the strength of the rope by up to 60%.		
Shock-absorbing Lanyard - Shock-absorbing lanyards should be examined as a web lanyard. However, also look for signs of deployment. If the lanyard shows signs of having been put under load (e.g. torn out stitching), remove it from service.		
Hardware - Check "D" rings for distortion, cracks, breaks, and rough or sharp edges. The "D" ring should pivot freely. "D" ring back pads should also be inspected for damage.		
Anchorage – Is the anchor point properly located above the work area, positioned to minimize swing in the event of a fall, and capable of supporting 5000 pounds/2270 kg for each attached employee?		

1. Applicability

This program defines responsibilities and procedures and is applicable to operations of URS Corporation and its subsidiary companies that may require the use of respiratory protection including Immediately Dangerous to Life and Health (IDLH) and emergency conditions. This program also addresses the voluntary use of respirators.

2. Purpose and Scope

The purpose of this procedure is to protect those employees performing operations for which exposures can not be controlled by use of conventional engineering or administrative controls and prior to establishing a negative air exposure assessment, and to require that respiratory protective equipment is selected, used, maintained, and stored in accordance with acceptable practices.

3. Implementation

Implementation of this procedure is the responsibility of the manager directing activities of the facility or site.

A Corporate, Regional, or Strategic Business Unit (SBU) HSE Manager must approve deviations from this procedure.

Program Administration - URS Vice President HSE is responsible for the development and annual review of this program.

Regional or SBU HSE Managers are responsible to:

- Assist responsible employees in the implementation of the program.
- Assessing local compliance with the program.

4. Requirements

A. Determine if respirators are needed or going to be used for hazardous jobs before assigning that job to an employee.

1. If the determination is that a potential for respiratory hazards exists with any portion of that job activity then, complete Attachment 42-1.
2. Contact a HSE Manager if any of the questions in Attachment 42-1 are checked "yes."

3. Follow instructions in Attachment 42-2 for employees who wish to voluntarily use dust masks.
4. Follow all the requirements of this procedure for employees who wish to voluntarily use tight-fitting (e.g., air purifying) respirators.
5. Required respirators will be paid for by URS and will be provided without cost to the employee.

B. Select the proper respirator for the job.

1. For those jobs identified in Attachment 42-1, contact a HSE Manager for assistance in respirator selection.
2. Contact a HSE Manager for follow up if there are any problems implementing the recommendations made.

C. Require employees who will use respirators to be medically qualified before fit testing and assigning them a respirator.

1. For program details, refer to SMS 24, Medical Screening and Surveillance.
2. Require that employees have a current and accurate Medical Surveillance form (Attachment 24-2).
3. Obtain a copy of the employee's Health Status Medical Report from the Office Health and Safety Representative. The consulting occupational physician of the medical service provider following each work related examination issues the Health Status Medical Report. Employees cannot be assigned respirators unless they are medically cleared for respirator use.

D. Require respirator users to receive appropriate training.

1. All respirator users must be trained:
   a. Before they are assigned a respirator.
   b. Annually thereafter.
   c. Whenever a new hazard or job is introduced.
   d. Whenever employees fail to demonstrate proper use or knowledge.

2. Training must address, at a minimum, the following:

    a. Why the respirator is necessary, and what conditions can make the respirator ineffective.

    b. What the limitations and capabilities of the respirators are.

    c. How to use respirators effectively in emergency situations.

    d. How to inspect, put on and remove, and check the seals of the respirator.

    e. What the respirator maintenance and storage procedures are.

    f. How to recognize medical signs and symptoms that may limit or prevent effective use of the respirator.

E. Require respirator users to be fit tested.

1. Any employee who has been assigned a reusable respirator must be fit tested on an annual basis (no more than one year may elapse between fit tests), or when the employee is assigned a respirator of a different make, type or size from that previously tested.

2. Qualitative or quantitative fit testing can be performed by contract or in house personnel.

3. Obtain a signed written copy of the fit test results. The fit test results should include:

    a. Employee's name and social security number.

    b. Respirator brand, model and size fitted for.

    c. Date fit tested.

    d. Method of fit testing used.

    e. Name and signature of fit tester.

    f. Statement that fit test protocol met the requirements of 29 CFR 1910.134.

    g. Manufacturer and serial number of fit testing apparatus.

A qualitative fit test results form is available at Attachment 42-5. Documentation of quantitative fit tests should follow the recommendation of the manufacturer of the fit test equipment.

F. Provide qualified employees with respirator(s) and adequate amounts of parts and cartridges.

1. Assign employees whose duties require respirators their own respirator for which they have been fit tested.

2. Provide special eyeglass inserts designed for the respirator if an employee must wear eyeglasses with a full facepiece respirator. Contact lenses may be worn when wearing a full facepiece respirator.

G. Require respirators to be used properly.

1. Prohibit facial hair where the respirator-sealing surface meets the wearer's face.

2. Require employees to perform a positive and negative fit check every time the respirator is put on.

3. Employees will leave the area where respirators are being used:

    a. Before removing the facepiece for any reason.

    b. To change cartridges.

    c. If any of the following is detected:

        1. Vapor or gas breakthrough.

        2. Leakage around the facepiece.

        3. Changes in breathing resistance.

4. Use cartridges with End of Service Life Indicators or determine the respirator cartridge change out schedule. See Attachment 42-4 for Guidance.

H. Require respirators to be cleaned and stored properly.

1. Clean and disinfect respirators after each use.

2. Store respirators in a plastic bag or case and in a clean location.

3. Inspect respirators before use and after each cleaning.

I. Address issues associated with special use respirators self-contained breathing apparatus; air supply respirators; emergency use respirators).

1. Self Contained Breathing Apparatus

   Inspect self-contained breathing apparatus and other emergency use respirators monthly and after each use in accordance with manufacturer's instructions.

2. Air Supplied Respirators

   a. Air used for atmosphere-supplying respirators must meet or exceed the requirements for Type 1 - Grade D breathing air. Never use oxygen.

      1. A certificate of analysis must accompany bottled air.

      2. Compressors used to supply breathing air must:

         i. Prevent entry of contaminated air into the air supply.

         ii. Minimize moisture content.

         iii. Have suitable in-line sorbent beds and filter to provide appropriate air quality.

         iv. Have a high carbon monoxide alarm that sounds at 10 ppm.

   b. Couplings on air hose lines must be incompatible with other gas systems.

J. Require follow up training and medical surveillance to be provided as directed.

1. Provide follow-up physical examinations as directed by the SMS 24-3, Medical Screening and Surveillance Exam Protocol table.

2. Provide follow-up physicals as directed by the Regional Medical Surveillance Administrator.

3. Provide annual refresher training.

4. Provide annual fit testing.

5. Documentation Summary

A. Laboratory

1. File these records in the Laboratory Safety Filing System

   a. Completed forms:

      1. "Identifying When A Respirator Is Needed" - Attachment 42-1; and,

      2. "Respirator Standard Operating Procedure" - Attachment 42-3.

   b. Employee Health Status Medical Report includes clearance for respirator use.

   c. Employee Fit Test Records; and,

   d. Employee Respirator Training Records.

2. Send a copy of the following records to the Regional Health and Safety Manager:

   a. Completed "Voluntary Use of Respirators" form - Attachment 42-2.

   b. Employee Fit Test Records.

   c. Employee Respirator Training Records.

B. Field

1. File these records in the Project Health and Safety File:

   a. Completed forms:

      1. "Identifying When A Respirator Is Needed" - Attachment 42-1; and,

2. "Respirator Standard Operating Procedure" - Attachment 42-3.
3. Employee Health Status Medical Report includes clearance for respirator use.;
4. Employee Fit Test Records; and,
5. Employee Respirator Training Records.

2. Send a copy of the following records to the Regional Health and Safety Manager:
   a. Completed "Voluntary Use of Respirators" form - Attachment 42-2.
   b. Employee Fit Test Records; and,
   c. Employee Respirator Training Records.

6. Resources

A. U.S. OSHA Standard - Respiratory Protection - 29 CFR 1910.134

B. U.S OSHA Technical Links - Respiratory Protection

C. ANSI Z88.6, Respirator Use – Physical Qualifications for Personnel, Current Revision

D. ANSI Z88.2, Respiratory Protection, Current Revision

E. 3M Cartridge Service Life Interactive Program

F. Australian Standards AS/N25 1715 - 1994. Selection, Use, and Maintenance of Respiratory Protection Devices

G. Australian Standards HB9-1994. Occupational Personal Protection

H. AIHA, The Occupational Environment - Its Evaluation and Control

The following documents are PDF files which must be read with Adobe Reader:

I. NIOSH Respirator Decision Logic

J. NIOSH Guide to Industrial Respiratory Protection

K. Attachment 42-1 - Identifying When a Respirator is Needed

L. Attachment 42-2 - Voluntary Use of Respirators

M. Attachment 42-3 - Respirator Standard Operating Procedure

N. Attachment 42-4 - Respiratory Cartridge Change Schedule

O. Attachment 42-5 - Fit Test Results Form

P. Medical Screening and Surveillance Program - SMS 24

Site Location: _____ Date: _____

Name of Person Performing Evaluation: _____

Project: _____

Answer the questions below for the jobs you are to perform on site. If a 'yes' response is checked, consult with a Corporate, Regional, or Strategic Business Unit (SBU) HSE Manager to determine:

- If a respirator is truly needed for the job, as well as,
- The type of respirator needed for the job

Material Used or Process to be Performed	Yes (Respirator may be needed)	No	Notes
Abrasive Blasting • Abrasive blasting (with any type of grit or material) will be performed • Employee will fill abrasive blasting pots or perform clean-up activities • Employee will be ion a contained area where abrasive blasting is taking place			
Acids • Liquid or powder acids will be used in a situation where acid vapors, mists or dust may be breathed.			
Adhesives • Aerosols-propelled adhesives are to be used in areas where there is no or insufficient local exhaust ventilation • Two-part adhesives (mix part one with two, let set then use) are to be used in areas where there is limited ventilation.			
Alkalis/Bases/Caustics • Powdered alkalis will be used in a situation where an airborne dust may be breathed.			
Asbestos Abatement • Asbestos will be removed, repaired or sampled • Employees will be inspecting or overseeing areas where asbestos will be removed or disturbed.			
Cleaning Compounds • Degreasers or carbon removers will be used in areas where local exhaust ventilation is not provided.			

URS | Health and Safety Program | Attachment 42-1
IDENTIFYING WHEN A RESPIRATOR IS NEEDED | Rev 1: October 2006

Material Used or Process to be Performed	Yes (Respirator may be needed)	No	Notes
• Aerosol propelled cleaning compounds will be used in areas where there is no local exhaust ventilation. • Degreasers or carbon removers will be used in voids, tanks, or other confined spaces.			
Corrosion Preventive Compounds • Corrosion prevention compounds, including chemical conversion compounds and corrosion inhibitors, will be used in areas where there is no local exhaust ventilation.			
Detergents/Soaps • Ammonia based detergents will be used in large quantity (more than five gallons) in areas where local exhaust ventilation cannot be provided. • Large quantities (5 or 55 gallon containers) of high pH powder detergent/soap will be used in a situation where dust may be breathed.			
Fuels (including regular or unleaded gasoline, kerosene, diesel fuel, JP-5) • Employees will be inside unventilated fuel cells or other confined spaces containing fuels.			
Grinding, Cutting, Sanding • Cutting, grinding or sanding surfaces that have coatings containing lead, cadmium, chromium, zinc or beryllium. • Cutting, grinding or sanding surfaces that are concrete or glass without use of ventilation or water.			
Hazardous Waste Sites • Employees will be performing tasks on a hazardous waste site that requires the use of respirator (as indicated in the site safety & health plan). • Employees will be performing site assessments on potential hazardous waste sites.			
Hydraulic Fluids (including petroleum-based fluids, synthetic fire-resistant fluids, and water based fire resistant fluids) • Hydraulic fluids and the vapors generated will not be exhausted using local exhaust ventilation. • Synthetic fire-resistant fluids or water-based fire-resistant fluids will be used in an area where the			

Material Used or Process to be Performed	Yes (Respirator may be needed)	No	Notes
air is contaminated with visible mist or spray from hydraulic fluids.			
Inspection Penetrants (including Flouro-finder, water indicating pastes, and penetrant removers) • An aerosol-propelled inspection penetrant will be used in an area where local exhaust ventilation cannot be provided, or in a situation where the solvent vapors can be breathed.			
Lead Abatement Activities • Lead containing materials will be disturbed, removed or sampled. • Employees will be inspecting or overseeing areas were lead will be removed or disturbed.			
Lubricants/Oils • Aerosol lubricants/oils will be sprayed with no immediate exhaust ventilation.			
Oxidizers (materials that give off oxygen including chlorine laundry bleach, calcium hypochlorite, calcium oxide, oxygen candles, lithium hydroxide, hydrogen peroxide, and sodium dichromate) • Oxidizers containing organic chlorine will be used in a situation where the dusts/vapors may be breathed. • Powdered oxidizers will be used in a situation where airborne dust may be breathed.			
Paint Materials (including paints, primers, thinners, enamels, lacquers, strippers, coatings and varnishes) • Paint materials will be spray applied in areas where there is no local exhaust ventilation. • Two part (mix part a with part b, let set, then apply) polyurethane or epoxy polyamide paints will be brush or spray applied. • Paints containing lead, chromium, cadmium, beryllium, and zinc (refer to the MSDS). • Paint materials will be applied in confined spaces.			
Solvents (including hydrocarbon solvents such as acetone, methyl ethyl ketone, toluene, xylene, and alcohols, as well as mixed solutions like antifreeze, heat transfer fluid, turpene, dope and naphtha thinner) • Local exhaust ventilation will not be provided and			

Material Used or Process to be Performed	Yes (Respirator may be needed)	No	Notes
work will involve breathing solvent vapors • Solvents will be used within confined spaces • Solvents will be applied using aerosols.			
Thermal Insulation (including asbestos & non-asbestos materials like pipe lagging, fiberglass insulation, boiler insulation, packing materials and floor/ceiling tiles) • Insulation will be disturbed, removed or sampled			
Water Treatment Chemicals (includes corrosive chemicals such as tri-sodium phosphate, hardness buffer, tritrating solution, morpholine, caustic soda, citric acid and nitric acid as well as toxic chemicals such as mercuric nitrate, hydrazine, EDTA and sodium nitrate) • Morpholine, EDTA, or harness buffer/titrating solution is to be used in poorly ventilated spaces. • Powdered water treatment chemicals will be used in a situation where chemical dusts may be breathed			
Welding/Brazing • Welding will be performed in confined spaces • Welding galvanized metal or stainless steel • Brazing with cadmium or lead			
For Any of the Above Listed Activities • An employee will be in the immediate area – within 10 feet of the job or operation, or • Employee will be inside confined space where activities are taking place, or • Employee will be inside a "controlled area" such as found in asbestos abatement, lead abatement, radiation control area, or a hazardous waste site.			
Materials Safety Data Sheets • For any chemical product used, a respirator is recommended			
Product Labels • For any product used, instructions indicate a respiratory should be used.			
Standard Operating Procedures • A Standard Operating Procedure indicates the use of a respirator.			

URS	Health, Safety, and Environment **VOLUNTARY USE OF RESPIRATORS**	Attachment 42-2

Instructions: Have the employee that is opting to use a respirator for non-overexposure conditions read this page, and then sign on the bottom of the page. Maintain a copy in the employee's training file.

Respirators are an effective method of protection against designated hazards when properly selected and worn. Respirator use is encouraged, even when exposures are below the exposure limit, to provide an additional level of comfort and protection for employees. However, if a respirator is used improperly or not kept clean, the respirator itself can become a hazard to the employee. Sometimes employees may wear respirators to avoid exposures to hazards, even if the amount of the hazardous substance does not exceed the limits set by OSHA standards. If your employer provides respirators for your own voluntary use, or if you provide your own respirator, you need to take certain precautions to be sure that the respirator itself does not pose a hazard.
You should do the following

1. Read and follow all instructions provided by the manufacture on use, maintenance, cleaning and care, and warnings regarding the respirators limitations.
2. Choose respirators certified for use to protect against the contaminant of concern. NIOSH, the National Institute for Occupational Safety & Health of the U.S. Department of Health and Human Services, certifies respirators. A label or statement of certification should appear on the respirator or respirator packaging. It will tell you what the respirator is designed for and how it will protect you.
3. Do not wear your respirator into atmospheres containing contaminants for which your
4. Respirator is not designed to protect you against. For example, a respirator designed to filter dust particles will not protect you against gases, vapors, fumes, smoke or very small solid particles.
5. Keep track of your respirator so that you do not mistakenly use someone else's respirator.
6. If you have any health conditions (asthma; high blood pressure; emphysema; heart disease) that could be aggravated by using a respirator, you should check with your doctor before using one.

I have read and understand this information on:	Date:

Employee's Name (Please Print)
Employee's Signature

URS	Health, Safety, and Environment **RESPIRATOR STANDARD OPERATING PROCEDURE**	Attachment 42-3

Job Task Reviewed:
Date Reviewed
Task Review by:

ADMINISTRATIVE PROCEDURES

1. All respirator users must be medically qualified to use respirators.
2. Respirator users must be trained annually in respirator use and fit tested annually.
3. Only the person to whom it was issued will use respirator.
4. Persons using glasses who are required to use a full-face respirator may use contact lenses or eyeglass inserts designed for the respirator.

GUIDANCE FOR SELECTION OF RESPIRATOR & CARTRIDGES/FILTERS

1. Respirators are currently being issued and used for the following job activity:

2. The respirator will be equipped with the following cartridges/filters:

3. Filters are to be changed when the breathing resistance increases.

4. Cartridges are to be changed _____ or when the contaminant you are protecting yourself from can be smelled or tasted.

FIT TESTING & FIT CHECKING

1. Fit testing is required annually. To arrange for fit testing, call your local safety representative.
2. Respirator users will "fit check" the respirator every time the respirator is put on:
   Negative Check – cover filters/cartridges with palms of hands and breath in, leakage should not be detected around the face seal of the respirator. Do not use if leakage is detected.
   Positive Check – cover the exhalation valve cover with palm of hand and blow out slightly, leakage should not be detected around the respirator seal.
   For Air Supply Respirators – kink or close off air supply hose and breath in, leakage should not be detected around the face seal of the respirator.

CLEANING & MAINTENANCE OF RESPIRATOR

1. Clean and disinfect respirator after every use.
2. Inspect respirator after every day in use to ensure parts are not missing. Replace missing parts from stock supply.
3. Store clean respirator in labeled plastic bag out of direct sunlight.
4. Do not alter respirator in any way.

RESPIRATOR CARTRIDGE CHANGE SCHEDULE

A cartridge change schedule must be developed for cartridges or canisters used with air purifying respirators that do not have an End of Service Life Indicator (ESLI). The purpose of this is to prevent contaminants from breaking through the respirator's sorbent cartridge(s), and thereby over-exposing employees. NIOSH has approved ESLIs for only four cartridges or canisters (mercury vapor, carbon monoxide, ethylene oxide, and hydrogen sulfide). Historically we have relied on the warning properties (odor, irritation) of a contaminant to dictate cartridge change. OSHA no longer allows this as the sole basis for changing respirator cartridges. In developing a change schedule the following factors should be considered:

Contaminants.
Concentration.
Frequency of use (continuously or intermittently throughout the shift).
Temperature and humidity.
Work rate.
The presence of potentially interfering chemicals.

The worst-case conditions should be assumed to avoid early breakthrough. This must be documented in the project health and safety plan or, in the cases of office or labs, in the site specific Respiratory Protection Program.

Sources of Help

Manufacturers

3M has an interactive "Cartridge Service Life" program that can be downloaded for free:
http://www.mmm.com/market/safety/ohes2/index.html

This program will estimate cartridge service life for 3M products against many contaminants. The program does not evaluate the service life against mixtures (multiple contaminants). Because of the complexity in evaluating mixtures, OSHA offers the following guidance:

When the individual compounds in the mixture have similar breakthrough times (i.e., within one order of magnitude), service life of the cartridge should be established assuming the mixture stream behaves as a pure system of the most rapidly migrating component with the shortest breakthrough time (i.e., sum up the concentration of the components).

Where the individual compounds in the mixture vary by 2 odors of magnitude or greater, the service life may be based on the contaminant with the shortest breakthrough time.

URS | Health, Safety, and Environment | Attachment 42-4

RESPIRATOR CARTRIDGE CHANGE SCHEDULE

Rule of Thumb *("The Occupational Environment" - Its Evaluation and Control)*

If the chemical's boiling point is >70 C and the concentration is less than 200 pip you can expect a service life of 8 hours at a normal work rate.
Service life is inversely proportional to work rate.
Reducing concentration by a factor of 10 will increase service life by a factor of 5.
Humidity above 85% will reduce service life by 50 %.

OSHA Interpretation

The OSHA inspection procedures for the respiratory protection standard specifies that where contaminant migration is possible, respirator cartridges/canisters should be changed after each work shift where exposure occurs unless there is objective data to the contrary (description studies) showing the performance in the conditions and schedule of use/non-use found in the workplace.

Qualitative Respiratory Fit Test Record
Attachment 42-5

Name: _____ **Employee Number:** _____

Company/Office: _____ **Last Medical Exam:** _____

Fit Test Date: _____ **Corrective Lenses Needed:** Yes ☐ No ☐

Briefed on fundamental principles of respiratory protection, use, selection, inspection cleaning, maintenance and storage of equipment. Yes ☐ No ☐

Isoamyl acetate odor recognition Yes ☐ No ☐

	RESPIRATOR 1	RESPIRATOR 2	RESPIRATOR 3
Equipment Type	_____	_____	_____
Manufacturer's Name	_____	_____	_____
Model	_____	_____	_____
Size	_____	_____	_____
Facepiece Composition (Rubber/Silicone)	_____	_____	_____

TEST PERFORMED	RESPIRATOR 1	RESPIRATOR 2	RESPIRATOR 3
Negative Pressure Test:	P ☐ F ☐	P ☐ F ☐	P ☐ F ☐
Positive Pressure Test:	P ☐ F ☐	P ☐ F ☐	P ☐ F ☐
Isoamyl Acetate Vapor Test:	P ☐ F ☐	P ☐ F ☐	P ☐ F ☐
Irritant Smoke Test:	P ☐ F ☐	P ☐ F ☐	P ☐ F ☐

This qualitative fit test protocol has been adapted from OSHA Respiratory Protection Standard 29 CFR 1910.134, Appendix A.

_____ _____ _____
Examiner's Name (Please Print) **Examiner's Signature** **Date**

_____ _____
Employee's Signature **Date**

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1. Applicability

This procedure is applicable to subcontractors retained by URS to perform construction (including drilling and excavation), alteration, demolition, and/or repair activities utilizing their own workforce or equipment. This procedure is applicable to the operations of subcontractors and sub-subcontractors of any tier.

This procedure does not apply to third party contractor operations where there is no subcontract relationship between the contractor and URS Corporation. Health and safety issues regarding third party contractor operations are governed by project specific contracts and are not covered by this standard.

2. Purpose and Scope

This procedure provides guidelines on the pre-evaluation of subcontractor safety programs. It also provides guidance on contractual risk management, subcontractor safety performance on the job site, and the responsibilities of the Project Manager with respect to subcontractor jobsite safety performance.

It is recommended that each URS Corporation subcontractor be evaluated at least annually using Attachment 46-1, "Subcontractor Safety Evaluation Form," in order to perform work on any new URS Corporation projects.

3. Implementation

Field Activities - Implementation of this procedure is the responsibility of the Project Manager.

4. Guidelines

A. Pre qualification of Subcontractor - The Project Manager shall complete the following procedures for all subcontractors retained on projects covered by this standard (the PM should also require subcontractors to follow these procedures with respect to pre-qualification of sub-subcontractors of any tier):

1. Request all subcontractor candidates to complete the attached "Subcontractor Health and Safety Evaluation Form" (Attachment 46-1).

2. Conduct an assessment of each subcontractor's qualifications with respect to the subcontractor health and safety evaluation criteria contained in Attachment 46-2.

3. Verify that subcontractors meet the insurance requirements as stated in Attachment 46-2 or as approved by Counsel.

4. If the subcontractor has been successfully evaluated within the last 12 months, that evaluation may be substituted.

5. For long term projects, this evaluation should be updated within 12 months of the previous evaluation.

B. Contractual and Risk Management Requirements of Subcontractors

1. Ensure that subcontractor is contractually bound to comply with applicable client and URS Corporation Health and Safety Program requirements.

2. Ensure that subcontractor is contractually bound to develop additional safety procedures for work that is exclusive to their activities on the site and for which they may have superior knowledge.

3. Assess compliance of subcontractor's insurance with the URS Corporation subcontract requirements (including, but not limited to, necessary types and amounts of coverage, URS Corporation additional insured endorsement, etc.).

4. Ensure that URS Corporation has the right in its subcontract, without liability to the subcontractor, to stop the subcontractor's work in the event of any violations of the applicable Health & Safety Plan.

C. Subcontractor Safety Representative

1. Require each subcontractor to appoint a Subcontractor Safety Representative (SSR) who:

a. Is knowledgeable of the subcontractor's activities.

b. Understands the safety requirements of the subcontractor's activities.

c. Has the ability to recognize and the authority to correct safety deficiencies and execute a stop work order should an imminent danger arise.

d. Has the responsibility for the administration of the subcontractor Health and Safety Program.

e. Will serve as the direct contact with URS Corporation regarding resolution of Health and Safety issues.

D. Communication

1. Provide the SSR with information regarding Site Safety Program including but not limited to:

   a. Client Requirements.

   b. URS Corporation Site Safety Program.

   c. Site Hazard Communication Program.

   d. Site Emergency Action Plan.

   e. Any additional safety information from other contractors or subcontractors working on the site.

2. Provide SSR with name of URS Corporation project contact and alternate for addressing site Health and Safety issues.

3. Require the participation of subcontractors in all Site Safety Briefings.

4. Require subcontractor compliance with all safety directives and/or stop work orders issued by the URS Corporation site representatives.

E. Subcontractor Safety Performance

1. To the extent reasonable in light of URS Corporation's scope of work under the client contract, visit the site and periodically observe subcontractors operations (i.e., conduct spot checks) to assess whether subcontractor appears to be conducting its operations in accordance with applicable health and safety requirements. Periodically review any required subcontractor health and safety written documentation for compliance with applicable requirements.

2. In the event that deficiencies are observed immediately bring them to the attention of the SSR for resolution.

3. In the event of observation of an "Imminent Danger" situation (i.e. involving a situation that could result serious injury or death), immediately contact the SSR and stop the work.

4. Investigate all injuries/illnesses related to subcontractor operations to identify causes and effect corrective actions.

5. In the event of serious and/or continuing subcontractor breaches of applicable health and safety requirements contact legal counsel to assess whether formal contractual action is appropriate under the subcontract.

5. Documentation Summary

A. File in the Project Safety File

1. Subcontractor Health and Safety Evaluation Form.

2. Applicable and current Insurance Certificates.

3. Names and telephone numbers of SSR for each subcontractor.

4. Verification of Health and Safety documents transmitted to subcontractors and received from subcontractors.

5. Identified safety deficiencies as applicable for subcontractors and verification of correction of conditions.

6. All other safety related documentation between URS Corporation and subcontractor such as training certifications, etc.

7. Subcontractor safety plan, incident reports and resolution reports.

6. Resources

A. Federal OSHA Workplace Injury and Illness statistics (http://www.osha.gov/oshstats/work.html)

B. Managing Subcontractor Safety, Prepared by The Construction Industry Institute, Safety Task Force, Publication 13-1, The University of Texas at Austin, Austin, Texas, 1991 (http://www.construction-institute.org/)

C. American National Standard Construction and Demolition Operations -- Safety and Health Program Requirements for Multi-Employer Projects,

ANSI A10.33-1992, National Safety Council, Itasca, Illinois 60143-3201 (http://www.nsc.org)

D. "Liability, OSHA and the Safety of Outside Contractors," Professional Safety, American Society of Safety Engineers, January 1993 (http://www.asse.org)

E. "Proactive Construction Management; Dealing With the Problem of Subcontractor Safety," Professional Safety, American Society of Safety Engineers, January 1990 (http://www.asse.org)

F. "Design Professional Liability Under OSHA," Presented by Thomas F. Holt, Jr., HWAC Lawyer's Roundtable, June 14, 1995 (to be Published) (http://www.hwac.org)

G. "Occupational Injury and Illness Rates by SIC", Bureau of Labor Statistics, U. S. Department of Labor (http://stats.bls.gov/sahome.html)

H. Attachment 46-1 - Subcontractor Safety Evaluation Form

I. Attachment 46-2 - Subcontractor Evaluation Criteria

URS	Health, Safety, and Environment **SUBCONTRACTOR SAFETY EVALUATION FORM**	Attachment 46-1

It is the policy of URS to provide a safe and healthful environment for all of its employees through the prevention of occupational injuries and illnesses. As such, URS considers safety as paramount and requests the following information of all subcontractors.

Company Name	
Company Address	
Submitted By	
Title	
Phone	
Fax	
Type of services performed	
Standard Industrial Classification (SIC) Code	
Number of employees in company	
Date of submittal	

SAFETY PERFORMANCE DATA

1. Has your company performed work as a subcontractor to URS previously? ❑ Yes ❑ No

If yes, explain the nature of the work, project location and project date, URS Project Manager and telephone number.

2. Worker Compensation Experience Information

a) List you Interstate Worker Compensation Experience Modification Rate (EMR) for the last three full years below:

Year	EMR	Carrier	Policy Number

Intrastate (List statistics for highest EMR state)

Year	EMR	Carrier	Policy Number

b) We require verification of your EMR. Please attach the endorsement page from your policy listing your EMR, or have your insurance carrier or broker provide this information on their letterhead.

c) If your EMR is 1.0 or exceeds 1.0 for any one or more years above, please explain:

3. Workplace Injuries and Illnesses

	YEAR	YEAR	YEAR
PROVIDE THE FOLLOWING INFORMATION:			
A. Number of Fatalities[1]			
B. Number of cases that involved days away from work, or days of restricted work activity, or both (Totals from Columns H and I)			
C. Number of cases involving recordable cases without lost or restricted workdays (Totals from Column J)			
D. Total Recordable Cases (Sum of Items A, B, and C above for each given year)			

[1] Attach description of Event

URS | Health, Safety, and Environment | SUBCONTRACTOR SAFETY EVALUATION FORM | Attachment 46-1

	YEAR	YEAR	YEAR
PROVIDE THE FOLLOWING INFORMATION:			
E. Total hours worked			
F. OSHA Total Recordable Incident Rate[2]			
G. OSHA Lost Workday Case Incident Rate[3]			

4. Describe any workplace safety regulatory agency (e.g. OSHA) citation and violation the Company has received in the past three years. Explain the nature of the citation, classification, and final fine. Describe the resolution of any serious violations. Please feel free to attach separate statements where more space is required.

Year	Number of Citations	Final Fine Amount

Citation Statement

Year	Number of Citations	Final Fine Amount

Citation Statement

[2] Incident Rate (Item F) = $\frac{\text{Total Cases (Item D)} \times 200{,}000}{\text{Total hours worked (Item E)}}$

[3] Lost Workday Case Incident rate = $\frac{\text{Total Lost Workday Cases (Item B)} \times 200{,}000}{\text{Total hours worked (Item E)}}$

5. Has your company received any Willful violations? ❑ Yes ❑ No
6. Does your company maintain a written Health and Safety program? ❑ Yes ❑ No
   If yes please include a copy of the Table of Contents.
7. Does your firm have a safety officer? ❑ Yes ❑ No
   If yes, please provide name and telephone number

Name

Telephone

8. Is your company capable of preparing safety procedures specific to the work proposed for this project? ❑ Yes ❑ No

RISK MANAGEMENT / INSURANCE DATA

1. Does your firm have insurance coverage for commercial liability and automobile liability without limits of at least $1,000,000? ❑ Yes ❑ No
   (Note that certain URS client contracts require insurance in excess of the levels noted above. Inability to supply insurance at levels required by URS' client contract could result in disqualification.)
2. Are you able to provide URS with insurance certificates naming URS and if requested, URS' client as an additional insured? ❑ Yes ❑ No
3. Please provide proof of current Worker's Compensation and Employers Liability Insurance coverage (attach certificate).

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VERIFICATION OF DATA

Please have an officer of the Company sign below certifying that the information provided in this document is current and correct.

Name

Title

Signature _____

Date _____

Misrepresentation of data requested is grounds for immediate termination of contracts and disqualification from future consideration.

URS Use Only

Date Received: _____

Evaluated by: _____
Project Manager

Referrals only required as per Attachment 2

Submitted to Health and Safety Rep for evaluation: H&S Rep_____
Pass
Fail
Submitted to Counsel for evaluation: Counsel_____
Pass
Fail

Final Evaluation

Pass

Fail

Project Manager: _____

Signature: _____

Date: _____

Prior to engaging a subcontractor on a project, Project Managers are strongly recommended to ensure that the contractor has an effective safety program, is capable of conducting it's operations in a safe manner and has appropriate insurance coverage. The following guidelines shall be followed in determining whether the subcontractor may be used on a URS Corporation project.

GENERAL INFORMATION

The contractor must be able to complete the header section on Page 1 of the questionnaire including their Standard Industrial Classification. For assistance determining the SIC for a business refer to the Standard Industrial Classification Manual online at http://www.osha.gov/oshstats/sicser.html.

SAFETY PERFORMANCE DATA RESPONSES

The numbers in this section directly correspond to the questions in Attachment 46-1.

1. If yes, check safety performance history with previous URS Corporation Project Manager if unknown.

2. For any EMR listed as greater than 1.0 the contractor has failed the evaluation. Further consideration may not occur without referral to URS Corporation Health and Safety Program Professional in your Region for further assessment.

   If all EMRs listed are 1.0 or below, continue with evaluation.

3. Determine the most recent OSHA Incident Rate and Lost Workday Case Rate for the subcontractors SIC. This may be done online at http://www.osha.gov/oshstats/work.html.

   For rates in excess of the published averages the subcontractor has failed the evaluation. Further consideration may not occur without referral to URS Corporation Health and Safety Program Professional in your Region for further assessment.

   If the rates are at or below the average for the subcontractors SIC, continue with the assessment.

4. Determine the subcontractor's citation history at http://www.osha.gov/cgi-bin/est/est1. Compare the published data to the contractor questionnaire. The subcontractor must explain any discrepancies.

   Look for large numbers of serious and repeat violations. If the suggests a problem request information and refer to URS Corporation Health and Safety Program Professional in your Region for further assessment.

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SUBCONTRACTOR EVALUATION CRITERIA

5. If subcontractor answers yes to willful violations request a detailed explanation and refer to URS Corporation Health and Safety Program Professional in your Region for further assessment.

6. For small subcontractors a no answer is not unexpected and may be acceptable with good EMR and OSHA statistics. Generally some minimal program is expected depending on the breadth and complexity of the work. Contact URS Corporation Health and Safety Program Professional in your Region for further assessment if you have any questions or doubts.

7. See 6.

8. It is expected that a subcontractor being hired to perform services on the project site should be the best prepared to address safety issues for their operations, especially when specialty work is being conducted or for work in which the subcontractor possesses superior knowledge of their operations.

   A 'no' answer should be referred to the URS Corporation Health and Safety Program Professional in your Region for further assessment.

RISK MANAGEMENT/INSURANCE DATA

1. The inability to provide insurance coverage at or above $1,000,000 requires referral to Counsel.

2. Proof of Workers Compensation Insurance is required. Refer any questions to Counsel.

3. Ability to provide Insurance Certificates naming URS Corporation as an additional insured is required. Refer any questions to Counsel.

1. Applicability

This program applies to job activities performed primarily in outdoor environments.

2. Purpose and Scope

The primary goal of this program is to eliminate or reduce illnesses and injuries transmitted by plants, insects, animals, and pathogenic agents. Although there are many animals and insects that are potentially harmful to humans (i.e. bees, spiders, bears, and rodents), this safety management standard focuses on six common biological hazards: ticks, poison plants, mosquitoes, snakes, Valley Fever, and water-borne pathogenic agents. See SMS 51 concerning Bloodborne Pathogens.

3. Implementation

The Project Manager, with support from the URS HS&E Regional Managers and Occupational Health Manager, will be responsible for implementation of this program.

4. Requirements

A. Ticks

1. Precautionary Measures

Background information: Ticks do not jump, crawl, or fall onto a person. They are picked up when clothing or hair brushes a leaf or other object the tick is on. Ticks are generally found within three feet of the ground. Once picked up, they will crawl until they find a likely site to feed. Often they will find a spot at the back of the knee, near the hairline, behind the ears, or at pressure points where clothing presses against the skin (underwear elastic, belts, neckline). The best way to prevent tick borne diseases is not to be bitten by a tick. Ticks can carry a number of diseases including:

Lyme Disease is an infection caused by the corkscrew-shaped bacteria *Borrelia burgdorferi* that is transmitted by the bite of deer tick (ixodes) and western black-legged ticks. The disease occurs in the forested areas of North America, Europe, and Asia. Symptoms which occur 3-30 days following a tick bite include: a spreading 'bulls-eye" rash, fever, fatigue, headache, and joint and muscle aches. Prompt treatment with antibiotics is essential in order to prevent more serious complications that may occur if left untreated.

Rocky Mountain Spotted Fever is an infection caused by the bacteria *Rickettsia rickettsii*. The disease occurs in North, Central, and South America. Other Rickettsia organisms cause disease worldwide (Mediterranean, Japan, Africa, North Asia). Symptoms which occur 2-6 days following a tick bite include: fever, nausea, vomiting, diarrhea, rash, muscle and joint pain. The disease is treated with antibiotics.

Babesiosis is caused by hemoprotozoan parasites of the genus *Babesia*. It is transmitted by the ixodid tick. The geographic distribution is worldwide. Symptoms include fever, chills, fatigue, muscle aches, and an enlarged spleen and liver. The disease is treated with anti-protozoan drugs.

Ehrlichiosis is caused by several bacteria of the genus *Ehrlichiae*. The geographic distribution is global, primarily in temperate regions. Symptoms which occur 5-10 days following a tick bite include fever, headache, fatigue, muscle aches, nausea, vomiting, diarrhea, confusion, and occasionally a rash. The disease is treated with antibiotics.

a. Avoidance of tick habitats

Whenever possible, persons should avoid entering areas that are likely to be infested with ticks, particularly in spring and summer when nymphal ticks feed. Ticks favor a moist, shaded environment, especially that provided by leaf litter and low-lying vegetation in wooded, brushy, or overgrown grassy habitat. Both deer and rodent hosts must be abundant to maintain the life cycle of the tick.

b. Personal Protective Equipment

1. Wear light colored clothing or white Tyvek® to allow you to see ticks that are crawling on your clothing.

2. Tuck your pant legs into your socks or boots, wear high rubber boots, or use tape to close the opening where they meet so that ticks cannot crawl up the inside of your pant legs.

3. Wear a hat, tie back long hair.

4. Apply repellents to discourage tick attachment. Repellents containing permethrin can be sprayed on boots and clothing and will last for several days. Repellents containing DEET (n,n-diethyl-

m-toluamide) can be applied to the skin, but will last only a few hours before reapplication is necessary. Apply according to Environmental Protection Agency guidelines to reduce the possibility of toxicity.

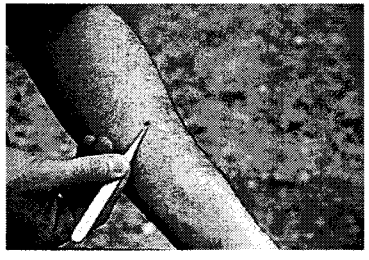
c. Tick Check

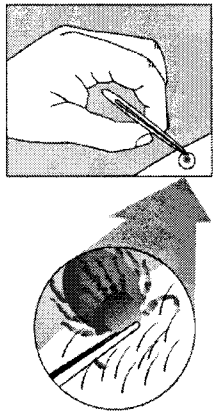
1. Change clothes when you return from an area where ticks may be located.
2. Shower to wash off any loose ticks.
3. Check your entire body for ticks. Use a hand held or full-length mirror to view all parts of your body.
4. Place clothing worn in tick infested areas into the dryer for at least 30 minutes in order to kill any ticks.

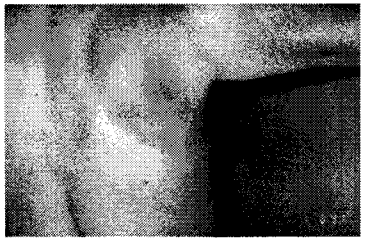
2. Tick Removal

Because it takes several hours of attachment before microorganisms are transmitted from the tick to the host, prompt removal of attached or crawling ticks is an important method of preventing disease. Remember, folklore remedies of tick removal to do not work! Methods such as the use of petroleum jelly or hot matches may actually make matters worse by irritating the tick and stimulating it to release additional saliva or regurgitate gut contents, increasing the chances of transmitting disease.

The best method to remove an attached tick is with a set of fine tipped tweezers.







a. Use fine-tipped tweezers. When possible, avoid removing ticks with bare hands.

b. Grasp the tick as close to the skin surface as possible and pull upward with steady, even pressure. Do not twist or jerk the tick; this may cause the mouthparts to break off and remain in the skin. If this happens, remove mouthparts with the tweezers.

c. Do not squeeze, crush, or puncture the body of the tick because its fluids (saliva and gut contents) may contain infectious organisms.

d. After removing the tick, thoroughly disinfect the bite site and wash your hands with soap and water.

e. Disinfect the tweezers.

f. Save the tick for identification in case you become ill. This may help the doctor make an accurate diagnosis. Place the tick in a vial or plastic zip lock bag and put it in the freezer. Write the date of the bite on a piece of paper with a pencil and place it in the bag.

3. Medical Follow-Up

In most circumstances, medical treatment of persons who only have a tick bite is not recommended. However, individuals who are bitten by a tick

should seek medical attention if any signs and symptoms of tick borne disease develop over the weeks following the tick bite.

B. Poisonous Plants

1. Background Information

Poison ivy and poison oak plants are the most common cause of allergic contact dermatitis in North America. These poisonous plants can be a hazard for many various outdoor activities at work, home, and play. Skin contact with the oleoresins (urushiol) from these plants can cause an itchy, red, oozing, blistered rash in sensitive individuals. Oil content in the plants is highest in the spring and summer, however the plants are even hazardous in the winter when they have dropped their leaves. There are three types of exposure:

Direct contact: An initial skin exposure in necessary to "sensitize" the individual. Subsequent contact in a sensitized person will result in a rash appearing within 4 to 48 hours. Approximately 50-70 % of the population is sensitized. Poison plant dermatitis is usually characterized by areas of linear or streaked patches where branches of the plant brushed the skin.

Indirect contact: Skin exposure can happen indirectly. Clothing, shoes, tools, personal protective equipment and other items can be contaminated with the oils and maintain potency for months.

Airborne smoke contact: Never burn poison plants. Droplets of oil can be carried by smoke and enter the respiratory system causing a severe internal outbreak.

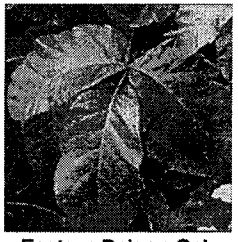
Poison plant rash is not contagious. Skin contact with blister fluid from an affected individual will not cause dermatitis in another sensitized person. Scratching the rash can only spread it to other parts of your body if the oil is still on your skin. After the oil has been washed off or absorbed by the skin, scratching will not spread the rash.

The most distinctive features of poison ivy and poison oak are their leaves, which are composed of three leaflets each and are green in the summer and red in the fall. Both plants also have greenish-white flowers and berries that grow in clusters. All parts of these plants are toxic.

Poison Ivy grows as a small plant, vine, and as a shrub. Leaves always consist of three glossy leaflets.

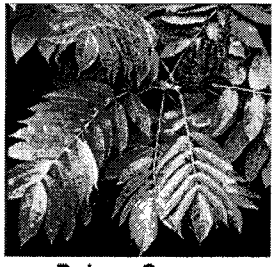
Poison Ivy

Poison Oak grows as a shrub or vine. It has three leaflets that resemble oak leaves.



Eastern Poison Oak

Poison Sumac grows as a woody shrub or small tree from 5 to 25 feet tall. It has 7 to 13 leaves that grow opposite each other with a leaflet at the tip.



Poison Sumac

1. Precautionary Measures

The best approach is to learn to identify the plants and avoid them.

Wear long pants and long sleeves, boots and gloves.

Barrier skin creams may offer some protection if applied before contact.

Avoid indirect contact from tools, clothing or other objects that have come into contact with a crushed or broken plant. Don't forget to wash contaminated clothing and clean up contaminated equipment.

If you can wash exposed skin areas within 3-5 minutes with cold running water, you may keep the urushiol from penetrating your skin. Proper washing may not be practical in remote areas, but a small wash-up kit with pre-packaged alcohol-based cleansing tissues can be effective.

2. Medical Follow-Up

Home treatment: Calamine lotion and an oatmeal (one cup to a tub full of water) bath can help relieve itching. To prevent secondary skin infection, scratching is not helpful and the finger nails should be cut to avoid damage to the skin. Over-the-counter hydrocortisone cream can decrease inflammation and itching, however read the label and use according to directions.

When to see the doctor: Severe cases may require further treatment. A physician should be seen if the rash appears infected, is on the face or other sensitive body areas, or is too extensive to be easily treated at home.

C. Mosquito Borne Diseases

1. Background Information

a. Arboviral encephalitis is a viral illness causing inflammation of the brain and is transmitted to humans by the bite of infected mosquitoes. Globally there are several strains including: Eastern equine, Japanese, La Crosse, St. Louis, West Nile, and Western equine encephalitis. Some of the strains have a vaccine. Symptoms of infection are nonspecific and flu-like: fever, headache, and tiredness. Fortunately, only a small proportion of infected people progress to encephalitis. Treatment is supportive, antibiotics are not effective.

b. Malaria is a serious but preventable disease spread by the bite of an infected anopheline mosquito. It is caused by four species of the parasite *Plasmodium (P. falciparum, P. vivax, P. ovale, and P malariae)*. Malaria-risk areas include primarily tropical areas of Central and South America, Africa, India, Southeast Asia, and the Middle East. Symptoms of malaria which occur 8 days to 1 year after infection

include fever, shaking chills, headache, muscle ache, tiredness, jaundice, nausea, vomiting, and diarrhea. Malaria can be cured with prescription drugs.

c. Dengue Fever is a potentially life-threatening viral illness transmitted by the bite of the Aedes mosquito, found primarily in urban areas. The disease is found in most of tropical Asia, the Pacific Islands, Central and South America, and Africa. There are four dengue virus serotypes. Symptoms include sudden onset, high fever, severe headache, joint and muscle pain, rash, nausea and vomiting. There is no specific treatment and no vaccine.

d. Yellow Fever is a viral disease transmitted between humans by mosquitoes. It occurs only in Africa and South America. There is a vaccine that confers immunity lasting 10 years or more. Symptoms begin 3-6 days after the mosquito bite and include fever, nausea, vomiting, headache, slow pulse, muscle aches, and restlessness. Treatment is symptomatic.

2. Precautionary Measures

Insect Repellent – Use insect repellants that contain DEET. The effect should last about 4 hours. Always use according to label directions. Use only when outdoors and wash skin after coming indoors. Do not breathe in, swallow, or get into the eyes. Do not put on wounds or broken skin.

Protective Clothing – wear long sleeved shirts and long pants, especially from dusk to dawn. Or avoid going outdoors during these hours.

Mosquito netting – Travelers who will not be staying in well-screened or air conditioned rooms should use a pyrethroid containing flying insect spray in living and sleeping areas during evening and nighttime hours. Sleep under mosquito netting (bed nets) that have been sprayed with permethrin.

Malaria prophylaxis medications may be prescribed, however they do not provide complete protection. The type of medication given depends on the area of travel.

D. Poisonous Snakes

1. Background Information

No single characteristic distinguishes a poisonous snake from a harmless one except the presence of poison fangs and glands. Only in dead specimens can you determine the presence of these fangs and glands without danger. Most poisonous snakes have both neurotoxic and hemotoxic venom, however, one type is dominant and the other is weak.

a. Hemotoxic venom. The folded-fang snakes (fangs can raise to an erect position) have venoms that affect the circulatory system, destroying blood cells, damaging skin tissues, and causing internal hemorrhaging.

b. Neurotoxic venom. The fixed-fang snakes (permanently erect fangs) have venoms that affect the nervous system, making the victim unable to breathe.

c. Poisonous snakes in the Americas: copperhead, coral snake, cottonmouth, and rattlesnake.

d. Poisonous snakes in Europe: adder, viper.

e. Poisonous snakes of Africa and Asia: viper, cobra, adder, green mamba.

f. Poisonous snakes in Australia: copperhead, adder, taipan, tiger snake.

2. Precautionary Measures

Bites occur when you don't hear or see the snake, when you step on them, or when you walk too close to them. Follow these simple rules to reduce the chance of accidental snakebite:

Don't put your hands into dark places, such as rock crevices, heavy brush, or hollow logs, without first investigating.

Don't step over a fallen tree. Step on the log and look to see if there is a snake resting on the other side.

Don't walk through heavy brush or tall grass without looking down. Look where you are walking.

Do not pick up any live snake. If you encounter a snake, walk around the snake, giving it plenty of room. A snake can strike half its length.

Don't pick up freshly killed snakes without first severing the head. The nervous system may still be active and a dead snake can deliver a bite.

3. Medical Follow-up

If you are bitten by a snake, the primary goal is to get to a hospital as soon as possible to receive professional medical evaluation and possible treatment with antivenom if warrented. Initial first aid should include: Wash the bite with soap and water. Immobilize the bitten area and keep it lower than the heart. Try to remain calm. If you are unable to reach a hospital within 30 minutes, a bandage, wrapped two to four inches above the bite, may help slow the venom. The bandage should not cut off blood flow from a vein or artery, make sure the band is loose enough that a finger can slip under it. A suction device from a commercial snakebite kit may be placed over the bite to help draw venon out of the wound.

Research has shown the following to be potentially harmful, DO NOT: apply ice, use a tourniquet, or make incisions into the wound.

E. Valley Fever

1. Background Information

Valley Fever is an illness that results from exposure to a fungal spore (*Coccidioides immitis*). It is endemic to the San Joaquin Valley in California as well as areas of Southwestern U.S., Mexico, Central and South America though it has been found in many other areas. It is particularly associated with arid soils that are not cultivated. Exposure is generally by inhalation of spores, though it may also enter through broken skin. Approximately two weeks after inhalation exposure, severe weakness and flu-like symptoms develop; severe pneumonia may occur. It may also affect the brain, bones, and joints causing disability, spinal meningitis, or death. Dermal forms of the infection can form disfiguring fungal lesions.

2. Precautionary Measures

Because it is associated with arid soils, personnel should avoid locations and activities that create dust. Persons at risk of exposure include geologists, surveyors, excavators, archaeologists, etc. Dust suppression

methods should be employed and the use of particulate respirators should be considered for areas known to harbor the fungus. At one phase of the fungus' life cycle, cottony, spider web-like growths may be seen on the soil surface. If observed, these growths must not be disturbed and work should be relocated if possible.

3. Medical Follow-up

Approximately 60% of exposed persons will not have symptoms. Persons that have been in areas associated with Valley Fever should be alert to the development of flu-like symptoms, fatigue, or skin rashes two to four weeks later. Valley Fever can be treated with anti-fungal medication. Early treatment is critical as disseminated forms of the disease can result in chronic disease or death.

F. Pathogenic organisms

1. Background Information

Employees who perform certain activities, such as disaster response, may be in areas where water-borne pathogens may be present. A partial list of agents includes: E. coli, Hepatitis A, typhoid, and cholera. Chemical hazards and molds and fungus may also be present. See SMS 51 for information concerning Bloodborne Pathogens.

2. Precautionary Measures

All work must be performed within the scope of either a Health and Safety Plan or Safe Work Plan that identifies the task hazards and specifies appropriate controls. A medical exam and/or inoculations may be required. See SMS 24, Medical Screening and Surveillance or contact the Occupational Health Manager for assistance.

Where contact with water or wet materials may occur, personnel must use protection such as impervious coveralls, boots/waders, faceshields, etc, as specified in the project Health and Safety Plan or Safe Work Plan. Personnel must protect any areas of broken skin, eyes, nose, and mouth from contact with potentially infectious materials and practice good personal hygiene before eating, drinking, etc.

3. Medical Follow-up

Medical evaluation and/or an inoculation schedule may be required prior to beginning work. Because early evaluation and treatment is more

successful, personnel should be alert to signs and symptoms of possible pathogenic organisms and seek prompt medical evaluation if illness develops or is suspected.

5. Documentation Summary

Complete and distribute a URS Incident Report form 49-1 for all work-related biological exposure incidents.

6. Resources

A. Centers for Disease Control
http://www.cdc.gov

B. U. S. Occupational Safety and Health Administration
http://www.osha.gov

C. U.S. Food and Drug Administration
Treating and Preventing Venomous Snake Bites
http://www.fda.gov/fdac/features/995_snakes.html

1. Applicability

This procedure applies to URS Corporation offices and field operations.

2. Purpose and Scope

The purpose of this procedure is to provide guidance for the timely reporting of work related injuries, illness, and incidents. This procedure also defines incident notification procedures for URS employees. Note – For incidents involving motor vehicles, the reporting and notification requirements of URS SMS 057 – Vehicle Safety Program may also apply.

For significant incidents (e.g., fatality, serious injury, injury to members of the public), SMS 066 – Incident Investigation is also required.

3. Implementation

Office Locations - Implementation of this program is the responsibility of the employee's Supervisor.

Field Activities - Implementation of this program is the responsibility of the Project Manager.

4. Requirements

A. Reporting: All employees shall immediately notify their appropriate level of management (line, project, and/or office) of a reportable incident. A reportable incident includes the following:

1. An injury or illness to any URS employee or subcontractor, even if the injury does not require medical attention;
2. An injury to a member of the public, including clients, occurring on a URS controlled work site;
3. Illness resulting from suspected chemical exposure;
4. Chronic or re-occurring conditions such as back pain or cumulative trauma disorders (example: carpal tunnel syndrome);
5. Fire, explosion, or flash;
6. Any vehicle accidents occurring on site, while traveling to or from client locations, or with any company-owned, rented, or leased vehicle (including personal vehicles used for company business);

7. Property damage resulting from any URS or subcontractor activity;
8. Structural collapse or potential structural hazards;
9. Unexpected release or imminent release of a hazardous material;
10. Unexpected chemical exposures to workers or the public;
11. A safety related complaint from the public regarding URS activities.
12. Incidents that could result in adverse public media interest concerning URS or a URS project.
13. Any incident that could result in, or any actual investigation by, OSHA, DOT, EPA, or State, Federal, or local law enforcement agency.
14. Any other significant occurrence that could impact safety – including a near-miss.

Note: A near-miss is defined as an incident having the potential to cause significant injury or property damage as listed above – but did not. Examples of a near-miss include:

A worker steps off a ledge and falls three feet (1 meter) to the floor – and is uninjured.

A crane drops a 1,000-pound (454 kg) beam during a lift – and nobody is hurt, no equipment is damaged.

A work crew is conducting a survey along the highway. A vehicle leaves the roadway (driver asleep) and the vehicle enters the survey area at 50 mph (80 kph). The vehicle misses an employee by 3-feet (1 meter), the driver recovers control of the vehicle and leaves the area.

B. Actions: The following actions will be taken following a reportable incident:

1. Employees:

   a. If necessary, suspend operations and secure and/or evacuate the area;

   b. Immediately notify your supervisor and/or project manager

   c. Record information pertaining to the incident (e.g., time, date, location, name and company of person(s) involved witnesses,

description of event, and actions taken) and initiate either an Incident Report (49-1) or Near-Miss Report (49-2);

d. Assist with incident investigation as directed by management;

e. Implement corrective actions as directed by management;

f. *Do not* discuss the incident with members of the news media or legal representatives (except URS legal counsel or your personal legal advisor) unless directed to do so by URS management;

g. *Do not* make statements pertaining to guilt, fault, or liability.

2. Line/Project Management:

a. For instances involving serious accidents, injuries, or other significant consequences, verbally notify the URS H&S Management Team as soon as possible at the following numbers:

In the U.S., Canada, and Mexico: (866) 326-7321
Fax +1 (512) 419 6413

In Europe: +44-1291-621768
Fax +44 1291 621768

In Asia/Pacific: +61 (3) 8699 7500
Fax +61 (3) 8699 7550

Notification should in no case occur later than the end of the work shift. Follow-up notification by faxing an SMS 49-1 Incident Report Form within 24 hours to the URS Occupational Health Manager (OHM) at +1-512.419.6413. Also, assure copies of the report are distributed as outlined on the form.

URS Corporate H&S Management will make notification to Federal and State authorities as appropriate.

b. For minor incidents involving only first aid treatment, minor damage to vehicle of equipment, etc., make notifications to the above number as soon as reasonable during normal business hours and fax the SMS 49-1 Incident Report Form to the URS

OHM within 24 hours at +1-512.419.6413. Also, assure copies of the report are distributed as outlined on the form.

c. For a near-miss incident, complete the Near-Miss Report Form (49-2) and give it to the Office or Project Health and Safety Representative. Also, assure copies of the report are distributed as outlined on the form.

d. Review circumstances (i.e., who, what, when, where, and how) of the incident with applicable employee(s) to determine apparent causes and to develop recommended corrective actions;

e. Discuss with department or project staff the circumstances surrounding the incident and corrective actions taken.

3. Local Office or Project Health And Safety Representative

a. Assist with incident evaluation;

b. With management, identify cause(s) of incident and identify corrective actions needed to avoid recurrence;

c. Review injury/incident report or the near-miss report for completeness and accuracy. Assure the reports are distributed properly.

d. Assure notifications are made in a timely manner.

e. Assure that the injured employee is properly counseled/advised as directed by SMS 65 - Injury Management. Communicate with the OHM at (866) 326-7321.

4. Occupational Health Manager

a. Report work-related injuries and illness to workers' compensation carrier.

b. Assure that the employee's injury is managed in accordance with SMS 065. Provide guidance for the affected Office or Project Health and Safety Representative.

c. Periodically disseminate near-miss reporting summary information to the Regional and Corporate H&S Managers.

5. Corporate Health and Safety Management

   a. Notify URS management of any significant occurrence including lost-time injuries, deaths, or other serious result or circumstance.

   b. The Occupational Health Manager (OHM) will review all reported incidents to determine OSHA reporting and recording requirements with input from the appropriate Corporate Health and Safety Manager. For a determination of recordability in those infrequent instances where there is not a clear answer, the Vice President, Health, Safety, and Environment shall make the final determination. All decisions will be based strictly on current Federal OSHA guidelines.

   c. Official records (including required reports and logs for all reported incidents) will be maintained at one central location by the OHM.

   d. Each January the OHM will prepare and distribute, to each URS establishment, the appropriate government injury/illness reports. These reports will summarize all required government information for incidents that occurred during the preceding calendar year.

5. Documentation Summary

A. File these records in the Office Safety File:

1. Attachment 49-1 - Incident Report Form
2. Attachment 49-2 – Near-Miss report

B. File these records in the Project Health and Safety File

1. Attachment 49-1 - Incident Report Form
2. Attachment 49-2 – Near-Miss report

URS	Health and Safety Program **INCIDENT REPORT FORM**	Attachment 49-1 Revision 2: May 2004

ADMINISTRATIVE INFORMATION:

URS Division/Company: _____

Project or Office: _____

Project Number: _____

Date/Time of Incident: _____ _____

Location/Client Name: _____ _____

TYPE OF INCIDENT (Check all applicable items)			
☐ Illness	☐ Injury	☐ Fire, Explosion, Flash	☐ Unexpected Exposure
☐ Property Damage	☐ Vehicular Accident	☐ Other (describe):	

FOR INJURIES/ILLNESS ONLY	
Name of Injured Employee _____	Phone No. _____
Describe Injury _____	
Medical Treatment / First Aid _____	

EMPLOYEES' DESCRIPTION OF INCIDENT: (Describe the facts contributing to the incident. Identify individuals involved, witnesses, and their affiliations. Attach additional sheets, drawings, or photographs as needed.)

_____

_____

_____

_____

_____

_____

_____

_____

Employee Name _____

Employee Signature _____ Date _____

URS	Health and Safety Program **INCIDENT REPORT FORM**	Attachment 49-1 Revision 2: May 2004

SUPERVISORS' DESCRIPTION OF INCIDENT: (Provide any additional/different details than provided by employee. Attach additional sheets, drawings, or photographs as needed.) Use additional sheets if necessary.

_____

_____

_____

_____

_____

CORRECTIVE ACTIONS (*For Internal Use Only*):

_____

_____

_____

_____

_____

REVIEWED BY:

Supervisor or Project Manager _____ Date _____

Office Manager _____ Date _____

Health and Safety Representative _____ Date _____

Supervisor must deliver this report to the office or project health and safety representative within 24 hours of the reported incident.

DISTRIBUTION: The Office or Project Health and Safety Representative distributes to:

- Office Manager
- Project Manager
- Project / Office file
- Regional Health and Safety Manager
- URS Occupational Health Nurses

  Fax: 512.419.6413
  URS Phone: 866.326.7321
  EG&G Phone: 866.344.1415

(For URS Asia/Pacific and Europe Operations – distribute this form in accordance with the directions in SMS 49.)

Note: The Regional Health and Safety Manager will distribute this Incident Report to other appropriate URS line managers as appropriate.

URS	Health and Safety Program **NEAR-MISS REPORT**	Attachment 49-2 Issue Date: Feb. 2003

URS Division/Company: _____

Project /Location _____

Date/Time of Near-miss: _____

Name of Preparer: _____ Date: _____

The following is an account of what happened:

_____

_____

_____

_____

I believe this could have resulted in injury and/or damage to: (Check all that pertain)

☐ **Personnel** ☐ **Property** ☐ **Equipment**

If these circumstances occurred:

_____

_____

_____

_____

I recommend the following actions to prevent this from occurring in the future:

_____

_____

_____

_____

_____

REVIEWED BY:

Project Manager _____ Date _____

Health and Safety Representative _____ Date _____

DISTRIBUTION:

- **Regional H&S Manager**
- **Project / Office file**
- **URS Occupational Health Manager**
  Fax: 512.419.6413
  Phone: 866.326.7321

1. **Applicability**

This program applies to all employees who may incur exposure to blood or other potentially infectious body fluids as a result of performing their assigned job duties. Examples include: designated first aid responders or work assignment at a client's medical laboratory site. Note: Sewage work does not typically involve exposure to bloodborne pathogens even though other biological hazards may be present.

2. **Purpose and Scope**

The purpose of this program is to identify jobs and tasks where occupational exposure to bloodborne pathogens (i.e. Human Immunodeficiency Virus, Hepatitis B and C Viruses, and others) may occur and to implement controls which will eliminate or significantly reduce the risk of infectious bloodborne diseases in accordance with the OSHA Bloodborne Pathogen Standard (29 CFR 1910.1030). This program also includes provisions for affected employees to receive personal protective equipment, Hepatitis B vaccinations, training, and if necessary, confidential medical evaluations and follow up.

3. **Implementation**

Office/Laboratory Locations – Implementation is the responsibility of the Operations Manager.

Field Activities – Implementation is the responsibility of the Project Manager.

Program Administration – The Occupational Health Specialist (OHS) and URS Health & Safety Director are responsible for implementation and annual evaluation of the Exposure Control Plan (ECP) – Attachment 51-1. The OHS will ensure that all medical actions required are performed and that the appropriate employee health and OSHA records are maintained. The URS Health & Safety Director will oversee provisions of necessary personal protective equipment and supplies, training, documentation of training, and will make the written ECP available to employees and OSHA representatives.

4. **Requirements**

A. Risk Identification

1. The Project Manager, with assistance from the site Health & Safety Representative, will perform an exposure determination concerning

which employee may or may not have exposure to bloodborne pathogens. Employees will be classified into two categories:

a. Employees formally designated as part of their job to perform tasks that may involve direct contact with blood or potentially infectious body fluids.

i. Requires initial and annual training

ii. Hepatitis B vaccination series will be offered

iii. Requires procedures be followed in ECP

b. Employees not assigned to jobs or tasks that involve exposure to blood or potentially infectious body fluids, but who could in extraordinary situations, voluntarily assist injured or ill individuals, and therefore could have exposure to bloodborne pathogens.

i. Requires post-exposure procedures outlined in ECP

2. The ECP will be reviewed and updated at least annually, and whenever necessary to include new or modified tasks and procedures.

B. Exposure Control Methods

1. All employees will utilize universal precautions – an approach to infection control where all human blood and body fluids are treated as potentially infectious.

2. Engineering and work practice controls (e.g. sharps disposal containers, perform procedures to prevent splashing) will be used to eliminate or minimize exposure to employees.

3. Personal protective equipment (e.g. disposable gloves, face masks with eye protection, liquid impermeable gowns, CPR pocket masks) will be provided and used in order to place a barrier between the employee and the blood or body fluids.

4. Hands are to be washed immediately with soap and water after removing gloves or performing any work with blood or body fluids.

5. Housekeeping and decontamination of work surfaces with EPA-registered germicides or a bleach solution diluted 1:10 with water, will be performed as needed to maintain a safe working environment.

6. Regulated biohazardous waste (contaminated sharps or items that are capable of releasing blood or body fluids through employee handling) will be disposed of in special waste receptacles lined with red bags and incinerated per federal and state regulations. This does not include small amounts of waste from a minor wound which can be sealed in a plastic bag and disposed of in regular trash.

C. Hepatitis B Vaccination series will be made available to all employees who have been designated to perform tasks that involve direct exposure to bloodborne pathogens. Further, this vaccination series will be made immediately available to employees that have had an occupational bloodborne exposure incident, whether as a result of their assigned tasks or occurring as a result of incidental contact.

D. In the event that an employee is exposed to blood or body fluids, they should immediately flush the affected area with copious amounts of water. A confidential medical evaluation and follow-up with an occupational physician should be arranged for the employee as soon as possible following the report of an exposure incident, preferably within 1-2 hours after the exposure incident has occurred.

E. Hazard Communication

1. Orange-red biohazard warning labels will be used to identify lab areas or disposal containers with blood or other potentially infectious materials present.

2. Initial and annual training classes will be conducted by the Division Health & Safety Managers for all employees assigned to tasks where occupational exposure may occur.

F. Exposure Incident Investigation

The OHS and Division Health & Safety Manager will review the circumstances of each exposure incident to determine if the appropriate work procedures were being followed at the time of the incident and to assess and implement any necessary corrective actions, including changes required in the ECP.

5. Documentation Summary

A. Distribute Medical Surveillance Evaluation form to Medical Services Provider, site Health & Safety Representative, and Supervisor.

B. Post-exposure medical records from consulting physician and exposure incident reports will be retained in employee's confidential medical record.

C. Send initial and annual training records to the Division Health & Safety Manager.

D. Regulated infectious medical waste manifest records will be stored by the site Health & Safety Representative.

6. Resources

A. U.S. OSHA 29 CFR 1910.1030 Occupational Exposure to Bloodborne Pathogens Standard, current revision.

B. Centers for Disease Control Morbidity and Mortality Weekly Report: "Public Health Service Guidelines for the Management of Health-Care Worker Exposure to HIV and Recommendations for Post-exposure Prophylaxis" May 15, 1998; Vol. 47, No. RR-7.

C. Centers for Disease Control Morbidity and Mortality Weekly Report: "Immunization of Health-Care Workers: Recommendations" December 26, 1997; Vol. 46, No. RR-18.

D. Centers for Disease Control Morbidity and Mortality Weekly Report: "Recommendations for Prevention and Control of Hepatitis C Virus (HCV) Infection and HCV-Related Chronic Disease" October 16, 1998; Vol. 47, No. RR-19.

E. Bloodborne pathogens standard and the construction industry (OSHA letter of interpretation 01-26-93)

F. Clarification on first aid requirements for hazardous waste sites (OSHA letter of interpretation 04-20-93)

G. Worksafe Australia: National Occupational Health & Safety Commission. National Code of Practice for health care workers and other people at risk of the transmission of Human Immunodeficiency Virus and Hepatitis B in the workplace. [NOHSC: 2010(1993)]

1. **Introduction**

Employees are at risk for exposure to and possible transmission of infectious diseases each time they are in contact with blood or body fluids. Bloodborne pathogens are microorganisms present in human blood and other body fluids that can cause serious disease in humans and include, but are not limited to Hepatitis B Virus (HBV), Hepatitis C Virus (HCV), and Human Immunodeficiency Virus (HIV). Therefore, this exposure control plan (ECP) has been established to ensure that employees are effectively informed concerning potential workplace health hazards and that protective measures necessary to eliminate or minimize bloodborne exposure incidents are utilized whenever possible.

2. **Exposure Determination**

The Medical Surveillance Evaluation form will be used to evaluate which employees may incur occupational exposure to blood or other potentially infectious materials when performing routine tasks and procedures. These exposure determinations will be made without regard to the use of personal protective equipment and regardless of exposure frequency.

The employees in the following job classifications may have occupational exposure to bloodborne pathogens and are covered by this program:

Occupational health nurse

Designated first aid providers

Medical laboratory employees

Tasks and procedures which may expose employees to bloodborne pathogens include:

Treating cuts, abrasions, and burns

Cleaning contaminated environmental surfaces

Administering cardiopulmonary resuscitation (CPR)

Collecting samples at municipal waste sites or sewage lagoons

Environmental sewer samplers or sewer construction workers

Construction of residential sewer lines

3. **Exposure Control**

A. "Universal precautions" are a required method of control to prevent exposure to blood and body fluids. This term refers to the concept that all human blood and certain human body fluids are treated as if known to be infectious for HIV,

URS | Health, Safety and Environment | Attachment 51-1
BLOODBORNE PATHOGENS EXPOSURE CONTROL PLAN

HBV, HCV, and other bloodborne pathogens, regardless of the perceived risk status of another individual. Universal precautions apply to blood, other body fluids containing visible blood, semen, and vaginal fluids. Universal precautions do not apply to feces, nasal secretions, saliva, sweat, tears, sputum, urine, and vomitus unless they contain visible blood. Although these fluids have an extremely low or nonexistent risk for bloodborne pathogens, they are a potential source for other infectious diseases and precautions should also be followed when these body fluids are present.

B. Engineering and Work Practice Controls

The following engineering controls shall be in place in all areas of occupational exposure:

1. Accessible handwashing facilities. If soap and running water are not available, an antiseptic hand cleaner in conjunction with clean paper towels or antiseptic towelettes are acceptable temporary alternatives to running water. When this alternative method is used, employees must wash their hands with soap and running water as soon as feasible.
2. Containers for disposable contaminated sharps will be puncture resistance, labeled a biohazard, leakproof, and have a closable top.
3. Containers for storage, transport, or shipment of blood or other potentially infectious materials, regulated waste, and contaminated laundry will be labeled with the biohazard symbol, site address, and have a securely closing lid.

The following work practice controls must be strictly followed to minimize exposure and isolate or remove bloodborne pathogens from the workplace:

4. Personal protective equipment will be provided at no cost to the employee will be chosen based on the anticipated exposure to blood. PPE is considered appropriate if it does not permit blood or other potentially infectious materials to reach or pass through clothes, skin, or mucous membranes of the eyes or mouth under normal conditions of use and for the duration of time the equipment will be used. PPE must be readily accessible and will be removed prior to leaving the work area.
   a. Disposable, single use gloves shall be used as a protective barrier in all situations in which contact with body fluids is anticipated. Gloves of the correct size will be provided. Disposable gloves will not be washed or disinfected for reuse and will be replaced between employees and if they become torn or punctured. Gloves are especially important if the employee has cuts, abraded skin, chapped hands, or dermatitis.

b. Liquid impermeable gowns, boots, and masks, in combination with eye protective devices such as goggles and shatterproof glasses with solid-side shields or chin-length face shields, shall be worn whenever splashing, spraying, or spattering of blood droplets or body fluids can be reasonably anticipated.

c. Disposable pocket mask ventilation devices should be provided in all first aid kits and used to avoid mouth-to-mouth contact during emergency cardiopulmonary resuscitation.

Examples of Recommended PPE (depending on task, more PPE may be needed).

Task	Gloves	Gown	Mask	Goggles	Boots
Bleeding control w/ minimal bleeding	Yes	No	No	No	No
Bleeding control w /spurting blood	Yes	Yes	Yes	Yes	No
Cardiopulmonary resuscitation	No	No	Yes	No	No
Decontamination/clean-up	Yes	No	No	No	No
Collection of sewage waste	Yes	No	No	Yes	Yes
Construction of sewage lines	Yes	No	No	Yes	Yes
Medical laboratory activities	Yes	Yes	Yes	Yes	No

5. Eating, drinking, smoking, applying cosmetics, and handling of contact lenses are prohibited in work areas where there is a reasonable likelihood of occupational exposure. Food and drink will not be kept in refrigerators, freezers, shelves, cabinets, or on counter tops where blood or body fluids are present.
6. Contaminated needles and other sharps will not be bent or recapped unless a one-handed technique is used. They will be disposed of in an appropriate sharps container.
7. All regulated, biohazardous waste will be placed in a waste receptacle that has designated red biohazard bags and a closable top controlled by a foot peddle. When full, the bags shall be removed with gloved hands, tied off, and placed in a biohazard shipping carton, to be held for pick-up. If any biohazard bag appears to be leaking, it must be double-bagged. The waste will be incinerated per federal and state regulations.

C. Housekeeping

1. Universal precautions will be used when cleaning or decontaminating any surface or equipment that may be contaminated. Appropriate PPE will be used for protection during decontamination.
2. All contaminated environmental work surfaces such as countertops or floors will be cleaned with a household bleach solution diluted 1:10 with water directly following contamination with blood or body fluids.
3. Instruments such as tweezers, bandage scissors, and thermometers will be disposable rather than reusable equipment and will be disposed of in an appropriate manner.
4. Broken, contaminated glassware will not be picked up directly with the hands. It will be cleaned up using a mechanical means such as a brush and dustpan or tongs.

4. Hepatitis B Vaccination

Within 10 working days of placement, all employees assigned to tasks with potential occupational exposure to bloodborne pathogens will be offered the Hepatitis B vaccination at no cost to the employee, unless the employee has had a previous Hepatitis B vaccination series, antibody testing reveals the employee is immune or the vaccine is contraindicated for medical reasons. Further, this vaccination series will be made immediately available to employees who have an occupational exposure whether as a result of their assigned tasks or occurring from an incidental contact.

The local occupational medical facility used for routine medical surveillance will administer the vaccinations.

Employees who decline the Hepatitis B vaccine will sign a copy of the waiver form located at the end of this attachment. The signed waiver will be stored in the employee's medical record with the Occupational Health Specialist. Employees may initially decline the vaccination, but at a later date, while still covered under this plan, may then decide to take them. The vaccinations will be made available to the employee at that time.

Employees choosing to take the vaccination series will sign a consent form at the occupational clinic prior to receiving the injections and are advised to read the package insert regarding the efficacy, safety, method of administration, and benefits of the vaccine. Employees may also ask questions directly of the Medical Service Provider or local occupational physician. Employees are not required to participate in a prescreening program (to determine immunity) before receiving the vaccinations. If a routine booster of Hepatitis B vaccine is recommended by the U.S. Public Health Service at a future date, such booster dose(s) will be made available to affected employees.

5. Post-Exposure Incident Evaluation And Follow-Up

All occupational bloodborne pathogen exposures are to be reported to a Health & Safety Representative or the Occupational Health Specialist immediately after initial decontamination first aid is accomplished. Following the report of an exposure incident, a confidential medical evaluation with an occupational physician will be arranged as soon as possible, ideally no later than 1-2 hours after the incident has occurred. In some states, depending on applicable workers' compensation law, employees may choose treatment from their personal physician. A copy of the Bloodborne Pathogen Standard will be provided if the physician does not have a copy. A written URS Incident Report will be completed as soon as possible, fully describing the incident.

A. First aid protocol for treatment immediately after an exposure incident:

1. Lacerations, punctures, and abrasions should be washed under cool running water for at least 5 minutes allowing free bleeding. Cleanse area well with soap or iodine solution. Apply sterile dressing as needed. Give tetanus booster if indicated (7-10 years since last booster).
2. Ocular exposure requires irrigation of the eye with water or sterile normal saline solution for 15 minutes.
3. Mucous membrane exposure requires rinsing mouth with ½ strength 3% hydrogen peroxide for 30 seconds, four separate and consecutive times.

B. Confidential Medical Evaluation

1. The treating occupational physician will receive documentation of the routes of exposure, the circumstances surrounding the incident, and identification of the source individual (the individual the employee was exposed to). The blood of the source individual will be tested if possible and after consent is obtained. When legally permissible, results of testing of the source individual will be made available to the exposed employee with the exposed employee informed about the applicable laws and regulations concerning the disclosure of the identity and infectivity of the source individual.
2. Testing of the exposed employee's blood, if consented to (the employee may consent to baseline blood collection, but may request that the sample not be tested for HIV for up to 90 days, it at all), is recommended.

3. Post-exposure medical treatment will be offered in accordance with the current recommendations of the U.S. Public Health Services. This may include, but is not limited to:
   a. A series of HIV post-exposure blood tests
   b. Hepatitis B vaccination and/or Hepatitis B immune globulin
   c. HIV post-exposure prophylactic medications
   d. Evaluation of acute febrile illnesses following exposure
   e. Employee counseling concerning precautions to take during the period after the exposure incident and information on signs and symptoms of potential illnesses.

C. Healthcare Professional's Written Opinion

The Occupational Health Specialist will obtain and provide the employee with a copy of the evaluating physician's written opinion within 15 days of the completion of the medical evaluation. A copy will be maintained in the employee's confidential medical record. The written opinion will be in accordance with the requirements of the Bloodborne Pathogens Standard indicating that the employee has been informed of any medical conditions resulting from exposure that require further evaluation or treatment. All other findings or diagnoses will remain confidential and will not be included in the report.

6. Hazard Communication

A. Fluorescent red or orange-red warning labels bearing the universal biohazard symbol and the legend BIOHAZARD must be firmly affixed to all containers (e.g. waste cans, sharps containers, and refrigerators) used for the storage or shipment of blood or other potentially infectious materials.

B. All employees designated to perform tasks involving occupational exposure shall receive bloodborne pathogens training at the time of initial assignment to the job. This training will be given during working hours and at no cost to employees. Refresher courses will be provided annually and if new tasks or procedures are implemented. Material appropriate in content and vocabulary to education level, literacy, and language of the employees shall be used for all required training. The Division Health & Safety Representatives will be the qualified instructors for the training classes.

Training will include: making accessible a copy of the regulatory text of the standard and explanation of its contents, general discussion on bloodborne diseases and their transmission, exposure control plan, engineering and work practice controls, personal protective equipment, hepatitis B vaccine,

response to emergencies involving blood, how to handle exposure incidents, the post-exposure evaluation and follow-up program, signs/labels/color-coding, and question and answer time with the trainer.

7. Exposure Incident Investigation

The site Health & Safety Representative will review the circumstances of any exposure incident to determine corrective actions. The incident report will include:

A. Engineering controls in use at the time

B. Work practices followed

C. A description of any equipment being used

D. A description of the work being performed

E. PPE that was used at the time of the incident

F. Date, time, and location of the incident

G. Employee's training

Within 24 hours, a copy of this incident report will be forwarded to the Occupational Health Specialist and Division Health & Safety Manager who will evaluate what follow-up actions should be addressed, including if revisions need to be made to the Exposure Control Plan.

8. Recordkeeping

A. The Occupational Health Specialist will be responsible for establishing and maintaining accurate, confidential workers' compensation medical records for each employee with occupational exposure for the duration of employment plus 30 years in accordance with OSHA 29 CFR 1910.1020 "Access to Employee Exposure and Medical Records".

B. The Division Health & Safety Manager will responsible for maintaining the bloodborne pathogens training class records for at least 3 years from the date of training. The records will include the date of the training class, a summary of the class contents, the names of the qualified instructors, and the names and job titles of person attending the training.

C. Employee medical records will be made available to employees (or their designated representative) with written consent by the employee within 15 working days of request.

D. An exposure incident will be evaluated by the Occupational Health Specialist and Corporate Health & Safety Managers to determine if the case meets OSHA's Recordkeeping Requirements (29 CFR 1904).

HEPATITIS B VACCINATION DECLINATION 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 be vaccinated with 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 hepatitis B vaccine, I can receive the vaccine series at no cost to me.

Name _____

Date _____

Witness _____

Date _____

1. Applicability

This program applies to URS projects in which truck-mounted, or other engine powered, drill rigs are used. For drill rigs operated by contractors, the primary responsibility for drilling safety is with the drilling contractor.

2. Purpose and Scope

The purpose of these guidelines is to provide an overview for working safely around drilling operations with truck-mounted and other engine-powered drill rigs. The procedure addresses off-road movement of drill rigs, overhead and buried utilities, use of augers, rotary and core drilling, and other drilling operations and activities.

3. Implementation

Field Activities: Drill rig safety and maintenance is the responsibility of the drill rig operator. URS employees are responsible for their own safety including recognizing and avoiding drill rig hazards. URS employees that observe a drill rig condition believed to be unsafe shall advise the drill rig operator of the unsafe condition.

If the drilling firm is a subcontractor to URS, work will be stopped if conditions are determined to be unsafe.

4. Safety Guidelines

A. General Guidelines

URS technicians, geologists, engineers, or other field staff assigned to observe drilling operations or collect soil samples should observe the following guidelines:

Require a meeting at project start-up regarding the drill rig operator responsibility for rig safety and any site and equipment specific safety requirements

Set up any sample tables and general work areas for the URS field staff to the side of the drill rig (preferably 10 meters away) and not directly behind the rig.

URS engineers, technician, and geologists shall not assist the drillers with the drilling equipment or supplies and shall not at any time operate the drill rig controls.

B. Movement of Drill Rigs

Before moving a rig, the operator must do the following:

To the extent practical, walk the planned route of travel and inspect it for depressions, gullies, ruts, and other obstacles.

Check the brakes of the truck/carrier, especially if the terrain along the route of travel is rough or sloped.

Discharge all passengers before moving on rough or steep terrain.

Engage the front axle (on 4x4, 6x6, etc. vehicles) before traversing rough or steep terrain.

Driving drill rigs along the sides of hills or embankments should be avoided; however, if side-hill travel becomes necessary, the operator must conservatively evaluate the ability of the rig to remain upright while on the hill or embankment. The possibility must be considered that the presence of drilling tools on the rig may reduce the ability of the rig to remain upright (raises the center of mass of the rig).

Logs, ditches, road curbs, and other long and horizontal obstacles should be normally approached and driven over squarely, not at an angle.

When close lateral or overhead clearance is encountered, the driver of the rig should be guided by another person on the ground.

Loads on the drill rig and truck must be properly stored while the truck is moving, and the mast must be in the fully lowered position.

After the rig has been positioned to begin drilling, all brakes and/or locks must be set before drilling begins. If the rig is positioned on a steep grade and leveling of the ground is impossible or impractical, the wheel of the transport vehicle should be blocked and other means of preventing the rig from moving or topping over employed.

C. Buried and Overhead Utilities

The location of overhead and buried utility lines must be determined before drilling begins, and the locations should be noted on boring plans and/or assignment sheets.

When overhead power lines are close by, the drill rig mast should not be raised unless the distance between the rig and the nearest power line is at least 20 feet (7 meters) or other distance as required by local ordinances, whichever is greater. The drill rig operator or assistant should walk completely around the rig to make sure that proper distance exists.

When the drill rig is positioned near an overhead line, the rig operator should be aware that hoist lines and power lines can be moved towards each other by wind. When necessary and approved by the Project Manager (PM), the utility and/or power lines may be shielded, shut down, or moved by the appropriate personnel.

For additional information, please refer to SMS 34 "Utility Clearances and Isolation".

D. Clearing the Work Area

Before a drill rig is positioned to drill, the area on which the rig is to be positioned should be cleared of removable obstacles and the rig should be leveled if sloped. The cleared/leveled area should be large enough to accommodate the rig and supplies.

E. Safe Use of Augers

Never place hands or fingers under the bottom of an auger flight or drill rods when hoisting the augers or rods over the top of another auger or rod in the ground or other hard surfaces, such as the drill rig platform.

Never allow feet to get under the auger or drill rod while they are being hoisted.

When the drill is rotating, stay clear of the drill string and other rotating components of the drill rig. Never reach behind or around a rotating auger for any reason.

Move auger cuttings away from the auger with a long-handled shovel or spade; never use hands or feet.

Never clean an auger attached to the drill rig unless the transmission is in neutral or the engine is off, and the auger has stopped rotating.

Do not wear loose clothing or jewelry while working near the drill rig. Long hair must be pulled back to avoid entanglement with moving parts.

Hearing protection is required when working near an operating drill rig.

F. Safe Use of Hand Tools

Regulations regarding hand tools should be observed in addition to the guidelines provided below:

Each tool should be used only to perform tasks for which it was originally designed.

Damaged tools should be repaired before use or discarded.

Safety goggles or glasses should be worn when using a hammer or chisel. Nearby co-workers and by-standers should be required to wear safety goggles or glasses also, or move away.

Tools should be kept cleaned and stored in an orderly manner when not in use.

G. Safe use of Wire Line Hoists, Wire Rope, and Hoisting Hardware

Safety rules described in Title 29 Code of Federal Regulations (CFR) 1926.552 and guidelines contained in the Wire Rope User's Manual published by the American Iron and Steel Institute shall be used whenever wire line hoists, wire rope, or hoisting hardware are used. The driller should provide written reports (upon request) documenting inspections of equipment.

H. Traffic Safety

Drilling in streets, parking lots or other areas of vehicular traffic requires definition of the work zones with cones, warning tape, etc. and compliance with local police requirements. Refer to SMS 32 "Work Zone Traffic Control".

I. Fire Safety

Fire extinguishers (type ABC) shall be kept on or near drill rigs for fighting small fires.

If methane or other flammable gases or vapors are suspected in the area, a combustible gas indicator (CGI) shall be used to monitor the air near the borehole with all work to stop at 20 percent of the Lower Explosive Limit (LEL).

Work shall stop during lightning storms.

J. Drilling at Potential MEC/UXO Sites

If the project site is suspected of munitions and explosives of concern (MEC) or unexploded ordnance (UXO) contamination, the UXO team will conduct a reconnaissance and MEC/UXO avoidance to provide clear access routes to each site prior to drilling crews entering the area. The following procedures will be implemented:

Drilling operations on MEC/UXO sites will not be conducted until a complete plan for the site is prepared and/or approved by the URS

UXO Safety Officer. MEC/UXO avoidance must be conducted during drilling operations on known or suspect MEC/UXO sites (SMS-039).

The UXO team will identify, and clearly mark the boundaries of a clear approach path for the drilling crews, vehicles, and equipment to enter the site. This path will be, at a minimum, twice the width of the widest vehicle. No personnel will be allowed outside any marked boundary.

If MEC/UXO is encountered on the ground surface, the UXO team will clearly mark the area where it is found, report it to the proper authorities, and divert the approach path around it.

The UXO team will conduct an access survey using the appropriate geophysical instrument over the approach path for avoidance of MEC/UXO that may be in the subsurface. If a magnetic anomaly is encountered, it will be assumed to be MEC/UXO and the approach path will be diverted around the anomaly. UXO personnel only will operate the appropriate geophysical instrument and identify MEC/UXO.

An incremental geophysical survey of the drill hole location(s) will be initially accomplished by the UXO team using a hand auger to install a pilot hole. If MEC/UXO is encountered or an anomaly cannot be positively identified as inert material, HTRW sampling personnel will select a new drill hole location.

Once a drilling site has been surface cleared and a pilot hole established as described above, the drilling contractor will be notified that the site is available for subsurface drilling.

Additional guidance for MEC/UXO support during drilling activities is provided in URS SMS 039.

K. Protective Gear

1. Minimum Protective Gear

Items listed below should be worn by all staff working within 30 feet (10 meters) of drilling activities.

Hearing Protection;

Hard Hat;

Eye Protection (safety glasses, goggles, or face-shield)

Safety Shoes (shoes or boots with steel toes)

2. Other Gear

Items listed below should be worn when conditions warrant their use. Some of the conditions are listed after each item.

Safety Harnesses and Lifelines: Safety harnesses and lifelines shall be worn by all persons working on top of an elevated derrick beam or mast. The lifeline should be secured at a position that will allow a person to fall no more than six feet (2 meters). OSHA Fall Protection (1926 Subpart M) requirements apply.

Life Vests: Use for work over water.

5. Resources

A. International Association of Drilling Contractors Safety Alerts http://iadc.org/alerts.htm

B. Fall Protection - SMS 040

C. Hearing Conservation - SMS 026

D. Subcontractor Health and Safety Requirements - SMS 046

E. Utility Clearances and Isolation - SMS 034

F. Munitions Response / Munitions and Explosives of Concern - SMS 039

G. Environmental Remediation Drilling Safety Guideline

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1. Applicability

This procedure applies to all URS Corporation operations.

This Safety Management Standard (SMS) applies to employees operating motor vehicles that are owned, rented or leased by the Company, and the use of personal vehicles while on Company business.

This SMS does not apply to heavy equipment operations (see SMS 019).

2. Purpose and Scope

This Safety Management Standard sets for the policies that will help URS minimize losses, injuries, and legal liabilities associated with improper vehicle use.

The Standard applies to operations world-wide. Some terminology may need to be read in context of local or national regulations for countries outside the US.

3. Implementation

The overall responsibility for program implementation is with the URS Office Manager. Other responsibilities include:

Administration -	Fleet management, participation in the Vehicle Safety Program, vehicle acquisition, insurance claims reporting, controlling access to vehicles, maintenance of vehicles, participating on accident review processes.
Human Resources -	Documentation of driver's license annually, participation in the accident review processes.
Health and Safety -	Employee safety training, maintenance of the vehicle safety program, and participation in the accident review processes.
Employee -	Familiarization with URS Vehicle Safety Program and compliance with its requirements.

4. Requirements

A. Authorized Drivers

1. Authorized Drivers are those individuals permitted to drive URS owned, leased, or rented vehicles, and employees driving a personal vehicle for work purposes being reimbursed mileage.

2. Must be at least 18 years of age (non-commercial license) or 21 years of age (commercial license) and have a current driver's license for the appropriate class of vehicle (unless more stringent requirements are established by the leasing/renting agency).

3. Human Resources / Administration will annually obtain and review a copy of the state issued drivers license for all Authorized Drivers. The Operating Unit Manager shall audit this function annually. URS employees that are Authorized Drivers shall provide a copy of their driver's license upon request. Authorized drivers who lose their license through legal action ***must*** notify their Human Resources Representative immediately. The Human Resources Representative will notify the Fleet Manager.

4. Authorized drivers must:

   a. Review the Vehicle Safety Program (SMS 057) and sign the Drivers Information form (Attachment 57-2) annually.

   b. Report any conviction for driving under the influence of drugs or alcohol to the HR representative responsible for your office or operation.

   c. Complete vehicle safety training; URS web-based training module, or other sanctioned driving courses described in section - 4.B. Training.

   d. Report all accidents. If the authorized driver has an accident in a URS owned, rented or leased vehicle, the accident must be reported immediately to the Office Manager. The SMS 57-1 form must be completed and submitted to the local Fleet Manager and copied to the Regional HS&E Manager (see 57-1 for reporting instructions).

   e. Cooperate with any URS investigation concerning the accident.

   f. Complete remedial driver safety training described in 4.B.2 as appropriate following an accident.

5. Non-URS employees (e.g., subcontractors, alliance partners) may operate URS vehicles only when this activity is specifically agreed to in the applicable contract, and only within the parameters of the contract and project plans.

6. URS operations or offices that plan vehicle use that requires compliance with Federal motor carrier regulations, the affected Office Manager must obtain approvals from the URS Health and Safety Director and the URS Fleet Manager. This requirement typically applies to vehicles with a gross vehicle weight over 10,000 pounds or vehicles used for hazardous materials transport. The driver must have an appropriate commercial driver's license and may be subject to medical surveillance (see SMS 24).

7. Only Authorized Drivers can be reimbursed mileage for the use of their person vehicle on company business. Requests for reimbursements for mileage by non-designated drivers shall be denied.

B. Training

1. Authorized Drivers shall be provided basic driver safety training, including a review of the URS Vehicle Safety Program (SMS 057) and the on-line training, within 6 months of the effective date of this SMS or within 3 months of their hire date. Other training may be substituted for the on-line training if approved by the URS Regional Health and Safety Manager. Alternative training may include commercially available driver safety videos, presentations by local law enforcement officers, or training by the URS Regional Health and Safety Manager.
2. Additional training is required for employees that have been involved in a vehicle accident where $2,000 in damages was sustained or when the accident includes a police citation. This additional training will be in the form of a 4-hour web-based training provided through the National Safety Council. The site is located at http://www.safetyserve.com/urscorp. Use **URSDDC** as the access code.
3. All Authorized Drivers who drive permanently assigned URS owned or leased vehicles are required to complete the 4-hour National Safety Council web based training at the web site in the above paragraph.

C. General Operating Policy and Procedure (Applies to Authorized and Non-Authorized Drivers Operating Motor Vehicles on Official Company Business)

1. Only properly licensed employees who are specifically authorized to drive Company vehicles may operate company owned/rented/leased motor vehicles.
2. Authorized drivers required to operate vehicles with special hazards (i.e. trucks carrying fuel cells, vehicles used to tow trailers, vehicles with limited visibility, etc.) shall be thoroughly briefed on the hazards and control measures necessary for safe operation of the vehicle. The local office shall maintain documentation of the briefing.
3. Drivers/operators shall know and obey all federal, state and local motor vehicle laws applicable to the operation of their vehicle.
4. A driver shall not permit unauthorized persons to operate a URS owned/rented/leased vehicle.
5. URS policy regarding reimbursement and insurance coverage requirements for use of personal automobiles may be found in the Policy and Procedures Manual (Section 074.020). Only Authorized Drivers may be reimbursed mileage for the use of a personal vehicle.
6. All cargo extending 4 feet or more beyond the end of a truck, trailer or similar vehicle shall be clearly marked with a red warning flag or cloth measuring no less than 16 inches square. Red lights must be used at night.

7. Company owned/rented/leased vehicles are for official business use only and are not to be used for personal activities without the specific approval of a Division Manager, Senior Vice President, or the URS Fleet Manager.
8. Seat belts and shoulder harnesses (occupant restraint systems) shall be worn or used whenever the vehicle is in operation. The vehicle may not move until all passengers have fastened their restraints.
9. When parking or leaving a vehicle, the following procedures must be followed: Shut off the engine, engage the transmission in park (automatic transmission) or first gear (standard transmission), set the parking brake, remove the ignition keys, and lock the vehicle.
10. The vehicle's engine is to be turned off during refueling. Smoking or cell phone use is not allowed while refueling.
11. Drivers/operators will not drive or operate vehicles while under the influence of alcohol or illegal drugs. Further details on the URS Substance Abuse Policy may be found in the Policy and Procedure Manual (section 034.030).
12. Drivers/operators will not drive or operate vehicles while under the influence of medications when told by a physician, another healthcare provider, or the manufacturer (i.e. instructions on the label) that the activity is unsafe.
13. Vehicle operators are responsible for any fines levied by law enforcement agencies for the operation of their vehicles.
14. Driver/operators may not deactivate or muffle any backup warning device.
15. Distractions while driving are a major cause of accidents. Distractions include the use of cellular phones, eating, and engaging in intense conversations. URS Authorized drivers must exercise proper control of the vehicle at all times, including the management of possibly distracting actions and behaviors. The use of hands-free devices for the cell phones is required. If you need to make a call on a cell phone, have a colleague dial the number or pull over and park in a safe area. If you have to eat, pull over and park. If you become engaged in an intense conversation to the point of distraction, pull over and park or end the conversation.

D. Field Site Vehicle Safety

1. Define specific vehicle travel routes and parking areas at field sites. Use fencing, cones or other markings to define roads and parking. SMS 32 provides additional information on Work Zone Traffic Control.
2. If parking on the shoulder of an active road, park as far off the road as possible.
3. If work is required alongside an active road (e.g., surveying) park the vehicle behind the area of work to provide a barrier against out-of-control vehicles.
4. URS will not transport DOT-placard quantities of hazardous materials. However, small quantities of hazardous materials (e.g., sample coolers)

may be transported if properly packaged. Be careful to prevent chemical contamination of the vehicle. Further details on DOT shipping may be found in the DOT Shipping SMS 048.

5. Nuclear density meters (e.g., Troxler units) may be transported only by employees who have been trained in the use of nuclear density meters (see SMS 044). Nuclear density meters must be secured from movement and locked during transport. NRC and state-specific regulations regarding transport documentation also apply.
6. When performing fieldwork requiring the blocking of traffic lanes (e.g., bridge inspection), follow URS SMS 032, the Manual on Uniform Traffic Control Devices for Streets and Highways (ANSI D6.1) and local police requirements for barriers, cones, and flaggers.
7. No employee may ride in the bed of a pickup truck unless seating and restraints are provided for this specific use.
8. Articles, tools, equipment, etc. placed in vehicles shall be stored as not to interfere with vision or the proper operation of the vehicle in any way. This also includes preventing items from flying about or out of the vehicle during sudden stops, turning, etc.
9. Trucks or vehicles with obstructed rear-view mirrors must observe the following procedures when backing up: Position an employee to act as a spotter at the rear of the vehicles, in the driver's line of sight, to ensure that the area behind the truck is clear. If no other employee is present, then the driver must step out of the vehicle and check the area behind the vehicle before backing up. As an added precaution, avoid backing up whenever possible.

E. Accident Response and Reporting

1. In case of injury, call or have someone else call, 9-1-1 immediately for emergency assistance. If you are involved in an accident and are not injured, do the following:
   a. Protect the accident scene.
   b. Do not admit liability or place any blame for the accident.
   c. Provide only your name, address, driver's license number, and vehicle insurance information.
   d. Obtain the following:
      i. name(s), addresses, and telephone number(s) of the owner
      ii. driver and occupants of other vehicle(s)
      iii. the owner's insurance company
      iv. driver's license number
      v. year, make, model and license number of the vehicle(s)
      vi. name(s) and addresses of any witnesses

   e. **DO NOT:**

      Call the insurance company; the Fleet Manager's office will do this (unless the incident involves your personal vehicle).

      Give a statement to the press.

      Give a signed statement to the claims adjuster representing the other driver's insurance company.

      NOTE: The Auto Claim Report (Attachment 57-1) for Company-leased or owned vehicles is located in the vehicle glove compartment. The driver must complete this form at the scene of the accident and submit it to management along with a copy of the most recently submitted SMS 57-2 Driver's Information form.

2. Notification

   All accidents with a Company-leased, rented, or owned vehicle must be reported to your Office/Branch Manager/Supervisor and Regional HS&E Manager and local Fleet Manager within 24-hours of the time it occurs. Use the Auto Claim Report (Attachment 57-1) for this purpose. The Fleet Administrator will report the accident to the insurance carrier (leased and owned vehicles only) promptly.

F. Accident Review

1. A violation of the policy in this Vehicle Safety SMS is subject to disciplinary action up to and including termination. The Fleet Manager will review all accidents involving URS-owned, rented or leased vehicles.
2. The Company may suspend the privilege to operate vehicles on Company business due to non-compliance with the URS Vehicle Safety Program, involvement in a motor vehicle accident, or resulting citations or other legal actions associated with motor vehicle violations. Personnel authorized to suspend an employee's status as an Authorized Driver include:
   a. A Project Manager with responsibility for dedicated vehicles on a site. The suspension is applicable to those site vehicles only.
   b. A URS Operations Manager responsible for the employee.
   c. The URS Fleet Manager.
   d. The URS Health and Safety Director.
3. The employee's driving privileges ***will be*** suspended for any of the following:
   a. Accidents or legal action involving alcohol or drug use (e.g., DUI).

b. Driving without a license.

c. Hit-and-run driving / leaving the scene of an accident.

d. Unauthorized use of Company vehicles (i.e. using a company vehicle for moving personal items, carrying passengers who are not associated with work activities, etc...).

4. The employee's driving privileges ***may be*** suspended for any of the following:

   a. Two or more accidents involving the same Authorized Driver within a 12 month period

   b. Multiple speeding tickets or multiple citations for violations of the motor vehicle code.

   c. Multiple complaints from other employees or members of the public about driving performance.

   d. Any accident caused by a URS Authorized Driver where damages exceed $2,000.

5. An Authorized Driver's driving privileges may be reinstated if:

   a. For any suspension resulting from law enforcement agency legal action involving drugs and alcohol on the part of the former Authorized Driver– the driving privileges may be reinstated only by concurrent agreement from the Operating Unit Manager, the URS Fleet Manager, the URS Health and Safety Director, and the appropriate Human Resources Regional Manager.

   b. For those Authorized Driver's privilege suspensions that are not related to driving under the influence of drugs or alcohol, privileges may be reinstated with concurrent agreement by the URS Operating Unit Manager and the URS Health and Safety Director upon completion of required remedial training (see section 4.B.2 of this SMS).

6. Disciplinary action includes possible:

   a. Loss of URS driving privileges

   b. Additional driver safety training (required for accidents resulting in more that $2,000 in damages – optional for all other accidents).

   c. Suspension without pay

   d. Termination

G. Inspection

   1. The driver is responsible for inspecting the vehicle prior to use and not driving a vehicle with obvious safety defects.

   2. Basic safety checks must include:

      a. Tire condition/pressure

      b. Lights/turn signals

      c. A clean windshield and adequate window washer fluid

      d. Gauges/warning lights indicating a normal condition

      e. Mirrors properly adjusted

      f. Brakes with adequate pedal pressure for proper braking

      g. Any defects must be reported to the local office Fleet Representative/Office Administrator.

      h. Vehicle Maintenance

      i. The Office Administrator (or designee) is to ensure that all URS-leased/owned vehicles are properly maintained.

      j. Routine maintenance must be performed in accordance the schedule provided in the owner's manual stored in the vehicle.

      k. Reported defects/problems with vehicles must be repaired promptly.

5. Documentation Summary

A. Auto Claim Report - (Attachment SMS 57-1)

B. Driver's Information - (Attachment SMS-57-2)

6. References

The following sites provide additional information to assist you:

A. National Safety Council; Information on Defensive Driving Courses
http://www.nsc.org/psg/ddc.htm

B. AAA Foundation for Traffic Safety
http://www.aaafts.org/

C. 4-Hour Defensive Driver Training
http://www.safetyserve.com/urscorp password: URSDDC

URS	Health and Safety Program AUTO CLAIM REPORT	Attachment 57-1 Page 1 of 2 Revision 3: March 2006

To be used for **all** vehicle accidents involving URS-leased/rented/owned vehicles and for personal vehicles used on company business.

Name of Employee Involved in Accident _____

Was the employee injured? Yes ❑ No ❑ **Job Title:** _____ **Age:** _____

Was anybody else injured? _____

Office Location _____ **Contact Person** _____

Phone Number _____ **Fax Number** _____

Describe Injury (including medical treatment, if any):

Company Vehicle ❑ On Company business at the time of accident? Yes ❑ No ❑
Personal Vehicle ❑ Vehicle Identification Number (company or personal):
Rental Vehicle ❑ _____

Year _____ Make _____ Model _____

Other Driver's Information

Name _____ Phone Number _____

Address _____

Insurance Co. _____ Policy # _____

License Plate # _____ Make _____ Model _____

Description of Accident

Date of Accident _____ Police Report # _____

Location of Accident _____ Police Department _____

Description (provide a clear, inclusive description of the accident):

_____

_____

_____

_____

Accidents should be reported immediately to the Office Administrator who will then forward the information to:

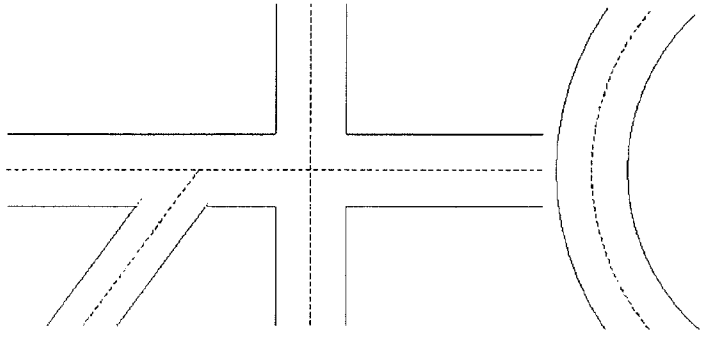
All accidents occurring in the US shall be reported to:
URS Corporation
Kay Tenuta in the Tampa, FL. Office.
813-636-2196, 813-636-2111 (Fax)

All accidents occurring outside the US shall be reported to the Regional HS&E Manager.

URS	Health and Safety Program AUTO CLAIM REPORT	Attachment 57-1 Page 2 of 2 Revision 3: March 2006

To be used for **all** vehicle accidents involving URS-leased/rented/owned vehicles and for personal vehicles used on company business.

Draw a diagram showing the position of vehicles before and after the accident. Correct the diagram to fit your situation.



Check all applicable conditions on each subject

WEATHER
- ❑ Clear
- ❑ Cloudy
- ❑ Fog
- ❑ Rain
- ❑ Snow
- ❑ Sleet
- ❑ Other

LIGHTING
- ❑ Daylight ❑ Dark
- ❑ Dusk ❑ Dawn
- ❑ Dark - no street lights on
- ❑ Dark - street lights on
- ❑ Headlights
- ❑ Headlights on dim
- ❑ Headlights on bright
- ❑ No lights on

ROAD SURFACE
- ❑ Dry
- ❑ Wet
- ❑ Muddy
- ❑ Snowy
- ❑ Snow-covered
- ❑ Ice in places
- ❑ Ice -covered
- ❑ Other

ROAD DESCRIPTION
- ❑ Straight ❑ Curve
- ❑ Level
- ❑ Hill ❑ Up ❑ Down
- ❑ Paved ❑ Black top
- ❑ One-way
- ❑ Two-way
- ❑ Divided road
- ❑ Intersection

ACTION OF DRIVER	You	Other
Exceeding safe speed		
On wrong side of street		
Did not have right-of-way		
Disobeyed traffic signal		
Passed illegally		
Improper turning		
Improper backing		
Following too closely		
Failure to signal		
Improper lane change		
Misjudged clearance		
Other		

What was speed limit? _____ MPH

Witnesses? ❑ Yes ❑ No

Traffic control
- ❑ Signal lights
- ❑ Caution lights
- ❑ Stop sign
- ❑ Police officer
- ❑ None ❑ Other

Witness Name _____

Address _____

_____

Name _____

Address _____

URS	Health, Safety and Environment **DRIVERS INFORMATION**	Attachment 57-2

Policy

All Company employees who operate a vehicle on company business must comply with the URS Vehicle Safety Program (SMS 57). Violation of this policy is subject to disciplinary action up to and including termination.

License

I currently have a valid driver license and authorize URS, its agents, or insurance carrier to verify my motor vehicle record.

I agree to notify URS Administration immediately if my driver's license is suspended or revoked.

Please Print Legibly

Name _____ _____ _____ Date of Birth _____
First Middle Last

License Number _____ State _____ Class _____

Employee Signature _____ Date _____

Repeated accidents, loss of driver's license, or violation of URS' Vehicle Safety Program will result in loss of permission to drive on Company business.

(Attach the applicant's driver's license to this space and photocopy this sheet. All information on the license must be legible after photocopying.)

URS	Health, Safety, and Environment **ACCIDENT REVIEW & CLASSIFICATION CHECKLIST**	Attachment 57-3

The Accident Review Committee may use this checklist as a guide for determining if the accident was **preventable** or **non-preventable**.

If the answer to any of the following questions is "no", our driver failed to make the correct decisions and contributed to the accident. Please check the appropriate answer.

	YES	NO
INTERSECTIONS		
Did our driver approach the intersection at a controlled speed that was reasonable for the conditions?		
Was our driver prepared to stop before entering the intersection?		
Did our driver make certain the other driver was stopping for a traffic light or stop sign?		
Did our driver obey all traffic signs?		
Did our driver signal well in advance of his/her change in direction?		
Did our driver turn from the proper lane?		
Was he/she alert for the turns of other vehicles?		
Did he/she avoid overtaking and passing in the intersection?		
Did he/she refrain from jumping the green signal?		
Did our driver refrain from attempting to pass through on a late yellow or an early red signal?		
Did he/she follow the precautionary steps required when approaching a flashing red or yellow signal?		
Did our driver pull out slowly at a blind corner, prepared to stop his/her vehicle if necessary?		
REAR ENDED OTHER VEHICLE		
Was our driver maintaining a safe following distance for speed, traffic and weather conditions?		
Did he/she approach the green traffic light cautiously, expecting the driver ahead to stop suddenly on a signal change?		
Did he/she allow the driver ahead to develop adequate space before moving ahead from a standing start?		
Did he/she keep from skidding?		
BACKING		
Was it necessary to back?		
Did our driver have to park so close to the vehicle ahead as to require backing to leave the parking space?		
Was it necessary to drive into the narrow street, dead-end alley or driveway from which he/she backed?		
If he/she could not see where they were backing:		
Did he/she try to get someone to guide them?		
Did our driver look all around the vehicle before getting in?		
Did he/she back immediately after looking?		
Did he/she use the horn while backing?		
Did our driver look to the rear without depending on the rear vision mirror?		
If the distance was long, did he/she stop, get out and look around occasionally?		

URS	Health, Safety, and Environment **ACCIDENT REVIEW & CLASSIFICATION CHECKLIST**	Attachment 57-3

	YES	NO
Did he/she back slowly?		
Did our driver judge backing clearance accurately?		
PULLING OUT FROM THE CURB		
Did our driver look to the rear and front for approaching traffic immediately before starting to pull out?		
Did he/she look back rather than depend upon rear vision mirror?		
Did he/she signal before pulling from curb?		
Did our driver start out only when his/her action would not require traffic to change its speed or direction to avoid him/her?		
Did he/she continue to glance back as he/she pulled out?		
SKIDDING		
Was our driver driving at a speed safe for condition of weather and road? (i.e., fog, steam, dust)		
Was he/she keeping a safe following distance?		
Was he/she expecting ice on and under bridges, in gutters, ruts and near the curb?		
Was he/she alert for melting snow, freezing in the shade, loose gravel, sand, ruts, etc.?		
Did he/she keep out of rail tracks and cross them at wide angles?		
Were the steering and braking actions proper?		
PASSING		
Did our driver see enough clear space beyond the vehicle ahead to make the pass safely?		
Did he/she build up enough acceleration before starting the pass to ensure that he would not remain in the oncoming lane unduly long on a two lane road?		
Did he/she stay inside the no-passing lane markings?		
Did our driver allow enough clearance before pulling back into the right lane?		
HEAD-ON COLLISION: OUR DRIVER'S ACTIONS		
If there was early indication of erratic driving by the oncoming operator, did our driver immediately begin evasive action?		
Did he/she blow the horn and flash the lights?		
Did he/she slow down quickly and drive to the extreme right side of the road and stop?		
PEDESTRIANS		
Did our driver pass through congested sections anticipating that pedestrians might step in front of the vehicle?		
Did he/she keep as much clearance between the vehicle and parked cars as safety permitted?		
Did he/she refrain from passing vehicles that had stopped to allow pedestrians to cross?		
Did he/she check the location of pedestrians before starting on the green signal or riding through on a yellow clearance indication?		
Was our driver aware of groups of children and prepared to stop in the event one ran into the street suddenly?		
Did he/she give all pedestrians the right of way?		
Did he/she tap the horn to alert the pedestrian of his/her approach?		
Did he/she refrain from passing a school bus which was stopped?		

2

URS	Health, Safety, and Environment **ACCIDENT REVIEW & CLASSIFICATION CHECKLIST**	Attachment 57-3

	YES	NO
PARKED		
Was our driver parked on the proper side of the road?		
Was it necessary to park near the intersection?		
Did he/she have to park on the traveled portion of the highway, on the curve, or on the hill?		
Did he/she park parallel to curb and not more than I S" from it?		
Was it necessary to park close to an alley or directly across from a driveway?		
MISCELLANEOUS/OTHER CONSIDERATIONS		
Collision with train		
Our driver fell asleep		
Hit stationary object (other than listed previously)		
Open load fell off (not properly secured or regularly checked en route)		
Vehicle door(s) flew open en route, struck other vehicle, or cargo fell out and caused accident to following vehicle (usually applicable)		
Visibility obstructed by fog, steam or bad weather conditions		

NOTES: _____

Accident Review Committee Members: _____

Employee Reviewed: _____

Date of Review: _____ **Accident Date:** _____

3

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1. Applicability

This procedure applies to URS projects where field crews are working outdoors in damp and cool (below 50° F or 10°C) conditions or anytime temperatures are below 32°F or 0°C.

2. Purpose and Scope

The purpose of this procedure is to protect project personnel from the following conditions:

Hypothermia: Hypothermia results when the body loses heat faster than it can be produced. When this situation first occurs, blood vessels in the skin constrict in an attempt to conserve vital internal heat. Hands and feet are first affected. If the body continues to lose heat, involuntary shivers begin. This is the body's way of attempting to produce more heat, and it is usually the first real warning sign of hypothermia. Further heat loss produces speech difficulty, confusion, loss of manual dexterity, collapse, and finally death. Wet clothes or immersion in cold water greatly increases the hypothermia risk. The progressive clinical presentation of hypothermia may be seen in Attachment 59-1.

Frostbite: Local injury resulting from cold is included in the generic term frostbite. There are several degrees of damage. Frostbite can be categorized into:

Frost Nip or Initial Frostbite: (1st degree frostbite) Characterized by blanching or whitening of skin.

Superficial Frostbite: (2nd degree frostbite) Skin has a waxy or white appearance and is firm to the touch, but tissue beneath is resilient. Blistering and peeling of the frozen skin will follow exposure.

Deep Frostbite: (3rd degree frostbite) Tissues are cold, pale, and solid; extremely serious injury with possible amputation of affected area.

Frostbite can occur without hypothermia when the extremities do not receive sufficient heat. The toes, fingers, cheeks, and ears are the most commonly affected. Frostbite occurs when there is freezing of the fluids around the cells of the affected tissues. The first symptom of frostbite is an uncomfortable sensation of coldness, followed by numbness. There may be tingling, stinging, or cramping. Contact by the skin with tools or other metal objects below 20°F (-7°C) may result in contact frostbite.

3. Implementation

Field Activities - Implementation of this procedure is the responsibility of the Project Manager and the field supervisor.

4. Requirements

A. Carefully plan work anticipated to be performed in cool or cold conditions. Include costs in project budgets for specialized equipment and supplies needed to complete the field activities.

B. Monitor weather forecasts immediately prior to entering the field.

C. Observe and monitor weather conditions such as ambient temperature, wind speed, and precipitation while in the field. Use Attachment 59-2 to determine wind chill.

D. Wear at least 3 layers of clothing.

An outer layer to break the wind and allow some ventilation (e.g., Gortex® or nylon)

A middle layer of down, wool, or similar materials to provide insulation

An inner layer of cotton or synthetic weave to allow ventilation

In addition:

Wear a hat. Up to 40% of body heat can be lost when the head is left exposed.

Wear insulated boots or other insulated footwear.

Keep a change of dry clothing available in case work clothes become wet.

Do not wear tight clothing. Loose clothing allows better ventilation.

E. Use the following work practices:

Use Attachment 59-3 to establish work/rest cycles in cold weather.

Drink plenty of warm liquids. It is easy to become dehydrated in cold

weather.

Avoiding caffeine and alcohol. Alcohol will accelerate loss of body heat.

Eat high calorie snacks to help maintain body metabolism.

If possible, heavy work should be scheduled during the warmer parts of the day. Take breaks out of the cold.

Work in pairs to keep an eye on each other and watch for signs of cold stress.

NEVER IGNORE SHIVERING. Persistent or violent shivering is a clear warning that you are on the verge of hypothermia.

Avoid exhaustion.

F. When possible, use the following engineering controls:

Provide shelter to escape cold, wind and precipitation

Provide a source of heat (such as warm packs or portable heaters)

Use insulating materials on equipment handles when temperatures drop below 30°F or -1°C.

G. Watch for symptoms and signs of hypothermia (see Attachment 59-1).

H. Treat cold stress illness as follows:

Hypothermia: Prompt treatment of hypothermia is essential. Once the body temperature drops below 95°F or 35°C, the loss of temperature control occurs, and the body can no longer rewarm itself. Initial treatment includes reducing heat loss by moving the individual out of the wind and cold, removal of wet clothing, applying external heat (such as a pre-warmed sleeping bag, electric blanket, or body-heat from other workers) and follow-up medical attention.

Frost Bite: The initial treatment for frostbite includes bringing the individual to a warm location, removal of clothing in the affected area, and, **if help is delayed**, placing the affected parts in warm (100° to104° F or 38° to 40°C) water. Do not massage or rub the frostbite area. After

the initial treatment, wrap the affected area loosely in sterile gauze and seek medical attention.

For further discussion on Cold Stress treatment, please refer to Attachment 59-1

I. Hypothermia in Water:

Loss of body heat to the water is a major cause of deaths in boating accidents. Often the cause of death is listed as drowning; however the primary cause is often hypothermia. It should also be noted that alcohol lowers the body temperature around two to three degrees by dilating the blood vessels. Do not drink alcohol around cold water. The following table shows the effects of hypothermia in water:

WATER TEMPERATURE	EXHAUSTION	SURVIVAL TIME
32.5° F (0°C)	Under 15 min.	Under 15 to 45 min.
32.5 to 40°F (0 – 4°C)	15 to 30 min.	30 to 90 min.
40 to 50°F (4 – 10°C)	30 to 60 min.	1 to 3 hrs.
50 to 60°F (10 – 16°C)	1 to 2 hrs.	1 to 6 hrs.
60 to 70°F (16 – 21°C)	2 to 7 hrs.	2 to 40 hrs.
60 to 70°F (16 – 21°C)	3 to 12 hrs.	3 hrs. to indefinite
Over 80°F (27°C)	Indefinite	Indefinite

SOME POINTS TO REMEMBER:

Wear your PFD. Review SMS 053 - Marine Safety and Boat Operations.

If water is less than 50°F (10°C), wear a wet suit or dry suit for work in water (e.g., wading) or if significant potential to fall in water.

While in the water, do not attempt to swim unless to reach nearby safety. Unnecessary swimming increases the rate of body heat loss. Keep your head out of the water. This will increase your survival time.

Keep a positive attitude about your rescue. This will increase your chances of survival.

If there is more than one person in the water, huddling is recommended.

J. Training

Workers at risk of developing hypothermia or cold-related injury will be trained in:

recognition of the signs and symptoms of cold injury or impending hypothermia,

proper re-warming procedures and appropriate first aid treatment,

proper use of clothing,

proper eating and drinking practices

safe work practices appropriate to the work that is to be performed.

5. Documentation Summary

File these records in the Project Safety File.

A. Completed Project Hazard Analysis form (see Health and Safety Website – "Hazard Analysis")

B. Cold stress training records

6. Resources

A. OSHA Fact Sheets – "Protecting Workers in Cold Environments" http://www.osha-slc.gov/OshDoc/Fact_data/FSNO98-55.html

B. Attachment 59-1 "Signs of, and Treatment for, Cold Stress related Illnesses"

C. Attachment 59-2(a) "Wind Chill Index" (units in °F and miles/hour)

D. Attachment 59-2(b) "Wind Chill Index" (units in °C and Kilometers/hour)

E. Attachment 59-3 "TLVs Work/Warm-up Schedule for Outside Workers based on a Four-hour Shift"

F. OSHA Publication 3156 – Quick Reference Card http://www.osha.gov/Publications/osha3156.pdf

Attachment 59-1
Signs of and Treatment for Cold Stress Related Illnesses

Condition	Signs/Symptoms	Treatment
Hypothermia **Mild** (98° - 90° F) (36° - 32°C)	shivering lack of coordination stumbling, fumbling hands slurred speech memory loss pale, cold skin	move to warm area stay active remove wet clothes and replace with dry clothes or blankets cover the head drink warm (not hot) sugary drink
Hypothermia **Moderate** (90° - 86° F) (32° - 30°C)	shivering stops unable to walk or stand confused and irrational	All of the above, plus Call for an ambulance Cover all extremities completely Place very warm objects, such as hot packs or water bottles on the victim's head, neck, chest and groin
Hypothermia **Severe** (86° - 78° F) (30° - 26°C)	severe muscle stiffness very sleepy or unconscious ice cold skin death	Call for an ambulance Treat the victim very gently Do not attempt to re-warm -- the victim should receive treatment in a hospital
Frostbite	Cold, tingling, stinging or aching feeling in frostbitten area; numbness Skin color turns red, then purple, then white or very pale skin, cold to the touch Blisters in severe cases	Seek medical attention Do not rub the area Wrap in soft cloth If help is delayed, immerse in warm, not hot, water
Trench Foot	Tingling, itching or burning sensation Blisters	Soak feet in warm water, then wrap with dry cloth bandages Drink a warm, sugary drink

Source: Princeton University, Department of Environmental Health and Safety, posted 2/2/99.

Attachment 59-2(a)
Wind-Chill Index[1]
(miles per hour and °F.)

	ACTUAL THERMOMETER READING (F)									
	50	40	30	20	10	0	-10	-20	-30	-40
Wind speed in mph	EQUIVALENT TEMPERATURE (F)									
calm	50	40	30	20	10	0	-10	-20	-30	-40
5	48	37	27	16	6	-5	-15	-26	-36	-47
10	40	28	16	4	-9	-21	-33	-46	-58	-70
15	36	22	9	-5	-18	-36	-45	-58	-72	-85
20	32	18	4	-10	-25	-39	-53	-67	-82	-96
25	30	16	0	-15	-29	-44	-59	-74	-88	-104
30	28	13	-2	-18	-33	-48	-63	-79	-94	-109
35	27	11	-4	-20	-35	-49	-67	-82	-98	-113
40	26	10	-6	-21	-37	-53	-69	-85	-100	-116
Over 40 mph (little added effect)	Little Danger (for properly clothed person)				Increasing Danger (Danger from freezing of exposed flesh)			Great Danger		

[1] Source: Fundamentals of Industrial Hygiene, Third Edition. Plog, B.A., Benjamin, G.S., Kerwin, M.A., National Safety Council, 1988

Attachment 59-2(b)
Wind-chill Index[1]
(Kilometers per hour and °C.)

Estimated wind speed	Actual temperature reading (°C)												
	10	5	0	-5	-10	-15	-20	-25	-30	-35	-40	-45	-50
(in km/h)	Equivalent chill temperature (°C)												
0 (Calm)	10	5	0	-5	-10	-15	-20	-25	-30	-35	-40	-45	-50
8	9	3	-2	-7	-12	-18	-23	-28	-33	-38	-44	-49	-54
16	4	-2	-7	-14	-20	-27	-33	-38	-45	-50	-57	-63	-69
24	2	-5	-11	-18	-25	-32	-38	-45	-52	-58	-65	-72	-78
32	0	-7	-14	-21	-28	-35	-42	-50	-56	-64	-71	-78	-84
40	-1	-8	-16	-24	-31	-38	-46	-53	-60	-67	-76	-82	-90
48	-2	-10	-17	-25	-33	-40	-48	-55	-63	-70	-78	-86	-94
56	-3	-11	-18	-26	-34	-42	-50	-58	-65	-73	-81	-89	-96
64	-3	-11	-19	-27	-35	-43	-51	-59	-66	-74	-82	-90	-98
(Wind speeds greater than 64 km/h have little additional effect.)	LOW HAZARD Risk of exposed, dry skin being affected in less than one hour. Awareness of hazard low.				INCREASING HAZARD Danger from freezing of exposed flesh within one minute.			HIGH HAZARD Flesh may freeze within 30seconds.					

The table was originally developed by the U.S. Army Research Institute of Environmental Medicine, Natick, MA, and is adapted from the 1995-1996 *Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices*, published by the ACGIH. The ACGIH publication provides the equivalent table with temperature in degrees Fahrenheit and wind speed in mph.

Equivalent chill temperature requiring dry clothing to maintain core body temperature above 36°C (96.8°F).

Attachment-59-3

TLVs Work/Warm-up Schedule for Outside Workers based on a Four-hour Shift*

The ACGIH has adopted the guidelines developed by the Saskatchewan Labour for working outdoors in cold weather conditions. These guidelines recommend protective clothing and limits on exposure time. The recommended exposure times are based on the wind chill factor, a scale based on air temperature and wind speed. The work-break schedule applies to any four-hour period with moderate or heavy activity. The warm-up break periods are of 10-minute duration in a warm location. The schedule assumes that "normal breaks" are taken once every two hours. At the end of a 4-hour period, an extended break (e.g. lunch break) in a warm location is recommended. More information is available in the ACGIH publications "2000 TLVs and BEIs" and "Documentation of TLVs and BEIs" and on the Saskatchewan Labour web page "Cold Conditions Guidelines for Outside Workers".

Air Temperature - Sunny Sky		**No Noticeable Wind**		**5 mph Wind**		**10 mph Wind**		**15 mph Wind**		**20 mph Wind**	
°C (approx.)	°F (approx.)	Max. work Period	No. of Breaks**	Max. Work Period	No. of Breaks	Max. Work Period	No. of Breaks	Max. Work Period	No. of Breaks	Max. Work Period	No. of Breaks
-26° to -28°	-15° to -19°	(Norm breaks) 1		(Norm breaks) 1		75 min.	2	55 min.	3	40 min.	4
-29°to -31°	-20°to -24°	(Norm breaks) 1		75 min.	2	55 min.	3	40 min.	4	30 min.	5
-32° to -34°	-25°to -29°	75 min.	2	55 min.	3	40 min.	4	30 min.	5	Non-emergency work should cease	
-35° to -37°	-30° to -34°	55 min.	3	40 min.	4	30 min.	5	Non-emergency work should cease			
-38° to -39°	-35° to -39°	40 min.	4	30 min.	5	Non-emergency work should cease					
-40° to -42°	-40°to -44°	30 min.	5	Non-emergency work should cease							
-43° & below	-45° & below	Non-emergency work should cease									

*2000 TLVs and BEIs - Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices. Cincinnati : American Conference of Governmental Industrial Hygienists (ACGIH), 2000 - page 176. Adopted from Saskatchewan Labour "Cold Conditions Guidelines for Outside Workers"

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URS SAFETY MANAGEMENT STANDARD
HAND SAFETY

1. Applicability

This standard applies to the operations of URS Corporation and its subsidiary companies.

2. Purpose and Scope

This procedure is intended to protect employees from activities that might or could expose them to injury. This procedure provides information on recognizing those conditions that require personal protective equipment or specific work practices to reduce hand injury risk.

Hand injuries represent over 25% of the medical treatment cases in URS and subsidiary operations. These injuries can be prevented by using the proper tool, body position, and PPE.

Also refer to SMS 016, Hand Tools and Portable Equipment.

3. Implementation

Implementation of this procedure is the responsibility of the manager directing activities of the facility or site.

A Corporate, Regional, or Strategic Business Unit (SBU) HSE Manager must approve deviations from this procedure.

4. Requirements

A. Personal Protective Equipment

1. Perform hazard assessments for those work activities likely to require PPE.

   a. Use SMS 29-1 (PPE Hazard Assessment Certification Form) to perform the assessment. The Hazard Assessment Certification Form shall accompany URS personnel at job sites for use in the event of a job or task change.

   b. Reevaluate completed hazard assessments when the job or task changes.

2. If possible, eliminate the hazards identified through engineering or administrative controls. Examples of controls are: chemical substitution, machine guarding, and use of different tools.

URS SAFETY MANAGEMENT STANDARD
HAND SAFETY

3. Select PPE that will protect employees if hazards cannot be eliminated.

   a. Review Material Safety Data Sheets for project or task-specific chemicals to determine appropriate PPE. If needed, consult with the URS Health and Safety Representative for assistance.

   b. Review glove manufacturer recommendations for both physical and chemical protection.

   c. Obtain gloves of the correct size for project field staff

   d. When both chemical and physical protection are of concern, the chemical protection gloves (e.g. nitrile) shall be worn inside the physical protection gloves (e.g. leather, Kevlar®).

   e. Latex gloves are not recommended for chemical protection.

B. Guidelines for Working With and Around Equipment (Hand Tools, Portable Equipment)

1. General

   a. Keep hand and power tools in good repair and used only for the task for which they were designed.

   b. Remove damaged or defective tools from service.

   c. Do not remove or bypass a guarding device for any reason.

   d. Keep surfaces and handles clean and free of excess oil to prevent slipping.

   e. Wear proper PPE, including gloves, as necessary.

   f. Do not carry sharp tools in pockets.

   g. Clean tools and return to the toolbox or storage area upon completion of a job.

   h. Wrenches must have a good bite before pressure is applied.

      i. Brace yourself by placing your body in the proper position so that in case the tool slips you will not fall.

      ii. Make sure hands and fingers have sufficient clearance in the event the tool slips.

iii. Always pull on a wrench, never push.

i. When working with tools overhead, place tools in a holding receptacle when not in use.

j. Do not throw tools from place to place, from person to person, or drop from heights.

k. Inspect all tools prior to start-up or use to identify any defects.

l. Powered hand tools should not be capable of being locked in the on position.

m. Require that all power-fastening devices be equipped with a safety interlock capable of activation only when in contact with the work surface.

n. Do not allow loose clothing, long hair, loose jewelry, rings and chains to be worn while working with power tools.

o. Do not use cheater pipes.

p. Make provisions to prevent machines from restarting through proper lockout/tagout (refer to SMS 023 – Lockout and Tagout Safety).

2. Cutting Tools

a. Always use the specific tool for the task. Tubing cutters, snips, self-retracting knives, concealed blade cutters, and related tools are task specific and minimize the risk of hand injury. Sample tools may be seen in Attachment 64-1.

b. Fixed open blades knives (FOBK) are prohibited from use. Examples of fixed open blade knives include pocket knives, multi-tools, hunting knives, and standard utility knives.

c. Personnel when utilizing cutting tools shall observe the following precautions to the fullest extent possible:

i. Use the correct tool and correct size tool for the job,

ii. Cut in a direction away from yourself and not towards other workers in the area,

iii. Maintain the non-cutting hand and arm towards the body and out of the direction of cutting tool if it were to slip out of the material being cut.

iv. Ensure that the tool is sharp and clean; dirty and dull tools typically cause poor cuts and more hazard than a sharp clean cutting tool

v. Store these tools correctly with covers in-place or blades retracted as provided by the manufacturer.

vi. On tasks where cutting may be very frequent or an all day task (e.g., liner samples), Kevlar® gloves should be considered in the PPE evaluation for the project.

vii. Do not remove guards on paper cutters.

3. Moving/Rotating Equipment

a. General Requirements for Drilling

i. Require a meeting at project start-up regarding the drill rig operator responsibility for rig safety and any site and equipment specific safety requirements. The significant potential for hand injuries (including finger amputation) in drilling operations requires proper work practices and well-maintained equipment.

ii. Set up any sample tables and general work areas for the URS field staff to the side of the drill rig (preferably 10 meters away) and not directly behind the rig.

iii. URS engineers, technician, and geologists shall not assist drillers with the drilling equipment or supplies and shall not at any time operate the drill rig controls.

iv. Do not wear loose clothing or jewelry while working near rotating equipment.

b. Safe Use of Augers (Drilling work)

i. When the drill is rotating, stay clear of the drill string and other rotating components of the drill rig. Never reach behind or around a rotating auger for any reason.

ii. Move auger cuttings away from the auger with a long-handled shovel or spade; never use hands.

iii. Never clean an auger attached to the drill rig unless the transmission is in neutral or the engine is off, and the auger has stopped rotating.

c. Other Rotating Equipment (feed augers, chippers, conveyors, etc.)

i. Never place hands, fingers, extremities near hoppers and operational areas of machinery.

ii. When the equipment is rotating, stay clear of the rotating components and only operate equipment with proper machine guarding in place.

iii. Never clean a jammed piece of equipment unless the transmission is in neutral and the power source or the engine is off, and the moving parts of the equipment have stopped rotating. Refer to SMS 23, Lockout and Tagout Safety.

5. Physical Hazards – Non-tool

a. Activities such as drum handling, fencing, work near razor-wire, manhole cover removal and demolition also pose hazards to hands

b. The SMS 29 - Personnel Protective Equipment should be utilized to determine what type of PPE will be needed for a job.

c. Plan work to avoid pinch points for hands when moving drums, moving man-hole covers back in to position, and handling other heavy objects.

d. Work handling scrap metal or other sharp edges requires proper hand PPE (Kevlar® or leather gloves).

C. Ergonomics - Hand & Wrist Care

1. Keep your wrist in neutral. Avoid using your wrist in a bent (flexed), extended, or twisted position for long periods of time. Instead try to maintain a neutral (straight) wrist position. Ergonomic tools may be needed for long-term work.

2. Watch your grip. Gripping, grasping, or lifting with the thumb and index finger can put stress on your wrist. When practical, use the whole hand and all the fingers to grasp an object.

3. Minimizing repetition. Even simple, light tasks may eventually cause injury. If possible, avoid repetitive movements or holding an object in the same way for extended periods of time.

4. Reduce speed and force. Reducing the speed with which you do a forceful, repetitive movement gives your wrist time to recover from the effort. Using power tools helps reduce the force.

5. Rest your hands. Periodically give your hands a break by letting them rest briefly. Or you may be able to alternate easy and hard tasks, switch hands, or rotate work activities.

D. Biological Impacts

1. Poisonous Plants

a. Personnel in regions where potential contact with poisonous plants should be aware of the hazard.

i. Avoid contact

ii. Wear appropriate PPE

iii. Thorough hand cleaning after impact prior to further work tasks

2. Further information can be obtained from the SMS 47 - Biological Hazards

E. Cleaning Hands

1. Avoid contamination of hands by proper use of gloves when contact with physical, chemical, or biological hazards is possible.

2. Use soap and water for normal hand cleaning. Do not use solvents for cleaning as they remove essential oils in the skin and may cause dermatitis. Do not use pressure washers for hand cleaning.

3. If the hands contact a corrosive (e.g. nitric acid), wash the area with water for fifteen minutes and then seek medical attention.

4. Use antibiotic ointment and skin protection on minor breaks/scratches of the skin.

5. Resources

A. SMS 16 - Hand Tools and Portable Equipment

B. SMS 29 - Personal Protective Equipment

C. SMS 54 - Office Ergonomics

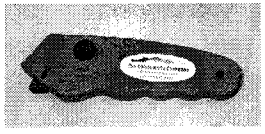
D. SMS 56 - Drilling Safety Guidelines

SAFER ALTERNATIVE TOOLS

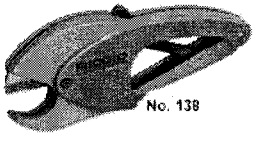
Types of safety knives or alternative cutting tools:

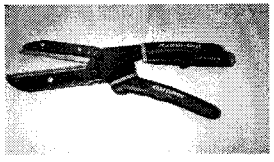
Self-retracting utility knives (brands – OLFA, Martor, Allway Tools)

Guarded utility knives (brands – The Safety Knife Co., Martor)

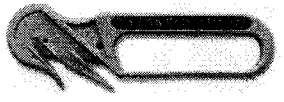


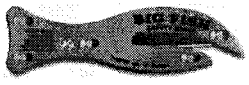
Shears, snips, scissors (brands – Ridgid, Craftsman, Wolfcraft)





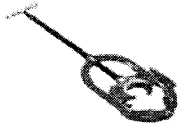
Concealed blade cutters (brands – The Safety Knife Co., Martor)

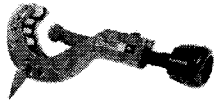




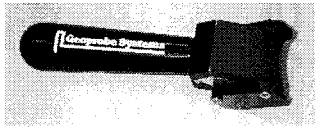
SAFER ALTERNATIVE TOOLS

Pipe cutters (brands – Ridgid, Empire)





Specialty cutter (brand – Geoprobe)



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1. Applicability

This standard applies to all U.S. based operations of URS Corporation and its subsidiary companies.

2. Purpose and Scope

This standard is designed to ensure that employees receive appropriate, immediate, and high-quality health care services that will minimize disability, promote rapid recovery and save lives.

3. Implementation

Implementation of this procedure is the responsibility of the manager directing activities of the facility or site.

A Corporate, Regional, or Strategic Business Unit (SBU) HSE Manager must approve deviations from this procedure.

4. Requirements

A. Pre-Injury Management

The following pro-active plans and procedures shall be in place before an injury or illness occurs.

1. Work Site Evaluation

Project and office locations shall evaluate their location for first aid and medical requirements. The following factors should be considered:

- Types of accidents that could reasonably occur
- Location of local clinics and hospitals
- Response time for external emergency services
- If corrosive or hazardous materials are in use
- Any industry specific requirements
- Types of training for employees and first aid responders
- What first aid supplies should be available

2. First Aid Services

a. First Aid Responders

At least one person, and preferably two or more, trained in first aid must be available at the worksite if either of these conditions exist:

(1). If life threatening injuries can reasonably be expected, trained personnel must be available within 3 to 4 minutes. This generally means that community emergency medical services cannot be relied on since their response time is usually greater than 3 minutes.

(2). If no life threatening injuries can reasonably be expected, the response time for trained personnel is extended to 15 minutes.

The trained first aid responders should be designated so that the other employees know who they are and how to contact them. The trained responder must have a current first aid certificate and be trained in Bloodborne Pathogens (See SMS 51).

b. First Aid Kits

Each site shall maintain a first aid kit in accordance with SMS 24-9.

c. Emergency Information

Each location shall post a current list of emergency telephone numbers and maps to access local medical emergency providers (SMS 003). Advance contact with ambulance services to ensure they are familiar with location, access routes, and hospital locations is advised in remote or new locations.

d. Eyewash Facilities

If corrosive materials are used, eyewash and body flush facilities must be provided. Where possible, these should provide large quantities of clean water. The water source must be pressure controlled and clearly identified. Portable eyewash stations must contain a minimum of 1 gallon of potable water.

e. Identification of Medical Facilities

Field and office location shall identify a suitable local clinic, preferably specializing in occupational medicine, to treat non-emergency injuries and illnesses. In addition, a local hospital emergency room shall be identified for treatment of life threatening or after hours injuries. The URS Occupational Health Specialist (OHS) or the workers' compensation insurance carrier pre-injury consultant should be contacted to provide a listing of recommended medical facilities.

The HSE Representative should visit the medical facility and meet with the medical provider in order to establish expectations. Clinics should be conveniently located, clean, professionally staffed, offer multiple services and be supportive of early return to work practices.

Field/construction projects shall make appropriate arrangements with local ambulance/emergency service providers prior to the start of work activities to ensure appropriate transportation can be provided in the event of an emergency. These arrangements include establishment of an identifiable project address and emergency access point (i.e. location to meet emergency personnel).

B. Post-Injury Management

1. Transportation

When employees require urgent medical attention as the result of a work-related injury/illness, transportation shall be provided to the doctor's office, clinic, or hospital. Employees should not be permitted to drive unless safe to do so.

2. Emergency Injury/Illness Treatment

In all cases, critical injuries must be immediately referred for professional medical attention. The manner in which the referral is accomplished, and the person responsible for the referral, should be clearly defined in either a project safety plan and/or an office Emergency Action Plan (SMS 003). Critical injuries/illnesses include, but may not be limited to, the following:

- Loss of consciousness
- Unexplained chest pain
- Breathing difficulty
- Uncontrolled bleeding

- Fractured bones
- Suspected internal injuries
- Suspected exposure to chemical/biological hazard
- Second or third degree thermal or chemical burns (i.e. blistering)
- Electrocution
- Unexplained change in mental state following an injury (may indicate shock or other internal injuries)

3. Non-Emergency Injury/Illness Treatment

When a work-related incident results in a non-critical injury/illness, the primary objective is to provide appropriate medical services to diagnose and treat the injury/illness. Options available to the employee and project/office management in these situations include the following:

- First aid treatment and/or review by a qualified first aid responder
- First aid treatment and/or review by a qualified first aid responder followed by a referral to the Occupational Health Specialist (866-326-7321).

Additional support for the employee and managers in these situations can also be obtained from a URS H&S professional.

Attachment 065-1 provides a flow chart to assist employees and managers in determining the most appropriate option for obtaining medical services for non-emergency injuries/illnesses.

Note – Some states allow injured workers to choose their own initial medical provider. Employees are to be cautioned that not all medical providers accept workers' compensation insurance and coverage should be verified prior to treatment if an employee lives in a state that permits him/her to elect to see their personal doctor rather than the company recommended physician.

C. Workers' Compensation Case Management

1. Health and Safety

a. URS Occupational Health Specialist will:

(1). Evaluate and file workers' compensation claims for cases covered by the URS insurance program. Evaluate and provide consultation for injuries occurring in Monopolistic states (Ohio, Washington, West Virginia, North Dakota, and Wyoming).

(2). Provide date of injury support to employees and supervisors, including Monopolistic state claims.

(3). Coordinate regular follow-up of all cases, including Monopolistic state claims, to ensure effective case management.

(4). Offer pre-injury consultation for offices and project sites.

(5). Provide training and communication regarding the workers' compensation process.

b. The HSE Managers will assist with the early return to work program by interfacing with the supervisor and employee to evaluate if appropriate and safe temporary transitional work is available.

c. HSE Representatives will:

(1). Provide support to ensure that the requirements of this SMS are in place.

(2). Provide training on this SMS

(3). Ensure proper reporting of incidents in accordance with SMS 049.

(4). Ensure that requirements of this SMS are incorporated into all project H&S plans.

2. Human Resources

a. The HR Representatives will:

(1). Provide on-site contact for injured employees by maintaining necessary forms and referring employee to OHS to file the workers' compensation claim.

(2). Act as the on-site point of contact for the workers' compensation insurance carrier adjuster.

(3). Forward any external communication (clinic bills, Monopolistic state forms, etc.) to the OHS upon receipt.

b. Regional HR Managers will coordinate any Short Term Disability benefits owed to employees disabled from working over one week because of a work-related injury/illness.

3. Supervisor

The Supervisor (or HR or H&S Representative) will:

a. Sign the Medical Treatment Referral form (065-2) prior to the employee leaving the site for medical treatment (this will not be necessary in an emergency). The employee will also be given the Medical Authorization Form (065-3) to be signed with copy provided to the employee, health care provider and OHS.

b. Provide transitional job assignments, with consultation and approval of the office manager, whenever possible to enable an injured worker to return to work (Return to Work Policy 065-4). Transitional employment is defined as temporary modified or light duty work that covers the time from the injury until the release to full duty from the doctor. The return to work hierarchy includes:

(1). Return to own job

(2). Return to own job with accommodations/modifications

(3). Return to another job at URS with or without accommodations/modifications

(4). Placement in alternate jobs through telecommuting or other job assignments determined on a case by case basis.

c. Provide, when requested by the treating physician or insurance carrier, the Description of Employee's Job Duties form (065-5).

d. Maintain regular contact with employees who are temporarily disabled (contact at least weekly by phone or email).

4. Employee

The employees will:

a. Report injuries as soon as possible to their supervisors. Employees are encouraged to contact their supervisor and/or the OHS prior to seeking any medical services for non-emergency injuries and illnesses.

b. Provide the Medical Treatment Referral form to the treating physician. If employees are unable to obtain the form prior to being treated (i.e. onset of symptoms during non-work hours, work in remote locations, etc.) they must notify their supervisor as soon as possible on the next scheduled workday.

c. Provide their supervisor with written return to work and follow up paperwork from the treating physician immediately following each doctor appointment.

5. Documentation Summary

A. The following documents shall be maintained by the HSE Representative:

- Posting of medical services providers and emergency phone numbers
- List of qualified first aid providers
- Documentation of coordination between URS and emergency service providers for field/construction projects.
- Completed Injury/Illness/Incident Report Form (SMS 49-1) (copy to OHS)
- Description of Employee's Job Duties form (copy to OHS) – 065-5
- Medical Treatment Referral form – 065-2
- Medical Authorization Letter – 065-3

B. The following documents shall be maintained by the HR Representative and copied to the OHS.

- Physician's First Report of Injury and follow up reports
- Medical Treatment Referral form
- Medical Authorization Letter
- Description of Employee's Job Duties form

6. Resources

- OSHA 1910.151 Medical Services and First Aid
- OSHA Instruction CPL 2-2.53 Guidelines for First Aid Programs
- OSHA Safety & Health Topics: Medical and First Aid
- Red Cross Health & Safety Services www.redcross.org/services/hss/
- SMS 003 Emergency Action Plans
- SMS 024 Medical Surveillance
- SMS 049 Incident Reporting
- SMS 051 Bloodborne Pathogens
- Medical Services Provider – WorkCare™ 1-800-455-6155
- Workers' compensation insurance provider AIG – www.aigcs.net
- Occupational Health Specialist – Jeanette Schrimsher, RN COHN-S
- Phone 866-326-7321
- Confidential Fax 512-419-6413

Attachments

065-1 Injury Management Procedures (Flow Chart)

065-2 Medical Treatment Referral form

065-3 Medical Authorization Letter

065-4 Return to Work Policy

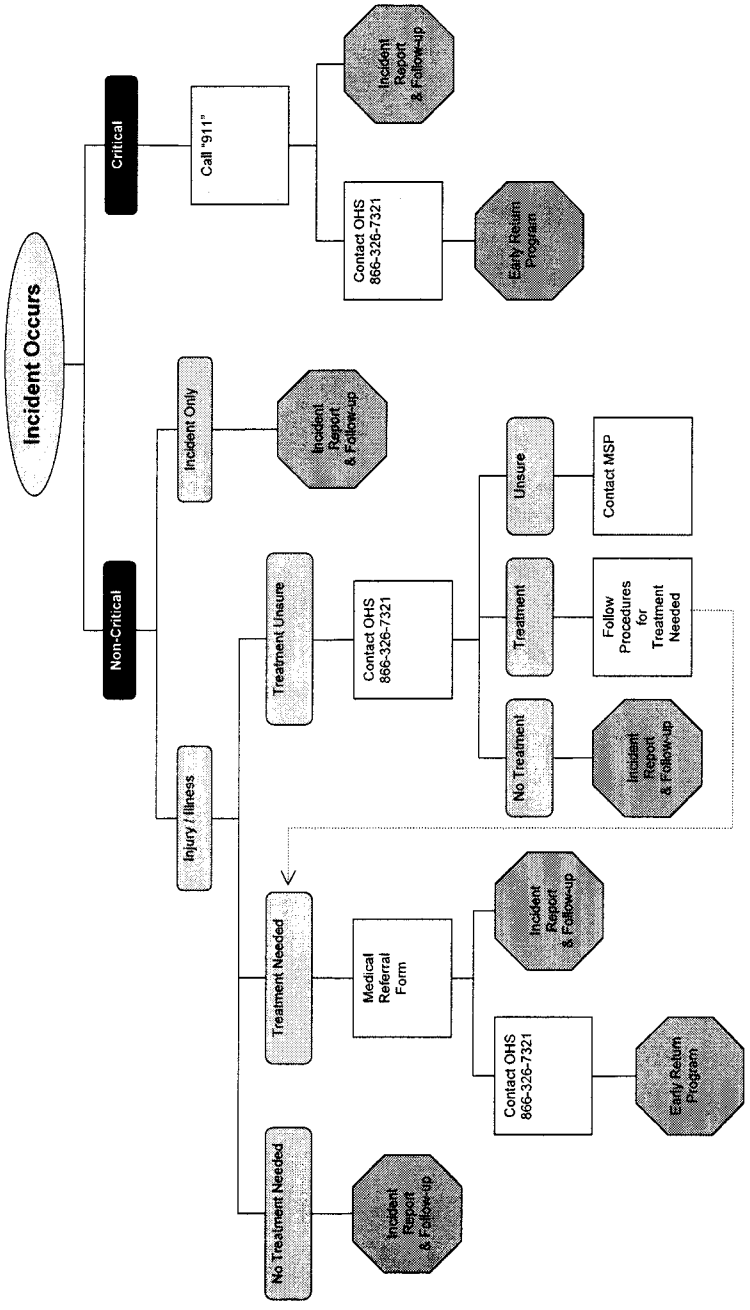
065-5 Description of Employee's Job Duties

URS

Health and Safety Program

INJURY MANAGEMENT PROCEDURES FLOW CHART

Attachment 65-1



URS

Health and Safety Program

MEDICAL TREATMENT REFERRAL

Attachment 65-2

Date: _____ Site Phone Number: _____

URS Site Contact: _____

Employee Name _____ Social Security # _____

Employee Signature: _____

Brief Job Description _____

Date of Injury _____ Body Part Injured _____

Place of Injury _____

Post-accident drug and/or alcohol test required? Yes ❑ No ❑

Medical Provider:

Name: _____ Phone: _____

Address: _____

Employee Transported to Medical Provider by:

Workers' Compensation Insurance Carrier: **AIG Claim Services** (except for: Washington, Ohio, West Virginia, North Dakota, Wyoming)

For questions, please contact: **Occupational Health Specialist, Jeanette Schrimsher, RN COHN-S 866-326-7321**

Early Return-to-Work and Transitional Employment Policy

To Medical Providers: URS Corporation values its employees and believes that it is helpful to an injured worker's recovery to return to work as soon as medically approved. Please contact us if you have any questions regarding releasing the employee to work either in a modified/light duty status or full duty clearance. Please send a work status report to the site contact listed above following the initial medical evaluation and each follow up appointment.

Supervisor Name _____ Supervisor Signature _____

URS	Health and Safety Program MEDICAL AUTHORIZATION FORM	Attachment 65-3

WORKERS' COMPENSATION
EMPLOYEE AUTHORIZATION LETTER

To be signed with copies provided to employee, URS Occupational Health Specialist and medical provider(s).

To Whom It May Concern:

I, _____ hereby authorize any hospital,
Please Print Name
medical practitioner, clinic, other medical or medically related facility, pharmacy, insurance company to furnish to URS Corporation or its subsidiaries or representatives (orally or in writing), information with respect to any work-related injury or illness including, treatments, consultations, prescriptions, and copies of applicable records that may be requested. I also authorize my employer to disclose information needed to process my workers' compensation claim.

The information provided to URS Corporation, its subsidiaries or representatives is to be used solely for the administration of my workers' compensation claim.

A photo static copy of this authorization is to be considered as valid as the original and is effective for the duration of the claim.

Signature: _____ Date: _____

Note: A true copy of this authorization is available to the employee at any time.

URS	Health and Safety Program RETURN TO WORK POLICY	Attachment 65-4

Our primary goal in safety is the prevention of work related injuries. When an injury does occur, it is the policy of URS to provide our employees with the best possible recovery program. A major component of any successful recovery program is returning the injured employee to the workforce as soon as medically possible. This type of Early Return Strategy has been shown to dramatically reduce the overall recovery time of injured workers creating a benefit for the employee, his/her family, coworkers, and the firm.

As part of this policy, Operations, Human Resources, Health and Safety, and our workers' compensation insurance carrier will work together with our employees and their treating physician to establish a recovery program that minimizes both the number of cases and total days away from work experienced by our employees. URS operations will accommodate transitional work (i.e. light duty or modified work) requirements for employees recovering from work related injuries. The work limits, as defined by the treating physician, will be strictly adhered to. Modified job assignments will be structured to meet the capacities and therapy needs of the injured employee.

URS	Health and Safety Program **DESCRIPTION OF EMPLOYEE'S JOB DUTIES**	Attachment 65-5 Revision 1: Oct 2006

Print Name:		
Location:	Phone:	
Job Title:	No. Hours Day:	No. Days Week:
General Job Description:		

1. Check the frequency & number of hours a day the activity is performed:

Activity	Frequency		Number of Hours Per Day									
	Continuous	Intermittent	0	1	2	3	4	5	6	7	8	9+
Sitting												
Walking												
Standing												
Bending												
Squatting												
Climbing												
Kneeling												
Twisting												

2. Hand manipulation required? (If yes, complete 2 a, b, c, d) Yes ❑ No ❑

2a.	Simple grasping?	Yes ❑	No ❑	Right ❑	Left ❑
2b.	Power grasping?	Yes ❑	No ❑	Right ❑	Left ❑
2c.	Pushing and pulling?	Yes ❑	No ❑	Right ❑	Left ❑
2d.	Fine manipulation?	Yes ❑	No ❑	Right ❑	Left ❑

3. Does the job require reaching at or above shoulder level? Yes ❑ No ❑

4. Does the job require use of the feet to operate foot controls? Yes ❑ No ❑

5. Are there special visual requirements? (Describe) Yes ❑ No ❑

6. Are there special hearing requirements? (Describe) Yes ❑ No ❑

URS	Health and Safety Program **DESCRIPTION OF EMPLOYEE'S JOB DUTIES**	Attachment 65-5 Revision 1: Oct 2006

7. Lifting and carrying (check weight lifted, frequency, and how far carried):

Weight	Frequency			Distance Carried
	Hourly	Daily	Weekly	
1-10 lbs.				
11-25 lbs.				
25-40 lbs.				
41-60 lbs.				
61-75 lbs.				

8. Environmental conditions (check yes or no):

8a.	Work near dust, gas, vapors, or fumes?	Yes ❑	No ❑
8b.	Work in noisy environment?	Yes ❑	No ❑
8c.	Work in extremely hot temperature?	Yes ❑	No ❑
8d.	Work in extremely cold temperature?	Yes ❑	No ❑
8e.	Work at heights?	Yes ❑	No ❑
8f.	Walk on uneven surfaces?	Yes ❑	No ❑

9. Equipment operated (check yes or no):

9a.	Computer and mouse? If yes, hours per day _____	Yes ❑	No ❑
9b.	Drive car, truck or van?	Yes ❑	No ❑
9c.	Operate forklift or heavy equipment?	Yes ❑	No ❑
9d.	Other (please describe):		

10. Comments:

Employee Signature: Date of Hire:

Date:

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1. Applicability

This standard applies to URS operations where personnel perform manual handling of materials. For this procedure, manual material handling (MMH) is defined as the movement of items by lifting, lowering, pushing, pulling, carrying, holding, or restraining.

2. Purpose and Scope

The purpose of this procedure is to prevent common injuries caused by the practice of MMH. Immediate or short-term effects include lacerations, bruises, and muscle fatigue. Long-term effects include chronic pain, typically in the lower back.

3. Implementation

Implementation of this procedure is the responsibility of the manager directing activities of the facility or site.

A Corporate, Regional, or Strategic Business Unit (SBU) HSE Manager must approve deviations from this procedure

4. Requirements

A. General

1. Prior to lifting, lowering, pushing, pulling, carrying, holding, or restraining an object of any significant size or weight, employees must evaluate the object and the required task to determine if they can handle the object safely.
2. If the employee has any doubt about whether than can safely move the object by themselves, additional manual or mechanical help should be obtained.
3. Healthy employees with no physician imposed restrictions should lift and carry a maximum of 50 pounds (23 kilograms) using proper lifting and carrying techniques. Physical and workplace factors may reduce this recommended weight limit (RWL) significantly and should be considered prior to attempting lifts of this magnitude.
4. An employee's personal "safe" MMH capability is defined as the employee's personal capability to manually lift, carry, push, or pull an object alone. This "safe" limit must consider the employee's past experience and training with MMH, health status, and any other personal or environmental characteristics affecting the

employee's ability to perform these tasks. An employee's "safe" MMH capability is typically at or below the calculated RWL.

5. An MMH task that exceeds an employee's personal "safe" MMH capability or RWL should be brought to the attention of the applicable Manager.
6. If, due to a medical or health condition, the employee's physician or the employee has set a personal "safe" MMH capability, then appropriate medical documentation must be provided to the applicable Manager to define these limits.
7. A recommended RWL can be calculated using the factors described in Attachment 69-1. The weight limit derived from these calculations is considered to be a load that over 99% of men and over 75% of women can safely handle without application of engineering or administrative controls. **Implementation of the calculations in Attachment 69-1 should only be attempted with the assistance of a safety professional knowledgeable in the application of these factors. The calculations are intended to determine RWLs for repetitive lifting scenarios rather than occasional lifts.**

B. Pre-Planning

1. If a heavy object is to be moved to another location, the safest transport route should be determined prior to the activity.
2. The area around the object and the route over which it will be transported should be checked for slip, trip, and fall hazards. Hazards should be removed prior to initiation of the task.
3. The object to be moved should be inspected for grasping or handling hazards, including slivers, sharp edges, grease, water, etc. Eliminate or abate any identified hazards where possible. Safe grasping or handling points on the object should be determined.
4. The distance to be traveled and the length of time which a grip on the object must be maintained should be considered before moving objects.

C. Lifting/Lowering Guidelines

1. Reduce or eliminate manual lifting and lowering tasks where possible. Determine if there are ways to abate the safety and ergonomic hazards associated with manual lifting.

2. The recommended technique for manual lifting/lowering involves five maneuvers:
   a. Get a firm footing. Keep your feet apart for a stable base. Put one foot slightly in front of the other.
   b. Bend your knees. Do not bend at the waist. When grasping the object, a firm grip should be obtained before lifting/lowering.
   c. Lift/lower with your legs. Lift/lower the load slowly and in a straight line, avoiding sudden movements.
   d. Keep the load close to the body. Generally, the closer the load is to the body, the less force it exerts on your back.
   e. Keep your back straight. Do not add the weight of your body to the load. Avoid twisting.
3. When a turn or change of direction is necessary, the object should be lifted or lowered into a carrying position, then the whole body should be turned with the feet, avoiding any trunk twisting motion.
4. Objects to be lifted to shoulder height should first be lifted to waist height, then rested on a level surface so the grasping position can be changed prior to lifting to a higher level.
5. Employees should never lift a load above their head.

D. Carrying/Holding Guidelines
1. Manual carrying is an inefficient way of transporting materials in the work place. Where possible, reduce or eliminate manual carrying tasks.
2. Employees should never carry a load above their head.
3. Carry an object close to the body using both hands. One-handed carries are awkward and tend to unbalance the employee.
4. Do not carry objects that are so large they will obstruct visibility.
5. Grips on an object should not be changed while carrying or holding an object. Rest the object on a secure surface prior to changing grip.
6. Avoid two person carries where possible. If an object is of a size, shape, or mass that it requires two people to carry, use two people of similar size and physique. Perform lifting of the item in unison.
7. Avoid carrying objects on stairs, particularly where the line of sight may be obstructed or the object can interfere with leg movement.

E. Pushing/Pulling Guidelines
1. Check the condition of the floor, ground, or other surface prior to pushing or pulling an object across it.
2. Be aware of the "break out" force of the object - the force at which a push or pull overcomes the frictional force between the surface and object. Adjust posture to avoid losing balance when this point is reached.
3. Get assistance when moving or guiding a large load.
4. Where possible, always push rather than pull a load.

F. Workplace Design
1. Store heavy or bulky materials at heights between the knee and shoulder to avoid the need to stretch or bend.
2. Pack or arrange items to be lifted to avoid shifting of weight in the package.
3. Design work areas to avoid the need to lift, carry, push, or pull heavy or bulky materials for extended distances.
4. Design workplaces with the following in mind.
   a. Lifts from the floor should be avoided.
   b. The torso should never twist while handling loads.
   c. Asymmetrical or unbalanced one-handed lifts should be avoided.
   d. Loads should not be lifted with sudden movements.
   e. Loads should not be lifted over obstacles.
   f. Loads should not be lifted at extended reaches.
   g. Uncomfortable postures should not be necessary throughout the work cycle.
   h. Environmental factors (e.g., task lighting, dry work surfaces, heat stress) should be considered.

G. Training
1. Require that personnel who may have MMH as part of their duties receive training that includes the following topics:
   a. Showing personnel how to avoid unnecessary physical stress and strain during MMH operations.

b. Teaching personnel to become aware of what they can comfortably handle without undue strain.

c. Instructing personnel on the proper use of equipment.

d. Teaching personnel to recognize potential hazards and how to prevent or correct them.

2. This training must be completed prior to an employee being assigned to a task that involves MMH activities.

5. Documentation Summary

Training rosters or other proof of completion of MMH training will be filed in the Health and Safety File.

6. Resources

A. Recommended Weight Limit Calculations (RWL) – Attachment 69-1

B. Work Practices Guide for Manual Lifting, NIOSH
http://www.cdc.gov/niosh

C. Canadian Centre for Occupational Health and Safety
http://www.ccosha.ca/oshaanswers/ergonomics/mmh/

D. Oregon OSHA "Ergonomics of Manual Materials Handling"
http://www.cbs.state.or.us/external/osha/pdf/workshops/206w.pdf

E. North Carolina Department of Labor "A Guide to Manual Materials Handling and Back Safety
http://www.nclabor.com/osha/etta/indguide/ig26.pdf

F. European Agency for Safety and Health at Work
http://uk.osha.eu.int/good_practice/msd.stm

This lifting equation, developed by the National Institute for Occupational Safety and Health (NIOSH), takes into account the weight of an object plus several other variables in lifting tasks that contribute to the risk of injury. For example, if the situation requires frequent lifts or lifting loads far away from the body, there is an increased risk of injury. Under these conditions, the weight limit would be reduced from a baseline weight or "load constant" (LC) to a recommended weight limit (RWL). A "load constant" (LC) of 23 kg (about 51 pounds) has been established by NIOSH as a load that, under ideal conditions, is safe for 75% of females and 90% of males.

To calculate the RWL, you must first measure or assess several variables related to the lifting task. The six variables that are considered in determining the RWL are:

The horizontal distance (H) the load is lifted (distance of hands from midpoint between ankles),

The starting height of the hands from the ground (V),

The vertical distance of lifting (D),

The time between lifts or frequency of lifting (F),

The angle of the load in relation to the body (e.g., straight in front of you or off to the side, A), and

The quality of the grasp or handhold based on the type of handles available (hand-to-load coupling, C).

Each of these variables is then assigned a numerical value (multiplier factor) from look-up charts. The equation includes six multiplier factors to calculate the RWL:

$$RWL = LC \times HM \times VM \times DM \times FM \times AM \times CM$$

Where LC is the load constant (23 kg) and other factors in the equation are:

HM, the "Horizontal Multiplier" factor,

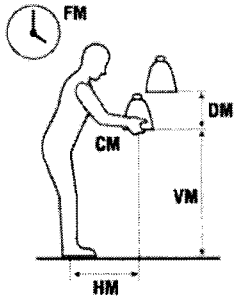
VM, the "Vertical Multiplier" factor,

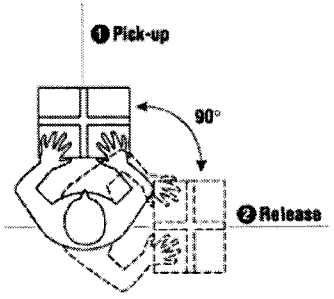
DM, the "Distance Multiplier" factor,

FM, the "Frequency Multiplier" factor,

AM, the "Asymmetric Multiplier" factor, and

CM, the "Coupling Multiplier" factor.





Horizontal Multiplier is the distance the object is from the body. Measure (in centimeters) the distance from in between the person's ankles to their hands when holding the object. Write down this number. Next, look up the number on the accompanying chart and find the matching "multiplier factor". Use this factor in the lifting equation.

Vertical Multiplier is measured as the starting point of the lift and is the distance in centimeters of the hands up from the ground. Measure this distance and use the number to determine which value to use on the chart.

Distance Multiplier is the number of centimeters the load travels up (or down) from the starting position. Measure this distance and use the number to determine which value to use on the chart.

Frequency Multiplier is how often the lift is repeated within a certain time period. You need to determine if the lift is done while standing or stooping, for more or less than one hour (in total time for the shift), and how much time there is for rest between lifts.

Asymmetric Multiplier measures if the body must twist or turn during the lift. This measurement is done in degrees (with 360 being one complete circle).

Coupling Multiplier determines the "coupling" or type of grasp the person has on the container. It rates the type of handles as good (handles), fair (make-shift cut outs in cardboard boxes) or poor. You also need to know if the lift is done in a standing or stooping position.

When these multipliers are placed into the equation, determine the RWL. If the weight of the object to be lifted exceeds the RWL, the task is considered to be dangerous. Assess the relevant factors which contribute most to the risk (the lower the factor, the more it contributes to the risk) and redesign the handling task.

URS | Health, Safety, and Environment | Attachment 69-1
RECOMMENDED WEIGHT LIMIT (RWL) CALCULATIONS | Issue Date: Sept 04

The lifting equation only applies in certain situations. It does not apply in situations where a person is lifting (or lowering):

- With one hand,
- For over 8 hours,
- While seated or kneeling,
- In a restricted work space,
- Objects that are unstable (such as buckets or containers of liquids),
- While pushing or pulling,
- With wheelbarrows or shovels,
- With high speed motion (faster than about 30 inches/second),
- Extremely hot or cold objects or in extreme temperatures, or
- With poor foot/floor coupling (high risk of a slip or fall).

This equation applies to most workers for:

- Two-handed lifting,
- Comfortable lifting postures, and
- Comfortable environments and non-slip floorings.

FACTORS USED IN RWL CALCULATIONS

Horizontal Multiplier (HM): Horizontal distance (H, in cm) from the midpoint between the ankles to the hands while holding the object.

H = Horizontal Distance (cm)	HM Factor
25 or less	1.00
30	0.83
40	0.63
50	0.50
60	0.42

Vertical Multiplier (VM): The vertical distance (V, in cm) of the hands from the ground at the start of the lift.

V = Starting Height (cm)	VM Factor
0	0.78
30	0.87
50	0.93
70	0.99
100	0.93
150	0.78
175	0.70
>175	0.00

Distance Multiplier (DM): The vertical distance (D, in cm) that the load travels.

D = Lifting Distance (cm)	DM Factor
25 or less	1.00
40	0.97
55	0.90
100	0.87
145	0.85
175	0.85
>175	0.00

Asymmetric Multiplier (AM): The twisting angle (A) of the body while lifting, measured in degrees.

A = Angle (degrees)	AM Factor
90°	0.71
60°	0.81
45°	0.86
30°	0.90
0°	1.00

URS | Health, Safety, and Environment | RECOMMENDED WEIGHT LIMIT (RWL) CALCULATIONS | Attachment 69-1 | Issue Date: Sept 04

Frequency Multiplier (FM): The frequency (F) of lifts and the duration of lifting (in minutes or seconds) over a work shift.

F = Time Between Lifts	FM Factor			
	Lifting While Standing		Lifting While Stooping	
	One Hour or Less	Over One Hour	One Hour or Less	Over One Hour
5 min	1.00	0.85	1.00	0.85
1 min	0.94	0.75	0.94	0.75
30 sec	0.91	0.65	0.91	0.65
15 sec	0.84	0.45	0.84	0.45
10 sec	0.75	0.27	0.75	0.27
6 sec	0.45	0.13	0.45	-
5 sec	0.37	-	0.37	-

Coupling Multiplier (CM): The quality of grasp (or coupling, C) classified as good, fair or poor and depends on the body position (either standing or stooping).

C = Grasp	CM Factor	
	Standing	Stooping
Good (handles)	1.00	1.00
Fair	1.00	0.95
Poor	0.90	0.90

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1. Applicability

This standard applies to the operations of URS Corporation and its subsidiary companies involving the use of powered industrial trucks. A powered industrial truck is defined as a mobile, power-propelled truck used to carry, push, pull, lift, stack, or tier materials. Forklifts, pallet trucks, rider trucks, fork trucks, lift trucks, pallet jacks, motorized hand trucks, and skid steer loaders are all types of powered industrial trucks. This procedure does not apply to aerial lifts, cranes, or vehicles intended primarily for earth-moving or over-the-road hauling.

2. Purpose and Scope

The purpose of this standard is to provide direction for the safe operation of powered industrial trucks on all operations of URS Corporation and its subsidiary companies, thus limiting the potential for injury to both the operators of the equipment and ground personnel working in the immediate vicinity.

3. Implementation

Implementation of this standard is the responsibility of the manager directing activities of the facility or site.

A Corporate, Regional, or Strategic Business Unit (SBU) HSE Manager must approve deviations from this procedure.

4. Requirements

A. Training

1. Employees operating a powered industrial truck must be trained and authorized to use the specific type of truck to which they are assigned. Training and evaluation shall be conducted by personnel with adequate knowledge, training, and experience in the operation of the truck.
2. Employee training documentation shall be maintained in the office health and safety files.
3. Training shall consist of a combination of formal instruction, practical training, and an evaluation of the operator's performance, and should consist of the following subjects:
   a. Operating instructions, warning, and precautions;
   b. Differences between the truck and automobiles;
   c. Truck controls and instrumentation;
   d. Engine/motor operation;
   e. Steering and maneuvering;

   f. Visibility, including restrictions;
   g. Attachment adaptation, operation, and use limitations;
   h. Vehicle capacity and stability;
   i. Refueling and/or recharging;
   j. Operating limitations; and
   k. Any other instructions, warnings, and precautions listed in the operator's manual.
4. Operators completing training shall receive a certificate of completion. The certificate shall include:
   - Name of the operator
   - Date of training
   - Date of evaluation
   - Identity of the person(s) performing the training evaluation.
5. Refresher training shall be conducted at least once every three years. Refresher training may be conducted on an as-needed basis if:
   a. The operator is observed to be using the truck in an unsafe manner;
   b. The operator has been in an accident or a near-miss incident which is attributable to the operation of the truck;
   c. The operator receives an evaluation that indicates unsafe operation of the truck;
   d. The operator is assigned a different type of truck; or
   e. A change occurs in the workplace that could affect the safe operation of the truck.
6. No employees under the age of 18 are allowed to operate powered industrial trucks.

B. Inspections

1. Inspect the truck daily before each shift if used around the clock.
2. Inspections should include each of the following:
   a. Adjustment and wear of the control mechanisms;
   b. Operation of safety devices (horns, seat belts, etc.);
   c. Operation/deterioration of the hydraulic systems;

d. Operation of electrical systems;

e. Operation of steering and breaking systems; and

f. Condition of truck tires.

3. Use Attachment 70-1 as a guide to inspections for battery-operated lift trucks and Attachment 70-2 as a guide to inspections for engine-powered lift trucks.

4. Report any damage or problems identified during the inspection to your immediate supervisor.

5. Approved trucks shall carry labels, nameplates, or identifying marks indicating the following:

   a. Approval of the truck for fire safety purposes by a nationally recognized testing laboratory;

   b. Capacity of the truck and its attachments;

   c. Operation and maintenance instructions; and

   d. Designation of the truck, based on fuel type and fire safety features. The eleven standard truck designations are discussed in Table 1.

6. Ensure that all labels, nameplates, or identifying marks are maintained in legible condition.

C. Operation

1. Review and follow truck operating instructions as provided in the machine's operator manual.

2. Securely fasten seat belts or other restraining devices. Remain seated at all times while the truck is in operation.

3. Keep body parts within the truck while driving. Do not place any part of the body between mast uprights or any other part of the truck where a shear or crushing hazard may exist.

4. Look toward and keep a clear view of the path of travel.

5. Do not permit passengers to ride on the truck unless a separate seat and restraining device is provided.

6. Use extreme caution on or near ditches, holes, embankments, grades, ramps, or other slopes. Avoid turning on grades. Avoid use of the truck in areas where cracks and crumbling surface materials may be present. Never run over loose objects on the roadway surface.

7. Do not make quick starts, jerky stops, or turns at excessive speeds.

8. Slow the truck and sound the horn at cross aisles, intersections, building corners, or other locations where vision is obstructed. Lightly tap the horn to warn pedestrians when approaching from behind.

9. Operate the truck only at those speeds that will permit it to be stopped safely. Pay particular attention to wet or slippery surfaces.

10. Do not drive the truck up to anyone standing in front of a fixed object.

11. Observe all traffic regulations and signage. Maintain at least three truck lengths from other vehicles following the same travel path.

12. Cross railroad tracks or other bumps in the travel path diagonally where possible.

13. When dismounting from the truck, engage the parking brake, lower any lifting devices, and neutralize all controls. Block or chock the wheels if parked on an incline.

14. Stunt driving or horseplay is strictly prohibited.

15. Never allow anyone to ride on a truck's lifting device (if present) unless an acceptable elevating platform is used. If an elevating platform is used to raise personnel to a higher level, secure the elevating platform to the lifting carriage of the truck. Additionally, use a restraining device such as a rail, chain, or body belt with a lanyard for the employee on the platform.

16. In the event that a truck overturns, do not attempt to jump from the machine. Stay in the truck, holding on firmly and leaning in the opposite direction of the overturn.

17. Restrict the use of trucks in areas where large numbers of pedestrians are present (e.g., break areas, primary exits, etc.).

18. Use trucks only for the purpose for which they were designed. Do not use trucks to bump, push, or otherwise move materials or other trucks.

D. Lifting and Moving Loads

1. Handle only stable or safely arranged loads.

2. Place heavy objects with the weight as low as possible.

3. Block or tie objects as necessary to prevent tipping or rolling.

4. Do not load objects to a height that blocks the view of the operator.

5. Do not exceed the rated capacity of the truck or of any attachments. Attachments shall have a load rating plate affixed which indicates the weight that may safely be carried.
6. Do not raise or lower a truck's lifting devices while the truck is in motion.
7. Use extreme care when tilting loads. Tilting a truck attachment forward (e.g., forks, etc.) shall be prohibited except when picking up or depositing a load.
8. On grades, tilt the load back slightly and raise it only as far as is needed to clear the road surface. For grades in excess of 10%, keep the load pointed upslope when ascending or descending.
9. If using a truck to load or unload materials from a trailer or rail car, ensure that their brakes are set and that wheel blocks have been set prior to loading or unloading. Inspect the flooring of trailers and rail cars for breaks or weakness prior to driving onto them.
10. Ensure that dock boards and/or bridge plates are properly secured before being driven over. Drive over dock boards and bridge plates slowly. Never exceed the rated capacity of a dock board or bridge plate.
11. Be observant of overhead installations and utilities such as doorways, pipes, sprinklers, and lights. Review travel pathways for sufficient clearance.

E. Ground Personnel

1. Separate truck traffic and ground personnel where possible.
2. If possible, install physical barriers between workstations and truck travel paths.
3. Do not stand or pass underneath the raised portion of a truck.
4. Do not stand between an operating truck and a fixed object (i.e., walls, posts, docks, benches).
5. Do not ride on the forks or in the cab of a truck unless specifically permitted to do so (see Section C).

F. Service and Maintenance

1. Turn off engines before filling or replacing fuels tanks or recharging/replacing batteries. Ensure that "No Smoking" signs are posted in refueling and/or recharging areas. Immediately clean up any fuel, oil, or electrolyte leaks.
2. Battery charging locations must be provided with facilities for:

a. Flushing and neutralizing spilled electrolyte;
b. Fire protection;
c. Protection of charging apparatus; and
d. Adequate ventilation for dispersal of fumes.

3. Trucks in need of repair shall be removed from service until restored to a safe operating condition.
4. Power sources shall be disconnected or locked out before repairs can be started.
5. Modifications, additions, or attachments which will affect the capacity and safe operation of the truck are prohibited without the written approval of the manufacturer.

G. Hazardous Atmospheres

1. The atmosphere of a work location shall be classified as to whether it is hazardous or non-hazardous prior to considering which designation of powered industrial truck to use in the area.
2. Powered industrial trucks shall not be used in atmospheres containing hazardous concentrations of acetylene, butadiene, ethylene oxide, hydrogen (or gases or vapors equivalent in hazard to hydrogen, such as manufactured gas), propylene oxide, acetaldehyde, cyclopropane, diethyl ether, ethylene, isoprene, or unsymmetrical dimethyl hydrazine (UDMH).
3. Powered industrial trucks shall not be used in atmospheres containing hazardous concentrations of aluminum (and its commercial alloys), magnesium (and its commercial alloys), or other metals of similarly hazardous characteristics.
4. A list describing the use of powered industrial trucks in hazardous atmospheres by truck designation is provided in Table 2.
5. When using fuel-powered trucks in an enclosed area, evaluate carbon monoxide concentrations to ensure that they do not exceed published exposure limits.

5. Documentation Summary

Completed employee training records and truck inspections will be filed in the Health and Safety File.

6. Resources

A. Daily Battery-Powered Powered Industrial Truck Safety Inspection Checklist – Attachment 70-1

B. Daily Engine-Powered Powered Industrial Truck Safety Inspection Checklist – Attachment 70-2

C. Powered Industrial Truck Designations – Table 1

D. Use of Powered Industrial Trucks in Various Hazardous Locations – Table 2

E. U.S. OSHA 29 CFR 1910.178 (Powered Industrial Trucks) http://www.osha.gov/pls/oshaweb/

F. National Institute of Environmental Health Services Health and Safety Manual http://www.niehs.nih.gov/odhsb/manual/man10b.htm

G. American Society of Mechanical Engineers B56.1-1993 http://www.asme.org/codes

H. Fair Labor Standards Act (FLSA) 29 USC 201 et seq. http://www.dol.gov/esa/whd/flsa/

Table 1

POWERED INDUSTRIAL TRUCK DESIGNATIONS

Designation	Description
D	Diesel powered units having minimum acceptable safeguards against inherent fire hazards
DS	Diesel powered units provided with additional safeguards to the exhaust, fuel, and electrical system
DY	Diesel powered units provided with DS unit safeguards which have no electrical equipment (including ignition) and are equipped with temperature limitation features
E	Electrically powered units having minimum acceptable safeguards against inherent fire hazards
ES	Electrically powered units provided with additional safeguards to the electrical system to prevent emission of hazardous sparks and to limit surface temperatures
EE	Electrically powered units that have the electric motor and all other electrical equipment completely enclosed
EX	Electrically powered units in which electrical fittings and equipment are so designed, constructed, and assembled that the units may be used in certain atmospheres containing flammable vapors or dusts
G	Gasoline powered units having minimum acceptable safeguards against inherent fire hazards
GS	Gasoline powered units provided with additional safeguards to the exhaust, fuel, and electrical systems
LP	Liquefied petroleum gas powered units having minimum acceptable safeguards against inherent fire hazards
LPS	Liquefied petroleum gas powered units provided with additional safeguards to the exhaust, fuel, and electrical systems

Table 2
Use Of Powered Industrial Trucks In Various Hazardous Locations

Designation	Use Location
D	Piers, wharves, general storage, industrial or commercial properties with no hazardous atmospheres
DS	• Storage of hazardous liquids in sealed containers • Storage of liquefied or compressed gases in containers • Storage or handling of easily ignitable fibers • Any location designated for D units
DY	• Areas where volatile flammable liquids or gases are handled, processed, or used, but in which the hazard is normally contained within a closed container or system • Areas where deposits of accumulations of ignitable dusts are sufficient to be ignited by arcs or sparks originating from the truck • Areas where ignitable fibers or flyings are present, but are not likely to be present in quantities to produce ignitable mixtures • Any location designated for DS units
E	Piers, wharves, general storage, industrial or commercial properties with no hazardous atmospheres
ES	• Storage of hazardous liquids in sealed containers • Storage of liquefied or compressed gases in containers • Storage or handling of easily ignitable fibers • Any location designated for E units
EE	• Areas where volatile flammable liquids or gases are handled, processed, or used, but in which the hazard is normally contained within a closed container or system • Areas where deposits of accumulations of ignitable dusts are sufficient to be ignited by arcs or sparks originating from the truck • Areas where ignitable fibers or flyings are present, but are not likely to be present in quantities to produce ignitable mixtures • Any location designated for ES units
EX	• Areas where combustible dust is or may be in suspension constantly, intermittently, or periodically under normal conditions in quantities sufficient to produce explosive or ignitable mixtures (typically includes grain, flour, starch, or other organic dust-producing facilities; coal pulverizing plants; metal dust and powder producing facilities; and other similar locations) • Any location designated for EE units
G	Piers, wharves, general storage, industrial or commercial properties with no hazardous atmospheres
GS	• Storage of hazardous liquids in sealed containers • Storage of liquefied or compressed gases in containers • Storage or handling of easily ignitable fibers • Any location designated for G units
LP	Piers, wharves, general storage, industrial or commercial properties with no hazardous atmospheres
LPS	• Storage of hazardous liquids in sealed containers • Storage of liquefied or compressed gases in containers • Storage or handling of easily ignitable fibers • Any location designated for LP units

URS	Health, Safety, and Environment Daily Battery-Powered Industrial Truck Safety Inspection Checklist	Attachment 70-1 Issue Date: Sept 04

Equipment ID No _____ Inspector's Name _____

Equipment Name _____ Employee Number _____

INSTRUCTIONS: The operator shall inspect all applicable items indicated at the start of each shift. If an unsatisfactory condition is observed, suspend operation of the truck and report the unsatisfactory condition to the site supervisor immediately.

ITEM INSPECTED	CHECK IF SATISFACTORY	COMMENTS
Falling Object Protective Structure (FOP)		
Seat Belts		
Grab Handles		
Back-up Alarm		
Lights		
Horn		
Mirrors		
Fire Extinguisher		
Battery Connection		
Battery Charge		
Battery Load Test		
Hydraulic System		
Hydraulic Controls		
Gauge and Instrument Operation		
Tires		
Steering		
Brakes: Service and Emergency		
Attachments		
Informational Plates/ Markings		
Other (as appropriate)		

Operator Signature _____

Date: _____ Time: _____

URS	Health, Safety, and Environment **Daily Engine-Powered Industrial Truck Safety Inspection Checklist**	Attachment 70-2 Issue Date: Sept 04

Equipment ID No _____ Inspector's Name _____

Equipment Name _____ Employee Number _____

INSTRUCTIONS: The operator shall inspect all applicable items indicated at the start of each shift. If an unsatisfactory condition is observed, suspend operation of the truck and report the unsatisfactory condition to the site supervisor immediately.

ITEM INSPECTED	CHECK IF SATISFACTORY	COMMENTS
Falling Object Protective Structure (FOP)		
Seat Belts		
Grab Handles		
Back-up Alarm		
Lights		
Horn		
Mirrors		
Fire Extinguisher		
Fuel Level		
Oil Pressure and Level		
Radiator Water Level		
Hydraulic System		
Hydraulic Controls		
Gauge and Instrument Operation		
Tires		
Steering		
Brakes: Service and Emergency		
Attachments		
Informational Plates/ Markings		
Other (as appropriate)		

Operator Signature _____

Date: _____ Time: _____

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URS SAFETY MANAGEMENT STANDARD
Behavior Based Safety

1. Applicability

This procedure applies to URS office and field operations.

2. Purpose and Scope

Behavior based safety is a process that provides a higher level of safety excellence by promoting proactive responses, building ownership, and developing opportunities which relate to employee safety. A primary concept is that most accidents are due to unsafe behavior, and behavior changes may be made that significantly reduce accident risk.

3. Implementation

The Project Manager has primary responsibility for program implementation. A client-specific Behavior Based Safety program may be substituted for the URS program.

4. Definitions

At-risk Behavior

Individual actions that increase the chance of injury, despite knowledge of the hazard. An example is excessive speed while driving.

Activators

URS activators for safety include, but are not limited to, policy statements, safety management standards (SMS), training, health and safety plans, safe work plans, safety meetings, rules and regulations.

Behaviors

Safe behaviors include following health and safety plans, using work practices that minimize risk, coaching others on safe behavior, and having safety as a priority over speed and convenience.

Consequences

Consequences are a result of safe behavior and at-risk behavior. Examples of consequences include self-approval, reprimand, peer approval, penalty, feedback, inconvenience, and comfort. The most effective consequences are:

1. Certain – high probability that you will receive the consequence.

URS SAFETY MANAGEMENT STANDARD
Behavior Based Safety

2. Soon – the consequence occurs immediately after your behavior.
3. Significant – the consequence is significant or meaningful to you.

5. Requirements

A. Values of Behavior Based Safety

1. Employees hold safety as a value.
2. Each employee feels responsible for the safety of their coworkers as well as themselves.
3. Each employee is willing and able to "go beyond the call of duty" on behalf of the safety of others.

B. Roles for Safe Behavior

1. Supervisor's Role:
   a. Provide clearly defined safety expectations.
   b. Enforce consequences for observed at-risk behavior. Consequences may include verbal warnings, written warnings, or suspension from a project.
   c. Provide positive feedback for safe behavior.
2. Co-Worker Role:
   a. Intervene when observing at-risk behavior.
   b. Provide positive feedback for safe behavior.

C. Identification of At-risk Behaviors.

Review of incident and near miss data will be used by URS Safety to help identify at-risk behavior.

D. Observations of Behaviors.

1. Employee observations.
   a. Observation checklists, either project specific or Attachment 072-1, will be used as a tool to help identify critical behaviors and why the behavior occurred.

b. Employees will be instructed on using the checklists.

c. Checklists will be included in the site-specific health and safety plan or the safe work plan.

d. The checklists will include the expected safe behaviors that the observer is documenting.

e. Peers will complete the checklist for applicable work tasks.

f. Checklists may change throughout the project to include additional observations.

2. Management and health and safety staff will perform safety audits.

E. Feedback to Employees

1. Observers will immediately provide one-on-one feedback to the observed, noting both safe and at-risk behavior.

2. Employees being observed will be given a chance to respond.

3. Potential solutions will be discussed when giving correcting feedback.

4. Praise will be given for safe behavior.

F. Feedback Follow-up

1. Observation checklists will be collected and discussed at weekly project safety meetings.

2. The project supervisor will review the trends for at-risk and safe behavior and reports the trends to the employees.

3. Project specific trends are analyzed and areas of additional action are identified.

6. Resources

Attachment 072-1 – Behavior Based Safety Checklist

URS	Health and Safety Program BEHAVIOR BASED SAFETY CHECKLIST	Attachment 72-1 Issue Date: Sept 2003

Observer	Location	Date

	Critical Behaviors	Safe	Comments *
1.0	**Personal Protective Equipment**		
	Head	❑	
	Hand	❑	
	Feet	❑	
	Eyes/Face	❑	
	Skin	❑	
	Hearing	❑	
	Fall Protection	❑	
2.0	**Equipment/Tools**		
	Proper tool for the job	❑	
	Condition	❑	
	Proper Use	❑	
3.0	**Body Use / Position**		
	Lifting	❑	
	Pinch Point	❑	
	Ladder / stairs	❑	
	Hand placement	❑	
	Travel path / speed	❑	
	Body position	❑	
4.0	**Work Practices**		
	Follow Safety Plan / Procedures	❑	
	Housekeeping	❑	
5.0	**Other**		
		❑	
		❑	
		❑	

* Use comment column when unsafe behavior / conditions were observed. Describe what was observed and why this occurred.

ALCONOX MSDS

Section 1 : MANUFACTURER INFORMATION

Product name: Alconox

Supplier: Same as manufacturer.

Manufacturer: Alconox, Inc.
30 Glenn St.
Suite 309
White Plains, NY 10603.

Manufacturer emergency phone number: 800-255-3924.
813-248-0585 (outside of the United States).

Manufacturer: Alconox, Inc.
30 Glenn St.
Suite 309
White Plains, NY 10603.

Supplier MSDS date: 2005/03/09

D.O.T. Classification: Not regulated.

Section 2 : HAZARDOUS INGREDIENTS

C.A.S.	CONCENTRATION %	Ingredient Name	T.L.V.	LD/50	LC/50
25155-30-0	10-30	SODIUM DODECYLBENZENESULFONATE	NOT AVAILABLE	438 MG/KG RAT ORAL 1330 MG/KG MOUSE ORAL	NOT AVAILABLE
497-19-8	7-13	SODIUM CARBONATE	NOT AVAILABLE	4090 MG/KG RAT ORAL 6600 MG/KG MOUSE ORAL	2300 MG/M3/2H RAT INHALATION 1200 MG/M3/2H MOUSE INHALATION
7722-88-5	10-30	TETRASODIUM PYROPHOSPHATE	5 MG/M3	4000 MG/KG RAT ORAL 2980 MG/KG MOUSE ORAL	NOT AVAILABLE
7758-29-4	10-30	SODIUM PHOSPHATE	NOT AVAILABLE	3120 MG/KG RAT ORAL 3100 MG/KG MOUSE ORAL >4640 MG/KG RABBIT DERMAL	NOT AVAILABLE

Section 2A : ADDITIONAL INGREDIENT INFORMATION

Note: (supplier).
CAS# 497-19-8: LD50 4020 mg/kg - rat oral.
CAS# 7758-29-4: LD50 3100 mg/kg - rat oral.

Section 3 : PHYSICAL / CHEMICAL CHARACTERISTICS

Physical state: Solid

Appearance & odor: Almost odourless.
White granular powder.

Odor threshold (ppm): Not available.

Vapour pressure (mmHg): Not applicable.

Vapour density (air=1): Not applicable.

By weight: Not available.

Evaporation rate (butyl acetate = 1): Not applicable.

Boiling point (°C): Not applicable.

Freezing point (°C): Not applicable.

pH: (1% aqueous solution).
9.5

Specific gravity @ 20 °C: (water = 1).
0.85 - 1.10

Solubility in water (%): 100 - > 10% w/w

Coefficient of water\oil dist.: Not available.

VOC: None

Section 4 : FIRE AND EXPLOSION HAZARD DATA

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.

Auto-ignition temperature: Not available.

Flash point (°C), method: None

Lower flammability limit (% vol): Not applicable.

Upper flammability limit (% vol): Not applicable.

Not available.

Sensitivity to mechanical impact: Not applicable.

Hazardous combustion products: Oxides of carbon (COx).
Hydrocarbons.

Rate of burning: Not available.

Explosive power: None

Section 5 : REACTIVITY DATA

Chemical stability: Stable under normal conditions.

Conditions of instability: None known.

Hazardous polymerization: Will not occur.

Incompatible substances: Strong acids.
Strong oxidizers.

Hazardous decomposition products: See hazardous combustion products.

Section 6 : HEALTH HAZARD DATA

Route of entry: Skin contact, eye contact, inhalation and ingestion.

Effects of Acute Exposure

Eye contact: May cause irritation.

Skin contact: Prolonged contact may cause irritation.

Inhalation: Airborne particles may cause irritation.

Ingestion: May cause vomiting and diarrhea.
May cause abdominal pain.
May cause gastric distress.

Effects of chronic exposure: Contains an ingredient which may be corrosive.

LD50 of product, species & route: > 5000 mg/kg rat oral.

LC50 of product, species & route: Not available for mixture, see the ingredients section.

Exposure limit of material: Not available for mixture, see the ingredients section.

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.

Medical conditions aggravated by exposure: Not available.

First Aid

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.
Seek medical attention if symptoms persist.

Ingestion: Dilute with two glasses of water.
Never give anything by mouth to an unconscious person.
Do not induce vomiting, seek immediate medical attention.

Section 7 : PRECAUTIONS FOR SAFE HANDLING AND USE

Leak/Spill: Contain the spill.
Recover uncontaminated material for re-use.
Wear appropriate protective equipment.
Contaminated material should be swept or shoveled into appropriate waste container for disposal.

Waste disposal: In accordance with municipal, provincial and federal regulations.

Handling procedures and equipment: Protect against physical damage.
Avoid breathing dust.
Wash thoroughly after handling.
Keep out of reach of children.
Avoid contact with skin, eyes and clothing.
Launder contaminated clothing prior to reuse.

Storage requirements: Keep containers closed when not in use.
Store away from strong acids or oxidizers.
Store in a cool, dry and well ventilated area.

Section 8 : CONTROL MEASURES

Precautionary Measures

Gloves/Type:

Neoprene or rubber gloves.

Respiratory/Type:

If exposure limit is exceeded, wear a NIOSH approved respirator.

Eye/Type:

Safety glasses with side-shields.

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.

FISHER SCIENTIFIC -- BENTONITE, B235-500 -- -

==========
Product Identification
==========
Product ID:BENTONITE, B235-500
MSDS Date:12/12/1997
FSC:NIIN:Submitter:N EN
Status Code:A
MSDS Number: CJZNV
=== Responsible Party ===
Company Name:FISHER SCIENTIFIC
Address:1 REAGENT LANE
City:FAIRLAWN
State:NJ
ZIP:07410
Country:US
Info Phone Num:201-796-7100
Emergency Phone Num:201-796-7100
Chemtrec Ind/Phone:(800)424-9300
CAGE:1B464
=== Contractor Identification ===
Company Name:FISHER SCIENTIFIC CO. CHEMICAL MFG DIV
Address:1 REAGENT LANE
Box:City:FAIRLAWN
State:NJ
ZIP:07410-2802
Country:US
Phone:201-796-7100
CAGE:1B464

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Composition/Information on Ingredients
==========
Ingred Name:BENTONITE (EINECS/ELINCS: 215-108-5)
CAS:1302-78-9
RTECS #:CT9450000
= Wt:100.
Other REC Limits:N/K
OSHA PEL:N/K
OSHA STEL:N/K
ACGIH TLV:N/K
ACGIH STEL:N/K

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Hazards Identification
==========
LD50 LC50 Mixture:NOT AVAILABLE.
Routes of Entry: Inhalation:YES Skin:YES Ingestion:YES
Reports of Carcinogenicity:NTP:NO IARC:NO OSHA:NO
Health Hazards Acute and Chronic:ACUTE: EYES: MAY CAUSE EYE IRRITATION. SKIN: MAY CAUSE SKIN IRRITATION. INGESTION: INGESTION OF LARGE AMOUNTS MAY CAUSE GASTROINTESTINAL IRRITATION. THE TOXICOLOGICAL PROPERTIES OF THIS SUBSTANCE HAVE NOT BEEN FULLY INVESTIGATED. INHALATION: MAY CAUSE RESPIRATORY TRACT IRRITATION. THE TOXICOLOGICAL PROPERTIES OF THIS SUBSTANCE HAVE NOT BEEN FULLY

INVESTIGATED. CHRONIC: MAY CAUSE CANCER ACCORDING T O ANIMAL STUDIES. CHRONIC INHALATION MAY CAUSE LUNG CHANGES, CHEST PAIN, BREATH SHORTNESS, AND BRONCHITIS.

Explanation of Carcinogenicity:NOT LISTED BY ACGIH, IARC, NIOSH, NTP, OR OSHA.

Effects of Overexposure:SEE HEALTH HAZARDS.

==========
First Aid Measures
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First Aid:EYES: FLUSH WITH PLENTY OF WATER FOR AT LEAST 15 MINUTES, OCCASIONALLY LIFTING UPPER AND LOWER LIDS. GET MEDICAL AID. SKIN: FLUSH WITH PLENTY OF SOAP AND WATER FOR AT LEAST 15 MINUTES WHILE REMOVING C ONTAMINATED CLOTHING AND SHOES. GET MEDICAL AID IF IRRITATION DEVELOPS OR PERSISTS. INGESTION: IF CONSCIOUS AND ALERT, GIVE 2-4 CUPFULS OF MILK OR WATER. NEVER GIVE ANYTHING BY MOUTH TO AN UNCONSCIOUS PERSON. GET MEDICAL AID. INHALATION: REMOVE TO FRESH AIR IMMEDIATELY. GET MEDICAL AID IF COUGH OR OTHER SYMPTOMS APPEAR. NOTES TO PHYSICIAN: TREAT SYMPTOMATICALLY AND SUPPORTIVELY.

==========
Fire Fighting Measures
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Extinguishing Media:FOR SMALL FIRES, USE WATER SPRAY, DRY CHEMICAL, CARBON DIOXIDE OR CHEMICAL FOAM.

Fire Fighting Procedures:WEAR NIOSH APPROVED SELF-CONTAINED BREATHING APPARATUS AND FULL PROTECTIVE EQUIPMENT .

Unusual Fire/Explosion Hazard:NFPA RATING: NOT PUBLISHED.

==========
Accidental Release Measures
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Spill Release Procedures:USE PROPER PERSONAL PROTECTIVE EQUIPMENT AS INDICATED IN CONTROL MEASURES SECTION. VACUUM OR SWEEP UP MATERIAL AND PLACE INTO A SUITABLE DISPOSAL CONTAINER. AVOID GENERATING DUSTY CONDITIONS.

==========
Handling and Storage
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Handling and Storage Precautions:USE WITH ADEQUATE VENTILATION. AVOID CONTACT WITH SKIN AND EYES. AVOID INGESTION AND INHALATION. STORE IN A COOL, DRY PLACE. STORE IN A TIGHTLY CLOSED CONTAINER.

==========
Exposure Controls/Personal Protection
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Respiratory Protection:FOLLOW THE OSHA RESPIRATOR REGULATIONS FOUND IN 29 CFR 1910.134 OR EUROPEAN STANDARD EN 149. ALWAYS USE A NIOSH OR EUROPEAN STANDARD EN 149 APPROVED RESPIRATOR WHEN NECESSARY.

Ventilation:USE ADEQUATE VENTILATION TO KEEP AIRBORNE CONCENTRATIONS LOW.

Protective Gloves:APPROPRIATE PROTECTIVE GLOVES.WEAR IMPERVIOUS GLOVES.

Eye Protection:ANSI APPROVED CHEMICAL WORKERS GOGGLES .

Other Protective Equipment:ANSI APPROVED EMERGENCY EYEWASH AND DELUGE

SHOWER . WEAR APPROPRIATE PROTECTIVE CLOTHING TO MINIMIZE CONTACT WITH SKIN.

Supplemental Safety and Health

PHYSICAL/CHEMICAL PROPERTIES: MOLECULAR FORMULA: NOT APPLICABLE.

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Physical/Chemical Properties

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Solubility in Water:INSOLUBLE

Appearance and Odor:CREAM SOLID; ODORLESS.

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Stability and Reactivity Data

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Stability Indicator/Materials to Avoid:YES

NONE REPORTED.

Stability Condition to Avoid:STABLE UNDER NORMAL TEMPERATURES AND PRESSURES. AVOID MOISTURE.

Hazardous Decomposition Products:IRRITATING AND TOXIC FUMES AND GASES.

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Toxicological Information

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Toxicological Information:RTECS # CT9450000, CAS # 1302-78-9. EPIDEMIOLOGY: EXPERIMENTAL TUMORIGENIC DATA HAS BEEN REPORTED. TERATOGENICITY, REPRODUCTIVE EFFECTS, NEUROTOXICITY, MUTAGENICITY, OTHER STUDIES: NO DATA AVAILABLE.

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Ecological Information

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Ecological:ECOTOXICITY: NOT AVAILABLE. ENVIRONMENTAL FATE: NOT AVAILABLE. PHYSICAL/CHEMICAL: NOT AVAILABLE. OTHER: NOT AVAILABLE.

==========

Disposal Considerations

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Waste Disposal Methods:DISPOSE OF IN A MANNER CONSISTENT WITH FEDERAL, STATE, AND LOCAL REGULATIONS. RCRA D-SERIES MAXIMUM CONCENTRATION OF CONTAMINANTS: NONE LISTED. RCRA D-SERIES CHRONIC TOXICITY REFERENCE LEVELS: NONE LI STED. RCRA F-SERIES: NONE LISTED. RCRA P-SERIES: NONE LISTED. RCRA U-SERIES: NONE LISTED.

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MSDS Transport Information

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Transport Information:US DOT, IATA, RID/ADR, IMO, CANADA TDG: SHIPPING NAME: NO INFORMATION AVAILABLE.

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Regulatory Information

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SARA Title III Information:SECTION 302 (RQ): NONE OF THE CHEMICALS IN

THIS MATERIAL HAVE AN RQ. SECTION 302 (TPQ): NONE OF THE CHEMICALS IN THIS PRODUCT HAVE A TPQ. SECTION 313: NO CHEMICALS ARE REPORTABLE UNDER SECTION 313.

Federal Regulatory Information:TSCA: CAS # 1302-78-9 IS LISTED ON TSCA INVENTORY. HLTH & SFTY REPORTING LIST: NONE OF THE CHEMS ARE ON HLTH & SFTY REPORTING LIST. CHEM TEST RULES: NONE OF THE CHEMS IN PROD ARE UNDER CHEM TEST RULE. SECTION 12B: NONE OF THE CHEMS ARE LISTED UNDER TSCA SECTION 12B. TSCA SIGNIFICANT NEW USE RULE: NONE OF CHEMS IN THIS MATL HAVE A SNUR UNDER TSCA. CLEAN AIR ACT: THIS MATL DOES NOT CONTAIN ANY HAZ A IR POLLUTANTS. THIS MATL DOES NOT CONTAIN ANY CLASS 1/CLASS 2 OZONE DEPLETORS. CLEAN WATER ACT: NONE OF THE CHEMS IN THIS PROD ARE LISTED AS HAZ SUBSTANCES UNDER CWA/AS PRIORITY POLLUTANTS UNDER CWA/AS TOX POLLUTANTS UNDER CWA. (OTHER INFO)

State Regulatory Information:CAS # 1302-78-9 IS NOT PRESENT ON STATE LISTS FROM CA, PA, MN, MA, FL, OR NJ. CALIFORNIA NO SIGNIFICANT RISK LEVEL: NONE OF THE CHEMICALS IN THIS PRODUCT ARE LISTED.

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Other Information

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Disclaimer (provided with this information by the compiling agencies): This information is formulated for use by elements of the Department of Defense. The United States of America in no manner whatsoever, expressly or implied, warrants this information to be accurate and disclaims all liability for its use. Any person utilizing this document should seek competent professional advice to verify and assume responsibility for the suitability of this information to their particular situation.

Gasoline

CAS 8006-61-9

RTECS LX3300000

Synonyms & Trade Names
Motor fuel, Motor spirits, Natural gasoline, Petrol [Note: A complex mixture of volatile hydrocarbons (paraffins, cycloparaffins & aromatics).]

DOT ID & Guide
1203 128

Exposure Limits

NIOSH REL: Ca See Appendix A

OSHA PEL†: none

IDLH Ca [N.D.] See: IDLH INDEX

Conversion 1 ppm 2.95 mg/m^3 (approx)

Physical Description
Clear liquid with a characteristic odor.

MW: 72 (approx)	BP: 102°F	FRZ: ?	Sol: Insoluble
VP: 38-300 mmHg	IP: ?		Sp.Gr(60°F): 0.72-0.76
Fl.P: -45°F	UEL: 7.6%	LEL: 1.4%	

Class IB Flammable Liquid: Fl.P. below 73°F and BP at or above 100°F.

Incompatibilities & Reactivities
Strong oxidizers such as peroxides, nitric acid & perchlorates

Measurement Methods
OSHA PV2028
See: NMAM or OSHA Methods

Personal Protection & Sanitation
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contaminated
Remove: When wet (flammable)
Change: No recommendation
Provide: Eyewash, Quick drench

First Aid (See procedures)
Eye: Irrigate immediately
Skin: Soap flush immediately
Breathing: Respiratory support
Swallow: Medical attention immediately

Important additional information about respirator selection
Respirator Recommendations NIOSH
At concentrations above the NIOSH REL, or where there is no REL, at any detectable concentration: (APF = 10,000) Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode/(APF = 10,000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained positive-pressure breathing apparatus
Escape: (APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted organic vapor canister/Any appropriate escape-type, self-contained breathing apparatus

Exposure Routes inhalation, skin absorption, ingestion, skin and/or eye contact

Symptoms Irritation eyes, skin, mucous membrane; dermatitis; headache, lassitude (weakness, exhaustion), blurred vision, dizziness, slurred speech, confusion, convulsions; chemical pneumonitis (aspiration liquid); possible liver, kidney damage; [potential occupational carcinogen]

Target Organs Eyes, skin, respiratory system, central nervous system, liver, kidneys

Cancer Site [in animals: liver & kidney cancer]

See also: INTRODUCTION

MSDS *Material Safety Data Sheet*

From: Mallinckrodt Baker, Inc.
222 Red School Lane
Phillipsburg, NJ 08865

Mallinckrodt CHEMICALS J.T.Baker

24 Hour Emergency Telephone: 908-859-2151
CHEMTREC: 1-800-424-9300

National Response in Canada
CANUTEC: 613-996-6666

Outside U.S. and Canada
Chemtrec: 703-527-3887

NOTE: CHEMTREC, CANUTEC and National Response Center emergency numbers to be used only in the event of chemical emergencies involving a spill, leak, fire, exposure or accident involving chemicals.

All non-emergency questions should be directed to Customer Service (1-800-582-2537) for assistance.

HYDROCHLORIC ACID, 33 - 40%

MSDS Number: H3880 --- ***Effective Date: 05/10/01***

1. Product Identification

Synonyms: Muriatic acid; hydrogen chloride, aqueous
CAS No.: 7647-01-0
Molecular Weight: 36.46
Chemical Formula: HCl
Product Codes:
J.T. Baker: 5367, 5537, 5575, 5800, 5814, 5839, 5894, 5994, 6900, 7831, 9529, 9530, 9534, 9535, 9536, 9537, 9538, 9539, 9540, 9544, 9548
Mallinckrodt: 2062, 2612, 2624, 2626, 5587, H611, H613, H987, H992, H999, V078, V628

2. Composition/Information on Ingredients

Ingredient	CAS No	Percent	Hazardous
Hydrogen Chloride	7647-01-0	33 - 40%	Yes
Water	7732-18-5	60 - 67%	No

3. Hazards Identification

Emergency Overview

POISON! DANGER! CORROSIVE. LIQUID AND MIST CAUSE SEVERE BURNS TO ALL BODY TISSUE. MAY BE FATAL IF SWALLOWED OR INHALED. INHALATION MAY CAUSE LUNG DAMAGE.

J.T. Baker SAF-T-DATA(tm) Ratings (Provided here for your convenience)

Health Rating: 3 - Severe (Poison)
Flammability Rating: 0 - None
Reactivity Rating: 2 - Moderate
Contact Rating: 3 - Severe (Corrosive)
Lab Protective Equip: GOGGLES & SHIELD; LAB COAT & APRON; VENT HOOD; PROPER GLOVES
Storage Color Code: White (Corrosive)

Potential Health Effects

Inhalation:
Corrosive! Inhalation of vapors can cause coughing, choking, inflammation of the nose, throat, and upper respiratory tract, and in severe cases, pulmonary edema, circulatory failure, and death.
Ingestion:
Corrosive! Swallowing hydrochloric acid can cause immediate pain and burns of the mouth, throat, esophagus and gastrointestinal tract. May cause nausea, vomiting, and diarrhea. Swallowing may be fatal.
Skin Contact:
Corrosive! Can cause redness, pain, and severe skin burns. Concentrated solutions cause deep ulcers and discolor skin.
Eye Contact:
Corrosive! Vapors are irritating and may cause damage to the eyes. Contact may cause severe burns and permanent eye damage.
Chronic Exposure:
Long-term exposure to concentrated vapors may cause erosion of teeth. Long term exposures seldom occur due to the corrosive properties of the acid.
Aggravation of Pre-existing Conditions:
Persons with pre-existing skin disorders or eye disease may be more susceptible to the effects of this substance.

---

4. First Aid Measures

Inhalation:
Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention immediately.
Ingestion:

DO NOT INDUCE VOMITING! Give large quantities of water or milk if available. Never give anything by mouth to an unconscious person. Get medical attention immediately.

Skin Contact:

In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention immediately.

Eye Contact:

Immediately flush eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Get medical attention immediately.

---

5. Fire Fighting Measures

Fire:

Extreme heat or contact with metals can release flammable hydrogen gas.

Explosion:

Not considered to be an explosion hazard.

Fire Extinguishing Media:

If involved in a fire, use water spray. Neutralize with soda ash or slaked lime.

Special Information:

In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode. Structural firefighter's protective clothing is ineffective for fires involving hydrochloric acid. Stay away from ends of tanks. Cool tanks with water spray until well after fire is out.

---

6. Accidental Release Measures

Ventilate area of leak or spill. Wear appropriate personal protective equipment as specified in Section 8. Isolate hazard area. Keep unnecessary and unprotected personnel from entering. Contain and recover liquid when possible. Neutralize with alkaline material (soda ash, lime), then absorb with an inert material (e. g., vermiculite, dry sand, earth), and place in a chemical waste container. Do not use combustible materials, such as saw dust. Do not flush to sewer! US Regulations (CERCLA) require reporting spills and releases to soil, water and air in excess of reportable quantities. The toll free number for the US Coast Guard National Response Center is (800) 424-8802.

J. T. Baker NEUTRASORB® or TEAM® 'Low Na+' acid neutralizers are recommended for spills of this product.

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7. Handling and Storage

Store in a cool, dry, ventilated storage area with acid resistant floors and good drainage. Protect

from physical damage. Keep out of direct sunlight and away from heat, water, and incompatible materials. Do not wash out container and use it for other purposes. When diluting, the acid should always be added slowly to water and in small amounts. Never use hot water and never add water to the acid. Water added to acid can cause uncontrolled boiling and splashing. When opening metal containers, use non-sparking tools because of the possibility of hydrogen gas being present. Containers of this material may be hazardous when empty since they retain product residues (vapors, liquid); observe all warnings and precautions listed for the product.

---

8. Exposure Controls/Personal Protection

Airborne Exposure Limits:
-OSHA Permissible Exposure Limit (PEL):
5 ppm Ceiling
-ACGIH Threshold Limit Value (TLV):
5 ppm Ceiling

Ventilation System:
A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, *Industrial Ventilation, A Manual of Recommended Practices*, most recent edition, for details.
Personal Respirators (NIOSH Approved):
If the exposure limit is exceeded, a full facepiece respirator with an acid gas cartridge may be worn up to 50 times the exposure limit or the maximum use concentration specified by the appropriate regulatory agency or respirator supplier, whichever is lowest. For emergencies or instances where the exposure levels are not known, use a full-facepiece positive-pressure, air-supplied respirator. WARNING: Air purifying respirators do not protect workers in oxygen-deficient atmospheres.
Skin Protection:
Rubber or neoprene gloves and additional protection including impervious boots, apron, or coveralls, as needed in areas of unusual exposure to prevent skin contact.
Eye Protection:
Use chemical safety goggles and/or a full face shield where splashing is possible. Maintain eye wash fountain and quick-drench facilities in work area.

---

9. Physical and Chemical Properties

Appearance:
Colorless, fuming liquid.
Odor:
Pungent odor of hydrogen chloride.
Solubility:
Infinite in water with slight evolution of heat.

Density:
1.18
pH:
For HCL solutions: 0.1 (1.0 N), 1.1 (0.1 N), 2.02 (0.01 N)
% Volatiles by volume @ 21C (70F):
100
Boiling Point:
53C (127F) Azeotrope (20.2%) boils at 109C (228F)
Melting Point:
-74C (-101F)
Vapor Density (Air=1):
No information found.
Vapor Pressure (mm Hg):
190 @ 25C (77F)
Evaporation Rate (BuAc=1):
No information found.

---

10. Stability and Reactivity

Stability:
Stable under ordinary conditions of use and storage. Containers may burst when heated.
Hazardous Decomposition Products:
When heated to decomposition, emits toxic hydrogen chloride fumes and will react with water or steam to produce heat and toxic and corrosive fumes. Thermal oxidative decomposition produces toxic chlorine fumes and explosive hydrogen gas.
Hazardous Polymerization:
Will not occur.
Incompatibilities:
A strong mineral acid, concentrated hydrochloric acid is incompatible with many substances and highly reactive with strong bases, metals, metal oxides, hydroxides, amines, carbonates and other alkaline materials. Incompatible with materials such as cyanides, sulfides, sulfites, and formaldehyde.

Conditions to Avoid:
Heat, direct sunlight.

---

11. Toxicological Information

Inhalation rat LC50: 3124 ppm/1H; oral rabbit LD50: 900 mg/kg (Hydrochloric acid concentrated); investigated as a tumorigen, mutagen, reproductive effector.

```
--------\Cancer Lists\-----------------------------------------------------
                                        ---NTP Carcinogen---
Ingredient                              Known    Anticipated    IARC Category
```

Hydrogen Chloride (7647-01-0)	No	No	3
Water (7732-18-5)	No	No	None

12. Ecological Information

Environmental Fate:
When released into the soil, this material is not expected to biodegrade. When released into the soil, this material may leach into groundwater.
Environmental Toxicity:
This material is expected to be toxic to aquatic life.

13. Disposal Considerations

Whatever cannot be saved for recovery or recycling should be handled as hazardous waste and sent to a RCRA approved waste facility. Processing, use or contamination of this product may change the waste management options. State and local disposal regulations may differ from federal disposal regulations. Dispose of container and unused contents in accordance with federal, state and local requirements.

14. Transport Information

Domestic (Land, D.O.T.)

Proper Shipping Name: HYDROCHLORIC ACID
Hazard Class: 8
UN/NA: UN1789
Packing Group: II
Information reported for product/size: 475LB

International (Water, I.M.O.)

Proper Shipping Name: HYDROCHLORIC ACID
Hazard Class: 8
UN/NA: UN1789
Packing Group: II
Information reported for product/size: 475LB

15. Regulatory Information

```
--------\Chemical Inventory Status - Part 1\---------------------------------
Ingredient                                        TSCA  EC   Japan  Australia
----------------------------------------------  ----  ---  -----  ---------
Hydrogen Chloride (7647-01-0)                     Yes  Yes   Yes      Yes
Water (7732-18-5)                                 Yes  Yes   Yes      Yes

--------\Chemical Inventory Status - Part 2\---------------------------------
                                                         --Canada--
Ingredient                                        Korea  DSL   NDSL  Phil.
----------------------------------------------  -----  ---   ----  -----
Hydrogen Chloride (7647-01-0)                     Yes   Yes   No     Yes
Water (7732-18-5)                                 Yes   Yes   No     Yes

--------\Federal, State & International Regulations - Part 1\----------------
                                          -SARA 302-    ------SARA 313------
Ingredient                                RQ    TPQ     List  Chemical Catg.
----------------------------------------  ---   -----   ----  --------------
Hydrogen Chloride (7647-01-0)             5000  500*    Yes        No
Water (7732-18-5)                         No    No      No         No

--------\Federal, State & International Regulations - Part 2\----------------
                                                        -RCRA-    -TSCA-
Ingredient                                CERCLA        261.33     8(d)
----------------------------------------  ------        ------    ------
Hydrogen Chloride (7647-01-0)             5000          No         No
Water (7732-18-5)                         No            No         No


Chemical Weapons Convention:  No     TSCA 12(b):  No     CDTA:  Yes
SARA 311/312:  Acute: Yes      Chronic: Yes  Fire: No  Pressure: No
Reactivity: No          (Mixture / Liquid)
```

Australian Hazchem Code: 2R
Poison Schedule: None allocated.
WHMIS:
This MSDS has been prepared according to the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all of the information required by the CPR.

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16. Other Information

NFPA Ratings: Health: **3** Flammability: **0** Reactivity: **0**
Label Hazard Warning:
POISON! DANGER! CORROSIVE. LIQUID AND MIST CAUSE SEVERE BURNS TO ALL BODY TISSUE. MAY BE FATAL IF SWALLOWED OR INHALED. INHALATION MAY CAUSE LUNG DAMAGE.
Label Precautions:
Do not get in eyes, on skin, or on clothing.
Do not breathe vapor or mist.

Use only with adequate ventilation.
Wash thoroughly after handling.
Store in a tightly closed container.
Remove and wash contaminated clothing promptly.

Label First Aid:

In case of contact, immediately flush eyes or skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. If swallowed, DO NOT INDUCE VOMITING. Give large quantities of water. Never give anything by mouth to an unconscious person. If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. In all cases get medical attention immediately.

Product Use:

Laboratory Reagent.

Revision Information:

MSDS Section(s) changed since last revision of document include: 16.

Disclaimer:

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Prepared by: Environmental Health & Safety
Phone Number: (314) 654-1600 (U.S.A.)

MSDS Number: **H4070** * * * * * *Effective Date: 04/22/05* * * * * *Supercedes: 06/03/02*

MSDS Material Safety Data Sheet

From: **Mallinckrodt Baker, Inc.**
222 Red School Lane
Phillipsburg, NJ 08865

24 Hour Emergency Telephone: 908-859-2151
CHEMTREC: 1-800-424-9300
National Response in Canada
CANUTEC: 613-996-6666
Outside U.S. And Canada
Chemtrec: 703-527-3887

NOTE: CHEMTREC, CANUTEC and National Response Center emergency numbers to be used only in the event of chemical emergencies involving a spill, leak, fire, exposure or accident involving chemicals.

All non-emergency questions should be directed to Customer Service (1-800-582-2537) for assistance.

HYDROGEN PEROXIDE SOLUTION 3%

1. Product Identification

Synonyms: Hydrogen Dioxide Solution, 3%; Hydrogen Peroxide Topical Solution U.S.P
CAS No.: 7722-84-1
Molecular Weight: 34.01
Chemical Formula: H2O2 in aqueous solution (3%)
Product Codes: 2180, 2182

2. Composition/Information on Ingredients

Ingredient	CAS No	Percent	Hazardous
Hydrogen Peroxide	7722-84-1	2 - 4%	Yes
Phenacetin	62-44-2	< 0.05%	No
Water	7732-18-5	96 - 98%	No

3. Hazards Identification

Emergency Overview

WARNING! MAY BE HARMFUL IF SWALLOWED. CAUSES EYE IRRITATION.

SAF-T-DATA(tm) Ratings (Provided here for your convenience)

Health Rating: 2 - Moderate
Flammability Rating: 0 - None
Reactivity Rating: 1 - Slight
Contact Rating: 2 - Moderate
Lab Protective Equip: GOGGLES; LAB COAT; VENT HOOD; PROPER GLOVES
Storage Color Code: Green (General Storage)

Potential Health Effects

Inhalation:
Not expected to be a health hazard under normal conditions.

Ingestion:
Large oral doses may cause irritation and blistering to the mouth, throat, and abdomen. May also cause abdominal pain, vomiting, and diarrhea.
Skin Contact:
No adverse effects expected on intact skin. Contact on burn or open skin may cause stinging pain or irritation.
Eye Contact:
Causes irritation, redness, and pain.
Chronic Exposure:
No information found.
Aggravation of Pre-existing Conditions:
No information found.

---

4. First Aid Measures

Inhalation:
Not expected to require first aid measures.
Ingestion:
Give several glasses of water to drink to dilute. If large amounts were swallowed, get medical advice.
Skin Contact:
Not expected to require first aid measures. Wash exposed area with soap and water. Get medical advice if irritation develops.
Eye Contact:
Immediately flush eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Get medical attention immediately.

---

5. Fire Fighting Measures

Fire:
Not considered to be a fire hazard. Concentrated hydrogen peroxide (30%) is a strong oxidizer, but this dilute product does not present that hazard.
Explosion:
Not considered to be an explosion hazard. Drying of concentrated hydrogen peroxide on clothing or other combustible materials may cause fire or explosion.
Fire Extinguishing Media:
Use any means suitable for extinguishing surrounding fire.
Special Information:
In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode.

---

6. Accidental Release Measures

Ventilate area of leak or spill. Wear appropriate personal protective equipment as specified in Section 8. Contain and recover liquid when possible. Collect liquid in an appropriate container or absorb with an inert material (e. g., vermiculite, dry sand, earth), and place in a chemical waste container. Do not use combustible materials, such as saw dust. Small amounts of residue may be flushed to sewer with plenty of water.

---

7. Handling and Storage

Store in a cool, well-ventilated dark area. Protect from freezing. Isolate from incompatible substances. Protect container from physical damage. Containers of this material may be hazardous when empty since they retain product residues (vapors, liquid); observe all warnings and precautions listed for the product.

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8. Exposure Controls/Personal Protection

Airborne Exposure Limits:
-OSHA Permissible Exposure Limit (PEL):
1 ppm (TWA).
-ACGIH Threshold Limit Value (TLV):
1 ppm (TWA), A3: Animal carcinogen.
Ventilation System:
A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, *Industrial Ventilation, A Manual of Recommended Practices*, most recent edition, for details.
Personal Respirators (NIOSH Approved):

Not expected to require personal respirator usage. If the exposure limit is exceeded, wear a supplied air, full-facepiece respirator, airlined hood, or full-facepiece self-contained breathing apparatus. This substance has unknown warning properties.
Skin Protection:
Wear protective gloves and clean body-covering clothing.
Eye Protection:
Use chemical safety goggles and/or a full face shield where splashing is possible. Maintain eye wash fountain and quick-drench facilities in work area.

---

9. Physical and Chemical Properties

Appearance:
Clear, colorless solution.
Odor:
Odorless.
Solubility:
Infinitely soluble.
Specific Gravity:
ca. 1.0
pH:
No information found.
% Volatiles by volume @ 21C (70F):
100
Boiling Point:
ca. 100C (ca. 212F)
Melting Point:
ca. 0C (ca. 32F)
Vapor Density (Air=1):
No information found.
Vapor Pressure (mm Hg):
No information found.
Evaporation Rate (BuAc=1):
No information found.

---

10. Stability and Reactivity

Stability:
Stable under ordinary conditions of use and storage.
Hazardous Decomposition Products:
Decomposes to water and oxygen.
Hazardous Polymerization:
Will not occur.
Incompatibilities:
Heat, reducing agents, organic materials, dirt, alkalis, rust, and many metals.
Conditions to Avoid:
Light, heat, incompatibles.

11. Toxicological Information

--------\Cancer Lists\----------

Ingredient	---NTP Carcinogen--- Known	Anticipated	IARC Category
Hydrogen Peroxide (7722-84-1)	No	No	3
Phenacetin (62-44-2)	No	Yes	2A
Water (7732-18-5)	No	No	None

12. Ecological Information

Environmental Fate:
No information found.
Environmental Toxicity:
No information found.

13. Disposal Considerations

Dilute with water and flush to sewer if local ordinances allow, otherwise, whatever cannot be saved for recovery or recycling should be managed in an appropriate and approved waste disposal facility. Processing, use or contamination of this product may change the waste management options. State and local disposal regulations may differ from federal disposal regulations. Dispose of container and unused contents in accordance with federal, state and local requirements.

14. Transport Information

Not regulated.

15. Regulatory Information

--------\Chemical Inventory Status - Part 1\----------

Ingredient	TSCA	EC	Japan	Australia
Hydrogen Peroxide (7722-84-1)	Yes	Yes	Yes	Yes
Phenacetin (62-44-2)	Yes	Yes	Yes	Yes
Water (7732-18-5)	Yes	Yes	Yes	Yes

--------\Chemical Inventory Status - Part 2\----------

Ingredient	Korea	--Canada-- DSL	NDSL	Phil.
Hydrogen Peroxide (7722-84-1)	Yes	Yes	No	Yes
Phenacetin (62-44-2)	Yes	Yes	No	Yes
Water (7732-18-5)	Yes	Yes	No	Yes

--------\Federal, State & International Regulations - Part 1\----------

Ingredient	-SARA 302- RQ	TPQ	------SARA 313------ List	Chemical Catg.
Hydrogen Peroxide (7722-84-1)	No	No	No	No
Phenacetin (62-44-2)	No	No	No	No
Water (7732-18-5)	No	No	No	No

--------\Federal, State & International Regulations - Part 2\----------

Ingredient	CERCLA	-RCRA- 261.33	-TSCA- 8(d)
Hydrogen Peroxide (7722-84-1)	No	No	No
Phenacetin (62-44-2)	100	U187	No
Water (7732-18-5)	No	No	No

Chemical Weapons Convention: No TSCA 12(b): Yes CDTA: No
SARA 311/312: Acute: Yes Chronic: No Fire: No Pressure: No
Reactivity: Yes (Mixture / Liquid)

WARNING:
THIS PRODUCT CONTAINS A CHEMICAL(S) KNOWN TO THE STATE OF CALIFORNIA TO CAUSE CANCER.

Australian Hazchem Code: None allocated.
Poison Schedule: S5
WHMIS:
This MSDS has been prepared according to the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all of the information required by the CPR.

---

16. Other Information

NFPA Ratings: Health: **1** Flammability: **0** Reactivity: **1**
Label Hazard Warning:
WARNING! MAY BE HARMFUL IF SWALLOWED. CAUSES EYE IRRITATION.
Label Precautions:
Avoid contact with eyes.
Keep container closed.
Wash thoroughly after handling.
Label First Aid:
In case of eye contact, immediately flush eyes with plenty of water for at least 15 minutes. Get medical attention. If swallowed, give large amounts of water to drink. Never give anything by mouth to an unconscious person. If large amounts were swallowed, get medical advice.

Product Use:
Laboratory Reagent.
Revision Information:
MSDS Section(s) changed since last revision of document include: 3.
Disclaimer:
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Mallinckrodt Baker, Inc. provides the information contained herein in good faith but makes no representation as to its comprehensiveness or accuracy. This document is intended only as a guide to the appropriate precautionary handling of the material by a properly trained person using this product. Individuals receiving the information must exercise their independent judgment in determining its appropriateness for a particular purpose. MALLINCKRODT BAKER, INC. MAKES NO REPRESENTATIONS OR WARRANTIES, EITHER EXPRESS OR IMPLIED, INCLUDING WITHOUT LIMITATION ANY WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE WITH RESPECT TO THE INFORMATION SET FORTH HEREIN OR THE PRODUCT TO WHICH THE INFORMATION REFERS. ACCORDINGLY, MALLINCKRODT BAKER, INC. WILL NOT BE RESPONSIBLE FOR DAMAGES RESULTING FROM USE OF OR RELIANCE UPON THIS INFORMATION.
****

Prepared by: Environmental Health & Safety
Phone Number: (314) 654-1600 (U.S.A.)

AIRGAS INC -- ISOBUTYLENE-C4H8 -- 6665-01-448-3250
==========
MSDS Safety Information
==========
FSC: 6665
NIIN: 01-448-3250
MSDS Date: 01/16/1998
MSDS Num: CLCVZ
Tech Review: 05/17/2001
Product ID: ISOBUTYLENE-C4H8
Responsible Party
Cage: U0451
Name: AIRGAS INC
Address: 259 RADNOR-CHESTER RD SUITE 100
City: RADNOR PA 19087-5240 US
Info Phone Number: 1-610-687-5253
Emergency Phone Number: (800)424-9300
Resp. Party Other MSDS No.: DOCUMENT NUMBER: 1031
Preparer's Name: CHEMICAL SAFETY ASSOCIATE
Chemtrec IND/Phone: (800)424-9300
Review Ind: N
==========
Preparer Co. when other than Responsible Party Co.
==========
Cage: 0KBF5
Assigned Ind: N
Name: CHEMICAL SAFETY ASSOCIATES INC
Address: 9163 CHESAPEAKE DR
City: SAN DIEGO CA 92123-1002
==========
Contractor Summary
==========
Cage: U0451
Name: AIRGAS INC
Address: 259 RADNOR-CHESTER RD SUITE 100
City: RADNOR PA 19087-5240 US
Phone: 1-610-687-5253
Cage: 7Z016
Name: KAMPI COMPONENTS CO., INC.
Address: 210 RT 13
Box: 721
City: BRISTOL PA 19007-3517 US
Phone: 215-736-2000
==========
Item Description Information
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Unit of Issue: EA
Type of Container: CYLINDER
==========
Ingredients
==========
Cas: 115-11-7
RTECS #: UD0890000
Name: ISOBUTYLENE
> Wt: 99.
Ozone Depleting Chemical: N

Name: MAXIMUM IMPURITIES
< Wt: 1.
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Health Hazards Data
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Route Of Entry Inds - Inhalation: YES
Carcinogenicity Inds - NTP: NO
IARC: NO
OSHA: NO
Effects of Exposure: ACUTE: THE MOST SIGNIFICANT HAZARD IS OXYGEN-DEFICIENT ATOMSPHERES. AT HIGH CONCENTRATIONS UNCONSCIOUSNESS OR DEATH MAY OCCUR. CONTACT WITH LIQUIDFIED GAS OR RAPIDLY EXPANDING GASES MAY CAUSE FROSTBIT E. ISOBUTYLENE ALSO HAS SOME DEGREE OF ANESTHETIC ACTION AND CAN BE MILDLY IRRITATING TO THE MUCOUS MEMBRANES. CHRONIC: NO KNOWN ADVERSE HEALTH EFFECTS ASSOCIATED WITH CHRONIC EXPOSURE TO ISOBUTYLENE. TARGET ORGANS: RESPIRATORY SYSTEM.
Explanation Of Carcinogenicity: ISOBUTYLENE IS NOT FOUND ON THE FOLLOWING LISTS: FEDERAL OSHA Z LIST, NTP, IARC, CAL/OSHA, AND THEREFORE IS NEITHER CONSIDERED TO BE NOR SUSPECTED TO BE A CANCER-CAUSING AGENT BY THESE AGENCIES.
Signs And Symptions Of Overexposure: INHALATION: SYMPTOMS OF OXYGEN DEFICIENCY INCLUDE RESPIRATORY DIFFICULTY, HEADACHES, RINGING IN EARS, DIZZINESS, DROWSINESS, UNCONSCIOUSNESS, NAUSEA, VOMITING, AND DEPRESSION OF ALL THE SENSES. UNDER SOME CIRCUSTANCES OF OVEREXPOSURE, DEATH MAY OCCUR.
First Aid: RESCUERS SHOULD NOT ATTEMPT TO RETRIEVE VICTIMS OF EXPOSURE TO ISOBUTYLENE WITHOUT ADEQUATE PERSONAL PROTECTIVE EQUIPMENT. AT A MINIMUM, SELF-CONTAINED BREATHING APPARATUS AND FIRE-RETARDANT PERSONAL PROTECTIVE EQUIPMENT SHOULD BE WORN. FIRE PROTECTION MUST BE PROVIDED DURING RESCUE SITUATIONS. REMOVE VICTIMS(S) TO FRESH AIR. TRAINED PERSONNEL SHOULD ADMINISTER OXYGEN AND/OR CARDIO-PULMONARY RESUS CITATION, IF NECESSARY. IN CASE OF FROSTBITE, PLACE FROSTBITEN PART IN WARM WATER. (CONTD. SEE OTHER INFORMATION)
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Handling and Disposal
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Spill Release Procedures: UNCONTROLLED RELEASES SHOULD BE COVERED BY TRAINED PERSONNEL USING PRE-PLANNED PROCEDURES. PROPER PROTECTIVE EQUIPMENT SHOULD BE USED. ADEQUATE FIRE PROTECTION MUST BE PROVIDED. MINIMUM PERSONAL PROTE CTIVE EQUIPMENT SHOULD BE LEVEL B: FIRE RETARDANT PROTECTIVE CLOTHING, GLOVES RESISTANT TO TEARS AND SELF CONTAINED BREATHING APPARATUS. USE NON-SPARKING TOOLS AND (CONTD. SEE "WASTE DISPOSAL")
Waste Disposal Methods: WASTE DISPOSAL MUST BE IN ACCORDANCE WITH APPROPRIATE FEDERAL, STATE, AND LOCAL REGULATIONS. RETURN CYLINDERS WITH ANY RESIDUAL PRODUCT TO AIRGAS INC. DO NOT DISPOSE OF LOCALLY. (CONTD. FROM "SPILL RE LEASE") EQUIPMENT. IF NOT ABLE TO STOP RELEASE, ALLOW GAS TO RELEASE IN PLACE OR REMOVE TO A SAFE AR EA AND ALLOW GAS TO RELEASE.
Handling And Storage Precautions: STORE IN COOL(,< 125F), DRY, WELL-VENTILATED AREA AWAY FROM SOURCES OF HEAT, IGNITION, DIRECT SUNLIGHT. COMPRESSED GASES PRESENT SAFETY HAZARD. STORE AWAY FROM OXIDIZERS, OXIGEN, CHLORINE, FLUORINE, H EAVILY TRAFFICKED AREAS, EMERGENCY EXITS. POST "NO SMOKING OR NO OPEN FLAMES " SIGNS.
Other Precautions: ELECTRICAL EQUIPMENT SHOULD BE NON-SPARKING. MOVE CYLINDERS WITH HAND TRUCK. DO NOT DRAG, ROLL, DROP, STRIKE EACH OTHER. SECURE FIRMLY. DO NOT HEAT CYLINDER OR USE OILS OR GREASE ON GAS-HANDLING FITTI NGS OR EQUIPMENT. USE DESIGNATED CGA FITTINGS. DO NOT USE ADAPTERS. USE CHECK VALVE OR TRAP IN DISCH ARGE LINE.
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Fire and Explosion Hazard Information
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Flash Point Method: CC
Flash Point: <-10.C, 14.F

Autoignition Temp: =465.C, 869.F
Lower Limits: 1.8
Upper Limits: 9.6
Extinguishing Media: EXTINGUISH ISOBUTYLENE FIRES BY SHUTTING OFF THE SOURCE OF THE GAS. USE WATER SPRAY OR A FOAM AGENT TO COOL FIRE-EXPOSED CONTAINERS, STRUCTURES AND EQUIPMENT.
Fire Fighting Procedures: STRUCTURAL FIREFIGHTERS MUST WEAR SELF-CONTAINED BREATHING APPARATUS AND FULL PROTECTIVE EQUIPMENT. THE BEST FIRE-FIGHTING TECHNIQUE MAY BE SIMPLY TO LET THE BURNING GAS ESCAPE FROM THE PRESSURIZED CY LINDER, TANK CAR, OR PIPELINE. STOP THE LEAK BEFORE EXTINGUISHING FIRE. LEAKING GAS COULD EXPLOSIVELY RE-IGNITE.
Unusual Fire/Explosion Hazard: WHEN INVOLVED IN A FIRE, THIS MATERIAL MAY IGNITE AND PRODUCE TOXIC GASES, INCLUDING CARBON MONOXIDE AND CARBON DIOXIDE.

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Control Measures

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Respiratory Protection: MAINTAIN OXYGEN LEVELS ABOVE 19.5% IN THE WORKPLACE. USE SUPPLIED AIR RESPIRATORY PROTECTION IF OXYGEN LEVELS ARE BELOW 19.5% OR DURING EMERGENCY RESPONSE TO A RELEASE OF ISOUTYLENE. IF RESPIRATORY PR OTECTION IS REQUIRED, FOLLOW THE REQUIREMENTS OF THE FEDERAL OSHA RESPIRATORY STANDARD (29 CFR 1910.134) OR EQUIVALENT STATE STANDARDS.
Ventilation: USE ADEQUATE VENTILATION. LOCAL EXHAUST VENTILATION IS PERFERRED, BECAUSE IT PREVENTS ISOBUTYLENE DISPERSION INTO THE WORKPLACE BY EMLIMINATING IT AT THE SOURCE
Protective Gloves: RESISTANT TO TEARS. USE LOW-TEMPERATURE PROTECTIVE GLOVED (E.G., KEVLAR)
Eye Protection: SPLASH GOGGLES OR SAFETY GLASSES.
Other Protective Equipment: USE BODY PROTECTION . TRANSFER OF LARGE QUANTITIES UNDER PRESSURE MAY REQUIRE PROTECTIVE EQUIPMET TO PROTECT FROM SPLASHES OF LIQUIDFIED PRODUCT AS WELL AS FIRE RETARANAT ITEMS.
Work Hygienic Practices: AS WITH ALL CHEMICALS, AVOID GETTING ISOBUTYLENE IN YOU. DO NOT EAT OR DIRNK WHILE HANDLING CHEMICALS. BEWARE OF ANY SIGNS OF DIZZINESS OR FATIGUE; EXPOSURES TO FATAL CONCENTRATIONS OF ISOBUTYLENE COULD
Supplemental Safety and Health: (CONTD. FROM FIRST AID) DO NOT USE HOT WATER. IF WARM WATER NOT AVAILABLE, OR IMPRACTICAL TO USE, WRAP AFFECTED PARTS GENTLY IN BLANKETS. (SEE OTHER INFORMATION)

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Physical/Chemical Properties

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HCC: G2
Boiling Point: =-6.9C, 19.6F
Melt/Freeze Pt: =-140.C, -220.F
Vapor Pres: 39 PSIA
Vapor Density: 0.15LB/FT3
Spec Gravity: 1.997
PH: NA
Solubility in Water: INSOLUBLE
Appearance and Odor: COLORLESS LIQUID/ GAS WITH THE UNPLEASANT ODOR OF BURNING COAL.

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Reactivity Data

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Stability Indicator: YES
Stability Condition To Avoid: CONTACT WITH INCOMPATIBLE MATERIALS AND EXPOSURE TO HEAT, SPARKS, AND OTHER SOURCES OF IGNITION. CYLINDERS EXPOSED TO HIGH TEMPERATURES OR DIRECT FLAME CAN RUPTURE OR BURST.
Materials To Avoid: STRONG OXIDIZERS (E.G., CHLORINE, BROMINE

PENTAFLUORIDE, OXYGEN, OXYGEN DIFLUORIDE, AND NITROGEN TRIFLUORIDE).
Hazardous Decomposition Products: WHEN IGNITED IN THE PRESENCE OF OXYGEN, THIS GAS WILL BURN TO PRODUCE CARBON MONOXIDE AND CARBON DIOXIDE.
Hazardous Polymerization Indicator: NO
Conditions To Avoid Polymerization: WILL NOT OCCUR.

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Toxicological Information

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Toxicological Information: LC50 (RAT, INHALATION): 620 G/M3/ 4 HOURS; LC50 (MOUSE, INHALATION): 415 G/M3/ 2 HOUR. ISOBUTYLENE IS NOT FOUND ON FEDERAL OSHA Z LIST, NTP, IARC, CAL/OSHA, AND THEREFORE IS NEITHER CONSIDERED TO BE N OR SUSPECTED TO BE A CANCER-CAUSING AGENT BY THESE AGENCIES. PRODUCT MAY BE MILDLY IRRITATING TO THE MUCOUS MEMBRANES. IN ADDITION, CONTACT WITH RAPIDLY EXPANDING GASES CAN CAUSE FROSTBITE TO EXPOSED TISSUE. ISOBUTYLENE IS NOT KNOWN TO CAUSE SENSITIZATION IN HUMANS. NO MUTAGENIC EFFECTS, NO EMBRYOTOXIC EFFECTS, NO TERATOGENIC EFFECTS, NO REPRODUCTIVE TOXICITY EFFECTS HAVE BEEN DESCRIBED FOR BUTYLE NE.

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Ecological Information

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Ecological: ENVIRONMENTAL STABILITY: THIS GAS WILL BE DISSIPATED RAPIDLY IN WELL-VENTILATED AREAS. EFFECTS OF MATERIAL ON PLANTS OR ANIMALS: ANY ADVERSE EFFECT ON ANIMALS WOULD BE RELATED TO OXYGEN-DEFICIENT ENVI RONMENTS. NO ADVERSE EFFECT IS ANTICIPATED TO OCCUR TO PLANT LIFE, EXCEPT FOR FROST PRODUCED IN THE PRESENCE OF RAPIDLY EXPANDING GASES. EFFECT OF CHEMICAL ON AQUATIC LIFE: NO EVIDENCE IS CURRENTLY AV AILABLE ON THE EFFECTS OF ISOBUTYLENE ON AQUATIC LIFE.

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MSDS Transport Information

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Transport Information: THIS MATERIAL IS HAZARDOUS AS DEFINED BY 49 CFR 172.101 BY THE U.S. DEPARTMENT OF TRANSPORTATION. PROPER SHIPPING NAME: ISOBUTYLENE; CLASS: 2.1 (FLAMMABLE GAS); UN 1055; PKG: N/A; DOT LABELS REQUIRED: FLAMMABLE GAS; NORTH AMERICAN EMERGENCY RESPONSE GUIDEBOOK NUMBER (1996): 115. ALTERNATE DESCRIPTION: PSN: PETROLEUM GASES, LIQUIDFIED; CLASS: 2.1 (FLAMMABLE GAS); UN 1075; PKG N/A; DOT LABEL REQUIRE D: FLAMMABLE GAS; NORTH AMERICAN EMERGENCY GUIDEBOOK NUMBER: 115; MARINE POLLUTANT: ISOBUTYLENE IS NOT CLASSIFIED BY THE DOT AS A MARINE POLLUTANT (AS DEFINED BY 49 CFR 172.101, APPENDIX B). CANADA: SAME AS ABOVE.

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Regulatory Information

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Sara Title III Information: ISOBUTYLENE IS NOT SUBJECT TO THE REPORTING REQUIREMENTS OF SECTION 302, 304, AND 313 OF TITLE I I I OF THE SUPERFUND AMENDMENTS AND REAUTHORIZATION ACT. U.S. SARA THRESHOLD PLANNING QUANTITY: N/A. U. S. CERCLA REPORTABLE QUANTITY (RQ): NOT APPLICIABLE.
Federal Regulatory Information: ISOBUTYLENE IS LISTED ON THE U.S. TSCA INVENTORY. ISOBUTYLENE IS SUBJECT TO REPORTING REQUIREMENTS OF SECTION 112(R) OF THE CLEAN AIR ACT. THRESHOLD QUANTITY FOR THIS GAS IS 10,000 LB. DEPENDING ON SP ECIFIC OPERATIONS INVOLVING USE OF ISOBUTYLENE, REGULATIONS OF THE PROCESS SAFETY MANAGEMENT OF HIGHLY HAZARDOUS CHEMICALS MAY BE APPLICABLE (29 CFR 1910.119) UNDER THIS REGULATION ISOBUTYLENE IS NOT LISTED IN APPENDIX A; HOWEVER, ANY PROCESS THAT INVOLVES A FLAMMABLE GAS ON-SITE, IN ONE LOCATION, I N QUANTITIES OF 10,000 LB (4,553 KG) OR GREATER IS COVERED UNDER THIS REGULATION UNLESS IT IS USED AS A FUEL.
State Regulatory Information: CALIFORNIA SAFE DRINKING WATER AND TOXIC

ENFORCEMENT ACT (PROPOSITION 65): ISOBUTYLENE IS NOT ON THE CALIFORNIA PROPOSITION 65 LISTS. PRODUCT COVERED UNDER FOLLOWING STATE REGULATIONS: AK: DESIGNATED TOXIC AND HAZARDOUS SUBSTANCES. CA: PERMISSIBLE EXPOSURE LIMITS FOR CHEMICAL CONTAMINANTS; FL: SUBSTANCE LIST; MA: SUBSTANCE LIST; MN: LIST OF HAZARDOUS SUBSTANCES; NJ: RIGHT TO KNOW HAZARDOUS SUBSTAN CE LIST; PA: HAZARDOUS SUBSTANCE LIST; RI: HAZARDOUS SUBSTANCE LIST; TX: HAZARDOUS SUBSTANCE LIST: W V: HAZARDOUS SUBSTANCE LIST; WI: TOXIC AND HAZARDOUS SUBSTANCES.

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Other Information

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Other Information: NFPA RATINGS: HEALTH: 1; FLAMMABILITY: 4; REACTIVITY: 0. RATINGS: HEALTH: 1; FLAMMABILITY: 4; REACTIVITY: 0; PROTECTIVE EQUIPMENT: B. CANADIAN WSYMBOLS: CLASS A: COMPRESSED G; CLASS B1: FLAM MABLE GAS. (CONTD. FROM FIRST AID) DO NOT USE HOT WATER. IF WARM WATER NOT AVAILABLE, WRAP AFFECTED PARTS IN BLANKETS. ALTERNATIVELY, IF FINGERS OR HANDS ARE FORTBITTEN, PLACE IN ARMPIT. HAVE VICTIM G ENTLY EXERCISE AFFECTED PARTS WHILE BEING WARMED. SEEK MEDICAL ATTENTION. TAKE COPY OF LABEL AND MSDS TO PHYSICIAN WITH VICTIM.

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Transportation Information

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Responsible Party Cage: U0451
Trans ID NO: 156993
Product ID: ISOBUTYLENE-C4H8
MSDS Prepared Date: 01/16/1998
Review Date: 05/17/2001
Article W/O MSDS: N
Limited Quantity IND: N
Multiple KIT Number: 0
Review IND: N
Unit Of Issue: EA
Type Of Container: CYLINDER
Additional Data: TRANSPORTATION DATA PER MANUFACTURER'S MSDS.

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Detail DOT Information

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DOT PSN Code: HTR
DOT Proper Shipping Name: ISOBUTYLENE
DOT PSN Modifier: SEE ALSO PETROLEUM GASES, LIQUEFIED
Hazard Class: 2.1
UN ID Num: UN1055
Label: FLAMMABLE GAS
Special Provision: 19
Packaging Exception: 306
Non Bulk Pack: 304
Bulk Pack: 314,315
Max Qty Pass: FORBIDDEN
Max Qty Cargo: 150 KG
Vessel Stow Req: E
Water/Ship/Other Req: 40

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Detail IMO Information

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IMO PSN Code: IRQ
IMO Proper Shipping Name: ISOBUTYLENE
IMDG Page Number: 2147
UN Number: 1055
UN Hazard Class: 2(2.1)
IMO Packaging Group: -

Subsidiary Risk Label: -
EMS Number: 2-07
MED First Aid Guide NUM: 310
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Detail IATA Information
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IATA PSN Code: OHI
IATA UN ID Num: 1055
IATA Proper Shipping Name: ISOBUTYLENE
IATA UN Class: 2.1
IATA Label: FLAMMABLE GAS
Packing Note Passenger: FORB
Max Quant Pass: FORB
Max Quant Cargo: 150KG
Packaging Note Cargo: 200
Exceptions: A1
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Detail AFI Information
==========
AFI PSN Code: OHI
AFI Proper Shipping Name: ISOBUTYLENE
AFI Hazard Class: 2.1
AFI UN ID NUM: UN1055
Special Provisions: P4
Back Pack Reference: A6.3, A6.5
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HAZCOM Label
==========
Product ID: ISOBUTYLENE-C4H8
Cage: U0451
Company Name: AIRGAS INC
Street: 259 RADNOR-CHESTER RD SUITE 100
City: RADNOR PA
Zipcode: 19087-5240 US
Health Emergency Phone: (800)424-9300
Date Of Label Review: 05/17/2001
Label Date: 05/17/2001
Chronic Hazard IND: N
Eye Protection IND: YES
Skin Protection IND: YES
Signal Word: DANGER
Respiratory Protection IND: YES
Health Hazard: Moderate
Contact Hazard: Moderate
Fire Hazard: Severe
Reactivity Hazard: None
Hazard And Precautions: FLAMMABLE LIQUID AND GAS UNDER PRESSURE. CAN FORM EXPLOSIVE MIXTURES WITH AIR. MAY CAUSE FROSTBITE. KEEP AWAY FROM HEAT (<125F), FLAMES, AND SPARKS. STORE AND USE WITH ADEQUATE VENTILATION. MOST SIGNI FICANT HAZARD IS OXYGEN-DEFICIENT ATMOSPHERES.
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Disclaimer (provided with this information by the compiling agencies): This information is formulated for use by elements of the Department of Defense. The United States of America in no manner whatsoever expressly or implied warrants, states, or intends said information to have any application, use or viability by or to any person or persons outside the Department of Defense nor any person or persons contracting with any instrumentality of the United States of America and disclaims all liability for such use. Any person utilizing this instruction who is not a military or civilian employee of the United States of America should

seek competent professional advice to verify and assume responsibility for the suitability of this information to their particular situation regardless of similarity to a corresponding Department of Defense or other government situation.

MSDS Number: **N3660** * * * * * *Effective Date:* ***05/06/05*** * * * * * *Supercedes:* ***07/02/02***

MSDS **Material Safety Data Sheet**

From: **Mallinckrodt Baker, Inc.**
222 Red School Lane
Phillipsburg, NJ 08865

Mallinckrodt CHEMICALS J.T.Baker

24 Hour Emergency Telephone: 908-859-2151
CHEMTREC: 1-800-424-9300

National Response in Canada
CANUTEC: 613-996-6666

Outside U.S. and Canada
Chemtrec: 703-527-3887

NOTE: CHEMTREC, CANUTEC and National Response Center emergency numbers to be used only in the event of chemical emergencies involving a spill, leak, fire, exposure or accident involving chemicals.

All non-emergency questions should be directed to Customer Service (1-800-582-2537) for assistance.

NITRIC ACID, 50-70%

1. Product Identification

Synonyms: Aqua Fortis; Azotic Acid; Nitric Acid 50%; Nitric Acid 65%; nitric acid 69-70%
CAS No.: 7697-37-2
Molecular Weight: 63.01
Chemical Formula: HNO3
Product Codes:
J.T. Baker: 411D, 412D, 5371, 5796, 5801, 5826, 5856, 5876, 5896, 9597, 9598, 9600, 9601, 9602, 9603, 9604, 9606, 9607, 9608, 9610, 9616, 9617, 9670
Mallinckrodt: 1409, 2704, 2716, 6623, H862, H988, H993, H998, V077, V633, V650

2. Composition/Information on Ingredients

Ingredient	CAS No	Percent	Hazardous
Nitric Acid	7697-37-2	50 - 70%	Yes
Water	7732-18-5	30 - 50%	No

3. Hazards Identification

Emergency Overview

POISON! DANGER! STRONG OXIDIZER. CONTACT WITH OTHER MATERIAL MAY CAUSE FIRE. CORROSIVE. LIQUID AND MIST CAUSE SEVERE BURNS TO ALL BODY TISSUE. MAY BE FATAL IF SWALLOWED OR INHALED. INHALATION MAY CAUSE LUNG AND TOOTH DAMAGE.

SAF-T-DATA(tm) Ratings (Provided here for your convenience)

Health Rating: 4 - Extreme (Poison)
Flammability Rating: 0 - None
Reactivity Rating: 3 - Severe (Oxidizer)
Contact Rating: 4 - Extreme (Corrosive)
Lab Protective Equip: GOGGLES & SHIELD; LAB COAT & APRON; VENT HOOD; PROPER GLOVES
Storage Color Code: White (Corrosive)

Potential Health Effects

Nitric acid is extremely hazardous; it is corrosive, reactive, an oxidizer, and a poison.

Inhalation:
Corrosive! Inhalation of vapors can cause breathing difficulties and lead to pneumonia and pulmonary edema, which may be fatal. Other symptoms may include coughing, choking, and irritation of the nose, throat, and respiratory tract.
Ingestion:
Corrosive! Swallowing nitric acid can cause immediate pain and burns of the mouth, throat, esophagus and gastrointestinal tract.
Skin Contact:
Corrosive! Can cause redness, pain, and severe skin burns. Concentrated solutions cause deep ulcers and stain skin a yellow or yellow-brown color.
Eye Contact:
Corrosive! Vapors are irritating and may cause damage to the eyes. Contact may cause severe burns and permanent eye damage.
Chronic Exposure:
Long-term exposure to concentrated vapors may cause erosion of teeth and lung damage. Long-term exposures seldom occur due to the corrosive properties of the acid.
Aggravation of Pre-existing Conditions:
Persons with pre-existing skin disorders, eye disease, or cardiopulmonary diseases may be more susceptible to the effects of this substance.

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4. First Aid Measures

Immediate first aid treatment reduces the health effects of this substance.
Inhalation:
Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give

oxygen. Call a physician.
Ingestion:
DO NOT INDUCE VOMITING! Give large quantities of water or milk if available. Never give anything by mouth to an unconscious person. Get medical attention immediately.
Skin Contact:
In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention immediately.
Eye Contact:
Immediately flush eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Get medical attention immediately.

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5. Fire Fighting Measures

Fire:
Not combustible, but substance is a strong oxidizer and its heat of reaction with reducing agents or combustibles may cause ignition. Can react with metals to release flammable hydrogen gas.
Explosion:
Reacts explosively with combustible organic or readily oxidizable materials such as: alcohols, turpentine, charcoal, organic refuse, metal powder, hydrogen sulfide, etc. Reacts with most metals to release hydrogen gas which can form explosive mixtures with air.
Fire Extinguishing Media:
Water spray may be used to keep fire exposed containers cool. Do not get water inside container.
Special Information:
Increases the flammability of combustible, organic and readily oxidizable materials. In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode.

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6. Accidental Release Measures

Ventilate area of leak or spill. Wear appropriate personal protective equipment as specified in Section 8. Isolate hazard area. Keep unnecessary and unprotected personnel from entering. Contain and recover liquid when possible. Neutralize with alkaline material (soda ash, lime), then absorb with an inert material (e. g., vermiculite, dry sand, earth), and place in a chemical waste container. Do not use combustible materials, such as saw dust. Do not flush to sewer! US Regulations (CERCLA) require reporting spills and releases to soil, water and air in excess of reportable quantities. The toll free number for the US Coast Guard National Response Center is (800) 424-8802.

J. T. Baker NEUTRASORB® or TEAM® 'Low Na+' acid neutralizers are recommended for spills of this product.

7. Handling and Storage

Store in a cool, dry, ventilated storage area with acid resistant floors and good drainage. Protect from physical damage. Keep out of direct sunlight and away from heat, water, and incompatible materials. Do not wash out container and use it for other purposes. When diluting, the acid should always be added slowly to water and in small amounts. Never use hot water and never add water to the acid. Water added to acid can cause uncontrolled boiling and splashing. Containers of this material may be hazardous when empty since they retain product residues (vapors, liquid); observe all warnings and precautions listed for the product.

8. Exposure Controls/Personal Protection

Airborne Exposure Limits:
-OSHA Permissible Exposure Limit (PEL):
2 ppm (TWA), 4 ppm (STEL)
-ACGIH Threshold Limit Value (TLV):
2 ppm (TWA); 4 ppm (STEL)

Ventilation System:
A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, *Industrial Ventilation, A Manual of Recommended Practices*, most recent edition, for details.
Personal Respirators (NIOSH Approved):
If the exposure limit is exceeded, wear a supplied air, full-facepiece respirator, airlined hood, or full-facepiece self-contained breathing apparatus. Nitric acid is an oxidizer and should not come in contact with cartridges and canisters that contain oxidizable materials, such as activated charcoal. Canister-type respirators using sorbents are ineffective.
Skin Protection:
Wear impervious protective clothing, including boots, gloves, lab coat, apron or coveralls, as appropriate, to prevent skin contact.
Eye Protection:
Use chemical safety goggles and/or a full face shield where splashing is possible. Maintain eye wash fountain and quick-drench facilities in work area.

9. Physical and Chemical Properties

Appearance:
Colorless to yellowish liquid.
Odor:
Suffocating, acrid.

Solubility:
Infinitely soluble.
Specific Gravity:
1.41
pH:
1.0 (0.1M solution)
% Volatiles by volume @ 21C (70F):
100 (as water and acid)
Boiling Point:
122C (252F)
Melting Point:
-42C (-44F)
Vapor Density (Air=1):
2-3
Vapor Pressure (mm Hg):
48 @ 20C (68F)
Evaporation Rate (BuAc=1):
No information found.

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10. Stability and Reactivity

Stability:
Stable under ordinary conditions of use and storage. Containers may burst when heated.
Hazardous Decomposition Products:
When heated to decomposition, emits toxic nitrogen oxides fumes and hydrogen nitrate. Will react with water or steam to produce heat and toxic and corrosive fumes.
Hazardous Polymerization:
Will not occur.
Incompatibilities:
A dangerously powerful oxidizing agent, concentrated nitric acid is incompatible with most substances, especially strong bases, metallic powders, carbides, hydrogen sulfide, turpentine, and combustible organics.
Conditions to Avoid:
Light and heat.

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11. Toxicological Information

Nitric acid: Inhalation rat LC50: 244 ppm (NO2)/30M; Investigated as a mutagen, reproductive effector. Oral (human) LDLo: 430 mg/kg.

--------\Cancer Lists\----------

Ingredient	---NTP Carcinogen--- Known	Anticipated	IARC Category
Nitric Acid (7697-37-2)	No	No	None
Water (7732-18-5)	No	No	None

12. Ecological Information

Environmental Fate:
No information found.
Environmental Toxicity:
No information found.

13. Disposal Considerations

Whatever cannot be saved for recovery or recycling should be managed in an appropriate and approved waste facility. Although not a listed RCRA hazardous waste, this material may exhibit one or more characteristics of a hazardous waste and require appropriate analysis to determine specific disposal requirements. Processing, use or contamination of this product may change the waste management options. State and local disposal regulations may differ from federal disposal regulations. Dispose of container and unused contents in accordance with federal, state and local requirements.

14. Transport Information

Domestic (Land, D.O.T.)

Proper Shipping Name: NITRIC ACID (WITH NOT MORE THAN 70% NITRIC ACID)

Hazard Class: 8
UN/NA: UN2031
Packing Group: II
Information reported for product/size: 6.5GL

International (Water, I.M.O.)

Proper Shipping Name: NITRIC ACID
Hazard Class: 8
UN/NA: UN2031
Packing Group: II
Information reported for product/size: 6.5GL

15. Regulatory Information

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--------\Chemical Inventory Status - Part 1\--------------------------------
Ingredient                                        TSCA  EC   Japan  Australia
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Nitric Acid (7697-37-2)                          Yes  Yes   Yes      Yes
Water (7732-18-5)                                Yes  Yes   Yes      Yes

--------\Chemical Inventory Status - Part 2\--------------------------------
                                                      --Canada--
Ingredient                                       Korea  DSL   NDSL  Phil.
---------------------------------------------    -----  ---   ----  -----
Nitric Acid (7697-37-2)                           Yes   Yes   No     Yes
Water (7732-18-5)                                 Yes   Yes   No     Yes

--------\Federal, State & International Regulations - Part 1\---------------
                                          -SARA 302-    ------SARA 313------
Ingredient                                RQ    TPQ     List  Chemical Catg.
----------------------------------------  ---   -----   ----  --------------
Nitric Acid (7697-37-2)                   1000  1000    Yes        No
Water (7732-18-5)                         No    No      No         No

--------\Federal, State & International Regulations - Part 2\---------------
                                                        -RCRA-    -TSCA-
Ingredient                                CERCLA        261.33     8(d)
----------------------------------------  ------        ------    ------
Nitric Acid (7697-37-2)                   1000          No         No
Water (7732-18-5)                         No            No         No


Chemical Weapons Convention:  No     TSCA 12(b):  No     CDTA:  No
SARA 311/312:  Acute: Yes      Chronic: Yes  Fire: Yes Pressure: No
Reactivity: No          (Mixture / Liquid)
```

Australian Hazchem Code: 2PE
Poison Schedule: S6
WHMIS:
This MSDS has been prepared according to the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all of the information required by the CPR.

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16. Other Information

NFPA Ratings: Health: **3** Flammability: **0** Reactivity: **0** Other: **Oxidizer**
Label Hazard Warning:
POISON! DANGER! STRONG OXIDIZER. CONTACT WITH OTHER MATERIAL MAY CAUSE FIRE. CORROSIVE. LIQUID AND MIST CAUSE SEVERE BURNS TO ALL BODY TISSUE. MAY BE FATAL IF SWALLOWED OR INHALED. INHALATION MAY CAUSE LUNG AND TOOTH DAMAGE.
Label Precautions:
Do not get in eyes, on skin, or on clothing.
Do not breathe vapor or mist.
Use only with adequate ventilation.
Wash thoroughly after handling.
Keep from contact with clothing and other combustible materials.
Do not store near combustible materials.

Store in a tightly closed container.
Remove and wash contaminated clothing promptly.

Label First Aid:

In case of contact, immediately flush eyes or skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. If swallowed, DO NOT INDUCE VOMITING. Give large quantities of water. Never give anything by mouth to an unconscious person. If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. In all cases get medical attention immediately.

Product Use:

Laboratory Reagent.

Revision Information:

No Changes.

Disclaimer:

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Prepared by: Environmental Health & Safety
Phone Number: (314) 654-1600 (U.S.A.)

WEDRON SILICA CO -- SILICA SAND - ALL GRADES -- 5610-00N042569

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MSDS Safety Information

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FSC: 5610
MSDS Date: 01/04/1993
MSDS Num: BRNBV
LIIN: 00N042569
Tech Review: 09/11/1995
Product ID: SILICA SAND - ALL GRADES
Responsible Party
Cage: 0B8Y9
Name: WEDRON SILICA CO
Address: WALNUT & JACKSON ST
Box: 176
City: WEDRON IL 60557 US
Info Phone Number: 815-433-3696
Emergency Phone Number: 815-433-3696
Review Ind: N

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Contractor Summary

==========

Cage: 0B8Y9
Name: WEDRON SILICA CO
Address: WALNUT & JACKSON ST
Box: 177
City: WEDRON IL 60557 US
Phone: 815-433-3696

==========

Ingredients

==========

Cas: 14808-60-7
RTECS #: VV7330000
Name: SILICA, CRYSTALLINE - QUARTZ; (SILICON DIOXIDE)
% by Wt: 99.5
OSHA PEL: SEE TABLE Z3
ACGIH TLV: 0.1 MG/M3 RDUST;9293
Ozone Depleting Chemical: N

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Health Hazards Data

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LD50 LC50 Mixture: NONE SPECIFIED BY MANUFACTURER.
Route Of Entry Inds - Inhalation: YES
Skin: NO
Ingestion: NO
Carcinogenicity Inds - NTP: YES
IARC: YES
OSHA: NO
Effects of Exposure: TOTAL WEIGHT OF SILICA PRODUCT, AS SHIPPED, CONTAINS 0.03% OR LESS OF RESPIRABLE SIZE PARTICLES (10 MICRONS & LESS). MATERIAL IS NOT ACUTELY TOXIC. CONTINUED INHALATION OF DUST (<10 MICRON SIZE) OVER A NUMBER OF YEARS WITHOUT NIOSH/MSHA APPROVED RESPIRATORY PROTECTION MAY CAUSE SILICOSIS.
Explanation Of Carcinogenicity: SILICA, CRYSTALLINE - QUARTZ:IARC MONOGRAPHS, SUPPLEMENT, VOL 7, PG 341, 1987:GROUP 2A (FP N). NTP 6TH ANNUAL (SUP DAT)
Signs And Symptions Of Overexposure: SEE HEALTH HAZARDS.
Medical Cond Aggravated By Exposure: NONE SPECIFIED BY MANUFACTURER.
First Aid: INHAL:REMOVE TO FRESH AIR. SUPPORT BREATHING (GIVE OXYGEN/ARTIFICIAL RESPIRATION). CALL MD (FP N). INGEST:CALL MD

IMMEDIATELY (FP N). SKIN:FLUSH W/COPIOUS AMOUNTS OF WATER. CALL MD (FP N). EYES:IMMEDI ATELY FLUSH W/POTABLE WATER FOR A MINIMUM OF 15 MINS. SEEK ASSISTANCE FROM MD (FP N).

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Handling and Disposal

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Spill Release Procedures: PREFERRED PROCEDURE IS TO VACUUM MATERIAL. IF NOT POSSIBLE, THEN SPRAY WATER & CLEAN UP W/BROOM & SHOVEL.

Neutralizing Agent: NONE SPECIFIED BY MANUFACTURER.

Waste Disposal Methods: WET & CONTAIN MATERIAL. DISPOSE OF IN ACCORDANCE W/APPROPRIATE REGULATIONS. MATERIAL IS CHEMICALLY INERT.

Handling And Storage Precautions: RECOMMENDED DRY STORAGE FOR EASE IN HANDLING. WEAR NIOSH/MSHA APPROVED RESPIRATORS.

Other Precautions: NONE SPECIFIED BY MANUFACTURER.

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Fire and Explosion Hazard Information

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Flash Point Text: NONE

Extinguishing Media: USE MEDIA SUITABLE FOR SURROUNDING FIRE CONDITIONS (FP N).

Fire Fighting Procedures: WEAR NIOSH/MSHA APPROVED SCBA & FULL PROTECTIVE EQUIPMENT (FP N).

Unusual Fire/Explosion Hazard: NONE.

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Control Measures

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Respiratory Protection: ANY NIOSH/MSHA APPROVED RESPIRATOR OR DUST MASK.

Ventilation: OBSERVE CURRENT EPA STANDARDS. RECOMMENDED DUST COLLECTION SYSTEM W/FABRIC FILTER OR WET SCRUBBER.

Protective Gloves: IMPERVIOUS GLOVES (FP N).

Eye Protection: CHEMICAL SAFETY GOGGLES (FP N).

Other Protective Equipment: NONE SPECIFIED BY MANUFACTURER.

Work Hygienic Practices: NONE SPECIFIED BY MANUFACTURER.

Supplemental Safety and Health: BP:CONVERTS TO TRIDYMITE 1598F, 870C. EXPLAN OF CARCIN:REPORT ON CARCINOGENS, 1991:ANTICIPATED TO BE CARCINOGEN (FP N).

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Physical/Chemical Properties

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HCC: N1

B.P. Text: SUPP DATA

Spec Gravity: 2.65 (H_2O=1)

Evaporation Rate & Reference: 0

Solubility in Water: 0

Appearance and Odor: CRYSTALLINE, GRANULAR; ODORLESS.

Percent Volatiles by Volume: 0

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Reactivity Data

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Stability Indicator: YES

Stability Condition To Avoid: NONE SPECIFIED BY MANUFACTURER.

Materials To Avoid: NONE SPECIFIED BY MANUFACTURER.

Hazardous Decomposition Products: NONE SPECIFIED BY MANUFACTURER.

Hazardous Polymerization Indicator: NO

Conditions To Avoid Polymerization: NOT RELEVANT.

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Toxicological Information

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Ecological Information

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MSDS Transport Information
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Regulatory Information
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Other Information
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==========
HAZCOM Label
==========
Product ID: SILICA SAND - ALL GRADES
Cage: 0B8Y9
Company Name: WEDRON SILICA CO
Street: WALNUT & JACKSON ST
PO Box: 177
City: WEDRON IL
Zipcode: 60557 US
Health Emergency Phone: 815-433-3696
Date Of Label Review: 08/11/1993
Label Date: 08/11/1993
Chronic Hazard IND: Y
Eye Protection IND: YES
Skin Protection IND: YES
Signal Word: CAUTION
Respiratory Protection IND: YES
Health Hazard: Slight
Contact Hazard: None
Fire Hazard: None
Reactivity Hazard: None
Hazard And Precautions: RECOMMENDED DRY STORAGE FOR EASE IN HANDLING. TOTAL WEIGHT OF SILICA PRODUCT, AS SHIPPED, CONTAINS 0.03% OR LESS OF RESPIRABLE SIZE PARTICLES (10 MICRONS AND LESS). ACUTE: MATERIAL IS NOT ACUTELY TOXI C. CHRONIC: CANCER HAZARD. CONTAINS CRYSTALLINE SILICA-QUARTZ, WHICH IS LISTED AS A CARCINOGEN (FP N). CONTINUED INHALATION OF DUST (<10 MICRON SIZE) OVER A NUMBER OF YEARS WITHOUT RESPIRATORY PROTECT ION MAY CAUSE SILICOSIS.
==========
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MSDS Number: **S4034** * * * * * *Effective Date:* ***07/07/04*** * * * * * *Supercedes:* ***05/11/04***

MSDS **Material Safety Data Sheet**

From: **Mallinckrodt Baker, Inc.**
222 Red School Lane
Phillipsburg, NJ 08865

Mallinckrodt CHEMICALS J.T.Baker

24 Hour Emergency Telephone: 908-859-2151
CHEMTREC: 1-800-424-9300

National Response in Canada
CANUTEC: 613-996-6666

Outside U.S. and Canada
Chemtrec: 703-527-3887

NOTE: CHEMTREC, CANUTEC and National Response Center emergency numbers to be used only in the event of chemical emergencies involving a spill, leak, fire, exposure or accident involving chemicals.

All non-emergency questions should be directed to Customer Service (1-800-582-2537) for assistance.

SODIUM HYDROXIDE

1. Product Identification

Synonyms: Caustic soda; lye; sodium hydroxide solid; sodium hydrate
CAS No.: 1310-73-2
Molecular Weight: 40.00
Chemical Formula: NaOH
Product Codes:
J.T. Baker: 3717, 3718, 3721, 3722, 3723, 3728, 3734, 3736, 5045, 5565
Mallinckrodt: 7001, 7680, 7708, 7712, 7772, 7798

2. Composition/Information on Ingredients

Ingredient	CAS No	Percent	Hazardous
Sodium Hydroxide	1310-73-2	99 - 100%	Yes

3. Hazards Identification

Emergency Overview

POISON! DANGER! CORROSIVE. MAY BE FATAL IF SWALLOWED. HARMFUL IF INHALED. CAUSES BURNS TO ANY AREA OF CONTACT. REACTS WITH WATER, ACIDS AND OTHER MATERIALS.

SAF-T-DATA(tm) Ratings (Provided here for your convenience)

Health Rating: 4 - Extreme (Poison)
Flammability Rating: 0 - None
Reactivity Rating: 2 - Moderate
Contact Rating: 4 - Extreme (Corrosive)
Lab Protective Equip: GOGGLES & SHIELD; LAB COAT & APRON; VENT HOOD; PROPER GLOVES
Storage Color Code: White Stripe (Store Separately)

Potential Health Effects

Inhalation:
Severe irritant. Effects from inhalation of dust or mist vary from mild irritation to serious damage of the upper respiratory tract, depending on severity of exposure. Symptoms may include sneezing, sore throat or runny nose. Severe pneumonitis may occur.
Ingestion:
Corrosive! Swallowing may cause severe burns of mouth, throat, and stomach. Severe scarring of tissue and death may result. Symptoms may include bleeding, vomiting, diarrhea, fall in blood pressure. Damage may appears days after exposure.
Skin Contact:
Corrosive! Contact with skin can cause irritation or severe burns and scarring with greater exposures.
Eye Contact:
Corrosive! Causes irritation of eyes, and with greater exposures it can cause burns that may result in permanent impairment of vision, even blindness.
Chronic Exposure:
Prolonged contact with dilute solutions or dust has a destructive effect upon tissue.
Aggravation of Pre-existing Conditions:
Persons with pre-existing skin disorders or eye problems or impaired respiratory function may be more susceptible to the effects of the substance.

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4. First Aid Measures

Inhalation:
Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Call a physician.
Ingestion:
DO NOT INDUCE VOMITING! Give large quantities of water or milk if available. Never give anything by mouth to an unconscious person. Get medical attention immediately.
Skin Contact:
Immediately flush skin with plenty of water for at least 15 minutes while removing

contaminated clothing and shoes. Call a physician, immediately. Wash clothing before reuse.

Eye Contact:
Immediately flush eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Get medical attention immediately.

Note to Physician:
Perform endoscopy in all cases of suspected sodium hydroxide ingestion. In cases of severe esophageal corrosion, the use of therapeutic doses of steroids should be considered. General supportive measures with continual monitoring of gas exchange, acid-base balance, electrolytes, and fluid intake are also required.

---

5. Fire Fighting Measures

Fire:
Not considered to be a fire hazard. Hot or molten material can react violently with water. Can react with certain metals, such as aluminum, to generate flammable hydrogen gas.

Explosion:
Not considered to be an explosion hazard.

Fire Extinguishing Media:
Use any means suitable for extinguishing surrounding fire. Adding water to caustic solution generates large amounts of heat.

Special Information:
In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode.

---

6. Accidental Release Measures

Ventilate area of leak or spill. Keep unnecessary and unprotected people away from area of spill. Wear appropriate personal protective equipment as specified in Section 8. Spills: Pick up and place in a suitable container for reclamation or disposal, using a method that does not generate dust. Do not flush caustic residues to the sewer. Residues from spills can be diluted with water, neutralized with dilute acid such as acetic, hydrochloric or sulfuric. Absorb neutralized caustic residue on clay, vermiculite or other inert substance and package in a suitable container for disposal.
US Regulations (CERCLA) require reporting spills and releases to soil, water and air in excess of reportable quantities. The toll free number for the US Coast Guard National Response Center is (800) 424-8802.

---

7. Handling and Storage

Keep in a tightly closed container. Protect from physical damage. Store in a cool, dry, ventilated area away from sources of heat, moisture and incompatibilities. Always add the caustic to water while stirring; never the reverse. Containers of this material may be hazardous when empty since they retain product residues (dust, solids); observe all warnings and precautions listed for the product. Do not store with aluminum or magnesium. Do not mix with acids or organic materials.

---

8. Exposure Controls/Personal Protection

Airborne Exposure Limits:
- OSHA Permissible Exposure Limit (PEL):
2 mg/m3 Ceiling
- ACGIH Threshold Limit Value (TLV):
2 mg/m3 Ceiling

Ventilation System:
A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, *Industrial Ventilation, A Manual of Recommended Practices*, most recent edition, for details.

Personal Respirators (NIOSH Approved):
If the exposure limit is exceeded and engineering controls are not feasible, a half facepiece particulate respirator (NIOSH type N95 or better filters) may be worn for up to ten times the exposure limit or the maximum use concentration specified by the appropriate regulatory agency or respirator supplier, whichever is lowest.. A full-face piece particulate respirator (NIOSH type N100 filters) may be worn up to 50 times the exposure limit, or the maximum use concentration specified by the appropriate regulatory agency, or respirator supplier, whichever is lowest. If oil particles (e.g. lubricants, cutting fluids, glycerine, etc.) are present, use a NIOSH type R or P filter. For emergencies or instances where the exposure levels are not known, use a full-facepiece positive-pressure, air-supplied respirator.
WARNING: Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.

Skin Protection:
Wear impervious protective clothing, including boots, gloves, lab coat, apron or coveralls, as appropriate, to prevent skin contact.

Eye Protection:
Use chemical safety goggles and/or a full face shield where splashing is possible. Maintain eye wash fountain and quick-drench facilities in work area.

---

9. Physical and Chemical Properties

Appearance:
White, deliquescent pellets or flakes.

Odor:
Odorless.

Solubility:

111 g/100 g of water.
Specific Gravity:
2.13
pH:
13 - 14 (0.5% soln.)
% Volatiles by volume @ 21C (70F):
0
Boiling Point:
1390C (2534F)
Melting Point:
318C (604F)
Vapor Density (Air=1):
> 1.0
Vapor Pressure (mm Hg):
Negligible.
Evaporation Rate (BuAc=1):
No information found.

---

10. Stability and Reactivity

Stability:
Stable under ordinary conditions of use and storage. Very hygroscopic. Can slowly pick up moisture from air and react with carbon dioxide from air to form sodium carbonate.
Hazardous Decomposition Products:
Sodium oxide. Decomposition by reaction with certain metals releases flammable and explosive hydrogen gas.
Hazardous Polymerization:
Will not occur.
Incompatibilities:
Sodium hydroxide in contact with acids and organic halogen compounds, especially trichloroethylene, may causes violent reactions. Contact with nitromethane and other similar nitro compounds causes formation of shock-sensitive salts. Contact with metals such as aluminum, magnesium, tin, and zinc cause formation of flammable hydrogen gas. Sodium hydroxide, even in fairly dilute solution, reacts readily with various sugars to produce carbon monoxide. Precautions should be taken including monitoring the tank atmosphere for carbon monoxide to ensure safety of personnel before vessel entry.
Conditions to Avoid:
Moisture, dusting and incompatibles.

---

11. Toxicological Information

Irritation data: skin, rabbit: 500 mg/24H severe; eye rabbit: 50 ug/24H severe; investigated as a mutagen.

--------\Cancer Lists\----------

Ingredient	---NTP Carcinogen--- Known	Anticipated	IARC Category
Sodium Hydroxide (1310-73-2)	No	No	None

12. Ecological Information

Environmental Fate:
No information found.
Environmental Toxicity:
No information found.

13. Disposal Considerations

Whatever cannot be saved for recovery or recycling should be handled as hazardous waste and sent to a RCRA approved waste facility. Processing, use or contamination of this product may change the waste management options. State and local disposal regulations may differ from federal disposal regulations. Dispose of container and unused contents in accordance with federal, state and local requirements.

14. Transport Information

Domestic (Land, D.O.T.)

Proper Shipping Name: SODIUM HYDROXIDE, SOLID
Hazard Class: 8
UN/NA: UN1823
Packing Group: II
Information reported for product/size: 300LB

International (Water, I.M.O.)

Proper Shipping Name: SODIUM HYDROXIDE, SOLID
Hazard Class: 8
UN/NA: UN1823
Packing Group: II
Information reported for product/size: 300LB

15. Regulatory Information

--------\Chemical Inventory Status - Part 1\----------

Ingredient	TSCA	EC	Japan	Australia
Sodium Hydroxide (1310-73-2)	Yes	Yes	Yes	Yes

--------\Chemical Inventory Status - Part 2\--------

Ingredient	Korea	--Canada-- DSL	NDSL	Phil.
Sodium Hydroxide (1310-73-2)	Yes	Yes	No	Yes

--------\Federal, State & International Regulations - Part 1\--------

Ingredient	-SARA 302- RQ	TPQ	------SARA 313------ List	Chemical Catg.
Sodium Hydroxide (1310-73-2)	No	No	No	No

--------\Federal, State & International Regulations - Part 2\--------

Ingredient	CERCLA	-RCRA- 261.33	-TSCA- 8(d)
Sodium Hydroxide (1310-73-2)	1000	No	No

Chemical Weapons Convention: No TSCA 12(b): No CDTA: No
SARA 311/312: Acute: Yes Chronic: No Fire: No Pressure: No
Reactivity: Yes (Pure / Solid)

Australian Hazchem Code: 2R
Poison Schedule: S6
WHMIS:
This MSDS has been prepared according to the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all of the information required by the CPR.

---

16. Other Information

NFPA Ratings: Health: **3** Flammability: **0** Reactivity: **1**
Label Hazard Warning:
POISON! DANGER! CORROSIVE. MAY BE FATAL IF SWALLOWED. HARMFUL IF INHALED. CAUSES BURNS TO ANY AREA OF CONTACT. REACTS WITH WATER, ACIDS AND OTHER MATERIALS.
Label Precautions:
Do not get in eyes, on skin, or on clothing.
Do not breathe dust.
Keep container closed.
Use only with adequate ventilation.
Wash thoroughly after handling.
Label First Aid:
If swallowed, DO NOT INDUCE VOMITING. Give large quantities of water. Never give anything by mouth to an unconscious person. In case of contact, immediately flush eyes or skin with plenty of water for at least 15 minutes while removing contaminated clothing and

shoes. Wash clothing before reuse. If inhaled, remove to fresh air. If not breathing give artificial respiration. If breathing is difficult, give oxygen. In all cases get medical attention immediately.

Product Use:

Laboratory Reagent.

Revision Information:

MSDS Section(s) changed since last revision of document include: 3.

Disclaimer:

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Prepared by: Environmental Health & Safety
Phone Number: (314) 654-1600 (U.S.A.)

MSDS Number: **S8231** * * * * * *Effective Date:* ***02/04/05*** * * * * * *Supercedes:* ***05/08/03***

MSDS **Material Safety Data Sheet**

From: **Mallinckrodt Baker, Inc.**
222 Red School Lane
Phillipsburg, NJ 08865

24 Hour Emergency Telephone: 908-859-2151
CHEMTREC: 1-800-424-9300
National Response In Canada
CANUTEC: 613-996-6666
Outside U.S. And Canada
Chemtrec: 703-527-3887

NOTE: CHEMTREC, CANUTEC and National Response Center emergency numbers to be used only in the event of chemical emergencies involving a spill, leak, fire, exposure or accident involving chemicals.

All non-emergency questions should be directed to Customer Service (1-800-582-2537) for assistance.

Sulfuric Acid 57%

1. Product Identification

Synonyms: Oil of Vitriol,57%; Hydrogen Sulfate,57%
CAS No.: 7664-93-9
Molecular Weight: 98.08
Chemical Formula: H2SO4 in H2O
Product Codes: 9695, 9706

2. Composition/Information on Ingredients

Ingredient	CAS No	Percent	Hazardous
Sulfuric Acid	7664-93-9	43 - 57%	Yes
Water	7732-18-5	43 - 57%	No

3. Hazards Identification

Emergency Overview

POISON! DANGER! CORROSIVE. LIQUID AND MIST CAUSE SEVERE BURNS

TO ALL BODY TISSUE. MAY BE FATAL IF SWALLOWED OR CONTACTED WITH SKIN. HARMFUL IF INHALED. AFFECTS TEETH. WATER REACTIVE. CANCER HAZARD. STRONG INORGANIC ACID MISTS CONTAINING SULFURIC ACID CAN CAUSE CANCER. Risk of cancer depends on duration and level of exposure.

J.T. Baker SAF-T-DATA(tm) Ratings (Provided here for your convenience)

Health Rating: 3 - Severe (Poison)
Flammability Rating: 0 - None
Reactivity Rating: 3 - Severe (Water Reactive)
Contact Rating: 4 - Extreme (Corrosive)
Lab Protective Equip: GOGGLES & SHIELD; LAB COAT & APRON; VENT HOOD; PROPER GLOVES
Storage Color Code: White (Corrosive)

Potential Health Effects

Inhalation:
Inhalation produces damaging effects on the mucous membranes and upper respiratory tract. Symptoms may include irritation of the nose and throat, and labored breathing. May cause lung edema, a medical emergency.
Ingestion:
Corrosive. Swallowing can cause severe burns of the mouth, throat, and stomach, leading to death. Can cause sore throat, vomiting, diarrhea. Circulatory collapse with clammy skin, weak and rapid pulse, shallow respirations, and scanty urine may follow ingestion or skin contact. Circulatory shock is often the immediate cause of death.
Skin Contact:
Corrosive. Symptoms of redness, pain, and severe burn can occur. Circulatory collapse with clammy skin, weak and rapid pulse, shallow respirations, and scanty urine may follow skin contact or ingestion. Circulatory shock is often the immediate cause of death.
Eye Contact:
Corrosive. Contact can cause blurred vision, redness, pain and severe tissue burns. Can cause blindness.
Chronic Exposure:
Long-term exposure to mist or vapors may cause damage to teeth. Chronic exposure to mists containing sulfuric acid is a cancer hazard.
Aggravation of Pre-existing Conditions:
Persons with pre-existing skin disorders or eye problems or impaired respiratory function may be more susceptible to the effects of the substance.

---

4. First Aid Measures

Inhalation:
Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention immediately.

Ingestion:
If swallowed, DO NOT INDUCE VOMITING. Give large quantities of water. Never give anything by mouth to an unconscious person. Get medical attention immediately.
Skin Contact:
In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. Excess acid on skin can be neutralized with a 2% solution of bicarbonate of soda. Get medical attention immediately.
Eye Contact:
Immediately flush eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Get medical attention immediately.

---

5. Fire Fighting Measures

Fire:
Concentrated material is a strong dehydrating agent. Reacts with organic materials and may cause ignition of finely divided materials on contact.
Explosion:
Contact with most metals causes formation of flammable and explosive hydrogen gas. A violent exothermic reaction occurs with water. Sufficient heat may be produced to ignite combustible materials.
Fire Extinguishing Media:
Dry chemical, foam or carbon dioxide. Do not use water on material. However, water spray may be used to keep fire exposed containers cool.
Special Information:
In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode. Structural firefighter's protective clothing is ineffective for fires involving this material. Stay away from sealed containers.

---

6. Accidental Release Measures

Ventilate area of leak or spill. Wear appropriate personal protective equipment as specified in Section 8. Isolate hazard area. Keep unnecessary and unprotected personnel from entering. Contain and recover liquid when possible. Neutralize with alkaline material (soda ash, lime), then absorb with an inert material (e. g., vermiculite, dry sand, earth), and place in a chemical waste container. Do not use combustible materials, such as saw dust. Do not flush to sewer! US Regulations (CERCLA) require reporting spills and releases to soil, water and air in excess of reportable quantities. The toll free number for the US Coast Guard National Response Center is (800) 424-8802.

J. T. Baker NEUTRASORB® or TEAM® 'Low Na+' acid neutralizers are recommended for spills of this product.

---

7. Handling and Storage

Store in a cool, dry, ventilated storage area with acid resistant floors and good drainage. Protect from physical damage. Keep out of direct sunlight and away from heat, water, and incompatible materials. Do not wash out container and use it for other purposes. When diluting, always add the acid to water; never add water to the acid. When opening metal containers, use non-sparking tools because of the possibility of hydrogen gas being present. Containers of this material may be hazardous when empty since they retain product residues (vapors, liquid); observe all warnings and precautions listed for the product.

---

8. Exposure Controls/Personal Protection

Airborne Exposure Limits:
For Sulfuric Acid:
- OSHA Permissible Exposure Limit (PEL) -
1 mg/m3 (TWA)
- ACGIH Threshold Limit Value (TLV) -
0.2 mg/m3(T) (TWA) for sulfuric acid - A2 Suspected Human Carcinogen for sulfuric acid contained in strong inorganic mists.

Ventilation System:
A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, *Industrial Ventilation, A Manual of Recommended Practices*, most recent edition, for details.

Personal Respirators (NIOSH Approved):
If the exposure limit is exceeded and engineering controls are not feasible, a full facepiece respirator with an acid gas cartridge and particulate filter (NIOSH type N100 filter) may be worn up to 50 times the exposure limit, or the maximum use concentration specified by the appropriate regulatory agency or respirator supplier, whichever is lowest. If oil particles (e.g. lubricants, cutting fluids, glycerine, etc.) are present, use a NIOSH type R or P particulate filter. For emergencies or instances where the exposure levels are not known, use a full-facepiece positive-pressure, air-supplied respirator. WARNING: Air purifying respirators do not protect workers in oxygen-deficient atmospheres. Where respirators are required, you must have a written program covering the basic requirements in the OSHA respirator standard. These include training, fit testing, medical approval, cleaning, maintenance, cartridge change schedules, etc. See 29CFR1910.134 for details.

Skin Protection:
Wear impervious protective clothing, including boots, gloves, lab coat, apron or coveralls, as appropriate, to prevent skin contact.

Eye Protection:
Use chemical safety goggles and/or a full face shield where splashing is possible. Maintain eye wash fountain and quick-drench facilities in work area.

---

9. Physical and Chemical Properties

Appearance:
Colorless to yellow liquid.
Odor:
Odorless.
Solubility:
Complete (100%)
Specific Gravity:
1.4508 @ 25C (for 57% solution)
pH:
1 N solution (ca. 5% w/w) = 0.3; 0.1 N solution (ca. 0.5% w/w) = 1.2; 0.01 N solution (ca. 0.05% w/w) = 2.1.
% Volatiles by volume @ 21C (70F):
100
Boiling Point:
No information found.
Melting Point:
-64C (-83F) (65%)
Vapor Density (Air=1):
3.4
Vapor Pressure (mm Hg):
1 @ 145.8C (295F)
Evaporation Rate (BuAc=1):
No information found.

---

10. Stability and Reactivity

Stability:
Stable under ordinary conditions of use and storage. Concentrated solutions react violently with water, spattering and liberating heat.
Hazardous Decomposition Products:
Toxic fumes of oxides of sulfur when heated to decomposition. Will react with water or steam to produce toxic and corrosive fumes. Reacts with carbonates to generate carbon dioxide gas, and with cyanides and sulfides to form poisonous hydrogen cyanide and hydrogen sulfide respectively.
Hazardous Polymerization:
Will not occur.
Incompatibilities:
Water, potassium chlorate, potassium perchlorate, potassium permanganate, sodium, lithium, bases, organic material, halogens, metal acetylides, oxides and hydrides, metals (yields hydrogen gas), strong oxidizing and reducing agents and many other reactive substances.
Conditions to Avoid:
Heat, moisture, incompatibles.

---

11. Toxicological Information

Toxicological Data:
Oral rat LD50: 2140 mg/kg; inhalation rat LC50: 510 mg/m3/2H; standard Draize, eye rabbit, 250 ug (severe); investigated as a tumorigen, mutagen, reproductive effector.
Carcinogenicity:
Cancer Status: The International Agency for Research on Cancer (IARC) has classified "strong inorganic acid mists containing sulfuric acid" as a known human carcinogen, (IARC category 1). This classification applies only to mists containing sulfuric acid and not to sulfuric acid or sulfuric acid solutions.

--------\Cancer Lists\----------

Ingredient	---NTP Carcinogen--- Known	Anticipated	IARC Category
Sulfuric Acid (7664-93-9)	No	No	None
Water (7732-18-5)	No	No	None

12. Ecological Information

Environmental Fate:
When released into the soil, this material may leach into groundwater. When released into the air, this material may be removed from the atmosphere to a moderate extent by wet deposition. When released into the air, this material may be removed from the atmosphere to a moderate extent by dry deposition.
Environmental Toxicity:
LC50 Flounder 100 to 330 mg/l/48 hr aerated water/Conditions of bioassay not specified; LC50 Shrimp 80 to 90 mg/l/48 hr aerated water /Conditions of bioassay not specified; LC50 Prawn 42.5 ppm/48 hr salt water /Conditions of bioassay not specified.
This material may be toxic to aquatic life.

13. Disposal Considerations

Whatever cannot be saved for recovery or recycling should be handled as hazardous waste and sent to a RCRA approved waste facility. Processing, use or contamination of this product may change the waste management options. State and local disposal regulations may differ from federal disposal regulations. Dispose of container and unused contents in accordance with federal, state and local requirements.

14. Transport Information

Domestic (Land, D.O.T.)

Proper Shipping Name: SULFURIC ACID (WITH MORE THAN 51% ACID)
Hazard Class: 8
UN/NA: UN1830

Packing Group: II
Information reported for product/size: 12.5LB

International (Water, I.M.O.)

Proper Shipping Name: SULFURIC ACID (WITH MORE THAN 51% ACID)
Hazard Class: 8
UN/NA: UN1830
Packing Group: II
Information reported for product/size: 12.5LB

---

15. Regulatory Information

--------\Chemical Inventory Status - Part 1\--------

Ingredient	TSCA	EC	Japan	Australia
Sulfuric Acid (7664-93-9)	Yes	Yes	Yes	Yes
Water (7732-18-5)	Yes	Yes	Yes	Yes

--------\Chemical Inventory Status - Part 2\--------

Ingredient	Korea	--Canada-- DSL	NDSL	Phil.
Sulfuric Acid (7664-93-9)	Yes	Yes	No	Yes
Water (7732-18-5)	Yes	Yes	No	Yes

--------\Federal, State & International Regulations - Part 1\--------

Ingredient	-SARA 302- RQ	TPQ	------SARA 313------ List	Chemical Catg.
Sulfuric Acid (7664-93-9)	1000	1000	Yes	No
Water (7732-18-5)	No	No	No	No

--------\Federal, State & International Regulations - Part 2\--------

Ingredient	CERCLA	-RCRA- 261.33	-TSCA- 8(d)
Sulfuric Acid (7664-93-9)	1000	No	No
Water (7732-18-5)	No	No	No

Chemical Weapons Convention: No TSCA 12(b): No CDTA: Yes
SARA 311/312: Acute: Yes Chronic: Yes Fire: No Pressure: No
Reactivity: Yes (Mixture / Liquid)

Australian Hazchem Code: 2P
Poison Schedule: None allocated.
WHMIS:
This MSDS has been prepared according to the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all of the information required by the CPR.

16. Other Information

NFPA Ratings: Health: **3** Flammability: **0** Reactivity: **2** Other: **Water reactive**
Label Hazard Warning:
POISON! DANGER! CORROSIVE. LIQUID AND MIST CAUSE SEVERE BURNS TO ALL BODY TISSUE. MAY BE FATAL IF SWALLOWED OR CONTACTED WITH SKIN. HARMFUL IF INHALED. AFFECTS TEETH. WATER REACTIVE. CANCER HAZARD. STRONG INORGANIC ACID MISTS CONTAINING SULFURIC ACID CAN CAUSE CANCER. Risk of cancer depends on duration and level of exposure.
Label Precautions:
Do not get in eyes, on skin, or on clothing.
Do not breathe vapor or mist.
Keep container closed.
Use only with adequate ventilation.
Wash thoroughly after handling.
Do not contact with water.
Label First Aid:
In case of contact, immediately flush eyes or skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before re-use. Excess acid on skin can be neutralized with a 2% bicarbonate of soda solution. If swallowed, DO NOT INDUCE VOMITING. Give large quantities of water. Never give anything by mouth to an unconscious person. If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. In all cases get medical attention immediately.
Product Use:
Laboratory Reagent.
Revision Information:
MSDS Section(s) changed since last revision of document include: 8.
Disclaimer:
****

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FINAL—REVISION 1

SITE SD-11
QUALITY ASSURANCE PROJECT PLAN
CANNON AIR FORCE BASE, NEW MEXICO

AFCEE Contract No. FA8903-04-D-8679
Task Order No. 0049

Project No. CZQZ20057001

Prepared for:

United States Air Combat Command

Cannon Air Force Base, New Mexico

Under contract to:

Headquarters Air Force Center for Environmental Excellence
3300 Sidney Brooks
Brooks City-Base, TX 78235-5112

20 December 2006

URS

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Appendix A	Requested Variances to AFCEE QAPP 4.0

AA	atomic absorption
AAB	AFCEE Analytical Batch
A2LA	American Association for Laboratory Accreditation
ACC	Air Combat Command
AFB	Air Force Base
AFCEE	Air Force Center for Environmental Excellence
ANSI/ASQ	American National Standards Institute/American Society for Quality
ASCII	American Standard Code for Information Interchange
ASTM	American Society for Testing and Materials
BFB	4-bromofluorobenzene
CCV	continuing calibration verification
CERCLA	Comprehensive Environmental Response, Compensation, and Liabilities Act
CFR	Code of Federal Regulation
CLP	Contract Laboratory Program
COC	chain-of-custody
CVAA	cold vapor atomic absorption
DFTPP	decafluorotriphenylphosphine
DO	dissolved oxygen
DoD	Department of Defense
DQI	data quality indicator
DQO	data quality objective
DRO	diesel range organics
ECD	electron capture detector
EDD	electronic data deliverable
ELCD	electrolytic conductivity detector
EPA	United States Environmental Protection Agency
ERP	Environmental Restoration Program
ERPIMS	Environmental Resources Program Information Management System
FID	flame ionization detector
FSP	field sampling plan
GALP	Good Automated Laboratory Practices
GC	gas chromatography
GC/MS	gas chromatography/mass spectrometry
GRO	gasoline range organics
GCD	Guidance for Contract Deliverables
HAZWOPER	Hazardous Waste Operations and Emergency Response
HPLC	high-performance liquid chromatography
HSO	health and safety officer
IC	ion chromatography

ICAL	initial calibration
ICP	inductively coupled plasma
ICP-AES	inductively coupled plasma – atomic emission spectrometry
ICP-MS	inductively coupled plasma – mass spectrometry
ICV	initial calibration verification
ICS	interference check standard
IDL	instrument detection limit
IDQTF	Intergovernmental Data Quality Task Force
IS	internal standard
LC	liquid chromatography
LCS	laboratory control sample
MCL	maximum contaminant level
MDL	method detection limit
ME	marginal exceedance
MS	matrix spike or mass spectrometry
msl	mean sea level
MSD	matrix spike duplicate
NAVD	North American Vertical Datum
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NELAC	National Environmental Laboratory Accreditation Conference
NIST	National Institute of Standards and Technology
NMED	New Mexico Environment Department
NTU	nephelometric turbidity unit
ORP	oxidation-reduction potential
% D	percent drift (calibration statistic)
% RSD	percent relative standard deviation (QC and calibration statistic)
% R	percent recovery (QC statistic)
PAH	polynuclear aromatic hydrocarbon
PARCCS	data quality indicators (precision, accuracy, representativeness, completeness, comparability, and sensitivity)
PBR	Performance-Based Restoration
PCB	polychlorinated biphenyl
PCE	perchloroethylene
PID	photoionization detector
PM	Project Manager
PRG	preliminary remediation goal
PT	proficiency testing, also sometimes referred to as performance evaluation (PE)
PQL	practical quantitation limit
PQO	project quality objectives

PTFE	polytetrafluoroethylene (Teflon®)
QA	quality assurance
QAPP	quality assurance project plan
QC	quality control
QSM	Quality Systems Manual for Environmental Laboratories (DoD)
R	flag used to reject questionable data
RCA	recommendations for corrective action
RF	response factor
RL	reporting limit
RPD	relative percent difference
RSD	relative standard deviation
RT	retention time
s	standard deviation
S^2	variance
SAP	sampling and analysis plan
SIM	selected ion monitoring
SOP	standard operating procedure
SOW	statement of work
SPCC	system performance check compound
SPE	solid phase extraction
SSL	soil screening level
SVOC	semivolatile organic compound
SW-846	USEPA Test Methods for Evaluating Solid Waste
TAT	turnaround time
TCA	trichloroethane
TCE	trichloroethene
TCLP	toxicity characteristic leaching procedure
TIC	tentatively identified compounds
TPH	total petroleum hydrocarbons
UCL	upper control limit
UFP-QAPP	Uniform Federal Policy for Quality Assurance Project Plans
URS	URS Group, Inc.
USEPA	United States Environmental Protection Agency
USAF	United States Air Force
VOA	volatile organic analysis
VOC	volatile organic compound
WERC	Worldwide Environmental Restoration and Construction
WP	Work Plan

List of Standard Symbols and Abbreviations

°C	degrees Celsius
g	gram
µg/kg	micrograms per kilogram
µg/L	micrograms per liter
mg/kg	milligrams per kilogram
mg/L	milligrams per liter
nm	nanometer
oz.	ounce
ppm	parts per million (mg/kg, µg/g, approximately mg/L in water)
ppmv	parts per million by volume
ppb	parts per billion (µg /kg, approximately µg /L in water)
ppbv	parts per billion by volume

This detailed Quality Assurance Project Plan (QAPP) establishes the analytical protocols and documentation requirements to ensure the data are collected, reviewed, and assessed in a consistent manner to meet the overall project goals and that the data are scientifically valid and defensible. This QAPP presents, in specific terms, the policies, organization, functions, and Quality Assurance/Quality Control (QA/QC) requirements designed to achieve the data quality goals to be described in the approved project Sampling and Analysis Plan (SAP). The project QAPP and the project Work Plan (WP), also developed using AFCEE guidance, shall constitute, by definition, the project SAP. Individual Field Sampling Plans (FSPs) will be issued on a site-specific basis at various times throughout the project to address work at specific sites.

The project QAPP will be read by all essential staff participating in the work effort. The QAPP will be in the possession of the field teams and in all laboratories performing analytical services. All contractors and subcontractors will be required to comply with the procedures documented in the project QAPP in order to maintain comparability and representativeness of the data produced.

Controlled distribution of the project QAPP will be implemented by URS to ensure the current version is being used. A sequential numbering system will be used to identify controlled copies of the project QAPP. Controlled copies will be provided to applicable Air Force managers, regulatory agencies, remedial project managers, project managers, and QA coordinators. Whenever Air Force revisions are made or addenda added to the project QAPP, a document control system will be put into place to assure (1) all parties holding a controlled copy of the project QAPP will receive the revisions/addenda and (2) outdated material is removed from circulation. The document control system does not preclude making and using copies of the project QAPP; however, the holders of controlled copies are responsible for distributing additional material to update any copies within their organizations. The distribution list for controlled copies will be maintained by URS.

2.1 THE U.S. AIR FORCE ENVIRONMENTAL RESTORATION PROGRAM

The objective of the U.S. Air Force Environmental Restoration Program (ERP) is to assess past hazardous waste disposal and spill sites at U.S. Air Force installations and to develop remedial actions consistent with the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) for sites that pose a threat to human health and welfare or the environment. These objectives will be outlined in the project QAPP and in the Work Plan.

2.2 PROJECT BACKGROUND

Cannon Air Force Base (AFB) is located in Curry County in eastern New Mexico approximately 4 miles west of the City of Clovis. The Base occupies approximately 3,800 acres and is situated at elevations ranging from 4,250 to 4,350 feet above mean sea level (msl)/North American Vertical Datum (NAVD).

2.3 PROJECT SCOPE AND OBJECTIVES

The overall purpose of the Air Force Center for Environmental Excellence (AFCEE) Worldwide Environmental Restoration and Construction (WERC) project at Site SD-11 at Cannon AFB is to achieve Site Closure. In order to achieve closure of ERP sites, Air Combat Command (ACC) has implemented the Performance-Based Restoration (PBR) program. Under this program, if Site Closure is not attainable at a site within the duration of the contract, then an alternative interim performance objective, or Exit Strategy, is to be achieved that will ultimately achieve Site Closure.

The project management team and lines of authority are presented in Figure 3-1. This chart includes all individuals discussed below. The proper names of individuals for the positions identified below are included in Figure 3-1 and will be updated as needed for each project. A list of names of all key participants, including organization names and telephone numbers for project, field and laboratory project managers is presented in Table 3-1.

3.1 MANAGEMENT RESPONSIBILITIES

ACC Project Manager

The ACC Project Manager has the overall responsibility to ensure that the project complies with ACC protocol.

AFCEE Project Manager

The AFCEE Project Manager (PM) is responsible for implementing the project and has the authority to commit the resources necessary to meet project objectives. The AFCEE PM's primary function is to ensure that technical, financial, and scheduling objectives are achieved successfully.

NMED Project Manager

The New Mexico Environment Department (NMED) PM has the overall responsibility to ensure the program is in compliance with the NMED regulatory requirements.

USEPA Region 6 Project Manager

The U.S. Environmental Protection Agency (USEPA) Region 6 PM has the overall responsibility to ensure the program is compliance with USEPA Region 6 protocols.

Cannon AFB ERP Manager

The Cannon AFB ERP manager has the overall responsibility of all phases of the investigation as it pertains to Cannon AFB. The ERP Manager's responsibilities will additionally include compliance with USEPA protocols.

URS Program Manager

The URS Program Manager is responsible for project oversight, and has the authority to commit the resources necessary to meet project objectives and requirements. The URS Program Manager primary function is to ensure that technical, financial, and scheduling objectives are achieved successfully.

URS Project Manager

The URS PM is responsible for implementing the project, and has the authority to commit the resources necessary to meet project objectives and requirements. The URS PM's primary

function is to ensure that technical, financial, and scheduling objectives are achieved successfully. The URS PM will:

- Define project objectives and develop a detailed work schedule
- Establish project policy and procedures to address the specific needs of the project as a whole, as well as the objectives of each task
- Acquire and apply technical and corporate resources as needed to ensure performance within budget and schedule constraints
- Orient all field leaders and support staff concerning the project's special considerations
- Monitor and direct the field leaders
- Develop and meet ongoing project and/or task staffing requirements, including mechanisms to review and evaluate each task product
- Review the work performed on each task to ensure its quality, responsiveness, and timeliness
- Review and analyze overall task performance with respect to planned requirements and authorizations
- Approve all reports (deliverables) before their submission to AFCEE
- Ultimately be responsible for the preparation and quality of interim and final reports
- Represent the project team at meetings and public hearings
- Submit monthly progress reports

3.2 QUALITY ASSURANCE RESPONSIBILITIES

AFCEE QA Officer

The AFCEE QA Officer has the responsibility to review and approve all QAPPs as required by AFCEE and NMED protocols. This includes the adherence to the applicable AFCEE and NMED regulations. Additional responsibilities for the project include:

- Conducting external Performance and System Audits of the analytical laboratory (if completed)
- Evaluating results of QA split sample data (if collected)
- Reviewing and evaluating analytical field procedures of the URS field teams

If the AFCEE QA Officer determines that field or laboratory procedures do not adhere to the established protocols and the data integrity may be impacted, it is their responsibility to inform the AFCEE PM as well as the URS PM.

URS QA/QC Officer

The URS QA/QC Officer has primary reporting responsibility to the URS Program Manager. However, the QA/QC Officer works directly with the URS PM and other project personnel during completion of project tasks. The QA/QC Officer will advise the URS PM on matters regarding the implementation of the QA/QC program, but will function independently of the URS PM. The URS QA/QC Officer's primary responsibility will be to ensure that all standard URS procedures are followed during execution of the project, primarily through production and review of standard operating procedures. In addition, the QA/QC officer will be responsible for data review of all sample results from the analytical laboratories, and the completion of field audits (if needed). Details of the audit procedures are presented in Section 9. If project QA/QC issues are identified, the QA/QC Officer will first communicate directly with the URS PM to resolve the issue(s). If successful resolution to the issue(s) cannot be achieved with the URS PM, the QA/QC Officer is obligated to then report the issue(s) to the URS Program Manager. The URS Program Manager will then be responsible for achieving successful resolution of the issue(s).

Additionally, The URS QA/QC Officer will be responsible for communicating with the USEPA and NMED when laboratory issues (e.g. data quality) arise. These issues will be communicated to the USEPA and NMED as soon as possible for discussion and resolution.

URS Project Chemist

The URS Project Chemist reports to the QA/QC Officer, and also works directly with other project personnel. The primary responsibility of the Project Chemist is to act as a liaison between the project field team and the QA/QC Officer. The Project Chemist may work on other project-related activities, but may not monitor self-performed work for quality. This person will also be responsible for the data review for all sample results from the analytical laboratories.

URS Program Health and Safety Officer

The URS Program Health and Safety Officer (HSO) will report directly to the URS PM and can also work directly with project staff, or through the URS Site Health and Safety Officer. The Program HSO has the responsibility to monitor and verify that work is performed in accordance with the Health and Safety Plan written for the field activities. The Program HSO will advise the URS PM on health and safety issues; however, the HSO operates independently of the URS PM. The Program HSO will also designate and oversee the activities of the Project HSO.

URS Project Health and Safety Officer

The URS Project HSO monitors all project health and safety related activities, is responsible for implementation and compliance with the Health and Safety Plan, and will report directly to the URS Program HSO. In the Program HSO's absence, the Project HSO can report directly to the URS PM.

3.3 LABORATORY RESPONSIBILITIES

Laboratory QA Officer (APPL)

The laboratory QA Officer has the overall responsibility for data generated by the laboratory, as well as the adherence to acceptable practice. The laboratory QA Officer will communicate data issues through the laboratory project manager. In addition, the laboratory QA Officer will:

- Oversee laboratory QA
- Oversee QA/QC documentation
- Conduct detailed data review
- Determine whether to implement laboratory corrective actions, if required
- Define appropriate laboratory QA procedures
- Prepare laboratory standard operating procedures (SOPs)
- Sign the title page of the QAPP

3.4 FIELD RESPONSIBILITIES

URS Field Task Leader

The URS Field Task Leader is responsible for implementing the FSP. He/she is responsible for field equipment calibration, oversight of sample collection, field documentation, submittal of samples to contract laboratories and preparation of a summary report.

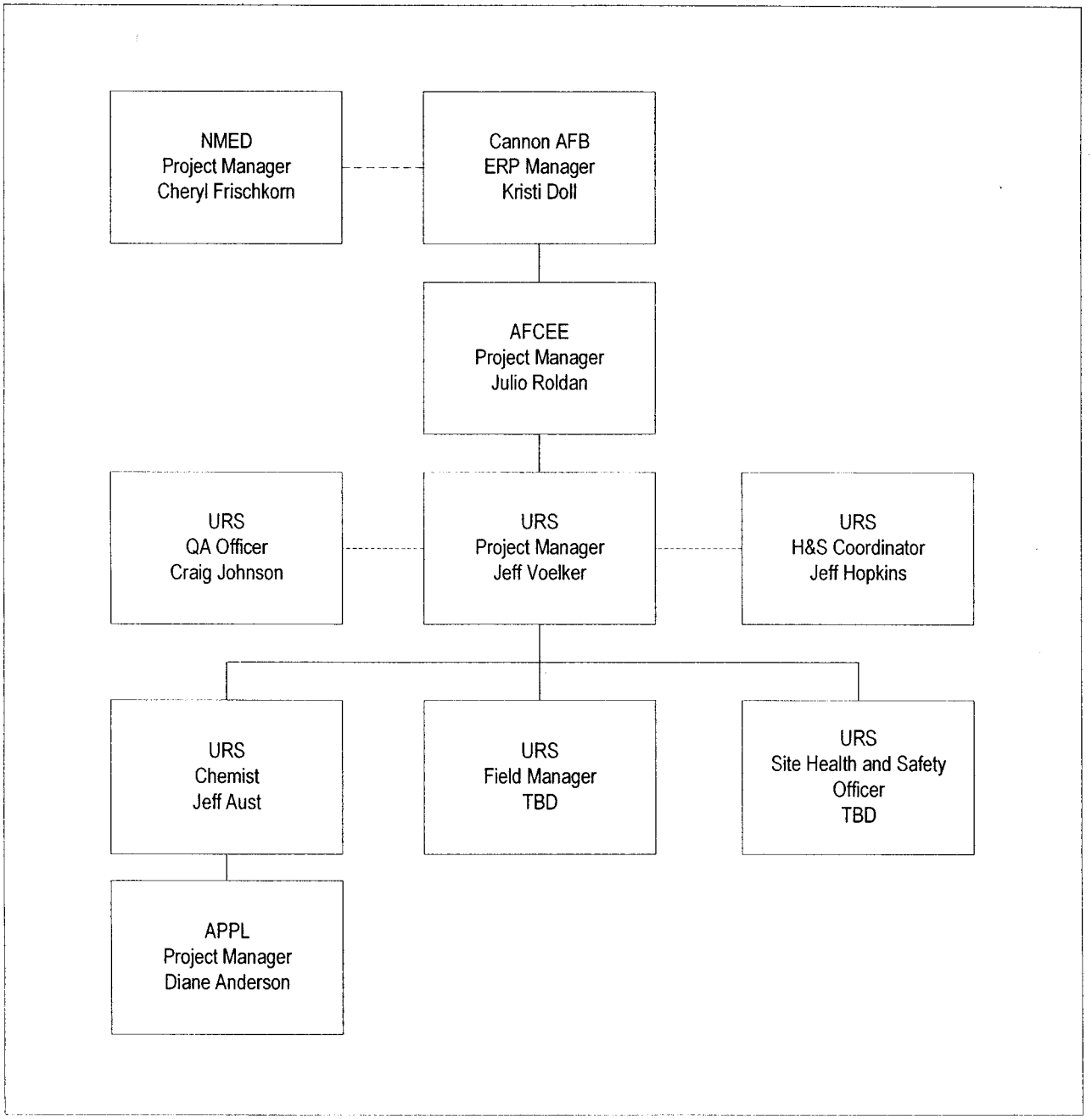
The URS Field Task Leader is responsible for leading and coordinating the day-to-day activities of the various resource specialists under his/her supervision. The URS Task Leader will report directly to the URS PM. Specific field team leader responsibilities include:

- Provision of day-to-day coordination with the URS PM on technical issues in specific areas of expertise
- Developing and implementing of field-related work plans, assurance of schedule compliance, and adherence to management-developed study requirements
- Coordinating and managing field staff
- Implementing QC for technical data provided by the field staff including field measurement data
- Adhering to work schedules provided by the URS PM
- Authoring, writing, and approving of text and graphics required for field team efforts
- Identifying problems at the field team level, resolving difficulties in consultation with the AFCEE PM and the URS PM, implementing and documenting corrective action procedures, and provision of communication between team and upper management
- Participating in preparation of the final report

TABLE 3-1
PROJECT CONTACT LIST
CANNON AFB

Name	Title	Address	Phone Number
Carol Stark	ACC Program Manager	HQACC/A7VR 129 Andrews Street, Suite 102, Langley AFB, VA 23665-2769	(757) 764-9431
Julio Roldan	AFCEE Project Manager	HQ AFCEE/ICC 3300 Sidney Brooks, Brooks City-Base, TX 78235-5112	(210) 536-6375
Cheryl Frishkorn	NMED Project Manager	New Mexico Environment Department 1190 St. Francis Drive, Suite N4050, Santa Fe, New Mexico 87502-0110	(505) 428-2550
Kristi Doll	Cannon AFB ERP Manager	27 CES/CEC 506 N. DL Ingram Blvd., Mountian Home AFB, ID 83648	(505) 784-1098
Jeff Voelker	URS Project Manager	URS Corporation 12120 Shamrock Plaza Suite 300, Omaha, NE 68154	(402) 952-2558
Craig Johnson	URS Project Quality Assurance Officer	URS Corporation 12120 Shamrock Plaza Suite 300, Omaha, NE 68154	(402) 952-2524
Dennis Day	URS Program Health and Safety Officer	URS Corporation 12120 Shamrock Plaza Suite 300, Omaha, NE 68154	(402) 952-2525
Jeff Hopkins	URS Project Health and Safety Officer	URS Corporation 12120 Shamrock Plaza Suite 300, Omaha, NE 68154	(402) 952-2531
Jeff Aust	URS Project Chemist	URS Corporation 12120 Shamrock Plaza Suite 300, Omaha, NE 68154	(402) 952-2516
Diane Anderson	Laboratory Project Manager	Agriculture and Priority Pollutnats Laboratory (APPL) 4203 West Swift Ave. Fresno, CA 93722	(559) 275-2175

Figure 3-1
Project Organization



Project quality objectives (PQOs) specify the data type, quality, quantity, and uses needed to make decisions and are the basis for designing data collection activities. PQOs are developed by URS with inputs from various sources, including stakeholders, regulators, and environmental professionals, for site-specific applications and become incorporated into the overall project decision-making process. The Cannon AFB data quality objectives (DQOs) are based on NMED Soil Screening Level (SSLs).

Specific measurement performance criteria for the data quality indicators (DQI) (precision, accuracy, representativeness, completeness, comparability, and sensitivity) were developed in the planning phase and are essential elements in the assessment of overall data quality. The goals of these indicators (field and laboratory) are incorporated into the overall PQOs and are included in the project QAPP. Evaluation of the data against well-defined measurement performance criteria facilitates the process of data qualification and/or necessary corrective actions.

4.1 DATA TYPES

The two general types of data are screening data and definitive data. Screening data are analytical data that are of sufficient quality to support an intermediate or preliminary decision but must eventually be supported by definitive data before the project is complete. Screening data are often generated by rapid methods of analysis with less rigorous sample preparation, calibration and/or QC requirements. Sample preparation steps may be restricted to simple procedures such as dilution with a solvent, instead of elaborate extraction/digestion and cleanup. Screening data may provide analyte identification and quantitation, although the quantitation may be relatively imprecise. Physical test methods (e.g., total organic vapor levels etc.) have been designated by definition as screening methods (see Section 6). Definitive data are analytical data that are suitable for final decision-making. Often, they are generated using rigorous analytical methods (see Section 7) such as approved USEPA SW-846 (Test Methods for Evaluating Solid Waste) reference methods. Definitive data are not restricted in their use unless quality problems require data qualification.

4.2 DATA QUALITY INDICATORS

Measurement performance criteria should be determined for each matrix, analytical group, concentration level, and analyte, as appropriate. The criteria should relate to the DQIs: precision, accuracy, representativeness, completeness, comparability, and sensitivity (PARCCS) commonly referred to as "PARCCS parameters". The DQIs are discussed in the following subsections. Procedures to measure data quality and the use of these indicators must be clearly presented in the project QAPP. The criteria are those presented in the AFCEE QAPP 4.0. The measurement performance criteria for precision, accuracy, and sensitivity for each method and matrix are identified in Sections 6 and 7.

4.2.1 Precision

Precision refers to the reproducibility of measurements. It is strictly defined as the degree of mutual agreement among independent measurements as the result of repeated application of the

same process under similar or prescribed conditions. Precision reflects random error and may be affected by systematic error. It also reflects variation imposed by a given matrix.

Laboratory precision is measured by the variability associated with duplicate (two) or replicate (more than two) analyses. One type of sample that can be used to assess laboratory precision is the laboratory control sample (LCS). Multiple LCS analyses over the duration of the project can be used to evaluate the overall laboratory precision for the project. In this case, the comparison is not between a sample and a duplicate sample analyzed in the same batch, rather the comparison is between LCSs analyzed in multiple batches.

Total precision is the measurement of the variability associated with the entire sampling and analytical process. It is determined by analysis of duplicate or replicate (split) field samples and measures variability introduced by both the laboratory and field operations. Field duplicate samples and matrix duplicate spiked samples shall be analyzed to assess field and laboratory precision. The precision is evaluated using the relative percent difference (RPD) between the duplicate sample results. The formula for the calculation of precision is provided in Table 4-1 as RPD. For replicate analyses, the relative standard deviation (RSD) is determined and used as the measure of precision. The formula for the calculation of RSD is provided in Table 4-1. Section 7 identifies the precision criteria.

4.2.2 Accuracy

Accuracy is of the degree of agreement between an observed value and a "true" value (correctness) and includes a combination of the random error (precision) and systematic error (bias) components that result from the sampling and analytical procedures. It therefore reflects the total error associated with a measurement. A measurement is considered accurate when the reported value agrees with the true value or known concentration of the spike or standard within acceptable limits. Analytical accuracy is measured by comparing the percent recovery of analytes spiked into an LCS to a control limit. For volatile and semivolatile organic compounds, surrogate compound recoveries are also used to assess accuracy and method performance for each sample analyzed. Analysis of proficiency testing (PT) samples may also be used to provide additional information for assessing the accuracy of the analytical data being produced.

Both accuracy and precision are calculated for each AFCEE analytical batch, and the associated sample results are interpreted by considering these specific measurements. The formula for calculation of accuracy is included in Table 4-1 as percent recovery (%R) from pure and sample matrices. Accuracy requirements are listed for each method in Section 7.

4.2.3 Representativeness

Representativeness is a qualitative term which refers to the degree in which data accurately and precisely depicts the characteristics of a population, whether referring to the distribution of contaminant within a sample, a sample within a matrix, or the distribution of a contaminant at a site. Representativeness is determined by appropriate program design, with consideration of elements such as proper well locations, drilling and installation procedures, and sampling locations. Objectives for representativeness are defined for each sampling and analysis task and are a function of the investigative objectives. Assessment of representativeness will be achieved

through use of the standard field, sampling, and analytical procedures. Decisions regarding sample/well/ boring locations and numbers and the statistical sampling design are documented in the project FSP.

4.2.4 Completeness

Completeness is a measure of the amount of valid data obtained compared with the amount that was expected to be obtained under correct, normal conditions. It is calculated for the aggregation of data for each analyte measured for any particular sampling event or other defined set of samples (e.g., by site) as set out in the PQOs. Valid data is data which is usable in the context of the project goals. Completeness is calculated and reported for each method, matrix, and analyte combination. The number of valid results divided by the number of possible individual analyte results, expressed as a percentage, determines the completeness of the data set. For completeness requirements, valid results are all results not qualified with an R-flag after a usability assessment has been performed. Completeness should not be determined only on the basis of laboratory data qualifiers. (See Section 8 for an explanation of flagging criteria.) The goal for completeness, which should be based on specific project goals, is typically 95 percent for aqueous samples and 90 percent for soil samples. URS will evaluate completeness with respect to project goals to determine its impact on the decision-making process.

The formula for calculation of completeness is presented below:

$$\% \text{ completeness} = \frac{\text{number of valid (i.e., non-R flagged) results}}{\text{number of possible results}}$$

4.2.5 Comparability

Comparability is a qualitative indicator of the confidence with which one data set can be compared to another data set. The objective for this QA/QC program is to produce data with the greatest possible degree of comparability. The number of matrices that are sampled and the range of field conditions encountered are considered in determining comparability. Comparability is achieved by using standard methods for sampling and analysis, reporting data in standard units, normalizing results to standard conditions, and using standard and comprehensive reporting formats. Complete field documentation using standardized data collection forms will support the assessment of comparability. Analysis of PT samples and reports from audits will also be used to provide additional information for assessing the comparability of analytical data produced among subcontracting laboratories. Historical comparability will be achieved through consistent use of methods and documentation procedures throughout the project. Assessment of comparability is primarily subjective and results will be interpreted by experienced environmental professionals with a clear knowledge of the PQOs and project decisions. Assessment will include a discussion of the level of uncertainty associated with the comparability of the specific data set and the potential consequences of using non-comparable data.

4.2.6 Sensitivity

Sensitivity is the ability of an analytical method or instrument to discriminate between measurement responses representing different concentrations. This capability is established during the planning phase to meet project-specific objectives. It is important to be able to detect the target analytes at the levels of interest. Sensitivity requirements include the establishment of various limits, which are described in Section 4.3, such as calibration requirements, instrument detection limits (IDLs), method detection limits (MDLs), and project-specific reporting limits (RLs). Both the IDLs and MDLs are normally based on an interference-free matrix (i.e. reagent water or purified solid), which do not take into account matrix effects and may not be achievable for environmental samples.

4.3 METHOD DETECTION LIMITS, REPORTING LIMITS AND INSTRUMENT CALIBRATION REQUIREMENTS

The MDLs, RLs, and instrument calibration procedures were established using the guidelines set forth below.

4.3.1 Method Detection Limits

The MDL, as defined by 40 Code of Federal Regulation (CFR) Part 136, Appendix B, is the minimum concentration of a substance that can be measured and reported with 99 percent confidence that the analyte concentration is greater than zero. The laboratory established MDLs for each method, matrix, and analyte.

The laboratory will provide the MDL demonstrations to AFCEE at the beginning of the project (i.e., before project samples are analyzed) and upon request in the format specified in Section 8.

Laboratories participating in this work effort will demonstrate the MDLs for each instrument, including confirmatory columns, method of analysis, analyte, and matrix (i.e., water and soil) using the following instructions:

(1) Estimate the MDL using one of the following:

(a) The concentration value that corresponds to an instrument signal/noise ratio in the range of 2.5 to 5, or

(b) The concentration equivalent of three times the standard deviation of replicate measurement of the analyte in reagent water, or

(c) The region of the standard curve where there is a significant change in sensitivity (i.e., a break in the slope of the standard curve).

(2) Prepare (i.e., extract, digest, etc.) and analyze seven samples of a matrix spike (ASTM Type II water for aqueous methods, Ottawa sand for soil methods, glass beads of 1 mm diameter or smaller or Teflon chips for metals) containing the analyte of interest at a concentration three to five times the estimated MDL. If more than seven replicates are

analyzed, all results must be used to calculate the MDLs, unless exclusion of a result is technically justified and documented. MDLs must be established for each extraction/ cleanup method combination employed for samples.

(3) Determine the variance (S^2) for each analyte as follows:

$$S^2 = \frac{1}{n-1}\left[\sum_{i=1}^{n}\left(x_i - \bar{x}\right)^2\right]$$

where x_i = the ith measurement of the variable x and $\bar{x}$ = the average value of x

$$\bar{x} = \frac{1}{n}\sum_{i=1}^{n} x_i$$

(4) Determine the standard deviation (s) for each analyte as follows:

$$s = (S^2)^{1/2}$$

(5) Determine the MDL for each analyte as follows:

$$MDL = 3.14(s)$$

(**Note**: 3.14 is the one-sided t-statistic at the 99 percent confidence level appropriate for determining the MDL using seven samples)

(6) If the spike level used in step 2 is more than 10 times the calculated MDL, repeat the process using a smaller spiking level.

Where multiple instruments are used, the MDL used for reporting purposes shall represent the least sensitive instrument.

4.3.2 MDL Verification

An MDL verification check will be performed on each instrument immediately following an MDL study and can be performed quarterly in place of the annual (every 12 months) MDL study. However, this may not substitute for the initial, MDL determination. The MDL check sample will be spiked at **approximately 2 times** the current reported MDL and taken through all preparatory and analytical steps. The MDL is verified if the laboratory can reliably detect and identify all analytes in the check sample by the method-specified criteria. If the method has no confirmation criteria, the check sample must produce a signal that is at least 3 times the instrument's noise level. If the MDL is not verified, spike at successively higher concentrations until the verification criteria are met, and use the first successful concentration as the reported MDL.

4.3.3 Reporting Limits

The laboratories participating in this work effort will compare the results of the MDL demonstrations to the RLs for each method that is listed in Section 7. The MDL may not be more than one-half the corresponding RL. The laboratories will also verify RLs by including a standard at or below the RL as the lowest point on the calibration curve. All results will be reported at or above the MDL values; however, for those results falling between the MDL and the RL, an F-flag will be applied to indicate the presence of an analyte(s) but in estimated quantity(ies). No results will be reported below the MDL.

4.3.4 Instrument Calibration

Analytical instruments will be calibrated in accordance with the analytical methods. All analytes reported will be present in the initial and continuing calibrations, and these calibrations will meet the acceptance criteria specified in Section 7. All results reported will be within the calibration range. Results outside the calibration range are unsuitable for quantitative work and only give an estimate of the true concentration. For SW6010B and SW7471A, results will be within the working range determined either by the daily initial calibration or by linear range studies. Records of standard preparation and instrument calibration will be maintained. Records will unambiguously trace the preparation of standards and their use in calibration and quantitation of sample results. Calibration standards will be traceable to standard materials.

Instrument calibration will be checked using all target analytes identified in the project-specific requirements and surrogates. The analytes listed in the QC acceptance criteria tables in Section 7 will serve as the analytes for the method. All calibration criteria will satisfy SW-846 requirements at a minimum. The initial calibration (ICAL) will be verified by a second source standard. Multipoint calibrations will contain the minimum number of calibration points specified in Section 7 with all points used for the calibration being contiguous. If more than the minimum number of standards is analyzed for the initial calibration, all of the standards analyzed will be included in the initial calibration. The only exception to this rule is a standard at either end of the calibration curve can be dropped from the calibration, providing the requirement for the minimum number of standards is met. Acceptance criteria for the calibration check are presented in Section 7. Analyte concentrations are determined with either calibration curves or response factors (RFs). For gas chromatography (GC) and GC/mass spectrometry (GC/MS) methods, when using RFs to determine analyte concentrations, the average RF from the initial calibration will be used. The continuing calibration will not be used to update the RFs from the initial calibration. The continuing calibration verification (CCV) will not be used as the LCS, except for methods that do not involve sample preparation (e.g., volatile organic compounds [VOCs]). A CCV will be performed daily before sample analysis (unless an initial calibration and second-source standard verification is performed immediately before sample analysis) and as required by the applicable method. (Section 7 gives the appropriate frequencies.) In addition, the concentration used for the CCV sample will be at or below the middle of the calibration curve. Finally, the lowest standard used will be at or below the RL for each analyte in the method.

4.4 QUALITY CONTROL ACTIVITIES

QC elements relevant to screening data are presented in Section 6.2. This section presents QC requirements relevant to analysis of environmental samples that will be followed during all analytical activities for fixed-base, mobile, and field laboratories producing definitive data. The purpose of these QC activities is to produce data of known quality that satisfy the PQOs. These activities provide a mechanism for ongoing control and evaluation of data quality measurements through the use of QC materials.

Laboratory QC samples (e.g., blanks and LCSs) will be included in the preparation batch with the field samples. An AFCEE analytical batch (AAB) is a group of samples (not exceeding 20 environmental samples plus associated laboratory QC samples) that are similar in composition (matrix) which are extracted or digested at the same time and with the same lot of reagents and analyzed together as a group. Matrix spikes (MS) and matrix spike duplicates (MSDs) are treated as environmental samples. The term AAB also extends to cover samples that do not need separate extraction or digestion (e.g., volatile analyses by purge and trap). The identity of each AAB will be unambiguously reported with the analyses so that a reviewer can identify the QC samples and the associated environmental samples. All references to the analytical batch in the following sections and tables in this QAPP refer to the AAB.

The type of QC samples and the frequency of use of these samples are discussed below and in the method-specific subsections of Section 7.

4.4.1 Laboratory Control Samples

The LCS is a sample of known composition prepared using contaminant-free water or an inert solid such as glass beads or Teflon chips that is spiked with all target analytes. Each analyte in the LCS will be spiked at a level less than or equal to the midpoint of the calibration curve. (The midpoint is defined as the median point in the curve, not the middle of the range). The LCS will be carried through the complete sample preparation and analysis procedure.

The LCS is used to evaluate each AFCEE analytical batch and to determine whether the method is in control. Except for VOC analysis, the LCS will not be used as the CCV.

At least one LCS will be included in every AFCEE analytical batch. If more than one LCS is analyzed in an AAB, results from all LCSs will be reported. A QC failure of an analyte in any of the LCSs will require appropriate corrective action, including qualification of the failed analyte in all of the samples, as required.

4.4.1.1 LCS Control Limits

The laboratory will use the LCS control limits obtained from the AFCEE QAPP 4.0. The performance of the LCS is evaluated against the QC acceptance limits. Whenever an analyte in the LCS is outside the acceptance limit, corrective action will be performed. When an analyte in the LCS exceeds the upper or lower control limit and no corrective action is performed or the corrective action is ineffective, the appropriate flag, as described in Sections 7 and 8, will be applied to all affected results.

4.4.1.2 Marginal Exceedance

A number of sporadic marginal exceedances of the LCS control limits is allowed. The number of exceedances is based on the total number of analytes spiked into the LCS and may not exceed 5% of the total number of analytes in the LCS. The table below presents the allowable number of marginal exceedances for a given number of analytes in the LCS.

NUMBER OF MARGINAL EXCEEDANCES

Number of Analytes in LCS	Allowable Number of Marginal Exceedances of LCS Control Limits
> 90	5
71 – 90	4
51 – 70	3
31 – 50	2
11 – 30	1
< 11	0

A marginal exceedance (ME) is defined as beyond the LCS control limits but within the marginal exceedance limits, which are set at 4 standard deviations around the mean. This outside boundary prevents a grossly out-of-control LCS from passing.

Marginal exceedances must be sporadic (i.e., random). If the same analyte exceeds the LCS control limits repeatedly (e.g., 2 out of 3 consecutive LCS), that is an indication that the problem is systematic, not random. The source of error should be located and appropriate corrective actions taken. Laboratories must monitor through QA channels the application of the sporadic marginal exceedance allowance to the LCS results to ensure random behavior.

4.4.1.3 LCS Failure

Each LCS will be evaluated against the LCS control limits and marginal exceedance limits before being accepted. The recoveries for the analytes spiked into the LCS will be compared with the LCS control limits. If a recovery is less than the lower control limit or greater than the upper control limit, that is an exceedance. The laboratory will note which analytes exceeded the control limits and make a comparison to the list of project-specific analytes of concern. **If a project-specific analyte of concern exceeds its LCS control limit, the LCS has failed.** The laboratory will add up the total number of exceedances for the LCS. Based on the number of analytes spiked into the LCS, the total number of exceedances is compared with the allowable number in the Table. **If an LCS has more than the allowable number of marginal exceedances, the LCS has failed.** Finally, the recoveries for those analytes that exceeded the LCS control limits should be compared to the ME limits. **If a single analyte exceeds its marginal exceedance limit, the LCS has failed.** (This only applies to methods with greater than 10 analytes.)

In summary, failure of the LCS can occur several ways:

- Exceedance of an LCS control limit by any project-specific analyte of concern

- Marginal exceedance of the LCS control limits by more than the allowable number of analytes
- Exceedance of the ME limits by one or more analytes

Once an LCS has failed, corrective action is required (see Section 4.4.1.4).

4.4.1.4 Corrective Action

If a sample fails based on any of the criteria in Section 4.4.1.3, corrective action is required. The corrective action requirement applies to all analytes that exceeded the LCS control limits, even if one specific analyte's exceedance was not the trigger of LCS failure. **All exceedances of the LCS control limits, marginal or otherwise, are subject to corrective action.**

If an LCS fails, an attempt will be made to determine the source of error and find a solution. All the findings and corrective action will be documented. After the system problems have been resolved and system control has been reestablished, all samples in the AFCEE analytical batch will be reprepped and reanalyzed for the out-of-control analyte(s) or the batch rerun with a new LCS. The corrective action applied will be based on professional judgment in the review of other QC measures (i.e., surrogates). If an analyte falls outside the LCS control limits a second time or if there is not sufficient sample material available to be reanalyzed, then all the results in the AAB for that analyte will be flagged. The recoveries of those analytes subject to corrective action will be documented in the case narrative, whether flagging is needed or not.

4.4.2 Matrix Spike/Matrix Spike Duplicate

The MS/MSD is an aliquot of sample spiked with known concentrations of all target analytes. The spiking occurs prior to sample preparation and analysis. Each analyte in the MS/MSD will be spiked at a level less than or equal to the midpoint of the calibration curve for each analyte. Only AFCEE samples will be used for spiking. The MS/MSD shall be designated on the chain of custody.

The MS/MSD are used to document potential matrix effects associated with a site. URS will select the samples for MS/MSDs. The sample replicates will be generated in the field and will be used by the laboratory to prepare the appropriate MS/MSDs. Only one soil sample container will be necessary for the parent sample, the MS sample, and the MSD sample (except for VOCs). The MS/MSD results and flags will be associated or related to samples that are collected from the same site from which the MS/MSD set were collected. MSs and MSDs will not be used to control the analytical process.

A site-specific MS/MSD will be specified for each media (e.g., any different soil, water, or sediment) at each site during each sampling event. The URS Project Manager will designate the MS/MSD and determine whether they are site specific based on the project requirements. A minimum of one MS and one MSD shall be designated by the project manager for each site and included for every 20 field samples (i.e., collect up to 20 field samples followed by two additional samples designated as MS and MSD). More than one MS/MSD pair may be submitted as part of the sample group of environmental samples; however, project managers will

coordinate with the laboratory providing analytical services for most cost effective sampling. Based on the projects size and duration, it is possible that not every sample delivery group will include an MS/MSD pair.

The performance of the MS and MSD will be evaluated against the QC acceptance limits given in the tables in Section 7. If either the MS or the MSD is outside the QC acceptance limits, the data will be evaluated to determine whether there is a matrix effect or analytical error and then the analytes in all related samples will be qualified according to the data flagging criteria in Sections 7 and 8. The laboratory will communicate potential matrix difficulties to URS so an evaluation can be made with respect to the PQOs.

4.4.3 Surrogates

Surrogates are compounds similar to the target analytes in chemical composition and behavior in the analytical process but are not normally found in environmental samples. Surrogates will be used to evaluate accuracy, method performance and extraction efficiency. Surrogates will be added to environmental samples, controls and blanks in accordance with the method requirements. Surrogate recoveries will be evaluated against the QC acceptance limits in Section 7. Failure of the surrogate recoveries will require corrective action. Samples with surrogate recovery failures will be re-prepared and re-analyzed. If the corrective action is not performed or is ineffective, the laboratory will flag according to criteria in Sections 7 and 8 of this QAPP.

4.4.4 Internal Standards

Internal Standards (ISs) are known amounts of standards added to a portion of a sample of sample extract and carried through the entire determination procedure. They will be used as a reference for calibration and for controlling precision and bias of the analytical method. ISs will be added to environmental samples, controls and blanks in accordance with the method requirements. IS results outside of the acceptance limits will require corrective action. After corrective measures have been implemented, all samples with internal standard failure will be reanalyzed. If the corrective action is not performed or is ineffective, the laboratory will flag according to criteria in Sections 7 and 8 of this QAPP.

4.4.5 Retention Time Windows

Retention time windows are used in GC, ion chromatography (IC) analysis for qualitative identification of analytes. They are calculated from replicate analyses of a standard on multiple days. The procedure and calculation method are given in SW-846, Method 8000C. The center of the retention time (RT) window is established for each analyte and surrogate using the RT of the mid-point standard of the initial calibration. For non-MS methods, these will be updated daily using the absolute RTs in the ICV.

When the retention time is outside of the acceptance limits, corrective action will be performed. This applies to all CCVs subsequent to the ICV and to LCSs. After the system problems have been resolved and system control has been reestablished, all samples analyzed since the last

acceptable retention time check will be reanalyzed. If corrective actions are not performed, the appropriate flag, as described in Sections 7 and 8, will be applied to the sample results.

4.4.6 Interference Check Samples

Interference check samples (ICS) are used in inductively coupled plasma – atomic emission spectrometry (ICP-AES) and contain known concentrations of both interfering and analyte elements. ICSs will be used to verify background and interelement correction factors and are analyzed at the beginning of each run sequence. ICS results outside of the acceptance limits will require corrective action. After corrective measures have been implemented, all samples in the batch will be reanalyzed. If the corrective action is not performed or is ineffective, the laboratory will flag according to criteria in Section 7 and 8 of this QAPP.

4.4.7 Method Blanks

Method blank samples are generated within the laboratory and used to assess contamination resulting from laboratory procedures. A method blank will be analyzed by the laboratory with each analytical batch samples for organic analyses will be re-analyzed if common laboratory contaminants are detected above the RL or when non-laboratory contaminants are reported greater than half the RL. Samples for metals analyses will be completed if the blank concentration is greater than the RL.

4.4.8 Trip Blanks

The trip blank consists of a VOC sample vial filled in the laboratory with ASTM Type II reagent grade or organic-free water, transported to the sampling site, handled like an environmental sample and returned to the laboratory for analysis. Trip blanks are not opened in the field. Trip blanks are prepared only when VOC samples are collected and analyzed for VOC analytes.

Trip blanks will be used to assess the potential introduction of contaminants from sample containers or during the transportation and storage procedures. Each cooler of samples sent to the laboratory for analysis of VOCs will contain one trip blank. For methanol preserved soil samples being analyzed for diesel-range organics (DRO), gasoline-range organics (GRO) or VOCs, a methanol blank will be utilized.

When an analyte is detected in the trip blank, the appropriate flag, as described in Section 8, will be applied to all sample results from samples in the cooler with the affected trip blank.

4.4.9 Field Duplicate Samples

Field duplicates are two (or more) field samples taken at the same time in the same location. They are intended to represent the same population and are taken through all steps of the analytical procedure in an identical manner. These samples will be used to assess precision of the entire data collection activity, including sampling, analysis, and site heterogeneity.

Duplicate samples are collected simultaneously or in immediate succession, using identical recovery techniques, and are treated in an identical manner during storage, transportation, and

analysis. The samples may be either collocated samples or subsamples (replicates) of a single sample collection. Examples of collocated samples include ambient air monitoring samples, surface water grab samples, and side-by-side soil core samples, while subsamples may be taken from one soil boring or sediment core. The sample containers will be assigned a unique identification number in the field. Specific locations will be designated for collection of field duplicate samples prior to the beginning of sample collection.

A minimum of one duplicate or replicate sample shall be included for every 20 field samples. Acceptance criteria are given in Section 7 and are the same as for matrix spike/matrix spike duplicate samples.

4.4.10 Split Samples

Split samples are two or more representative portions taken from a sample in the field or laboratory, analyzed by at least two different laboratories and/or methods. These are quality control samples used to assess precision, variability, and data comparability. Prior to splitting, the sample is mixed (except for VOCs, oil and grease, or otherwise directed) to minimize sample heterogeneity. Split samples will be collected as determined by the QA officer.

4.5 QUALITY CONTROL CHECKS

4.5.1 Holding Time Compliance

All sample preparation and analysis will be completed within the method-required holding times. The holding time for a sample begins at the time of sample collection. Some methods have more than one holding time requirement (e.g., methods SW8015B and SW8270C). The preparation holding time is calculated from the time of sample collection to the time of completion of the sample preparation process as described in the applicable method, prior to any necessary extract cleanup and/or volume reduction procedures. If no preparation (e.g., extraction) is required, the analysis holding time will be calculated from the time of sample collection to the time of completion of all analytical runs, including dilutions, second column confirmations, and any required reanalyses. In methods requiring sample preparation prior to analysis, the analysis holding time is calculated from the time of preparation completion to the time of completion of all analytical runs, including dilutions, second column confirmations, and any required reanalyses. Holding times are determined on the basis of days and hours. If the time of the sample collection is not provided, the laboratory will contact the URS Field Manager to determine the time of sample collection. If holding times are exceeded and the analyses are performed, the results will be flagged according to the procedures as described in Section 8 and identified in the data package case narrative.

4.5.2 Confirmation

Quantitative confirmation of results at or above the RL for samples analyzed by GC will be required and will be completed within the method-required holding times. If holding times are exceeded and the analyses are performed, the results will be flagged according to the procedures as described in Section 8. For GC methods, a second column is used for confirmation. Unless

otherwise specified or overlapping peaks are causing erroneously high results, the higher of the two confirmed results will be reported as the primary result. The column used for both the primary and confirmation results will be indicated on the sample reports. The associated calibration and QC results (including method blank, LCS, MS/MSD, surrogates and internal standards) will be submitted for both columns so that sample results can be appropriately evaluated.

4.5.3 Control Charts

Control charts are used to track laboratory performance over time. All analytes spiked into the LCS will be tracked via control charts. These charts are useful in identifying trends and problems in an analytical method and the laboratory will use these to establish in-house LCS control limits. Charts should be updated as needed, such as when there is a significant change to the analytical system, i.e. different column or detector, different operating conditions, etc. At a minimum, the charts will be updated annually and reviewed each time a data point is generated, so that corrective action can be taken in a timely manner. These charts can also be used to benchmark a laboratory's performance against AFCEE requirements to determine possible areas for improvement.

4.5.4 Standard Materials

Standard materials, including second source materials, used in calibration and to prepare samples will be traceable to National Institute Standards and Technology (NIST), USEPA, American Association of Laboratory Accreditation (A2LA) or other equivalent AFCEE approved source, if available. If an NIST, USEPA or A2LA standard material is not available, the standard material proposed for use will be included in an addendum to the SAP and approved before use. The standard materials will be current, and the following expiration policy will be followed: The expiration dates for ampulated solutions will not exceed the manufacturer's expiration date or one year from the date of receipt, whichever comes first. Expiration dates for laboratory prepared stock and diluted standards will be no later than the expiration date of the stock solution or material or the date calculated from the holding time allowed by the applicable analytical method, whichever comes first. Expiration dates for pure chemicals will be established by the laboratory and be based on chemical stability, possibility of contamination, and environmental and storage conditions. Expired standard materials will be either revalidated prior to use or discarded. Revalidation may be performed through assignment of a true value and error window statistically derived from replicate analyses of the material as compared to an unexpired standard. The laboratory will label standard and QC materials with expiration dates.

A second source standard is used to independently confirm the initial calibration. A second source standard is a standard purchased from a vendor different from that supplying the material used in the initial calibration. The second source material can be used for the continuing calibration standards and/or for the LCS. Two different lot numbers from the same vendor do not normally constitute a second source. However, when a project requires analyses for which there is not a separate vendor source available, the use of different lot numbers from the same vendor will be acceptable to verify calibration.

4.5.5 Supplies and Consumables

The laboratory will inspect supplies and consumables prior to their use in analysis. The materials description in the methods of analysis will be used as a guideline for establishing the acceptance criteria for these materials. Purity of reagents will be monitored and documented. An inventory and storage system for these materials will assure use before manufacturers' expiration dates and storage under safe and chemically compatible conditions.

TABLE 4-1
STATISTICAL CALCULATIONS
CANNON AFB

Statistic	Symbol	Formula	Definition	Uses
Mean	$\bar{X}$	$\frac{\left(\sum_{i=1}^{n} x_i\right)}{n}$	Measure of central tendency	Used to determine average value of measurements
Standard Deviation	S	$\left(\frac{\Sigma(x_i-\bar{x})^2}{(n-1)}\right)^{1/2}$	Measure of relative scatter of the data	Used in calculating variation of measurements
Relative Standard Deviation	RSD	$(S/\bar{X}) \times 100$	Relative standard deviation, adjusts for magnitude of observations	Used to assess precision for replicate results
Percent Difference	%D	$\left(\frac{X_1 - X_2}{X_2}\right) * 100$	Measure of the difference of two observations	Used to assess accuracy
Relative Percent Difference	RPD	$RPD = \left[\frac{\lvert M_1 - M_2 \rvert}{\frac{M_1 + M_2}{2}}\right] * 100$	Measure of variability that adjusts for the magnitude of observations	Used to assess total and analytical precision of duplicate measurements
Percent Recovery	%R	$\left(\frac{X_{meas}}{X_{true}}\right) \times 100$	Recovery of spiked compound in clean matrix	Used to assess accuracy
Percent Recovery	%R	$\left(\frac{\text{Value of spike sample - Value of unspiked sample}}{\textit{Value of added spike}}\right) * 100$	Recovery of spiked compound in sample matrix	Used to assess matrix effects and total precision
Correlation Coefficient	r	see SW8000B section 7.5.3		Evaluation of "goodness of fit" of a regression line
Coefficient of Determination	COD	see SW8000B section 7.5.3		Evaluation of "goodness of fit" of a polynomial equation

x = Observation (concentration) n = Number of observations

For %D, x_1 = Calculated concentration or calibration factor (CF) or response factor (RF) and x_2 = Theoretical concentration or CF or RF.

TABLE 5-1
SAMPLE CONTAINERS, PRESERVATION, AND HOLDING TIMES
CANNON AFB

Parameter	Analytical Methods	Soil/Solid Media		
		Sample Container	Preservation	Holding time
Volatile Organics (VOCs)	SW8260B	Encore® or Terra Core™ samplers (2 preweighed - 40 ml VOA vialwith water/ 1 preweighed - 40 ml VOA vial with methanol)	Encore® or Terra Core™ samplers (cool to 4 °C or frozen)	48 hours for Encore® or Terra Core™ unless extruded and preserved within 48 hours
Total petroleum hydrocarbons (TPH)-volatile	SW8015B	Encore® or Terra Core™ samplers (2 preweighed - 40 ml VOA vialwith water/ 1 preweighed - 40 ml VOA vial with methanol)	Encore® or Terra Core™ samplers (cool to 4 °C or frozen)	48 hours for Encore® or Terra Core™ unless extruded and preserved within 48 hours
Semivolatile organics	SW8270C	250 ml amber glass wide-mouth jar (or can be clear if stored in dark)	Cool to 4 °C	14 days until extraction and extracts analyzed within 40 days after extraction
TPH-extractable	SW8015B			
Metals (except mercury)	SW6010B	250 ml wide-mouth jar	Cool to 4 °C	180 Days
Mercury	SW7471A	250 ml wide-mouth jar	Cool to 4 °C	28 Days

5.1 FIELD SAMPLING

The field sampling procedures for collecting samples and sampling methods will be included in the project FSP.

5.1.1 Sampling Containers

Sample containers will be purchased precleaned and treated according to the USEPA specifications for the methods. Containers will be stored in clean areas to prevent exposure to fuels, solvents, and other contaminants. Amber glass bottles are used routinely where glass containers are specified in the sampling protocol and will be used for organic sampling to minimize the effects of ultraviolet light on compounds of interest.

5.1.2 Sample Volumes, Container Types, and Preservation Requirements

Sample volumes, container types, and preservation requirements for the analytical methods completed are listed in Table 5-1.

5.2 SAMPLE HANDLING AND CUSTODY

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 will be maintained in field records and combined with the laboratory records.

URS 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.

The following information concerning the sample will be documented on the AFCEE chain-of-custody (COC) form (as illustrated in Section 8):

- Unique sample identification for each container
- Date and time of sample collection
- Source of sample (including name, location, and sample type)
- Designation of MS/MSD
- Preservative used
- Analyses required
- Name of collector(s)
- Pertinent field data (pH, temperature, etc.)
- Serial numbers of custody seals and transportation cases (if used)

- Custody transfer signatures and dates and times of sample transfer from the field to transporters and to the laboratory or laboratories
- Bill of lading or transporter tracking number (if applicable)

All samples will be uniquely identified, labeled, and documented in the field at the time of collection in accordance with the project FSP.

Samples collected in the field will be transported to the laboratory or field testing site as expeditiously as possible. When a 4 degrees Celsius (°C) requirement for preserving the sample is indicated, the samples will be packed in ice or chemical refrigerant to keep them cool during collection and transportation. During transit, it is not always possible to rigorously control the temperature of the samples. As a general rule, storage at low temperature is the best way to preserve most samples. A temperature blank (a VOCs sampling vial filled with tap water) will be included in every cooler and used to determine the internal temperature of the cooler upon receipt of the cooler at the laboratory. If the temperature of the samples upon receipt exceeds the temperature requirements, the exceedance will be documented in laboratory records and discussed immediately with the URS QA officer. The decision regarding the potentially affected samples will also be documented.

Once the samples reach the laboratory, they will be checked against information on the COC form for anomalies. For the safety of the personnel involved, coolers containing AFCEE samples will be opened in a hood in case there has been any breakage of container of potentially contaminated sample material. The condition, temperature, and appropriate preservation of samples will be checked and documented on the COC form. Checking an aliquot of the sample using pH paper is an acceptable procedure except for VOCs where an additional sample is required to check preservation. The occurrence of any anomalies in the received samples and their resolution will be documented in laboratory records. All sample information will then be entered into a tracking system, and unique analytical sample identifiers will be assigned. A copy of this information will be reviewed by the laboratory for accuracy. Sample holding time tracking begins with the collection of samples and continues until the analysis is complete. Holding times for methods required routinely for AFCEE work are specified in Table 5-1. **Samples not preserved or analyzed in accordance with these requirements will be resampled and reanalyzed at the discretion of the URS QA Officer.** Subcontracted analyses will be documented with the AFCEE COC form. Procedures ensuring internal laboratory COC will also be implemented and documented by the laboratory. Specific instructions concerning the analysis specified for each sample will be communicated to the analysts. Analytical batches will be created, and laboratory QC samples will be introduced into each batch.

Samples will be stored in limited-access, temperature-controlled areas while in the laboratory. Refrigerators, coolers, and freezers will be monitored for temperature seven days a week. Acceptance criterion for the temperatures of the refrigerators and coolers is 4°C ± 2°C. Acceptance criterion for the temperatures of the freezers will be less than -7°C. All of the cold storage areas will be monitored by thermometers that have been calibrated with a NIST-traceable thermometer. As indicated by the findings of the calibration, correction factors will be applied to each thermometer. Records that include acceptance criteria will be maintained. Samples for volatile organics determination will be stored separately from other samples, standards, and

sample extracts. Samples will be stored after analysis until disposed, in accordance with applicable local, state, and federal regulations. Disposal records shall be maintained by the laboratory. Refrigerators storing AFCEE VOC samples will contain a blank that will be analyzed at a minimum of every two weeks.

SOPs describing sample control and custody will be maintained by the laboratory.

Screening or non-definitive analytical methods can be useful tools in generating quality environmental data. The various analytical screening methods contained in this section are shown in Table 6-1. This section includes brief descriptions of the methods and QC required for screening procedures commonly used to conduct work efforts. The methods and QC procedures were taken from *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods* (USEPA SW-846, Third Edition, and its subsequent updates), *Methods for Chemical Analysis of Water and Waste* (USEPA 1983), *ASTM Annual Book of Standards* (2002), and from various manufacturers' literature.

6.1 METHOD DESCRIPTIONS.

6.1.1 Real-Time Portable Organic Vapor Analyzers

The photoionization detector (PID)-equipped instrument uses the principle of photoionization to create ions and measure total hydrocarbon vapors. The instrument has an operating range of 0–2,000 parts per million (ppmv). During operation, a gas sample is drawn into the probe and past an ultraviolet light source by an internal pumping system. Contaminants in the sample are ionized, producing an instrument response if their ionization potential is equal to or less than the ionizing energy supplied by the lamp. The radiation produces a free electron for each molecule of ionized contaminant, which generates a current directly proportional to the number of ions produced. This current is measured and displayed on the meter. The PID instrument measures the *total* value for all species present with ionization potentials less than or equal to that of the lamp.

6.2 CALIBRATION AND QC PROCEDURES FOR SCREENING METHODS

All screening data will be flagged with an "S" data qualifier to show the reported data are screening data (see Section 8). The other data qualifiers that will be used with screening data are also shown in Table 6-2 and Section 8. Flagging criteria are applied (except for the S-flag) when acceptance criteria were not met and corrective action was not successful or corrective action was not performed.

TABLE 6-1
SCREENING ANALYTICAL METHODS
CANNON AFB

Method	Parameter
Organic vapor-analysis (PID)	Screening of borings and excavation for VOCs

PID - Photoionization detector

TABLE 6-2
CALIBRATION AND QC PROCEDURES FOR SCREENING METHODS
CANNON AFB

Method	Applicable Parameter	QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Data Flagging Criteria
None	Organic vapor concentrations (PID)	3 point calibration	Monthly	correlation coefficient ≤ 0.995	Recalibrate	Recalibrate check instrument and replace if necessary
		Calibration verification and check	Daily at beginning and end of day	Response ± 20% of expected value	Correct problem, recalibrate	Flagging criteria are not appropriate

PID - Photoionization detector

The following procedures basically follow requirements and guidelines set out in the USEPA SW-846 Test Methods for Evaluating Solid Waste, Physical/Chemical Methods. These methods have been developed specifically for the highly variable environmental samples and are reviewed and updated on a frequent basis in order to obtain the best possible quality data.

As with the screening procedures in Section 6, the following methods and associated quality control requirements are subject to project-specific objectives developed during the DQO or systematic planning process. Once adopted, modification of these method-specific quality control and corrective action requirements involves appropriate communications and requests for variances which demonstrate and document clearly the strict adherence to PQOs and are consistent with AFCEE environmental program goals. The ultimate goal is the generation of the highest quality defensible data necessary for informed decisions affording the decision-makers or stakeholders, a known and documented level of acceptable risk associated with the respective decision(s).

Section 7.1 contains brief descriptions of preparation methods. Section 7.2 contains subsections for each analytical procedure. Each subsection contains the following information:

- A brief method description
- A table of analyte reporting limits (RLs)
- A table of QC Acceptance Criteria
- A table summarizing calibration, QC procedures, and data verification guidelines for the laboratory

These tables were developed from various sources, including, *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods* (USEPA SW-846, Third Edition, and its subsequent updates); AFCEE *Guidance for Contract Deliverables (GCD), Version 1.1, March 1998,* and project experience. Definitions of terms are given in Section 4.0, and data review, verification, and validation procedures are presented in Section 8.0.

7.1 PREPARATIVE METHODS

Extraction and digestion procedures for solid matrices are presented in Table 7-1. These preparatory methods are also listed with the associated analytical procedures in Table 7-2. Method specific preparations are covered in the appropriate determinative methods.

7.1.1 Method SW5035 – Closed System Purge-and-Trap and Extraction for Volatile Organics in Soil and Waste Samples

Method SW5035 describes sample preparation and extraction for the analysis of VOCs in solid matrices. The method involves a heated purge of volatile components followed by analysis on a GC or GC/MS. Several sample preservation options are given in the method. Analyzing the sample unpreserved within the prescribed 48 hour holding time is the preferred option. If this is not possible, an appropriate preservation option must be chosen. For low-level VOC analysis, the preferred preservation is freezing with a 14 day holding time. The soil is extruded into a 40

or 60 mL volatile organic analysis (VOA) vial with water, polytetrafluoroethylene (PTFE) stirrer, and if necessary sodium bisulfate. Use of syringe-type purge and trap soil samplers is recommended. Samples should not be frozen below -20°C due to potential problems with vial or coring tool seals.

7.1.2 Method SW3540C/SW3541 – Soxhlet Extraction

Method SW3540C is a procedure for extracting nonvolatile and semivolatile organic compounds (SVOCs) from solids such as soils and sludges. Method SW3541 is an automated Soxhlet extraction. The Soxhlet extraction process ensures intimate contact of the sample matrix with the extraction solvent.

7.1.3 Method SW3050B/SW7471A – Acid Digestion of Solids, Sediments, and Sludges for Metals Analysis

Method SW3050B is applicable to the preparation of sediment, sludge, and soil samples for metals analysis by ICP-AES, ICP-MS or, for some metals, by cold vapor atomic absorption (CVAA). A sample is digested then refluxed with acid. A separate aliquot of the sample is dried for a total solids and/or percent moisture determination.

7.2 DETERMINATIVE METHODS

The analytical methods presented in this section are listed in Table 7-2. This section is organized by methodologies including, GC, GC/MS, ICP-AES and CVAA.

A brief description and two tables for each method are included in the following subsections. The first table presents the RLs for the default analytes in the method. The RLs are presented for soil matrix. The second table presents acceptance criteria for the accuracy of spiked analyte and surrogate recoveries. This table also presents acceptance criteria for the precision of matrix spike, field duplicate, and laboratory duplicate samples.

An additional table presents the calibration and QC procedures for each of the combined methodologies (i.e., GC, GC/MS, ICP-AES, etc.). Corrective actions and data flagging criteria are also included in this table. The first two columns in this table designate the QC check and minimum frequency that the check is to be preformed. The third column designates the acceptance criteria for each calibration and QC element, and the fourth column designates the corrective action in the event that a calibration or QC element does not meet the acceptance criteria. The last column designates the data flagging criteria that shall be applied by the laboratory in the event that the method-required calibration and QC acceptance criteria or acceptance criteria are not met. It should be clearly understood that these are laboratory data qualifiers. If a laboratory has more and they are consistent with these and properly defined, the laboratory may use them. When other flags are required contractually, they shall be used. Data usability will be carefully assessed by the URS QA officer.

It will be clearly understood that each analyst will demonstrate his or hers ability to generate acceptable accuracy and precision using at least four replicate analyses of a QC check sample. If

the acceptance criteria are not met, then the problem will be located and fixed and demonstration successfully rerun prior to the analyst analyzing project samples. All data analyzed by an unqualified analyst (i.e., failing to meet QC criteria) will be flagged R.

7.2.1 Gas Chromatography (GC) Methods

7.2.1.1 Method SW8015B –Volatile and Extractable Total Petroleum Hydrocarbons

Volatile petroleum hydrocarbon components, such as gasoline, jet fuel, and other low molecular weight petroleum products, are analyzed by the closed-system purge and trap technique described in Method SW5035 followed by a modified approach to Method SW8015B. Extractable petroleum hydrocarbon components are analyzed by extraction followed by GC analysis.

For volatile TPH, the sample is placed in the purge and trap sparge vessel and analysis is conducted using a GC equipped with a flame ionization detector (FID).

Method SW3540C typically prepares extractable total petroleum hydrocarbons (TPH) components, such as kerosene, diesel, motor oil, and other high molecular weight extractable petroleum products, for solid matrices. After the sample is extracted, analysis is accomplished on a GC equipped with a capillary or megabore column and a FID. RLs for volatile and extractable TPH are provided in Table 7-3.

Identification and quantitation of TPH components require more analytical judgment than other GC methods. The TPH chromatograms consist of groups of peaks that fall within a noted carbon retention time range (i.e., number of carbon atoms in the molecule). Standard fuel components are used to calibrate the instruments. The total petroleum hydrocarbons results are reported in mg/kg based on quantitation of the total area count for the gasoline range organics (i.e., C6-C10) or the diesel range organics (i.e., C10-C28). The retention time window shall be set such that the window encompasses only the C6 through C28 range of organics. Table 7-4 provides acceptance criteria for Method SW8015B. Table 7-5 identifies the QC checks, minimum frequencies, acceptance criteria, corrective actions, and flagging criteria. Second-column confirmation is not required.

7.2.2 Gas Chromatography/Mass Spectrometry Methods (GC/MS)

7.2.2.1 Method SW8260B – Volatile Organic Compounds (VOCs)

Volatile organic compounds in soil samples are analyzed using Method SW8260B. These methods use a capillary column GC/MS for separation and detection of compounds of interest. Volatile compounds are introduced into the GC by purge and trap (SW5035). An inert gas is bubbled through the soil-water slurry to transfer the purgeable organic compounds from the liquid to vapor phase. The vapor is then swept through a sorbent trap where the purgeable organics are trapped. The trap is backflushed and heated to desorb the purgeable organics onto a capillary GC column where they are separated and then detected with a mass spectrometer. The analytes and RLs (using a 25 mL purge) for this method are listed in Table 7-6. Soil samples with higher contaminant levels can be extracted using methanol before purging. However, the

RLs arising from the use of this preparatory method will be higher than those listed in Table 7-6 and the accuracy and precision requirements listed in Table 7-7 will not be met as well.

Tuning - The mass spectrometer must be hardware tuned to give an acceptable spectrum for 4-bromoflurobenzene (BFB). The tuning acceptance criteria are given in the following list in terms of ion abundances for each specified mass:

- mass 50 15 – 40 percent of mass 95
- mass 75 30 – 60 percent of mass 95
- mass 95 base peak, 100 percent relative abundance
- mass 96 5 – 9 percent of mass 95
- mass 173 less than 2 percent of mass 174
- mass 174 greater than 50 percent of mass 95
- mass 175 5 – 9 percent of mass 174
- mass 176 greater than 95 percent, but less than 101 percent of mass 174
- mass 177 5 –9 percent of mass 176

These criteria must be demonstrated each 12-hour shift during which samples are analyzed. No analyses may begin until these criteria are met.

The IS method is used for quantitation of analytes of interest. For quantitation, RFs are calculated from the base ion peak of a specific IS that is added to each calibration standard, blank, QC sample, and sample. Table 7-7 provides acceptance criteria for accuracy of spiked analytes and ISs, precision of duplicate/replicate analyses, and recommended IS associations. Also included in Table 7-10 are the marginal exceedances limits taken from the DoD QSM. Table 7-10 identifies the, - QC checks, minimum frequencies, acceptance criteria, corrective actions, and flagging criteria.

7.2.2.2 Method SW8270C – Semivolatile Organic Compounds (SVOCs)

SVOCs (also known as base/neutral and acid extractables) in soil samples are analyzed using Method SW8270C. This technique quantitatively determines the concentration of a number of SVOCs. Samples are extracted and both base/neutral and acid extracts are then concentrated through evaporation. Compounds of interest are separated and quantified using a capillary column GC/MS. The analytes and RLs for this method are listed in Table 7-8.

Tuning – The mass spectrometer will be hardware tuned to give an acceptable spectrum for decafluorotriphenylphosphine (DFTPP). The tuning acceptance criteria are given in the following list in terms of ion abundances for each specified mass:

- mass 51 30 – 60 percent of mass 198
- mass 68 less than 2 percent of mass 69

- mass 70 less than 2 percent of mass 69
- mass 127 40 – 60 percent of mass 198
- mass 197 less than 1 percent of mass 198
- mass 198 base peak, 100 percent relative abundance
- mass 199 5 – 9 percent of mass 198
- mass 275 10 – 30 percent of mass 198
- mass 365 greater than 1 percent of mass 198
- mass 441 present, but less than mass 443
- mass 442 greater than 40 percent of mass 198
- mass 443 17 – 23 percent of mass 442

These criteria must be demonstrated each 12-hour shift during which samples are analyzed. No analyses will begin until these criteria are met.

The IS method is used for quantitation of analytes of interest. For quantitation, RFs are calculated from the base ion peak of a specific IS that is added to each calibration standard, blank, QC sample, and sample. Table 7-9 provides acceptance criteria for accuracy of spiked analytes and ISs, precision of duplicate/replicate analyses, and recommended IS associations. Also included in Table 7-9 are the marginal exceedances limits taken from the DoD QSM. AFCEE has set a policy that the minimum upper acceptance limits for LCS recoveries for soil samples are 120% and 125% respectively. For this reason, the upper LCS control limits and marginal exceedances limits are the same for some analytes. Table 7-10 identifies the QC checks, minimum frequencies, acceptance criteria, corrective actions, and flagging criteria.

7.2.3 Metals

7.2.3.1 Method SW6010B – Trace Elements (Metals) by Inductively Coupled Plasma – Atomic Emission Spectroscopy (ICP-AES)

Samples are analyzed for trace elements or metals using Method SW6010B for soils. Analysis for most metals requires digestion of the sample. Following digestion, the trace elements are determined using simultaneously or sequentially using ICP-AES. The elements and RLs for this method are listed in Table 7-11. Table 7-12 provides acceptance criteria for Method SW6010B. Table 7-13 identifies the QC checks, minimum frequencies, acceptance criteria, corrective actions, and flagging criteria.

7.2.3.2 Method SW7471A – Mercury Cold-Vapor Atomic Absorption (CVAA)

Soil and other solid samples are analyzed for mercury using Method SW7471A. This method is a cold-vapor, flameless atomic absorption (AA) technique based on the absorption of radiation by mercury vapor. Mercury is reduced to the elemental state and aerated from solution in a closed system. The mercury vapor passes through a cell positioned in the light path of an AA

spectrophotometer. Mercury concentration is measured as a function of absorbance. The RL for this method is listed in Table 7-14. Table 7-15 provides acceptance criteria for Method SW7471A. Table 7-16 identifies the QC checks, minimum frequencies, acceptance criteria, corrective actions, and flagging criteria.

TABLE 7-1
SAMPLE PREPARATION METHODS
CANNON AFB

Method	Parameter
Volatile Organics	
SW5035A[a]	Closed-System Purge-and-Trap and Extraction for Volatile Organics in Soil and Waste Samples
Extractable Organics	
SW3540C	Soxhlet Extraction (solid samples)
Metals	
SW3050B	Acid Digestion of Solids, Sediments, and Sludges for Metals Analysis
SW7471A[b]	Mercury prep for solid samples

[a] Although method has not been promulgated, its use has received widespread use and acceptance.
[b] Follow the preparation procedure as detailed in the individual determinative method.

TABLE 7-2
ANALYTICAL METHODS
CANNON AFB

Analytical Method	Parameter	Preparation Method (Soil/Solid Media)
GC		
SW8015B	TPH - volatiles	5035A
SW8015B	TPH - extractables	3540C
GC/MS		
SW8260B	Volatile Organics	5035A
SW8270C	Semivolatile Organics	3540C
ICP-MS/CVAA		
SW6010B	Trace metals by ICP-MS	3050B
SW7471A	Mercury (solid)	N/A

CVAA - Cold Vapor Atomic Absorption
GC - Gas Chromatograph
ICP - Inductively Coupled Plasma
MS - Mass Spectrometer
TPH - Total Petroleum Hydrocarbons

TABLE 7-3
REPORTING LIMITS FOR VOLATILE AND EXTRACTABLE TOTAL PETROLEUM HYDROCARBONS (TPH)
CANNON AFB

Analyte	Soil		
	MDL	RL	Unit
TPH - volatiles (GRO)	0.3	1	mg/kg
TPH - extractables (DRO)	0.65	10	mg/kg

mg/kg - milligrams per kilogram
DRO - Diesel Range Organics
GRO - Gasoline Range Organics
TPH - Total Petroleum Hydrocarbons

TABLE 7-4
QC ACCEPTANCE CRITERIA FOR METHOD SW8015B
VOLATILE AND EXTRACTABLE TOTAL PETROLEUM HYDROCARBONS (TPH)
CANNON AFB

Analyte	Accuracy Soil (%R)	Precision Soil RPD (%)
TPH - GRO	57-146	≤ 50
Surrogates		
4-Bromofluorobenzene	50-150	-
TPH - DRO	51-153	≤ 50
Surrogates		
Octacosane	25-162	-
o-Terphenyl	47-142	-

%R - Percent Recovery
RPD-Relative Percent Difference

TABLE 7-5
CALIBRATION AND QC PROCEDURES FOR GC METHOD SW8015B
CANNON AFB

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Flagging Criteria
Initial multipoint calibration for all analytes (minimum five standards) (ICAL)	Initial calibration prior to sample analysis	One of the options below	Correct problem then repeat initial calibration.	Problem must be corrected. Samples may not be analyzed until there is a valid ICAL.
		Option 1: linear - RSD for each analyte ≤ 20%		
		Option 2: linear - least squares regression r ≥ 0.995 for each analyte.		
		Option 3: non-linear - COD ≥ 0.99		
		(six points shall be used for second order, seven points shall be used for third order)		
Second-source calibration verification	Once after each ICAL	All analytes within ± 20% of expected value	Correct problem and verify second source standard. Rerun second source verification. If that fails, correct problem and repeat initial calibration.	Problem must be corrected. Samples may not be analyzed until the calibration has been verified.
Retention time window position established for each analyte and surrogate	Each ICAL and after the initial daily CCV	Position shall be set using the midpoint standard of the initial calibration curve.	N/A	N/A
Retention time window width established for each analyte and surrogate	At method set-up and after major maintenance (e.g., column change)	3 times standard deviation for each analyte retention time from 72 hour study	N/A	N/A
		GRO: calculate retention time based on 2 methylpentane and 1,2,4 trimethylbenzene (see 7.4.2 in Method SW8015B).		
		DRO: calculate retention time based on C10 and C28 alkanes (see 7.4.3 in Method SW8015B).		
Retention time window verification for each analyte and surrogate	Each calibration verification	Analyte within established window	Correct problem then reanalyze all samples analyzed since the last acceptable retention time check.	**ICV**: Flagging criteria are not appropriate for initial verification.

TABLE 7-5
CALIBRATION AND QC PROCEDURES FOR GC METHOD SW8015B
CANNON AFB

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Flagging Criteria
				CCV: Apply Q-flag to all results for the specific analyte(s) in the sample which are outside the established window.
Calibration verification:initial (ICV) andcontinuing (CCV)	**ICV**: Daily, before sample analysis, unless ICAL performed on same day	All analytes within ± 20% of expected value (% D)	**ICV**: Correct problem, rerun ICV. If that fails, repeat initial calibration.	**ICV**: Flagging criteria are not appropriate.
	CCV: After every 10 samples and at the end of the analysis sequence		**CCV**: Correct problem then repeat CCV. Reanalyze all samples since last successful calibration verification.	**CCV**: Apply Q-flag to all results for the specific analyte(s) >20 %D for all samples associated with the calibration verification.
Method blank	One per analytical batch	No analytes detected > MDL.For common lab contaminants no analytes detected > RL.	Assess data. Correct problem. If necessary, reprep and analyze method blank and all samples processed with the contaminated blank.	Apply B-flag to all associated positive results for the specific analyte(s) as appropriate.See guidance Section 8.2.1.4
LCS for all analytes	One LCS per analytical batch	Acceptance criteria: Table 7-4	Correct problem then reanalyze. If still out, reprep and reanalyze the LCS and all samples in the affected AFCEE batch.	If corrective action fails, apply Q-flag to the specific analyte(s) which are not marginal exceedances in all samples in the associated preparatory batch.
		See Section 4.4.1.2 for guidance on determining marginal exceedances.		

TABLE 7-5
CALIBRATION AND QC PROCEDURES FOR GC METHOD SW8015B
CANNON AFB

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action[a]	Flagging Criteria[b]
Surrogate spike	Every sample, spiked sample, standard, and method blank	Acceptance criteria: Table 7-4	Correct problem then re-extract and reanalyze the affected samples.If matrix effect is verified, discuss in case narrative.	For the samples: If the %R > UCL for any surrogate, apply J-flag to all positive results for associated analytes.
				If the %R < LCL for any surrogate, apply J-flag to all positive results for associated analytes and UJ -flag to all associated non detects.
				If any surrogate recovery is <10%, apply Q-flag to all results for all associated analytes.
MS/MSD	One MS/MSD per every 20 Air Force project samples per matrix	Acceptance criteria: Tables 7-4	Assess data to determine whether there is a matrix effect or analytical error. Review LCS for failed target analytes. Potential matrix effects should be communicated to the prime contractor so an evaluation can be made with respect to the PQOs.	For the specific analyte(s) in all samples collected from the same site matrix as the parent, apply M-flag if; (1)%R for MS or MSD > UCL (2)%R for MS or MSD < LCL or (3)MS/MSD RPD > CL
MDL study	At initial setup and subsequently once per 12-month period or quarterly MDL verification checks.	Detection limits established shall be ≤ ½ the RLs in Table 7-3. See 40 CFR, Part 136 Appendix B. All analytes must be detected and identified by method-specified criteria for the for the verification check to be valid, or the verification check must produce a response that is at least 3X the instrument noise level and greater than the response in the blanks associated with the MDL study.	Run MDL verification check at higher level and set higher MDL or reconduct MDL study.	N/A
Results reported between MDL and RL	None	None	None	Apply F-flag to all results between MDL and RL.

a. All corrective actions associated with AFCEE project work shall be documented, and all records shall be maintained by the laboratory.

b. Flagging criteria are applied when acceptance criteria were not met and corrective action was not successful or corrective action was not performed

TABLE 7-6
REPORTING LIMITS FOR METHOD SW8260B
CANNON AFB

Analyte	Soil		
	MDL	RL	Units
1,1,1,2-Tetrachloroethane	0.0006	0.003	mg/kg
1,1,1-Trichloroethane	0.0004	0.005	mg/kg
1,1,2,2-Tetrachloroethane	0.0012	0.003	mg/kg
1,1,2-Trichloroethane	0.00027	0.005	mg/kg
1,1-Dichloroethane	0.00034	0.005	mg/kg
1,1-Dichloroethene	0.00076	0.006	mg/kg
1,1-Dichloropropene	0.00055	0.005	mg/kg
1,2,3-Trichlorobenzene	0.00028	0.005	mg/kg
1,2,3-Trichloropropane	0.00124	0.005	mg/kg
1,2,4-Trichlorobenzene	0.00052	0.005	mg/kg
1,2,4-Trimethylbenzene	0.00118	0.006	mg/kg
1,2-Dibromo-3-chloropropane	0.00219	0.01	mg/kg
1,2-Dibromoethane	0.0006	0.005	mg/kg
1,2-Dichlorobenzene	0.00046	0.005	mg/kg
1,2-Dichloroethane	0.00014	0.003	mg/kg
1,2-Dichloropropane	0.00062	0.005	mg/kg
1,3,5-Trimethylbenzene	0.00097	0.005	mg/kg
1,3-Dichlorobenzene	0.00067	0.006	mg/kg
1,3-Dichloropropane	0.00065	0.002	mg/kg
1,4-Dichlorobenzene	0.00067	0.002	mg/kg
1-Chlorohexane	0.00076	0.005	mg/kg
2,2-Dichloropropane	0.00067	0.005	mg/kg
2-Chlorotoluene	0.00099	0.005	mg/kg
4-Chlorotoluene	0.00105	0.005	mg/kg
Acetone	0.0028	0.05	mg/kg
Benzene	0.00063	0.002	mg/kg
Bromobenzene	0.00076	0.005	mg/kg
Bromochloromethane	0.00081	0.005	mg/kg
Bromodichloromethane	0.00069	0.002	mg/kg
Bromoform	0.0008	0.006	mg/kg
Bromomethane	0.0016	0.01	mg/kg
Carbon tetrachloride	0.0008	0.005	mg/kg
Chlorobenzene	0.00049	0.002	mg/kg
Chloroethane	0.00155	0.005	mg/kg
Chloroform	0.00143	0.002	mg/kg
Chloromethane	0.00182	0.005	mg/kg
cis-1,2-Dichlorethene	0.00022	0.005	mg/kg
cis-1,3-Dichloropropene	0.00047	0.003	mg/kg
Dibromochloromethane	0.00085	0.003	mg/kg
Dibromomethane	0.00065	0.005	mg/kg
Dichlorodifluoromethane	0.00083	0.005	mg/kg
Ethylbenzene	0.00064	0.005	mg/kg
Hexachlorobutadiene	0.0006	0.003	mg/kg
Isopropylbenzene	0.0011	0.005	mg/kg
m,p-Xylene	0.00043	0.005	mg/kg
Methyl ethyl Ketone (2-Butanone)	0.001	0.02	mg/kg
Methyl isobutyl ketone	0.002	0.02	mg/kg
Methylene chloride	0.00458	0.005	mg/kg
Methyl-tert-butyl ether	0.001	0.02	mg/kg

TABLE 7-6
REPORTING LIMITS FOR METHOD SW8260B
CANNON AFB

Analyte	Soil		
	MDL	RL	Unit
Naphthalene	0.00041	0.02	mg/kg
n-butylbenzene	0.00052	0.005	mg/kg
n-propylbenzene	0.00042	0.005	mg/kg
o-Xylene	0.00061	0.005	mg/kg
p-isopropyltoluene	0.00045	0.006	mg/kg
sec-butylbenzene	0.00093	0.005	mg/kg
Styrene	0.00069	0.005	mg/kg
tert-Butylbenzene	0.00045	0.005	mg/kg
Tetrachloroethene	0.00054	0.005	mg/kg
Toluene	0.00065	0.005	mg/kg
trans-1,2-Dichlorethene	0.00034	0.005	mg/kg
trans-1,3-Dichloropropene	0.00043	0.005	mg/kg
Trichloroethene	0.00094	0.005	mg/kg
Trichlorofluoromethane	0.00126	0.005	mg/kg
Vinyl chloride	0.0034	0.005	mg/kg

mg/kg - milligrams per kilogram

Results for all compounds will be reported down to the MDL.

TABLE 7-7
QC ACCEPTANCE CRITERIA FOR METHOD SW8260B
CANNON AFB

Analyte	Accuracy Soil (%R)	Precision Soil RPD (%)	ME Limits Soil (%R)	Associated IS
1,1,1,2-Tetrachloroethane	74-125	≤ 30	65-135	2
1,1,1-Trichloroethane	68-130	≤ 30	55-145	1
1,1,2,2-Tetrachloroethane	59-140	≤ 30	40-145	3
1,1,2-Trichloroethane	62-127	≤ 30	50-140	1
1,1-Dichloroethane	73-125	≤ 30	65-135	1
1,1-Dichloroethene	65-136	≤ 30	55-150	1
1,1-Dichloropropene	70-135	≤ 30	60-145	1
1,2,3-Trichlorobenzene	62-133	≤ 30	50-145	3
1,2,3-Trichloropropane	63-130	≤ 30	50-140	3
1,2,4-Trichlorobenzene	65-131	≤ 30	55-140	3
1,2,4-Trimethylbenzene	65-135	≤ 30	55-145	3
1,2-Dichloroethane	72-137	≤ 30	60-145	1
1,2-Dichlorobenzene	74-120	≤ 30	65-125	3
1,2-Dibromo-3-chloropropane	49-135	≤ 30	25-150	3
1,2-Dichloropropane	71-120	≤ 30	65-125	1
1,2-Dibromoethane	70-124	≤ 30	60-135	2
1,3,5-Trimethylbenzene	65-133	≤ 30	55-145	3
1,3-Dichlorobenzene	72-124	≤ 30	65-135	3
1,3-Dichloropropane	76-123	≤ 30	70-130	2
1,4-Dichlorobenzene	72-125	≤ 30	65-135	3
1-Chlorohexane	60-135	≤ 30	45-150	2
2,2-Dichloropropane	67-134	≤ 30	55-145	1
2-Chlorotoluene	69-128	≤ 30	60-140	3
4-Chlorotoluene	73-126	≤ 30	65-135	3
Acetone	40-141	≤ 30	10-180	1
Benzene	73-126	≤ 30	65-135	1
Bromobenzene	66-121	≤ 30	55-130	3
Bromochloromethane	71-127	≤ 30	60-135	1
Bromodichloromethane	72-128	≤ 30	60-135	1
Bromoform	66-137	≤ 30	45-150	2
Bromomethane	45-141	≤ 30	10-180	1
Carbon tetrachloride	67-133	≤ 30	55-145	1
Chlorobenzene	75-123	≤ 30	65-130	2
Chloroethane	41-141	≤ 30	20-175	1
Chloroform	72-124	≤ 30	65-135	1
Chloromethane	51-129	≤ 30	40-140	1
cis-1,2-Dichlorethene	67-125	≤ 30	55-135	1
cis-1,3-Dichloropropene	72-126	≤ 30	65-135	1
Dibromochloromethane	66-130	≤ 30	55-140	2
Dibromomethane	73-128	≤ 30	65-135	1
Dichlorodifluoromethane	34-136	≤ 30	15-155	1
Ethylbenzene	74-127	≤ 30	65-135	2
Hexachlorobutadiene	53-142	≤ 30	40-155	3
Isopropylbenzene	77-129	≤ 30	70-140	3
Methylene chloride	63-137	≤ 30	40-155	1
Methyl-tert-butyl ether	50-135	≤ 30	30-165	1
Methyl ethyl Ketone (2-Butanone)	40-135	≤ 30	10-180	1

TABLE 7-7
QC ACCEPTANCE CRITERIA FOR METHOD SW8260B
CANNON AFB

Analyte	Accuracy Soil (%R)	Precision Soil RPD (%)	MR Limits Soil (%R)	Associated IS
Methyl isobutyl ketone	47-147	≤ 30	30-165	1
n-butylbenzene	65-138	≤ 30	50-150	3
n-propylbenzene	63-135	≤ 30	50-145	3
m,p-Xylene	79-126	≤ 30	70-135	2
Naphthalene	51-135	≤ 30	25-140	3
o-Xylene	77-125	≤ 30	70-135	2
p-isopropyltoluene	75-133	≤ 30	65-140	3
sec-butylbenzene	63-132	≤ 30	50-145	3
Styrene	74-128	≤ 30	65-135	2
Trichloroethene	77-124	≤ 30	70-130	1
tert-Butylbenzene	65-132	≤ 30	55-145	3
Tetrachloroethene	67-139	≤ 30	55-150	2
Toluene	71-127	≤ 30	60-135	1
trans-1,2-Dichlorethene	66-134	≤ 30	55-145	1
trans-1,3-Dichloropropene	65-127	≤ 30	55-140	1
Trichlorofluoromethane	49-139	≤ 30	10-215	1
Vinyl chloride	58-126	≤ 30	45-140	1
Surrogates				
Dibromofluoromethane	65-135	-	-	1
Toluene-d8	84-116	-	-	2
4-Bromofluorobenzene	84-118	-	-	3
1,2-DCA-d4	52-149	-	-	1
Internal Standards				
Fluorobenzene	-	-	-	1
Chlorobenzene-d5	-	-	-	2
1,4-Dichlorobenzene-d4	-	-	-	3

TABLE 7-8
REPORTING LIMITS FOR METHOD SW8270C SEMIVOLATILE ORGANICS
CANNON AFB

Analyte	Soil		
	MDL	RL	Units
Base/Neutral Extractables			
1,2,4-Trichlorobenzene	0.0494	0.7	mg/kg
1,2-DCB	0.0512	0.7	mg/kg
1,3-DCB	0.0507	0.7	mg/kg
1,4-DCB	0.0489	0.7	mg/kg
2,4-DNT	0.0638	0.7	mg/kg
2,6-DNT	0.0606	0.7	mg/kg
2-Chloronaphthalene	0.0524	0.7	mg/kg
2-Methylnaphthalene	0.0504	0.7	mg/kg
2-Nitroaniline	0.0624	3.3	mg/kg
3-Nitroaniline	0.0611	3.3	mg/kg
3,3'-Dichlorobenzidine	0.0563	1.3	mg/kg
4-Bromophenyl phenyl ether	0.0566	0.7	mg/kg
4-Chloroaniline	0.0165	1.3	mg/kg
4-Chlorophenyl phenyl ether	0.0607	0.7	mg/kg
4-Nitroaniline	0.0728	3.3	mg/kg
Acenaphthylene	0.0531	0.7	mg/kg
Acenapthene	0.0538	0.7	mg/kg
Anthracene	0.0613	0.7	mg/kg
Benzo(a)anthracene	0.058	0.7	mg/kg
Benzo(a)pyrene	0.0507	0.7	mg/kg
Benzo(k)fluoranthene	0.061	0.7	mg/kg
Benzo(b)fluoranthene	0.06	0.7	mg/kg
Benzo(g,h,i)perylene	0.0552	0.7	mg/kg
Benzyl alcohol	0.0558	1.3	mg/kg
Bis(2-chloroethoxy)methane	0.0499	0.7	mg/kg
Bis(2-chloroethyl) ether	0.05	0.7	mg/kg
Bis(2-chloroisopropyl) ether	0.0473	0.7	mg/kg
Bis(2-ethylhexyl) phthalate	0.0616	0.7	mg/kg
Butyl benzyl phthalate	0.0555	0.7	mg/kg
Chrysene	0.0606	0.7	mg/kg
Di-n-butyl phthalate	0.0659	0.7	mg/kg
Di-n-octyl phthalate	0.0584	0.7	mg/kg
Dibenzo(a,h)anthracene	0.0594	0.7	mg/kg
Dibenzofuran	0.0573	0.7	mg/kg
Diethyl phthalate	0.0621	0.7	mg/kg
Dimethyl phthalate	0.0633	0.7	mg/kg
Fluoranthene	0.0654	0.7	mg/kg
Fluorene	0.0613	0.7	mg/kg
Hexachlorobenzene	0.0603	0.7	mg/kg
Hexachlorobutadiene	0.0517	0.7	mg/kg
Hexachloroethane	0.0499	0.7	mg/kg
Indeno(1,2,3-cd)pyrene	0.0604	0.7	mg/kg
Isophorone	0.057	0.7	mg/kg
N-Nitrosodiphenylamine	0.0506	0.7	mg/kg
N-Nitrosodi-n-propylamine	0.0549	0.7	mg/kg
Naphthalene	0.0505	0.7	mg/kg
Nitrobenzene	0.0498	0.7	mg/kg

TABLE 7-8
REPORTING LIMITS FOR METHOD SW8270C SEMIVOLATILE ORGANICS
CANNON AFB

Analyte	Soil		
	MDL	RL	Unit
Base/Neutral Extractables			
Phenanthrene	0.0582	0.7	mg/kg
Pyrene	0.0541	0.7	mg/kg
Acid Extractables			
2,4,5-Trichlorophenol	0.0601	3.3	mg/kg
2,4,6-Trichlorophenol	0.0483	0.3	mg/kg
2,4-Dichlorophenol	0.0505	0.3	mg/kg
2,4-Dimethylphenol	0.0439	0.3	mg/kg
2,4-Dinitrophenol	0.0637	3.3	mg/kg
2-Chlorophenol	0.0443	0.3	mg/kg
2-Methylphenol	0.0452	0.3	mg/kg
2-Nitrophenol	0.0478	0.3	mg/kg
4,6-Dinitro-2-methylphenol	0.0564	3.3	mg/kg
4-Chloro-3-methylphenol	0.0588	1.3	mg/kg
4-Methylphenol	0.0464	2	mg/kg
4-Nitrophenol	0.0598	1.6	mg/kg
Benzoic acid	0.0296	5	mg/kg
Pentachlorophenol	0.0587	3.3	mg/kg
Phenol	0.043	0.3	mg/kg

mg/kg - micrograms per kilogram
Results for all compounds will be reported down to the MDL.

TABLE 7-9
QC ACCEPTANCE CRITERIA FOR METHOD SW8270C
CANNON AFB

Analyte	Accuracy Soil (%R)	Precision Soil RPD (%)	MDL Limits Soil (%R)	Associated IS	Associated Surrogate
1,2,4-Trichlorobenzene	44-125	≤ 30	30-125	2	4
1,2-DCB	45-125	≤ 30	35-125	1	4
1,3-DCB	39-125	≤ 30	30-125	1	4
1,4-DCB	35-125	≤ 30	25-125	1	4
2,4-DNT	48-125	≤ 30	35-130	3	2
2,6-DNT	48-125	≤ 30	35-125	3	2
2-Chloronaphthalene	45-125	≤ 30	35-125	3	2
2-Methylnaphthalene	47-125	≤ 30	35-125	2	2
2-Nitroaniline	44-125	≤ 30	30-130	3	2
3-Nitroaniline	25-128	≤ 30	0-145	5	2
3,3'-Dichlorobenzidine	27-125	≤ 30	15-125	3	2
4-Bromophenyl phenyl ether	46-125	≤ 30	35-130	4	2
4-Chloroaniline	25-125	≤ 30	0-125	2	4
4-Chlorophenyl phenyl ether	47-125	≤ 30	35-125	3	2
4-Nitroaniline	34-125	≤ 30	20-125	3	2
Acenaphthylene	44-125	≤ 30	35-125	3	6
Acenapthene	46-125	≤ 30	35-125	3	6
Anthracene	53-125	≤ 30	45-125	4	6
Benzo(a)anthracene	52-125	≤ 30	40-125	5	6
Benzo(a)pyrene	50-125	≤ 30	40-125	6	6
Benzo(k)fluoranthene	45-125	≤ 30	35-125	6	6
Benzo(b)fluoranthene	38-126	≤ 30	25-140	6	6
Benzo(g,h,i)perylene	45-125	≤ 30	30-135	6	6
Benzyl alcohol	25-125	≤ 30	10-140	1	4
Bis(2-chloroethoxy)methane	43-125	≤ 30	30-125	2	4
Bis(2-chloroethyl) ether	38-125	≤ 30	25-125	1	4
Bis(2-chloroisopropyl) ether	25-125	≤ 30	10-130	1	4
Bis(2-ethylhexyl) phthalate	47-127	≤ 30	35-140	5	2
Butyl benzyl phthalate	49-125	≤ 30	35-135	5	2
Chrysene	53-125	≤ 30	45-125	5	6
Di-n-butyl phthalate	56-125	≤ 30	45-125	4	2
Di-n-octyl phthalate	41-132	≤ 30	25-145	5	2
Dibenzo(a,h)anthracene	41-125	≤ 30	25-140	6	2
Dibenzofuran	51-125	≤ 30	40-125	3	2
Diethyl phthalate	50-125	≤ 30	40-125	3	2
Dimethyl phthalate	49-125	≤ 30	40-125	3	2
Fluoranthene	54-125	≤ 30	45-125	4	6
Fluorene	49-125	≤ 30	40-125	3	6
Hexachlorobenzene	47-125	≤ 30	35-130	4	2
Hexachlorobutadiene	40-125	≤ 30	25-130	2	4
Hexachloroethane	34-125	≤ 30	20-125	1	4
Indeno(1,2,3-cd)pyrene	38-125	≤ 30	25-135	5	6
Isophorone	43-125	≤ 30	30-125	2	4
N-Nitrosodiphenylamine	40-125	≤ 30	30-125	1	4
N-Nitrosodi-n-propylamine	49-125	≤ 30	40-125	4	2
Naphthalene	40-125	≤ 30	30-125	2	6
Nitrobenzene	41-125	≤ 30	30-125	2	4
Phenanthrene	50-125	≤ 30	40-125	4	6
Pyrene	46-125	≤ 30	35-135	5	6
2,4,5-Trichlorophenol	49-125	≤ 30	40-125	3	1
2,4,6-Trichlorophenol	43-125	≤ 30	30-125	3	1
2,4-Dichlorophenol	45-125	≤ 30	35-125	2	3
2,4-Dimethylphenol	32-125	≤ 30	20-125	2	3
2,4-Dinitrophenol	25-132	≤ 30	10-150	3	1
2-Chlorophenol	44-125	≤ 30	35-125	1	3

TABLE 7-9
QC ACCEPTANCE CRITERIA FOR METHOD SW8270C
CANNON AFB

Analyte	Accuracy Soil (%R)	Precision Soil RPD (%)	MF Limits Soil (%R)	Associated IS	Associated Surrogate
2-Methylphenol	41-125	≤ 30	30-125	1	3
2-Nitrophenol	42-125	≤ 30	30-125	2	3
4,6-Dinitro-2-methylphenol	29-137	≤ 30	10-155	4	1
4-Chloro-3-methylphenol	46-125	≤ 30	35-125	2	1
4-Methylphenol	41-125	≤ 30	30-125	1	3
4-Nitrophenol	25-138	≤ 30	10-160	3	1
Benzoic acid	25-125	≤ 30	0-130	2	3
Pentachlorophenol	25-125	≤ 30	10-135	4	1
Phenol	39-125	≤ 30	30-125	1	5
Surrogates					
2,4,6-Tribromophenol	36-126			3	1
2-Fluorobiphenyl	43-120			3	2
2-Fluorophenol	37-120			1	3
Nitrobenzene-d5	37-120			2	4
Phenol-d5	40-120			1	5
Terphenyl-d14	32-120			5	6
Internal Standards					
1,4-Dichlorobenzene-d4				1	
Naphthalene-d8				2	
Acenaphthene-d10				3	
Phenanthrene-d10				4	
Chrysene-d12				5	
Perylene-d12				6	

%R - Percent Recovery
RPD-Relative Percent Difference

TABLE 7-10
CALIBRATION AND QC PROCEDURES FOR METHODS SW8260B AND 8270C
CANNON AFB

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action[1]	Flagging Criteria[2]
MS tuning check Use BFB (SW 8260B) or DFTPP (SW 8270C)	Prior to initial calibration and calibration verification	Refer to criteria listed in the method description. (Section 7.2.2.1 for SW8260B, Section 7.2.2.2 for SW8270C)	Retune instrument and verify.	Not appropriate
GC Performance Check (8270C only)	Daily prior to analysis of sample or calibration standards	Degradation ≤ 20% for DDT.No visible peak tailing for benzidine or pentachlorophenol (As a default, tailing factors should be less than 3.0 and 5.0, respectively.)	Correct problem, then repeat performance check.	Not appropriate
Initial multipoint calibration for all analytes (minimum five standards) (ICAL)	Initial calibration prior to sample analysis	**SPCCs**:Average RF ≥ 0.030[c] (SW8260B), ≥ 0.050 (SW8270C)	Correct problem then repeat initial calibration.	Problem must be corrected. Samples may not be analyzed until there is a valid ICAL.
		CCCs:% RSD for RFs ≤ 20% and one of the options below:		
		Option 1: linear - RSD for each analyte ≤ 15%		
		Option 2 linear - linear least squares regression r ≥ 0.995 for each analyte		
		Option 3 non-linear - COD ≥ 0.99 (6 points shall be used for second order, 7 points shall be used for third order)		
Second-source calibration verification	Once per ICAL	All analytes within ± 25% of expected value	Correct problem and verify second source standard. Rerun second source verification. If that fails, correct problem and repeat initial calibration.	Problem must be corrected.Samples may not be analyzed until the calibration has been verified.
Retention time window position establishment for each analyte and surrogate	Once per ICAL	Position shall be set using the midpoint standard of the initial calibration curve.	N/A	N/A
Retention time window verified for each analyte	Each sample.	Relative retention time (RRT) of the analyte within ± 0.06 RRT units of ICAL	Correct problem then reanalyze all samples analyzed since the last retention time check.	Apply Q-flag to all results for the specific analyte(s) in the sample which are outside the established window.
ContinuingCalibration verification(CCV)	Daily, before sample analysis unless ICAL performed on same day and after every 12 hours of analysis time	**SPCCs**:average RF ≥ 0.30[c] (SW8260B),average RF ≥ 0.050 (SW8270C);	Correct problem then rerun CCV. If that fails, repeat initial calibration.	Apply Q-flag to all results for the specific analyte(s) > 20% D for all samples associated with the calibration verification.

TABLE 7-10
CALIBRATION AND QC PROCEDURES FOR METHODS SW8260B AND 8270C
CANNON AFB

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action[a]	Flagging Criteria[b]
Continuing Calibration verification (contd)		CCCs: ≤ 20% D		
		All analytes within ± 20% D of expected value from ICAL (± 35% D of expected value for poor performers) **Note:** D = difference when using RFs or drift when using least squares, regression or non-linear		
Internal Standards(ISs)	Each sample	Retention time ± 30 seconds from retention time of the IS in the ICAL mid-point std.EICP area within -50% to +100% of area from IS in ICAL mid-point standard	Inspect mass spectrometer and GC for malfunctions and corrections made as appropriate. Reanalysis of samples analyzed while the system was malfunctioning is mandatory.	Apply Q-flag to all results for analytes associated with a failed IS unless a matrix effect can be verified, then apply M-flag.
Method blank	One per analytical batch	No analytes detected > MDL. For common lab contaminants no analytes detected > RL.	Assess data. Correct problem. If necessary, reprep and analyze method blank and all samples processed with the contaminated blank.	Apply B-flag to all associated positive results for the specific analyte(s) as appropriate.See guidance Section 8.2.1.4
LCS for all analytes	One LCS per analytical batch	Acceptance criteria: Tables 7-7 and 7-9	Correct problem then reanalyze. If still out, reprep and reanalyze the LCS and all samples in the affected AFCEE batch.	If corrective action fails, apply Q-flag to the specific analyte(s) which are not marginal exceedances in all samples in the associated preparatory batch.
		See Section 4.4.1.2 for guidance on determining marginal exceedances.		
Surrogate spike	Every sample, spiked sample, standard, and method blank	Acceptance criteria: Tables 7-7 and 7-9	Correct problem then re-extract and reanalyze the affected samples.If matrix effect is verified, discuss in case narrative.	For the samples: If the %R > UCL for any surrogate, apply J-flag to all positive results for associated analytes.
				If the %R < LCL for any surrogate, apply J-flag to all positive results for associated analytes and UJ -flag to all associated non detects.

TABLE 7-10
CALIBRATION AND QC PROCEDURES FOR METHODS SW8260B AND 8270C
CANNON AFB

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action[a]	Flagging Criteria[b]
Surrogate spike (contd)				If any surrogate recovery is <10%, apply Q-flag to all results for all associated analytes.
MS/MSD	One MS/MSD per every 20 Air Force project samples per matrix	Acceptance criteria: Tables 7-7 and 7-9	Assess data to determine whether there is a matrix effect or analytical error. Review LCS for failed target analytes. Potential matrix effects should be communicated to the prime contractor so an evaluation can be made with respect to the PQOs.	For the specific analyte(s) in all samples collected from the same site matrix as the parent, apply M-flag if; (1)%R for MS or MSD > UCL (2)%R for MS or MSD < LCL or (3)MS/MSD RPD > CL
MDL study	At initial setup and subsequently once per 12-month period or quarterly MDL verification checks.	Detection limits established shall be ≤ ½ the RLs in Table 7-8. See 40 CFR, Part 136 Appendix B. All analytes must be detected and identified by method-specified criteria for the for the verification check to be valid.	Run MDL verification check at higher level and set higher MDL or reconduct MDL study.	N/A
Results reported between MDL and RL	None	None	None	Apply F-flag to all results between MDL and RL.

a. All corrective actions associated with AFCEE project work shall be documented, and all records shall be maintained by the laboratory.

b. Flagging criteria are applied when acceptance criteria were not met and corrective action was not successful or corrective action was not performed

c. SW8260B:RF, ≥ 0.1 for chloromethane, bromoform, and 1,1 dichloroethane.

TABLE 7-11
REPORTING LIMITS FOR METHOD SW6010B
CANNON AFB

Analyte	Soil		
	MDL	RL	Unit
Aluminum	4.011	20	mg/kg
Antimony	0.207	10	mg/kg
Arsenic	0.174	5	mg/kg
Barium	0.047	1	mg/kg
Beryllium	0.044	1	mg/kg
Cadmium	0.028	0.5	mg/kg
Calcium	0.824	100	mg/kg
Chromium	0.029	1	mg/kg
Cobalt	0.051	1	mg/kg
Copper	0.094	2	mg/kg
Iron	1.632	5	mg/kg
Lead	0.092	3	mg/kg
Magnesium	2.411	100	mg/kg
Manganese	0.13	1	mg/kg
Molybdenum	0.074	3	mg/kg
Nickel	0.068	2	mg/kg
Potassium	13.883	200	mg/kg
Selenium	0.244	3	mg/kg
Silver	0.036	1	mg/kg
Sodium	7.361	100	mg/kg
Thallium	0.206	6	mg/kg
Vanadium	0.056	1	mg/kg
Zinc	1.145	5	mg/kg

mg/L - milligrams per liter
mg/kg - milligrams per kilogram

TABLE 7-12
QC ACCEPTANCE CRITERIA FOR METHOD SW6010B
CANNON AFB

Analyte	Accuracy Soil (%R)	Precision Soil RPD (%)
Aluminum	80-120	≤ 30
Antimony	80-120	≤ 30
Arsenic	80-120	≤ 30
Barium	80-120	≤ 30
Beryllium	80-120	≤ 30
Cadmium	80-120	≤ 30
Calcium	80-120	≤ 30
Chromium	80-120	≤ 30
Cobalt	80-120	≤ 30
Copper	80-120	≤ 30
Iron	80-120	≤ 30
Lead	80-120	≤ 30
Magnesium	80-120	≤ 30
Manganese	80-120	≤ 30
Molybdenum	80-120	≤ 30
Nickel	80-120	≤ 30
Potassium	80-120	≤ 30
Selenium	80-120	≤ 30
Silver	80-120	≤ 30
Sodium	80-120	≤ 30
Thallium	80-120	≤ 30
Vanadium	80-120	≤ 30
Zinc	80-120	≤ 30

%R - Percent Recovery
RPD-Relative Percent Difference

TABLE 7-13
CALIBRATION AND QC PROCEDURES FOR METHOD SW6010B
CANNON AFB

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action[1]	Flagging Criteria[2]
Initial calibration for all analytes(minimum one standard and a blank)(ICAL)	Daily initial calibration prior to sample analysis	If more than one standard is used, correlation coefficient must be ≥ 0.995	If applicable, correct problem and repeat initial calibration.	Problem must be corrected. Samples may not be analyzed until there is a valid ICAL.
Initial Calibration verification (second source)(ICV)	Daily after ICAL	All analytes within ± 10% of expected value	Correct problem and verify second source standard. Rerun ICV. If that fails, correct problem and repeat initial calibration.	Problem must be corrected. Samples may not be analyzed until the calibration has been verified.
Continuing Calibration verification (Instrument Check Standard) (CCV)	After every 10 samples. At the end of the analysis sequence	All analytes within ± 10% of expected value and RSD of replicate integrations < 5%.	Correct problem then repeat CCV and reanalyze all samples since last successful calibration verification.	Apply Q-flag to all results for the specific analyte(s) >10 %D for all samples associated with the calibration verification.
Calibration blank	Before beginning a sample run, after every calibration verification	No analytes detected > 2X MDL	Correct problem then analyze calibration blank and previous 10 samples.	Apply B-flag to all associated positive results for the specific analyte(s) as appropriate. See guidance Section 8.2.1.4.
Low-level calibration check standard (at or below RL)	Daily, after initial calibration. Not required if multi-point calibration (3 or more points) with low std at or below RL is performed	All analyte(s) with ± 20% of expected value	Correct problem then reanalyze.	No samples may be analyzed without a valid low-level calibration check standard. Low-level calibration check standard should be less than or equal to the reporting limit.
Linear range calibration (high) check standard	Every three months	Analyte within ± 10% of expected value	Correct problem then reanalyze or re-set linear range.	Apply J-flag to the specific analyte(s) for all results not within linear range.
Method blank(Preparation blank)	One per analytical batch	No analytes detected > 1/2 RL or common lab contaminants, no analytes detected > RL.	Assess data. Correct problem. If necessary, reprep and analyze method blank and all samples processed with the contaminated blank.	Apply B-flag to all associated positive results for the specific analyte(s) as appropriate. See guidance Section 8.2.1.4.
Interference check solutions (ICS A and ICS-AB)	At the beginning of an analytical run	**ICS-A**: All non-spiked analytes < 2 x 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; reanalyze all affected samples.	Flagging criteria are not appropriate. No samples may be analyzed without a valid ICS.

TABLE 7-13
CALIBRATION AND QC PROCEDURES FOR METHOD SW6010B
CANNON AFB

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action[a]	Flagging Criteria[b]
LCS for all analytes	One LCS per analytical batch	Acceptance criteria: Table 7-12 See Section 4.4.1.2 for guidance on determining marginal exceedances.	Correct problem then reanalyze.If still out, reprep and reanalyze the LCS and all samples in the affected AFCEE batch.	If corrective action fails, apply Q-flag to the specific analyte(s) which are not marginal exceedances in all samples in the associated preparatory batch.
Dilution test	Each new sample matrix, at least once per analytical batch (only applicable for analytes with concentration ≥ 50X MDL)	Fivefold (1+4) dilution must agree within ± 10% of the original determination.	Perform post digestion spike addition.	Apply J-flag to all sample results for the specific analyte from the same matrix in the batch if either of following exist: (1) dilution test not run and batch had analyte concentrations >50X MDL or (2) % D ≥ 10 and post digestion spike not performed.
Post digestion spike addition	When dilution test fails or if an analyte's concentration for all samples in a batch is less than 50X MDL	Recovery within 75-125% of expected results	Check for instrumental problem then reanalyze post digestion spike addition if appropriate.	Apply J-flag to all sample results (for same matrix) for the specific analyte(s) for all samples associated with the post digestion spike addition. If post digestion spike addition recovery is < 10%, apply Q-flag to all sample results (for same matrix) for the specific analyte(s) for all samples associated with the post digestion spike addition.
MS/MSD	One MS/MSD per every 20 Air Force project samples per matrix	Acceptance criteria: Table 7-12 See Section 4.4.1.2 for guidance on determining marginal exceedances.	Assess data to determine whether there is a matrix effect or analytical error. Analyze LCS for failed target analytes. Potential matrix effects should be communicated to URS so an evaluation can be made with respect to the PQOs.	For the specific analyte(s) in all samples collected from the same site matrix as the parent, apply M-flag if: (1) %R for MS or MSD > UCL, (2) %R for MS or MSD < LCL, or (3) MS/MSD RPD > CL

TABLE 7-13
CALIBRATION AND QC PROCEDURES FOR METHOD SW6010B
CANNON AFB

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action[a]	Flagging Criteria[b]
MDL study	At initial setup and subsequently once per 12-month period or quarterly MDL verification checks.	Detection limits established shall be ≤ ½ the RLs in Table 7-11. See 40 CFR, Part 136 Appendix B. Verification checks must produce a response at least 3X instrument noise level and must produce a response greater than the blanks associated with the MDL study.	Run MDL verification check at higher level and set higher MDL or reconduct MDL study.	N/A
Results reported between MDL and RL	None	None	None	Apply F-flag to all results between MDL and RL.

a. All corrective actions associated with AFCEE project work shall be documented, and all records shall be maintained by the laboratory.

b. Flagging criteria are applied when acceptance criteria were not met and corrective action was not successful or corrective action was not performed

TABLE 7-14
REPORTING LIMITS FOR METHOD SW7471A
CANNON AFB

Analyte	Soil		
	MDL	RL	Units
Mercury	0.0169	0.1	mg/kg

mg/kg - milligrams per kilogram

TABLE 7-15
QC ACCEPTANCE CRITERIA FOR METHOD SW7471A
CANNON AFB

Analyte	Accuracy Soil (%R)	Precision Soil RPD (%)
Mercury	80-120	≤ 30

%R - Percent Recovery
RPD-Relative Percent Difference

TABLE 7-16
CALIBRATION AND QC PROCEDURES FOR METHOD SW7471A
CANNON AFB

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Flagging Criteria
Initial multipoint calibration(minimum five standards and a blank)(ICAL)	Daily initial calibration prior to sample analysis	Correlation coefficient ≥ 0.995 for linear regression	Correct problem then repeat initial calibration.	Problem must be corrected.Samples may not be analyzed until there is a valid ICAL.
Second-source calibration check standard(ICV)	Once per ICAL	Analyte within ± 10% of expected value	Correct problem and verify second source standard. Rerun ICV. If that fails, correct problem and repeat initial calibration.	Problem must be corrected.Samples may not be analyzed until the calibration has been verified.
Calibration blank	Before beginning a sample run, after every 10 samples and at end of the analysis sequence	No analytes detected > 2X MDL	Correct problem then analyze calibration blank and previous 10 samples.	Apply B-flag to all associated positive results as appropriate.See guidance Section 8.2.1.4.
Calibration verification(CCV)	After every 10 samples and at the end of the analysis sequence	Analyte within ± 20% of expected value	Correct problem then repeat CCV and reanalyze all samples since last successful calibration verification.	Apply Q-flag to all samples associated with the calibration verification.
Method blank	One per analytical batch	No analytes detected > MDL	Assess data. Correct problem. If necessary, reprep and analyze method blank and all samples processed with the contaminated	Apply B-flag to all associated positive results as appropriate.See guidance Section 8.2.1.4.
Dilution Test	Each matrix in a analytical batch (only applicable for samples with concentrations >25X MDL)	Fivefold (1+4) dilution must agree within ± 10% of the original determination	None	Apply J-flag to all sample results if batch had sample(s) with concentrations >25X MDL and either of following exist: (1) dilution test not run or(2) % D ≥ 10
LCS	One LCS per analytical batch	Acceptance criteria: Table 7-15	Correct problem then reanalyze.If still out, reprep and reanalyze the LCS and all samples in the affected AFCEE batch.	If corrective action fails, apply Q-flag to all samples in the associated preparatory batch.

TABLE 7-16
CALIBRATION AND QC PROCEDURES FOR METHOD SW7471A
CANNON AFB

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action[a]	Flagging Criteria[b]
MS/MSD	One MS/MSD per every 20 Air Force project samples per matrix	Acceptance criteria: Table 7-15	Assess data to determine whether there is a matrix effect or analytical error. Analyze LCS for failed target analytes. Potential matrix effects should be communicated to the prime contractor so an evaluation can be made with respect to the PQOs.	For all samples collected from the same site matrix as the parent, apply M-flag if:(1) %R for MS or MSD > UCL,(2) %R for MS or MSD < LCL, or(3) MS/MSD RPD > CL
MDL study	At initial setup and subsequently once per 12-month period or quarterly MDL verification checks.	Detection limits established shall be ≤ ½ the RLs in Acceptance Criteria, Table 7-14. See 40 CFR, Part 136 Appendix B.Verification checks must produce a response at least 3X instrument noise level and must produce a response greater than the blanks associated with the MDL study.	Run MDL verification check at higher level and set higher MDL or reconduct MDL study.	N/A
Results reported between MDL and RL	None	None	None	Apply F-flag to all results between MDL and RL.

a. All corrective actions associated with AFCEE project work shall be documented, and all records shall be maintained by the laboratory.

b. Flagging criteria are applied when acceptance criteria were not met and corrective action was not successful or corrective action was not performed

The data reduction, verification, validation, assessment and reporting–procedures described in this section will ensure (1) the data are reviewed and documented (2) transcription and data reduction errors are minimized, (3) complete documentation is maintained, and (4) the reported results are accurate, or qualified if necessary. Laboratory data reduction and verification procedures are required to ensure the data deliverable(s) meet the overall project objectives. Data reduction, whether performed by instrumentation or manually, will follow methodologies specified in the laboratory SOPs or approved analytical methods. Project-specific variations of general procedures, statistical approach, or formulas must be identified and be detailed in the project QAPP. Any variances from established procedures will be requested and approved in advance. Automated procedures will be verified as required by USEPA's guidance on Good Automated Laboratory Practices (GALP, USEPA 2185); all software will be tested with a sample set of data to verify its correct operation via accurate capture, processing, manipulation, transfer, recording, and reporting of data. Data will be reported in hardcopy data package(s) and as electronic data deliverable(s) (EDDs).

8.1 DATA REVIEW REQUIREMENTS FOR SCREENING DATA

URS will complete a 100 percent review of all screening data. Applicable screening data will be qualified with an S-flag and shall be further qualified if critical calibration and QC requirements are not within acceptable limits. The calibration, QC requirements, corrective action requirements, and flagging criteria required are shown in Table 6-2. Definitions of these data qualifiers are provided in Table 8-1. The flagging criteria should be applied when acceptance criteria are not met and corrective action was either not successful or not performed. S- flags will be maintained in the final data qualification. Also, any data that has been affected by multiple qualifiers will retain these qualifiers in the final reviewed data package.

8.2 DATA REVIEW REQUIREMENTS FOR DEFINITIVE DATA

Data review is the process whereby data are examined and evaluated to varying levels of detail and specificity by a variety of personnel who have different responsibilities within the data management process. It includes verification, validation, and usability assessment. Data verification is the first step in data review. As used here, data verification is confirmation that the specified requirements have been performed, i.e., it is a completeness check. Data validation extends this and is confirmation that the requirements for a specific intended use are fulfilled. Data validation is the systematic process of evaluating the compliance of the data with the pre-defined requirements of the project, including method, procedural, or contractual requirements and the comparison of the data with criteria based on the quality objectives documented in the project QAPP. The purpose of data validation is to assess the performance associated with the analysis in order to determine the quality of the data. Data validation includes a determination, to the extent possible, of the reasons for any failure to meet performance requirements, and an evaluation of the impact of such failures on the usability of the data.

8.2.1 Laboratory Requirements

The chemistry data package must contain adequate information and be presented in a clear and concise manner. The laboratory will be required to provide pdf copies of the chemistry QC summary data package and raw data. The QC summary package will include: cover sheet which identifies the project; table of contents; case narrative which summarizes samples, analyses, and discusses any issues which may affect data usability; analytical results; laboratory reporting limits; sample management records; and internal laboratory QA/QC information. This will facilitate subsequent review, validation, and assessment.

The raw data package shall be similar in content to the Contract Laboratory Program (CLP) Level 4 data package but must also include the QC summary forms. The raw data package must include all raw data including, but not limited to, the following: chromatograms, quantitation reports, initial calibration curves, calibration verifications, instrument tuning, quality control samples (i.e. LCS, surrogate, MS/MSD), preparation logs, analytical logs, chain of custody copies and cooler receipt form. AFCEE forms are not required.

The laboratory data package should be organized such that the analytical results are reported on a per AFCEE analytical batch (AAB) basis. Based on the information in the data package, a reviewer should be able to determine the sensitivity, precision, accuracy, representativeness, comparability, and completeness of the data.

The standard turnaround time (TAT) for the sample data is to be 21 calendar days. Hard copy and EDDs must arrive at URS (Omaha) by the 21st day. The TAT is calculated as the number of calendar days from sample receipt at the laboratory.

8.2.1.1 Laboratory Data Reporting Requirements

An important part of the laboratory documentation is the case narrative. The case narrative contains essential information which affords an informed evaluation of data usability. The case narrative will include but not be limited to:

- Table summarizing samples received, correlating field sample numbers, laboratory sample numbers, and laboratory tests completed.
- Discussion of sample appearance and integrity issues which may affect data usability (temperature, preservation, pH, sample containers, air bubbles, multiphases, etc.)
- Samples received but not analyzed and why.
- Discussion of holding time excursions for sample prep and analyses.
- Analysis of all out-of-control or discrepancies of calibrations, continuing calibrations or QC sample results (surrogates, LCS, MS/MSD, post-digestion spikes, etc.), raw data/chromatograms and corrective actions taken.
- Identification of samples and analytes for which manual integration was necessary.
- Discussion of all qualified data and definition of qualifying flags.
- Discussion and recommendations of potential data usability of qualified data including detailed discussion of conditions associated with Q-flagged data.

Reporting details:

- MDLs and sample results should be reported to one decimal place more than the corresponding RL, unless the appropriate number of significant figures for the measurement dictates otherwise.
- Soil samples will have results reported on a dry weight basis. A routine amount of sample will be weighed or and extra 10 to 20 percent will be weighted for all samples. Reporting limits will be elevated accordingly, to compensate for percent moisture and the additional amount of sample.

If possible, samples will be analyzed undiluted and non-detects reported to the AFCEE specified RLs.

8.2.1.2 Manual Integrations

Manual integrations are an integral part of the chromatographic analysis process; they should be used judiciously to correct any incorrect integration by the automated instrumentation and not as a routine procedure for the purpose of meeting calibration or method QC acceptance criteria. Improper use of manual integrations (for example, peak shaving or peak enhancement) are considered improper, unethical, or illegal actions if performed solely to meet QC requirements. Manual integrations will be done only as a corrective action measures. Examples of instances where manual integration would be warranted include, but are not limited to, co-eluting compounds resulting in poor peak resolution, a misidentified peak, an incorrect retention time, or a problematic baseline. When manual integrations are used, the following procedures are to be implemented for documenting the event and for consistency in performing the manual integration:

- There be a laboratory or section SOP for manual integrations. This SOP will specify when automated integrations by the instrument are likely to be unreliable, what constitutes an unacceptable automated integration, and how the problems should be resolved by the analyst. This includes procedures for the analyst to follow in documenting any required manual integrations.
- When manual integrations are performed, raw data records will include a complete audit trail for those manipulations. The raw data records will include the results of both the automated and manual integrations (i.e., "before" and "after" chromatograms of manually integrated peaks), notation of the cause and justification for performing the manual integrations, and date, and signature/initials of person performing the manual operations.
- All manual integrations will be reviewed and approved by the section supervisor and/or the QA officer.

  Note: Both the primary and secondary reviews (analyst's and supervisory) may be performed electronically, provided all documentation and data integrity are maintained.

- All manual integrations will be identification in the case narrative.

This will ensure consistency when manual integrations are performed and facilitate review and acceptance of manually integrated data.

8.2.1.3 Laboratory Data Review Requirements

All analytical data generated by the laboratory will be verified prior to submittal to URS. This internal data review process, which is multi-tiered, will include all aspects of data generation, reduction, and quality control assessment. In each laboratory analytical section, the analyst performing the tests will review 100 percent of the definitive data. After the analyst's review has been completed, 100 percent of the data will be reviewed independently by a senior analyst or by the supervisor of the respective analytical section using the same criteria.

The following elements for review/verification at each level will include but not be restricted to:

- Sample receipt procedures and conditions.
- Sample preparation.
- Appropriate SOPs and analytical methodologies.
- Accuracy and completeness of analytical results.
- Correct interpretation of all raw data, including all manual integrations.
- Appropriate application of QC samples and compliance with established control limits.
- Verification of data transfers.
- Documentation completeness (e.g., all anomalies in the preparation and analysis have been identified, appropriate corrective actions taken, and have been documented in the case narrative(s), associated data have been appropriately qualified, anomaly forms are complete).
- Accuracy and completeness of data deliverables (hard copy and electronic).

8.2.1.4 Laboratory Data Evaluation

The calibration, QC, corrective actions, and flagging requirements for definitive data are shown in the tables in Section 7. Data qualifiers will be applied by the laboratory according to the requirements in the tables in Sections 6 and 7 as part of their validation activities. The allowable data qualifiers for definitive data are *Q, M, J, F, B, U, UJ* and *T*. The definitions of the data qualifiers are provided in Table 8-1. Flagging criteria apply when acceptance criteria are not met and corrective actions were not successful or not performed. The data qualifiers are reviewed by the supervisor of the respective analytical sections after the first and second level reviews of the laboratory data have been performed.

The laboratory QA section will perform a 100 percent review of 10 percent of the completed data packages, and the laboratory project representative will complete a final review on all the completed data packages.

URS will evaluate the flags applied by the laboratory as part of the data validation and usability assessment activities. The flags may be accepted, modified, or rejected. For all data qualifiers which are changed, URS will provide clear justification for those modifications based on project-

specific quality objectives. All Q-flagged data will be evaluated by URS and either accepted without qualification, accepted with qualification, or rejected.

8.2.1.5 Method Blank Evaluation Guidance

For method blanks, the source of contamination will be investigated and measures taken to correct, minimize, or eliminate the problem if the concentration exceeds one-half the RL. (Use the RL for common laboratory contaminants.) If one-half the RL is exceeded, the laboratory will evaluate whether reprocessing of the samples is necessary, based on the following criteria: i) the method blank contamination exceeds a concentration greater than 1/10 of the measured concentration of any sample in the associated preparation batch, or ii) there is evidence the blank contamination otherwise affects the sample results. Except when the sample analysis resulted in a non-detect, all samples associated with method blank contamination and meeting these criteria will be reprocessed in a subsequent preparation batch. If no sample volume remains for reprocessing, the results will be reported with a B-flag, along with any other appropriate data qualifier. If an analyte is found only in the method blank, but not in any batch samples, no flagging is necessary. Method blanks should also be examined to verify that any tentatively identified compounds (TICs) present in the samples are not found in the blank. Method blank contamination must be addressed in the case narrative.

8.2.2 URS Requirements

The ultimate goal of data review is to ensure that the decisions, which are made as a result of the environmental data collection effort, are supported by data of the type and quality suitable for their intended use. URS has overall responsibility for data quality.

8.2.2.1 Responsibility and Qualifications

The data validation/usability assessment processes involves exercise of professional judgment. The URS Project Chemist will perform these tasks. The URS Project Chemist will be involved during project planning in the systematic planning process, choice of preparation and analytical methods, and decisions made regarding data verification and data validation. Although discussed sequentially below, certain steps in the data review process may be performed simultaneously.

8.2.2.2 Data Verification Guidelines

The data verification performed by the laboratory will reviewed for completeness and accuracy. Data verification may be done electronically or manually, or by a combination of both. This may include but is not limited to:

- Sampling Documentation (COC form, etc.).
- Preservation Summary and Technical Holding Times.
- Presence of all analyses and analytes requested.
- Use of the required sample preparation and analysis procedures.

- The method detection and reporting limits will be evaluated against the project requirements.
- The correctness of the concentration units.
- Case Narrative

8.2.2.3 Data Validation Guidelines

The laboratory case narrative and data validation results should be reviewed and data qualifiers removed or added based on professional judgment based on project knowledge.

8.2.2.3.1 Raw Data Review

A raw data review will be done as determined by the URS QA officer. This will include:

- Instrument Calibration and QC Parameters. These parameters will be reviewed for compliance with the criteria specified in the applicable Summary of Calibration and QC Procedures tables, and flagged as necessary.
- Review of raw data and inspections of chromatograms.
- Review of System Performance.
- Review for proper integration (if applicable).
- Review of spectral matches, and/or retention times to verify analyte identification (where applicable).
- Random check of calculations, including, but not limited to sample and QC results, initial calibration response factors and relative standard deviations, calibration verification standard response factors, and percent differences or percent drifts from the expected values.
- Check for interference problems or system performance problems, such as chromatographic baseline anomalies and drifts, evidence of column degradation, etc.
- Estimated Results (F-qualifiers).
- Resolution by the laboratory of any identified problems, as necessary.

8.2.2.3.2 Data Analysis and Interpretation

This phase of the data validation process (assessment) relies heavily on the URS project chemist's professional judgment. It may include, but is not limited to:

- Evaluation of all Q-flagged data and final determination of its usability. All Q-flagged data must be accepted without qualification, accepted with qualification, or rejected. The Q-flag is not to be used in the final assessment. (See Section 8.2.1.4).
- Evaluation of all B-flagged data and final determination of its usability. (See Section 8.2.2.3.3).

- Evaluation of duplicate, replicate, and split sample analyses (if collected). Indications of poor precision should be investigated for cause and the impact on the overall usability of the data must be discussed. (See Section 8.2.2.3.4)
- Evaluation of all M-flagged data. Only the matrix spike sample is qualified by the laboratory. URS will apply any additional qualifying flag for a matrix effect to all samples collected from the same site as the parent sample or all samples showing the same lithologic characteristics as the MS/MSD. (See Section 8.2.2.3.5)
- Evaluation of the impact of multiple data issues on the final analytical results (for example, variability of results obtained from different dilutions, or different methods; chromatographic issues; etc.).
- Evaluation of the deficiencies identified during data verification and assessment of their impact on the sample results.
- Incorporation of site-specific factors and assessment of their impact on the data.
- Assessment of data usability and assignment of final data qualifiers, as necessary.
- Discussion of completeness, representativeness, and comparability.

A data validation report will be prepared summarizing the findings and discussing their impact on the overall data usability. This may be incorporated into the final usability assessment.

8.2.2.3.3 Blank Evaluation Guidelines

URS will evaluate laboratory B-qualified data such as method blanks, as well as other blanks (field blanks such as trip blanks, or equipment blanks, etc.) based on the concentration of the analyte in the samples in relation to the concentration in the blank, during the data validation process. The B-flag may be removed and not utilized if the analyte concentrations in the samples are much higher ($\geq$ 5X) than in the blank ($\geq$ 10X in case of common laboratory contaminants). Any blank contamination that may impact data usability will be discussed by URS in conjunction with project-specific goals.

8.2.2.3.4 Duplicate/Replicate Evaluation Guidance

As discussed in Section 4, QC measures for precision include field duplicates, laboratory duplicates, matrix spike duplicates, analytical replicates, and surrogates. These measures are evaluated by the laboratory and qualified according to the guidelines in Sections 7 and 8 with the exception of the field duplicates. Specifically, field duplicates (replicates) or split samples will be sent to the laboratory(ies) as blind samples and will be given unique sample identification numbers. These sample results will then be associated by URS and will be used to assess field sampling precision, laboratory precision, and, potentially, the representativeness of the matrix sampled. URS will use experience, professional judgment and site-specific knowledge to assess the value of the field duplicate samples as a measure of precision or representativeness. Flagging of results associated with field duplicates will be assigned such that the level of uncertainty required, as provided by the project-specific objectives, is taken into account. Poor overall precision may be the result of one or more of the following: field instrument variation, analytical

measurement variation, poor sampling technique, sample transport problems, or spatial variation (heterogeneous sample matrices). To identify the cause of imprecision, the field sampling design rationale and sampling techniques will be evaluated by URS, and both field and analytical duplicate/replicate sample results will be reviewed. If poor precision is indicated in both the field and analytical duplicates/replicates, then the laboratory may be the source of error. If poor precision is limited to the field duplicate/replicate results, then the sampling technique, field instrument variation, sample transport, and/or spatial variability may be the source of error. If data validation reports indicate that analytical imprecision exists for a particular data set or sample delivery group (SDG), then the impact of that imprecision on usability will be discussed in the report.

8.2.2.3.5 Matrix Interference Evaluation Guidance

In the case of matrix interference, the laboratory will follow the guidelines specified in appropriate Tables in Section 7. However, URS will apply M flags to additional samples from the same site and same matrix, as applicable.

8.2.2.4 Flagging Conventions

The allowable final data qualifiers for definitive data and the hierarchy of data qualifiers, listed in order of the most severe through the least severe, are *R*, *M*, *J*, *F*, *B*, *U*, and *UJ*. Their definitions are summarized in Table 8-2. Tables 8-3 and 8-4 present the general guidelines for applying these data qualifiers. The tables in Section 7 should be consulted for specific details.

8.3 QUALITY ASSURANCE REPORTS

The laboratory QA staff shall issue QA reports to the laboratory management, laboratory supervisors and task leaders. These reports shall describe the results of QC measurements, performance audits, and systems audits, and confirmation sample comparisons performed for each sampling and analysis task. Quality problems associated with performance of methods, completeness of data, comparability of data including field and confirmatory data, and data storage shall be documented with the corrective actions that have been taken to correct the deficiencies identified.

8.4 ELECTRONIC DATA REPORTS

8.4.1 ERPIMS Electronic Data Reports

The laboratory will provide URS an EDD in the Environmental Restoration Program Information Management System (ERPIMS) format as specified by the statement of work (SOW) for the project.

ERPIMS is a data management system designed to accommodate all types of data collected for ERP projects. Specific codes and data forms have been developed to allow consistent and efficient input of information to the system. The database information shall be provided by URS via American Standard Code for Information Interchange (ASCII) files in specified ERPIMS

format. The information transferred will include all required technical data such as site information; well characteristics; and hydrogeologic, geologic, physical, and chemical analysis results. Electronic data reporting formats and requirements are given in the most current version of the *ERPIMS Data Loading Handbook.*

8.5 ARCHIVING

Hardcopy and electronic data will be archived in project files and in electronic format by the laboratory for the duration of the project or a minimum of five years, whichever is longer, or as dictated by project requirements (if longer than five years). The laboratory will also provide URS and AFCEE all files associated with the project in electronic media. The data packages will be retrievable for AFCEE within seven calendar days. In the event of laboratory closure, all applicable documents and electronic media will be immediately transferred to AFCEE.

8.6 PROJECT DATA FLOW AND TRANSFER

The data flow from the laboratory and field to the project staff and data users shall be sufficiently documented to ensure the data are properly tracked, reviewed, and validated for use.

8.7 RECORD KEEPING

The laboratory will maintain electronic and hardcopy records sufficient to recreate each analytical event conducted pursuant to the SOW. The minimum records the laboratory will keep contain the following: (1) COC forms, (2) initial and continuing calibration records including standards preparation traceable to the original material and lot number, (3) instrument tuning records (as applicable), (3) method blank results, (4) IS results, (5) surrogate spiking records and results (as applicable), (6) spike and spike duplicate records and results, (7) laboratory records, (8) raw data, including instrument printouts, bench work sheets, and/or chromatograms with compound identification and quantitation reports, (9) corrective action reports, (10) other method and project required QC samples and results, and (11) laboratory-specific written SOPs for each analytical method and QA/QC function in place at the time of analysis of project samples.

8.8 HARDCOPY DATA REPORT FORMS FOR REPORTING SCREENING AND DEFINITIVE DATA

Hardcopy data reports will not need to conform to the AFCEE form format. However, the forms produced will include all of the information contained in the AFCEE forms.

TABLE 8-1
LABORATORY DATA QUALIFIERS
CANNON AFB

Qualifier	Description
Q	One or more quality control criteria (for example, LCS recovery, surrogate spike recovery) failed. Data must be carefully assessed by the prime contractor (or project team) with respect to the project-specific requirements and evaluated for usability. Subsequent assessment by DoD may result in rejection of data.
M	Matrix effect: The concentration is estimated due to a matrix effect.
J	Estimated: The analyte was positively identified, the quantitation is an estimation due to discrepancies in meeting certain analyte-specific quality control criteria.
F	Found: The analyte was positively identified but the associated concentration is estimation above the MDL and below the RL.
B	Blank contamination: The analyte was found in an associated blank above the MDL, as well as in the sample.
U	Undetected: The analyte was analyzed for, but not detected.
UJ	The analyte was not detected; however, the result is estimated due to discrepancies in meeting certain analyte-specific quality control criteria.
T	Tentatively identified compound: The analyte is a tentatively identified compound (mass spectrometry methods only).

TABLE 8-2
USABILITY ASSESSMENT DATA QUALIFIERS
CANNON AFB

Qualifier	Description
R	The data are rejected due to deficiencies in meeting QC criteria and may not be used for decision making.
M	Matrix effect: The concentration is estimated due to a matrix effect.
J	Estimated: The analyte was positively identified, the quantitation is an estimation due to discrepancies in meeting certain analyte-specific quality control criteria.
F	Found: The analyte was positively identified but the associated concentration is an estimation above the MDL and below the RL.
B	Blank contamination: The analyte was found in an associated blank above the MDL, as well as in the sample.
U	Undetected: The analyte was analyzed for, but not detected.
UJ	The analyte was not detected; however, the result is estimated due to discrepancies in meeting certain analyte-specific quality control criteria.
T	Tentatively identified compound: The analyte is a tentatively identified compound (mass spectrometry methods only).

TABLE 8-3
DATA QUALIFYING CONVENTIONS - GENERAL
CANNON AFB

QC Requirement	Criteria	Flag	Flag Applied To
Holding Time	Time exceeded for extraction or analysis	J for the positive results R or UJ for non-detects*	All analytes in the sample
LCS	% R > UCL %R < LCL	J for the positive results J for the positive results R for the non-detects	The specific analyte(s) in all samples in the associated AAB
Method Blank	Analyte(s) detected > ½ RL	B	The specific analyte(s) in all samples in the associated AAB with results above the MDL
Equipment Blank	Analyte(s) detected > ½ RL	B	The specific analyte(s) in all samples with the same sampling date as the equipment blank
Field duplicates	RPD > CL and field duplicates > RLs or one field duplicate > RL, one ND	J for the positive results UJ for the non-detects	The specific analyte(s) in all samples collected on the same sampling date.Note: No flagging is required for RPDs based on F-flagged results
MS/MSD	MS or MSD % R > UCL MS or MSD % R < LCL MS/MSD RPD > CL	M for all results	The specific analyte(s) in all samples collected from the same site as the parent sample
Sample Preservation/Collection	Preservation/collection requirements not met	J for the positive results R or UJ for non-detects*	All analytes in the sample
Sample Storage	< 2°C or > 6°C or as required	J for the positive results R or UJ for non-detects*	All analytes in the sample

UCL = Upper control limit
LCL = Lower control limit
CL = Control limit
* Based on analyte-specific review

TABLE 8-4
DATA QUALIFYING CONVENTIONS - QUANTITATION
CANNON AFB

	Criteria	Flag
Quantitation	< MDL	U, UJ
	≥ MDL < RL	F
	≥ RL	as needed
	≥ high std / linear range	J

Technical systems and performance audits will be performed as independent assessments of sample collection and analysis procedures. Audit results will be used to evaluate the ability of the laboratory to (1) produce data that fulfill the objectives established for the program, (2) comply with the QC criteria, and (3) identify any areas requiring corrective action. The systems audit is a qualitative review of the overall sampling or measurement system, while the performance audit is a quantitative assessment of a measurement system. Full data review/validation is also a quantitative check of the analytical process, where all documentation and calculations are evaluated and verified. Data review/validation procedures are discussed in Section 8.

9.1 PROJECT AUDITS

9.1.1 State/Federal Project Audits

Audits by various state and federal agencies are commonly conducted for the laboratories that will analyze project samples. Audit reports from these agencies should be reviewed by URS to determine whether data produced by the analytical laboratory can fulfill the objectives of the program.

All laboratories will participate in the USEPA Water Supply and Water Pollution Studies programs or equivalent programs for state certifications. Satisfactory performance in these nonproject-specific PT sample programs also demonstrates proficiency in methods used to analyze AFCEE samples. The laboratory will document the corrective actions to unacceptable PT sample results to demonstrate resolution of the problems.

Audit findings will be transmitted from the laboratory to URS and to AFCEE. URS will review the audit findings and provide a written report to AFCEE. This report will include the recommended corrective actions or procedures to remedy any deficiencies identified during the state/federal audit(s). The audit results and discussion will be incorporated into the QA report for each sampling effort.

9.1.2 Technical Systems Audits

A technical systems audit is an on-site, qualitative review of the sampling or analytical system to ensure that the activities are being performed in compliance with the project SAP specifications. Sampling, field procedures, and analytical laboratories will have been recently audited by URS before the beginning of the project. In addition, a laboratory systems audit may be performed by AFCEE if previous audit reports indicate corrective actions have not been completed, a recent audit has not been conducted, or quality concerns have arisen based upon the use of that laboratory for other projects. The laboratory systems audit results will be used to assess URS's oversight and to review laboratory operation and ensure the technical procedures and documentation are in place and operating to provide data that fulfill the project objectives and to ensure corrective actions have been implemented.

Critical items for a laboratory systems audit include: (1) sample custody procedures, (2) calibration procedures and documentation, (3) completeness of data forms, notebooks, and other reporting requirements, (4) data review and validation procedures, (5) data storage, filing, and record keeping procedures, (6) QC procedures, tolerances, and documentation, (7) operating conditions of facilities and equipment, (8) documentation of training and maintenance activities, (9) systems and operations overview, and (10) security of laboratory automated systems.

Critical items for field sampling systems audit include: (1) appropriate sampling plans (QAPP, FSP) (2) calibration procedures and documentation for field equipment, (3) documentation in field logbooks and sampling data sheets, (4) organization and minimization of potential contamination sources while in the field, (5) proper sample collection, storage, and transportation procedures, and (6) compliance with established COC and transfer procedures.

After each on-site audit, a debriefing session will be held for all participants to discuss the preliminary audit results. The auditor will then complete the audit evaluation and submit an audit report including observations of the deficiencies and the necessary recommendations for corrective actions to URS. Compliance with the specifications presented in the SAP will be noted and noncompliance or deviations shall be addressed in writing by URS to AFCEE with corrective actions and a time frame for implementation of the corrective actions. Follow-up audits will be performed prior to completion of the project to ensure corrective actions have been taken.

AFCEE personnel will be notified at least three weeks prior to conducting the field audit. Also, if AFCEE personnel plan to observe field activities during the audit, URS will provide the AFCEE attendee(s) with any needed personal protective equipment.

9.1.3 Project-Specific Performance Evaluation Audits

Performance audits quantitatively assess the data produced by a measurement system. A performance audit involves submitting project-specific PT samples for analysis for each analytical method used in the project. URS will submit project-specific PT samples once per quarter per project. The project-specific PT samples are selected to reflect the expected range of concentrations for the sampling program. The performance audit answers questions about whether the measurement system is operating within control limits and whether the data produced meet the analytical QA specifications.

The project-specific PT samples are made to look as similar to field samples as possible and are submitted as part of a field sample shipment so that the laboratory is unable to distinguish between them and project samples. This approach ensures unbiased sample analysis and reporting by the laboratory.

The critical elements for review of PT sample results include: (1) correct identification and quantitation of the PT sample analytes, (2) accurate and complete reporting of the results, and (3) measurement system operation within established control limits for precision and accuracy.

The concentrations reported for the PT samples will be compared to the known or expected concentrations spiked in the samples. The percent recovery will be calculated and the results assessed according to the accuracy criteria for the LCS presented in Section 7 and/or the values from the PT sample provider. If the accuracy criteria are not met, the cause of the discrepancy will be investigated and a second PT sample will be submitted. URS will notify the project staff, AFCEE, and agencies of the situation at the earliest possible time, and URS will keep AFCEE informed of corrective actions and subsequent PT sample results.

9.1.4 Magnetic Tape Audits

Magnetic tape audits involve the examination of the electronic media used by the analytical laboratory and by URS to collect, analyze, report, and store data. These audits are used to assess the authenticity of the data generated and the implementation of good automated laboratory practices. AFCEE may perform magnetic tape audits of the laboratories or of URS when warranted by on-site audit results or by other state/federal investigations.

9.2 TRAINING

40-Hour Hazardous Waste Operations and Emergency Response (HAZWOPER) Training will be provided to all project field personnel who perform work at hazardous waste sites to ensure compliance with the health and safety plan and technical competence in performing the work effort. Documentation of this training shall be maintained in the records of the contracted organizations.

A preventive maintenance program is in place to promote the timely and effective completion of a measurement effort. The preventive maintenance program is designed to minimize the downtime of crucial sampling and/or analytical equipment due to unexpected component failure. In implementing this program, efforts are focused in three primary areas: (1) establishment of maintenance responsibilities, (2) establishment of maintenance schedules for major and/or critical instrumentation and apparatus, and (3) establishment of an adequate inventory of critical spare parts and equipment.

10.1 MAINTENANCE RESPONSIBILITIES

Maintenance responsibilities for equipment and instruments are assumed by the respective facility managers. The managers then establish maintenance procedures and schedules for each major equipment item. This responsibility may be delegated to laboratory personnel, although the managers retain responsibility for ensuring adherence to the prescribed protocols.

10.2 MAINTENANCE SCHEDULES

The effectiveness of any maintenance program depends to a large extent on adherence to specific maintenance schedules for each major equipment item. Other maintenance activities are conducted, as needed. Manufacturers' recommendations provide the primary basis for the established maintenance schedules, and the manufacturers' service contracts provide primary maintenance for many major instruments (e.g., GC/MS instruments, AA spectrometers, and analytical balances).

10.3 SPARE PARTS

Along with a schedule for maintenance activities, an adequate inventory of spare parts is required to minimize equipment downtime. The inventory includes those parts (and supplies) that are subject to frequent failure, have limited useful lifetimes, or cannot be obtained in a timely manner should failure occur.

Field sampling task leaders and the respective laboratory managers are responsible for maintaining an adequate inventory of spare parts. In addition to spare parts and supply inventories, URS shall maintain an in-house source of backup equipment and instrumentation.

10.4 MAINTENANCE RECORDS

Maintenance and repair of major field and laboratory equipment shall be recorded in field or laboratory logbooks. These records shall document the serial numbers of the equipment, the person performing the maintenance or repairs, the date of the repair, the procedures used during the repair, and proof of successful repair prior to the use of the equipment.

Corrective actions, if necessary, shall be completed at once. If acceptance criteria were not met and a corrective action was not successful or corrective action was not performed, the appropriate flagging criteria must be applied. Requirements and procedures for documenting the need for corrective actions are described in this section.

11.1 CORRECTIVE ACTION REPORT

Problems requiring corrective action in the laboratory will be documented by the use of a corrective action report. The QA coordinator or any other laboratory member can initiate the corrective action request in the event QC results exceed acceptability limits, or upon identification of other laboratory problem(s). Corrective actions can include reanalysis of the sample or samples affected, resampling and analysis, or change in procedures, depending upon the severity of the problem.

11.2 CORRECTIVE ACTION SYSTEM

A system for issuing, tracking, and documenting completion of formal Recommendations for Corrective Action (RCA) exists for addressing significant and systematic problems. Recommendations for corrective actions are issued only by a member of the QA group or a designee in a specific QA role. Each RCA addresses a specific problem or deficiency, usually identified during QA audits of laboratory or project operations. An RCA requires a written response from the party to whom the RCA was issued. A summary of unresolved RCAs is included in the monthly QA report to management. The report lists all RCAs that have been issued, the manager responsible for the work area, and the current status of each RCA. An RCA requires verification by the QA group that the corrective action has been implemented before the RCA is considered to be resolved. In the event there is no response to an RCA within 30 days, or if the proposed corrective action is disputed, the recommendation and/or conflict is pursued to successively higher management levels until the issue is resolved.

QA reports will be generated for the project. At a minimum, the QA coordinator of the laboratory shall prepare a quarterly summary report of the status of the project, of QA/QC problems, corrective actions taken, and unresolved RCAs with recommended solutions for management. The report will also include results from all PE samples, audit findings, and periodic data quality assessments. This report will be available for review by AFCEE auditors upon request.

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URS Proposed Variances to Cannon AFB AFCEE QAPP (August 2006)

The following summarizes proposed variances to the Cannon AFB AFCEE QAPP, (August 2006). URS has reviewed and concurs with all laboratory proposed variances listed below. The requested variances will not impact our ability to meet the project objectives.

Reporting Limits (RLs) – Tables in Section 7

Requirement: RLs for selected compounds are given in the table below.
Proposed: APPL proposes higher RLs for selected compounds, as shown in the table below.

Justification: APPL proposes higher RLs for selected compounds because: (1) The MDL may not be more than one-half the corresponding RL. We are requesting reporting limits, which are twice or MDL in order to meet this requirement. The proposed RLs are sufficient to meet the project data quality objectives (DQOs).

Compound, Matrix	Method	APPL MDL	AFCEE RL	APPL Proposed RL	Project DQO
Naphthalene, soil (mg/kg)	SW8260B	0.00041	0.005 mg/Kg	0.02 mg/Kg	5.3E+01 mg/Kg
Zinc, soil (mg/kg)	SW6010B	1.145	2.0 mg/Kg	5.0 mg/Kg	2.3E+04 mg/Kg
Iron, soil (mg/kg)	SW6010B	1.632	3.0 mg/Kg	5.0 mg/Kg	2.3E+04 mg/Kg

Qualifier Ions - Method 8260B

Requirement: Qualifier ions are given in the table below.

Proposed: APPL proposes qualifier ions with higher responses and are more linear, as shown in the table below.

Justification: Trichlorofluoromethane – ion 151 is not present in a molecule with a molecular weight of 137.

Acetone – ion 43 responds much higher than ion 58 and is traditionally more linear.

MEK (2-Butanone) – ion 43 responds much higher than ion 58 and is traditionally more linear.

Styrene – Due to interference from o-xylene, ion 63 should be used.

MIBK (methyl isobutyl ketone) – ion 43 responds much higher than ion 100 and it is traditionally more linear.

1,2,3-Trichloropropane – Due to interference from the surrogate Bromofluorobenzene, ion 110 should be used.

Compound, Matrix	Method	AFCEE requirement	Requested Variance
Trichlorofluoromethane, soil (mg/Kg)	SW8260B	Q1 of ion 151	Q1 of ion 101
Acetone, soil (mg/Kg)	SW8260B	Q1 of ion 58	Q1 of ion 43
MEK (2-butanone), soil (mg/Kg)	SW8260B	Q1 of ion 58	Q1 of ion 43
Styrene, soil (mg/Kg)	SW8260B	Q1 of ion 104	Q1 of ion 63
MIBK (methyl isobutyl ketone), soil (mg/Kg)	SW8260B	Q1 of ion 100	Q1 of ion 43
1,2,3-trichloropropane, soil (mg/Kg)	SW8260B	Q1 of ion 75	Q1 of ion 110

List of Standard Operating Procedures

SOP No. 4	Subsurface Drilling and Soil Sampling
SOP No. 11	Equipment Decontamination
SOP No. 13	Sample Handling, Documentation, and Tracking
SOP No. 14	Trenching
SOP No. 15	Headspace Analysis
SOP No. 16	Boring Abandonment
SOP No. 17	Permits and Clearances
SOP No. 19	En Core® and Terra Core™ Sampling Method

4.1 PURPOSE AND SCOPE

The purpose of this document is to define the Standard Operating Procedure (SOP) for subsurface drilling and collection of soil samples at Cannon Air Force Base (AFB). These procedures give descriptions of equipment, field procedures, and Quality Assurance/Quality Control (QA/QC) procedures implemented for the collection of subsurface soil samples. Specific sample locations and frequency of collection are presented in the project-specific Work Plan (WP).

These procedures are intended to be used together with the WP and other appropriate SOPs. Health and safety procedures and equipment for the investigation are detailed in the Site Safety and Health Plan (SSHP). Applicable SOPs are listed below:

- SOP No. 11 - Equipment Decontamination
- SOP No. 13 - Sample Handling, Documentation, and Tracking
- SOP No. 15 - Headspace Analysis
- SOP No. 16 - Boring Abandonment
- SOP No. 17 - Permits and Clearances
- SOP No. 19 – En Core® Sampling Method

Reference Standards

Wherever an ASTM designation is cited in this document, it shall mean the American Society for Testing and Materials Standard Specification of that designation appearing in the "1994 Annual Book of ASTM Standards," published by the American Society for Testing and Materials, 1916 Race Street, Philadelphia, Pennsylvania. "EM 1110-2-1906" refers to United States Department of the Army, "Engineering and Design, Laboratory Soil Testing," 30 December 1970.

4.2 PROCEDURES FOR SOIL SAMPLING

Subsurface soil samples will be collected using a stainless-steel hand auger, stainless-steel split-spoon samplers when using a drill rig, or single-use sample tube liners approved for use in environmental sampling (such as cellulose acetate butyrate [CAB] or Teflon®) when using a direct push system. Surface soil samples will be collected from the 0- to 0.5-foot depth interval, except soil for volatile organic compound (VOC) analysis. Soil for VOC analysis will be collected from the 0.5- to 1.0-foot depth interval. Subsurface soil samples for VOC analysis will be collected using the EnCore® sampling method (SOP No. 19).

4.2.1 Equipment List

4.2.1.1 General Equipment List for Subsurface Soil Sampling

- En Core® soil sampling equipment

- Weighted tape measure with 0.1-foot increments
- Surveyor's stakes and flags
- Ruler marked in 0.1-foot increments
- Field books/field sheets
- Stainless-steel knife, bowl and spoon
- Sample bottles provided by the laboratory
- Sample bottle labels
- Label tape (clear)
- Paper towels
- Camera and film
- Waterproof and permanent marking pens
- Plastic sheeting
- Plastic bags
- Appropriate health and safety equipment, as specified in the SSHP
- Appropriate decontamination supplies, as specified in SOP No. 11
- Ice chest with ice

4.2.1.2 Additional Equipment for Subsurface Soil Sampling with a Hand Auger

- Stainless-steel hand auger and sample bucket

4.2.1.3 Additional Equipment for Subsurface Soil Sampling with Split Spoon or Continuous Sample Tube System

- Drill rig with appropriate drilling and sampling tools (e.g., stainless-steel split spoons or Central Mine Equipment's [CME's] continuous sample tube system, or the equivalent)

4.2.1.4 Additional Equipment for Subsurface Soil Sampling with Direct Push System

- Direct push rig with appropriate drilling and sampling tools (stainless-steel drive rods, piston sampler, and approved, single-use liners)

4.2.2 Decontamination

Before drilling or sampling begins, the drilling and sampling equipment will be decontaminated according to the procedures contained in SOP No. 11. Drilling and sampling equipment will be decontaminated between boring and sampling locations. Sampling equipment will also be decontaminated between depth intervals at the same boring location.

4.2.3 Drilling and Subsurface Soil Sampling Procedures

4.2.3.1 Subsurface Soil Sampling Using a Hand Auger

This method of soil sample collection is to be used at Cannon AFB in situations where the sampling depth makes it impractical to use hand utensils, or site conditions limit the accessibility of heavier drilling equipment. Hand auger borings will be completed in accordance with ASTM D 1452. Hand auger samples will be collected at the specified depth using a stainless-steel hand auger with a minimum 4-inch outside diameter (OD) bucket. The soil cuttings and excess soil will be treated as IDW. The procedure for collecting, labeling, storing, and transporting subsurface soil samples collected from a hand auger is described below:

- Record the boring location on a site map and in the field logbook.
- Decontaminate the drilling and sampling equipment according to SOP No. 11.
- Samples from each discrete 2-foot sample interval will be collected and stored per SOP No. 13 until all samples from a boring are collected. Samples will then be identified for laboratory analysis per the WP, based on headspace analysis (SOP No. 15) and visual contamination. The remaining samples will be disposed of as investigation-derived waste (IDW).
- Obtain PID background readings at the sampling location, readings just above the soil and in the breathing zone.
- Don a clean pair of nitrile gloves.
- Clear and remove vegetation and any surface debris such as rocks, as necessary.
- Using a decontaminated hand auger handle and sampling bucket, advance a borehole to the specified sampling depth. Removed soil should be placed on plastic sheeting.
- Collect the VOC sample using the En Core® sampling method according to SOP No. 19.
- Collect soil for the remaining parameters from the specified depth using a decontaminated stainless-steel sampling bucket. If more soil is necessary to fill the sample jars, the sampling area is to be expanded with an additional borehole without increasing the depth.
- Homogenize the remaining soil by thoroughly mixing the soil from the auger bucket in a decontaminated stainless-steel bowl with a decontaminated stainless-steel spoon. Fill the semivolatile organic compound (SVOC) jars completely full with soil from the sampling spoon immediately after compositing the soil. Then fill the remaining bottles with the composited soil for the specified analysis. The required analyses and appropriate containers are stated in the WP.
- Complete the lithologic description of the recovered sample according to the Unified Soil Classification System.
- Label, store, transport, and document the samples (depending on the use of the sample) according to SOP No. 13.

- If no other samples are to be collected from this sampling location, abandon sampling hole according to SOP No. 16.
- Identify the location for future reference using surveying stakes and flags.

4.2.3.2 Subsurface Soil Sampling Using a Drilling Rig

The process of drilling and collecting soil samples with a split spoon sampler is to be used at Cannon AFB in situations where the sampling depth makes it impractical to use hand utensils or hand augers, and site conditions are appropriate for the use of heavy drilling equipment. Split spoon soil sampling will begin by auger drilling a boring, using machine-driven hollow stem augers (HSA) with flights and a 4-1/4-inch minimum inside diameter to accommodate a 3-inch outside diameter stainless-steel split-spoon sampler or continuous sample tube system. Auger borings will be completed in accordance with ASTM D 1452. A HSA finger plug installed in the bit will be used to prevent soil material coming into the interior of the hollow stem augers. The soil cuttings and excess soil will be handled as IDW.

Soil samples will be obtained according to the WP specifications and the resistance to soil penetration will be measured using a split-spoon sampler in accordance with ASTM D 1586. When a drop hammer is used, penetration resistance (blow counts) for each sampling depth will be recorded on the field boring log (attached). The coupling head for the split-spoon sampler will be provided with a ball check valve and will have open vents. Where necessary for sample recovery, the sampler will also be equipped with a spring-type sample retainer or an equivalent retainer. The procedure for collecting, labeling, storing, and transporting subsurface soil samples collected from machine-driven HSAs is described below:

- Record the boring location on a site map and in the field logbook.
- Decontaminate the drilling and sampling equipment according to SOP No. 11.
- Samples from each discrete 2-foot sample interval will be collected and stored per SOP No. 13 until all samples from a boring are collected. Samples will then be identified for laboratory analysis per the WP, based on headspace analysis (SOP No. 15) and visual contamination. The remaining samples will be disposed of as IDW.
- Obtain PID background readings at the sampling location, readings just above the soil and in the breathing zone.
- Don a clean pair of nitrile gloves.
- Open the split-spoon sampler or soil core barrel, scan the length of the sample with the PID and record the readings, measure the recovery, and scrape off any soil smear zone from the recovered sample with a stainless-steel knife. If the soil is not cohesive or if the smear zone cannot be easily removed, an attempt will be made to remove soil from the portion of the sample that has not come in contact with the sampler.
- Determine and identify the use of the recovered sample. Each sample will always be used for soil classification and stratigraphic logging, but may also be used for chemical or headspace analysis.

- The sample must be handled quickly, especially if it is loose or crumbling, to avoid losing volatile contaminants.
- Collect the VOC sample immediately using the En Core® sampler or equivalent according to SOP No. 19. This should be done immediately upon opening the split spoon.
- Homogenize the remaining soil by thoroughly mixing the soil from the sampler in a decontaminated stainless-steel bowl with a decontaminated stainless-steel spoon. Fill the SVOC jars completely full with soil from the sampling spoon immediately after compositing the soil. Then fill the remaining bottles with the composited soil for the specified analysis. The required analyses and appropriate containers are stated in the WP.
- Complete the lithologic description of the recovered sample according to the Unified Soil Classification System.
- Label, store, transport, and document the samples (depending on the use of the sample) according to SOP No. 13.
- If no other samples are to be collected from this sampling location, abandon sampling hole according to SOP No. 16.
- Identify the location for future reference using surveying stakes and flags.

4.2.3.3 Subsurface Soil Sampling Using a Direct Push System

The process of drilling and of soil sample collection with a direct push system is to be used at Cannon AFB in situations where the sampling depth makes it impractical to use hand utensils or hand augers, where only unconsolidated materials are expected to be encountered, and where site conditions are not appropriate for the use of heavy drilling equipment (e.g., overhead obstructions that will still allow direct push access). Direct push soil sampling will begin by driving a sampler, which at a minimum includes a sample tube, liner and cutting shoe, into the ground with a hydraulically-powered machine. In the event of unstable soils collapsing into the hole, a closed-point system, which will also include a piston rod and point, will be used to ensure the collection of discrete samples from each depth interval. The excess soil will be handled as IDW.

Soil samples will be obtained according to the WP specifications. Where necessary for sample recovery, the sampler will also be equipped with a catcher-type sample retainer or an equivalent retainer. The procedure for collecting, labeling, storing, and transporting subsurface soil samples collected from a direct push system is described below:

- Record the boring location on a site map and in the field logbook.
- Decontaminate the drilling and sampling equipment according to SOP No. 11.
- Collect the soil samples using the drilling rig and split spoon sampler at the depths specified in the WP.
- Samples from each discrete 2-foot sample interval will be collected and stored per SOP No. 13 until all samples from a boring are collected. Samples will then be identified for

laboratory analysis per the WP, based on headspace analysis (SOP No. 15) and visual contamination. The remaining samples will be disposed of as IDW.

- Obtain PID background readings at the sampling location, readings just above the soil and in the breathing zone.
- Don a clean pair of nitrile gloves.
- Collect any required volatile organic compound (VOC) sample immediately using the En Core® sampler according to SOP No. 19. This should be done immediately upon opening the sampler.
- Scan the length of the sample with the PID and record the readings, measure the recovery, and scrape off any soil smear zone from the recovered sample with a stainless-steel knife. If the soil is not cohesive or if the smear zone cannot be easily removed, an attempt will be made to remove soil from the portion of the sample that has not come in contact with the sampler.
- The sample must be handled quickly, especially if it is loose or crumbling, to avoid losing volatile contaminants.
- Homogenize the remaining soil by thoroughly mixing the soil from the sampling bucket in a decontaminated stainless-steel bowl with a decontaminated stainless-steel spoon. Fill the SVOC jars completely full with soil from the sampling spoon immediately after compositing the soil. Then fill the remaining bottles with the composited soil for the specified analysis. The required analyses and appropriate containers are stated in the WP.
- Complete the lithologic description of the recovered sample according to the Unified Soil Classification System.
- Label, store, transport, and document the samples (depending on the use of the sample) according to SOP No. 13.
- If no other samples are to be collected from this sampling location, abandon sampling hole according to SOP No. 16.
- Identify the location for future reference using surveying stakes and flags.

4.2.4 Field Quality Assurance/Quality Control Procedures and Samples

Field QA/QC samples are designed to help identify potential sources of external sample contamination and to evaluate potential error introduced by sample collection and handling. All QA/QC samples are labeled with QA/QC identification numbers and sent to the laboratory with the other samples for analyses.

4.2.4.1 Field Blanks and Trip Blanks

Field blanks are QC samples that check for potential external contamination of samples. A trip blank serves as a check on sample contamination originating from the container or sample

transport. For Cannon AFB field investigations, field blanks and trip blanks are not required for soil sampling activities.

4.2.4.2 Duplicate Samples

Duplicate samples are samples collected to assess precision of sampling and analysis. For the soil sampling, a duplicate sample will be collected at the same time as the initial sample. The initial sample bottles for a particular parameter or set of parameters will be filled first, then the duplicate sample bottles for the same parameter(s), and so on until all necessary sample bottles for both the initial sample and the duplicate sample have been filled. The duplicate soil sample will be handled in the same manner as the primary sample. The duplicate sample will be assigned a QA/QC identification number, stored in an iced cooler, and shipped to the laboratory on the day it is collected. Duplicate samples will be collected for all parameters. Following collection of VOA samples, the remaining soil in the sample will be divided evenly and then homogenized separately and containerized for nonvolatile analyses. Duplicate samples will be blind to the laboratory.

4.2.4.3 Matrix Spikes and Matrix Spike Duplicates

Matrix spikes (MS) and matrix spike duplicates (MSD) are used to assess the potential for matrix effects. Samples will be designated for MS/MSD analysis on the chain-of-custody form and on the bottles. It may be necessary to increase the sample volume for samples where this designation is to be made.

4.2.5 Sample Identification, Handling, and Documentation

Samples will be identified, handled and recorded as described in this SOP and SOP No. 13. The parameters for analysis and preservation are specified in the WP.

4.2.6 Documentation

Each field activity must be properly documented to facilitate a timely and accurate reconstruction of events in the field (see SOP No. 13). Sample Collection Field Sheets (attached) will be completed for all soil samples submitted for chemical analysis.

4.2.6.1 Field Logbook

The most important aspect of documentation is thorough, organized, and accurate record keeping. All information pertinent to the investigation and not documented on the boring log will be recorded in a bound logbook with consecutively numbered pages. All entries in logbooks will be made in waterproof ink and corrections will consist of line-out deletions that are initialed and dated. Entries in the logbook will include the following, as applicable:

- Project name and number
- Sampler's name
- Date and time of sample collection

- Sample number, location, and depth
- Sampling method
- Observations at the sampling site
- Unusual conditions
- Information concerning drilling decisions
- Decontamination observations
- Weather conditions
- Names and addresses of field contacts
- Names and responsibilities of field crew members
- Names and titles of any site visitors
- Location, description, and log of photographs (if taken)
- References for all maps and photographs
- Information concerning sampling changes, scheduling modifications, and change orders
- Summary of daily tasks (including costs) and documentation on any cost or scope of work changes required by field conditions
- Signature and date by personnel responsible for observations

Field investigation situations vary widely. No general rules can include each type of information that must be entered in a logbook for a particular site. A project-specific logging procedure will be developed to include sufficient information so that the sampling activity can be reconstructed without relying on the memory of field personnel. The logbooks will be kept in the field team member's possession or in a secure place during the investigation. Following the investigation, the logbooks will become a part of the final project file.

4.2.6.2 Boring Logs

Boring logs will be completed for each boring by qualified personnel (geologist, geological engineer, or geotechnical engineer). The boring log form is attached.

Boring logs will include the following information:

- Boring location
- Boring identification
- Drilling agency
- Drilling equipment and method
- Date started and completed

- Completion depth
- Logger
- Description of lithologies by depth including soil or rock type, moisture content, color, and Unified Soil Classification
- Blow counts (if appropriate)
- Samples collected for laboratory analysis by depth of sample below surface, sample type and identification number, and sample interval
- Sample recovery
- Field screening results for soil headspace, breathing zone, and borehole with PID
- Origin of the lithologies (fill, loess, glacial till, glacial outwash, alluvium or colluvium, etc.)
- Other remarks or observations

SOIL SAMPLE COLLECTION FIELD SHEET

GENERAL INFORMATION

SITE NAME: _____ PROJECT NO. _____

SAMPLE NO. _____ BORING NO. _____

DATE/TIME COLLECTED: _____ PERSONNEL: _____

SAMPLE METHOD / DEPTH: _____ _____

SAMPLE MEDIA: SOIL

SAMPLE QA SPLIT: YES NO SPLIT SAMPLE NO. _____

SAMPLE QC DUPLICATE: YES NO DUPLICATE SAMPLE NO. _____

MS/MSD REQUESTED: YES NO

SAMPLE CONTAINERS, PRESERVATIVES, ANALYSIS

Sample Container	Preservative	Analysis Requested

OVA MEASUREMENTS

Background _____

Breathing zone _____

Boring _____

Headspace _____

SAMPLE DESCRIPTION

DEPTH: _____ DESCRIPTION: _____

_____ _____

_____ _____

_____ _____

_____ _____

GENERAL COMMENTS

_____

_____

_____

FIGURE 1

URS

HTRW DRILLING LOG

	DISTRICT	HOLE
1. COMPANY NAME	2. DRILLING SUBCONTRACTOR	SHEET SHEETS OF

3. PROJECT	4. LOCATION
5. NAME OF DRILLER	6. MANUFACTURE'S DESIGNATION OF DRILL
7. SIZES AND TYPES OF DRILLING AND SAMPLING	8. HOLE LOCATION
	9. SURFACE ELEVATION
	10. DATE STARTED / 11. DATE
12. OVERBURDEN	15. DEPTH GROUNDWATER ENCOUNTERED
13. DEPTH DRILLED INTO ROCK	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING
14. TOTAL DEPTH OF HOLE	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY)

18. GEOTECHNICAL	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY %
22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR		

LOCATION SKETCH/COMMENTS

SCALE:

PROJECT	HOLE

ENG FORM 5056-R, AUG 94

FIGURE 2

(Proponent: CECW-EG) URS

HTRW DRILLING LOG (CONTINUATION SHEET)

HOLE NO.

PROJECT	INSPECTOR	SHEET OF SHEETS

ELEV a.	DEPTH b.	DESCRIPTION OF MATERIALS c.	FIELD SCREENING RESULTS d.	GEOTECH SAMPLE OR CORE BOX NO. e.	ANALYTICAL SAMPLE NO. f.	BLOW COUNTS g.	REMARKS h.

PROJECT	HOLE

FIGURE 2

URS

11.1 INTRODUCTION AND TYPES OF CONTAMINATION

This document defines the Standard Operating Procedure (SOP) for decontamination at Cannon Air Force Base (AFB). This procedure is intended to be used together with the project-specific Work Plan (WP) and the other SOPs. Applicable SOPs are listed below:

- No. 4 – Subsurface Drilling and Soil Sampling
- No. 19 – En Core® Sampling Method

Site and/or Sample Cross-Contamination

The overall objective of multimedia sampling programs is to obtain samples that accurately depict the chemical, physical, and/or biological conditions at the sampling site. Extraneous contaminants can be brought onto the sampling location and/or introduced into the medium of interest during the sampling program (e.g. using sampling equipment that is not properly or fully decontaminated). Trace quantities of contaminants can consequently be captured in a sample and lead to false positive analytical results and, ultimately, to an incorrect assessment of the contaminant conditions associated with the site. Decontamination of sampling equipment (e.g., all non-disposable equipment that will come in direct contact with samples) and field support equipment (e.g., drill rigs, vehicles) is, therefore, required prior to, between, and after uses at Cannon AFB to ensure that sampling cross-contamination is prevented, and that on-site contaminants are not carried off-site.

11.2 EQUIPMENT DECONTAMINATION PROCEDURES

11.2.1 Equipment List

The following is a list of equipment that may be needed to perform decontamination:

- Brushes
- Wash tubs
- Buckets
- Scrapers, flat bladed
- Hot water - high-pressure sprayer
- Sponges or paper towels
- Alconox detergent (or equivalent)
- Potable tap water
- Laboratory-grade de-ionized water
- Garden-type water sprayers
- Appropriate Health and Safety equipment (i.e. nitrile gloves, safety glasses, etc.)
- Appropriate investigation-derived waste (IDW) containers

11.2.2 Decontamination

11.2.2.1 Personnel

A temporary personnel decontamination line will be set up around each exclusion zone. If contamination is not encountered, a dry decontamination station may be established which consists of discarding of disposable personal protective equipment (PPE).

If real-time monitoring instruments indicate that contamination has been encountered, (i.e. action levels requiring an upgrade from initial PPE levels are exceeded), a personnel decontamination station will be established.

The temporary decontamination line should provide space to wash and rinse boots, gloves, and all sampling or measuring equipment prior to placing the equipment into a vehicle. A container should be available to dispose of used disposable items such as gloves, tape or Tyvek® (if used).

The decontamination procedure for field personnel will include:

1. Glove and boot wash in an Alconox (or equivalent) solution
2. Glove and boot rinse
3. Duct tape removal
4. Outer glove removal
5. Coverall removal
6. Respirator removal (if used)
7. Inner glove removal

11.2.2.2 Sampling Equipment

The following steps will be used to decontaminate sampling equipment:

- Personnel will dress in suitable safety equipment to reduce personal exposure as required by the Site Safety and Health Plan (SSHP).
- Gross contamination on equipment will be scraped off at the sampling or construction site.
- Equipment that cannot be damaged by water will be placed in a washtub containing Alconox or low-sudsing non-phosphate detergent along with potable water and scrubbed with a bristle brush or similar utensil. Equipment will be rinsed with tap water in a second washtub followed by a de-ionized water rinse.
- Equipment that may be damaged by water will be carefully wiped clean using a sponge and detergent water and rinsed with de-ionized water. Care will be taken to prevent equipment damage.

Following decontamination, equipment will be placed in a clean area or on clean plastic sheeting to prevent contact with contaminated soil. If the equipment is not used immediately after

decontamination, the equipment will be covered or wrapped in plastic sheeting, foil, or heavy-duty trash bags to minimize potential contact with contaminants.

11.2.2.3 Drilling and Heavy Equipment

Drilling rigs and excavating equipment will be decontaminated at the decontamination station located near the staging area. Mobile decontamination trailers may be used to decontaminate heavy equipment at each site. The following steps will be used to decontaminate drilling and heavy equipment:

- Personnel will dress in suitable PPE to reduce personal exposure as required by the SSHP.
- Equipment showing gross contamination or having caked-on drill cuttings will be scraped with a flat-bladed scraper at the sampling or construction site.
- Equipment that cannot be damaged by water, such as drill rigs, augers, drill bits, and shovels, will be washed with a hot water, high-pressure sprayer then rinsed with potable water. Care will be taken to adequately clean the insides of the hollow-stem augers and backhoe buckets.

Following decontamination, drilling equipment will be placed on the clean drill rig and moved to a clean area. If the equipment is not used immediately, it will be stored in a clean area.

11.2.2.4 Equipment Leaving the Site

Vehicles used for activities in non-contaminated areas shall be cleaned on an as-needed basis, as determined by the Site Safety Officer, using soap and water on the outside and vacuuming the inside. On-site cleaning will be required for very dirty vehicles leaving the area. Construction equipment such as trucks, drilling rigs, backhoes, trailers, etc., will be pressure washed before the equipment is removed from the site to limit exposure of off-site personnel to potential contaminants.

11.2.2.5 Wastewater

Unless otherwise specified, liquid wastewater from decontamination will be containerized, labeled, and stored for later disposal as IDW.

11.2.3 Documentation

Sampling personnel will be responsible for documenting the decontamination of sampling and drilling equipment. The documentation will be recorded with waterproof ink in the sampler's field notebook with consecutively numbered pages. The information entered in the field book concerning decontamination should include the following:

- Decontamination personnel
- Date and start and end times
- Decontamination observations
- Weather conditions
- IDW handling

13.1 PURPOSE AND SCOPE

This document defines the Standard Operating Procedure (SOP) for sample handling, documentation, and tracking at Cannon Air Force Base (AFB). This procedure is intended to be used together with the project-specific Work Plan (WP) and other SOPs. Applicable SOPs are listed below:

- No. 4 - Subsurface Drilling and Soil Sampling

13.2 SAMPLE IDENTIFICATION

Samples collected during site activities shall have discrete sample identification numbers. These numbers are necessary to identify and track each of the many samples collected for analysis during the life of this project. In addition, the sample identification numbers will be used in the database to identify and retrieve the analytical results received from the laboratory.

Each sample is identified by a unique code that indicates the site number, sample location number, sample method and matrix identifier, and sample depth. For project-specific details, refer to the WP.

The sampling locations, sample type, and sample sequence identifiers will be established prior to field activities for each sample to be collected. On-site personnel will obtain assistance in defining any special sampling requirements from the Project Manager.

13.3 SAMPLE LABELING

Prior to beginning field-sampling activities each day, a designated member of the sampling team will fill out sample labels as completely as possible. The date, time, sampler's signature, and the last field of the sample identification number should not be completed until the time of sample collection. All sample labels shall be filled out using waterproof ink. At a minimum, each label shall contain the following information:

- Sampler's company affiliation
- Site location
- Sample identification code (i.e., CAB - SB02 - 018)
- Date and time of sample collection
- Analyses required
- Method of preservation (if any) used
- Sample matrix (i.e., soil, groundwater, surface water)
- Sampler's signature or initials

An example of a completed sample label is attached.

13.4 SAMPLE HANDLING

This section discusses proper sample containers, preservatives, and handling and shipping procedures. The WP summarizes the information contained in this section and also includes the sample holding times for each analyte.

13.4.1 Sample Containers

Certified, commercially clean sample containers shall be obtained from the contract analytical lab. The contract laboratory shall label the bottles to indicate the type of sample to be collected. Required preservatives shall be prepared and placed in the bottles at the laboratory prior to shipment to the site.

Appropriate sample containers for the specific analyses required are listed in the project-specific WP.

13.4.2 Sample Preservation

Sample preservation efforts shall commence at the time of sample collection and will continue until analyses are performed. Samples will be stored on ice at 4°C in coolers immediately following collection. The ice will be double bagged in Zipper-Lock-type storage bags. Additional sample preservation requirements are given in the WP. Chemical preservatives, if necessary, shall be added to the sample containers by the laboratory prior to shipment to the field, unless otherwise specified in the WP.

13.4.3 Sample Handling and Shipping

After collection, sample labels will be completed as described in Section 1.2 and samples stored on ice at 4°C in an insulated cooler. The ice will be double bagged in Zipper-Lock-type storage bags.

The sample containers will be placed in reclosable Zipper-Lock-type plastic storage bags and wrapped in protective packing material (bubble wrap). Samples will then be placed right side up in a cooler with ice (double bagged using plastic bags), taped with a custody seal for delivery to the laboratory. Samples will be hand delivered or shipped by overnight express carrier for delivery to the analytical laboratory. All samples must be shipped for laboratory receipt and analyses within specific holding times. This may require daily shipment of samples with short holding times. A chain-of-custody (COC) form will accompany each cooler. The temperature of all coolers will be measured upon receipt at the laboratory.

13.4.4 Holding Times and Analyses

The holding time is specified as the maximum allowable time between sample collection and analysis and/or extraction, based on the analyte of interest and stability factors, and preservative (if any) used. Allowable holding times will be listed in the WP. Samples should be sent to the

laboratory as soon as possible after collection by overnight courier service to minimize the possibility of exceeding holding times.

Chemical constituents that will be analyzed and other parameters to be measured during field investigations at Cannon AFB are identified in the WP.

13.5 SAMPLE DOCUMENTATION AND TRACKING

This section describes documentation required in the field notes and on the sample Chain-of-Custody forms.

13.5.1 Field Notes

Documentation of observations and data acquired in the field will provide information on the acquisition of samples and also provide a permanent record of field activities. The observations and data will be recorded using pens with permanent waterproof ink in a permanently bound weatherproof field log book containing consecutively numbered pages or on field sampling data sheets.

The information in the field logbook or on the data sheets will include the following as a minimum. Additional information is included in the specific SOPs regarding the data sheets.

- Project name
- Location of sample
- Sampler's printed name and signature
- Date and time of sample collection
- Sample identification code
- Description of samples (matrix sampled)
- Sample depth (if applicable)
- Number and volume of samples
- Sampling methods or reference to the appropriate SOP
- Sample handling, including filtration and preservation, as appropriate for separate sample aliquots
- Analytes of interest
- Field observations
- Results of any field measurements, such as depth to water, pH, temperature, and conductivity
- Personnel present
- Level of PPE used during sampling

Changes or deletions in the field book should be lined out with a single strike mark, initialed, and remain legible. Sufficient information should be recorded to allow the sampling event to be reconstructed without relying on the sampler's memory.

Each page in the field books will be signed by the person making the entry at the end of the day, as well as on the bottom of each page. Anyone making entries in another person's field book will sign and date those entries.

13.5.2 Sample Chain-Of-Custody

During field sampling activities, traceability of the sample must be maintained from the time that the samples are collected until laboratory data are issued. Initial information concerning collection of the samples will be recorded in the field logbook as described above. Information on the custody, transfer, handling, and shipping of samples will be recorded on a COC form. An example COC form is attached. The COC is a three-part carbonless form.

The sampler will be responsible for initiating and filling out the COC form. The sampler will sign the COC when the sampler relinquishes the samples to anyone else. One COC form will be completed for each cooler of samples collected daily. The COC will contain the following information:

- Sampler's signature and affiliation
- Project number
- Date and time of collection
- Sample identification number
- Sample type
- Analyses requested
- Number of containers
- Signature of persons relinquishing custody, dates, and times
- Signature of persons accepting custody, dates, and times
- Method of shipment
- Shipping air bill number (if appropriate)

The person responsible for delivery of the samples to the laboratory will sign the COC form, retain the last copy of the three-part COC form, document the method of shipment, and send the original and the second copy of the COC form with the samples. Upon receipt at the laboratory, the person receiving the samples will sign the COC form and return the second copy to the Project Manager. Copies of the COC forms documenting custody changes and all custody documentation will be received and kept in the central files. The original COC forms will remain with the samples until final disposition of the samples by the laboratory. The analytical laboratory will dispose of the samples in an appropriate manner 60 to 90 days after data reporting. After sample disposal, a copy of the original COC will be sent to the Project Manager by the analytical laboratory to be incorporated into the central files.

URS

12120 Shamrock Plaza, Suite 300
Omaha, NE 68154

Phone: (402) 334-8181
Fax: (402) 334-1984

Project:	**Supplemental Assessment AOCs A, B, & C**		
Sample ID:	**CAB-SB02-018**		
Analysis:	**VOCs**		
Preservative	**4°C**	Date:	**0-0-00**
Samplers:	**JV, UG**	Time:	**1300**

FIGURE 1

DAILY QUALITY CONTROL REPORT

Supplemental Assessment AOCs A, B, & C
Cannon AFB

Date _____

Day	S	M	T	W	TH	F	S

USACE Project Manager _____
Project _____
Project No. _____
Contract No. _____

Weather	Bright Sun	Clear	Overcast	Rain	Snow
Temp	To 32	32-50	50-70	70-85	85 up
Wind	Still	Moderate	High	**Report No.**	
Humidit	Dry	Moderate	Humid		

Subcontractors on Site:

Equipment on Site:

Visitors on Site:

URS Personnel on Site:

Field Work Performed (including sampling):

Quality Control Activities (including field calibration):

Health and Safety and Activities:

Observations/Problems Encountered/Corrective Action Taken:

By **Title**

FIGURE 2

DAILY QUALITY CONTROL REPORT

Supplemental Assessment AOCs A, B, & C
Cannon AFB

Date _____

Day	S	M	T	W	TH	F	S

USACE Project Manager _____
Project _____
Project No. _____
Contract No. _____

Weather	Bright Sun	Clear	Overcast	Rain	Snow
Temp	To 32	32-50	50-70	70-85	85 up
Wind	Still	Moderate	High	**Report No.**	
Humidity	Dry	Moderate	Humid		

Subcontractors on Site:

Equipment on Site:

Visitors on Site:

URS Personnel on Site:

Field Work Performed (including sampling):

Quality Control Activities (including field calibration):

Health and Safety and Activities:

Observations/Problems Encountered/Corrective Action Taken:

By **Title**

FIGURE 2

URS Corporation

12120 Shamrock Plaza Suite 300, Omaha, NE 68154 (402) 334-8181 Fax (402) 334-1984

CHAIN OF CUSTODY RECORD

Project Name	Project No.
Project Location	Project Manager
Sampler(s)	

Sample		Type		Sample Identification	Matrix	Containers		Analytical Parameters										Remarks
Date	Time	Comp.	Grab			No.	Type											

Signatures	Date	Time	Shipping Details	Special Instructions
Relinquished by:			Method of Shipment	
Received by:			Airbill No.	
Relinquished by:			Lab Address	
Received for Laboratory by:				

Custody.frm/jdg 3-09-92

White copy - Laboratory Yellow copy - Laboratory Pink copy - WCC

116917

14.1 PURPOSE AND SCOPE

The purpose of this document is to define the standard operating procedure (SOP) for completing trenches at Cannon AFB. Trenches may be excavated at suspected or known burial areas to identify the lateral and vertical extent of waste disposal and to characterize these materials both chemically and physically. Field personnel will not enter the trenches at any time. This procedure is to be used with project-specific Work Plan (WP) and the other SOPs. Applicable SOPs are listed below:

- SOP No. 11 Equipment Decontamination
- SOP No. 13 Sample Identification, Handling, Documentation Shipping and Tracking.
- SOP No. 15 Headspace Analysis
- SOP No. 19 En Core® and Terra Core™ Sampling Methods

14.1 PROCEDURES FOR TRENCHING

Trenches will be excavated using a trackhoe that can excavate to depths of at least 20 feet. Topsoil and overburden will be kept separate from deeper (greater than 10 feet bgs) subsurface soil. After completion of the trench, excavated materials will be returned to the trench in the order they were removed, with topsoil being replaced last. The materials should be tamped using the backhoe (or trackhoe) during backfilling. Trenches excavated more than 2 or 3 feet deep should not exceed one bucket width.

14.1.1 Equipment List

The following list of equipment will be needed to complete trenching activities at Cannon AFB:

- Trackhoe
- Measuring tape
- Field logbook/sample collection field sheets (SCFS)
- Trench log form for lithologic logging
- Trash bags
- Plastic sheeting
- Photoionization detector (PID)
- En Core ® or Terra Core™ soil sampling equipment
- Aluminum foil and headspace jars
- Stainless steel knife, bowl and spoon
- Sample bottles (provided by the laboratory)

- Sample bottle labels
- Label tape (clear)
- Paper towels
- Camera and film
- Water proof and permanent marking pens
- Wooden stakes for marking trench locations
- Appropriate health and safety equipment as specified in the Health and Safety Plan (HSP)
- Appropriate decontamination supplies as specified in SOP No. 11
- Ice chest with ice

14.1.2 Decontamination

Before trenching begins, all excavating equipment will be decontaminated according to the procedures contained in SOP No. 11. The excavating equipment will be decontaminated between trench locations and between sites.

14.1.3 Trenching Procedures

- Obtain all necessary utility clearances and digging permits prior to initiating trenching activities. If additional trenching locations will be selected based on what is found after trenching has been initiated, entire areas that may be trenched should be cleared and all utilities marked if possible, to avoid delays in obtaining clearances for subsequent trenches.
- Decontaminate all excavating equipment according to SOP No. 11.
- Make final check of trench location and utility clearances.
- Don a clean pair of nitrile gloves.
- Begin trenching. During trenching, separate all topsoil from subsoil and fill materials.
- Obtain PID readings from the backhoe bucket and excavated area during excavation.
- Collect soil analytical samples directly from the backhoe bucket. At no time should field personnel enter the trench for sampling. Immediately collect any required volatile organic compound (VOC) sample using the En Core® or Terra Core™ sampler (see SOP No. 19), and then collect a sufficient soil volume for head space analysis (see SOP No. 15).
- Using a stainless steel spoon, scoop soil from the backhoe bucket into a large, clean, stainless steel bowl. Fill the bowl three quarters full of excavated soil and composite by thoroughly mixing and blending the soil to a homogenized appearance. Once homogenized, fill all remaining soil sample containers with composited soil for any remaining analytical parameters. The required analyses and appropriate volumes and sample containers are presented in the project-specific WP.

- Complete trenching log, using Unified Soil Classification System (USCS) for logging materials encountered.
- Label, store, transport, and document soil samples collected according to SOP No. 13.
- Complete photographic documentation as necessary.
- Backfill the trench, replacing the excavated materials in the order in which they were removed, with subsurface soil and fill materials first and topsoil last.

During trenching, the excavating equipment should be placed upwind of the trench to limit potential exposure of the equipment operator to dust and other materials.

14.1.3.1 Collecting Soil Analytical Samples

VOC soil samples will be collected using the En Core® or Terra Core™ sampling method. Three 5-gram samplers will be filled for each VOC sample. Once VOC samples have been collected, the remaining soil will be composited. If required, semivolatile organic compound (SVOC) samples will be collected first from the composite soil, with any remaining parameters collected after that. Other sample containers for analytical parameters will be specified in project-specific WPs.

14.2 FIELD QUALITY ASSURANCE/QUALITY CONTROL SAMPLES

Field quality assurance/quality control (QA/QC) samples are designed to help identify potential sources of external sample contamination and evaluate potential error introduced by sample collection and handling. All QA/QC samples are labeled with QA/QC identification numbers and sent to the laboratory with the other samples for analyses.

14.2.1 Field Blanks and Trip Blanks

Field blanks are QC samples that check for potential external contamination of samples. A trip blank serves as a check on sample contamination originating from the container or sample transport. For Cannon AFB field investigations, field blanks and trip blanks are not required for soil sampling activities.

14.2.2 Duplicate Samples

Duplicate samples are samples collected to assess precision of sampling and analysis. For trench excavation soil sampling, duplicate samples will be collected at the same time as the initial samples. The initial sample bottles for a particular parameter or set of parameters will be filled first, then the duplicate sample bottles for the same parameter(s), and so on until all necessary sample bottles for both the initial sample and the duplicate sample have been filled. The duplicate samples will be handled in the same manner as the primary samples. The duplicate samples will be assigned a QA/QC identification number , stored in an iced cooler, and shipped to the laboratory on the day they are collected. Duplicate samples will be collected for all parameters. For soil samples, following collection of VOC samples, the remaining soil in the

sampler will be composited and containerized for nonvolatile analyses. Duplicate samples will be blind to the laboratory.

14.2.3 Matrix Spikes and Matrix Spike Duplicates

Matrix spikes (MS) and matrix spike duplicates (MSD) are used to assess the potential for matrix effects. Samples will be designated for MS/MSD analysis on the chain-of-custody form and on the bottles. It may be necessary to increase the sample volume for samples where this designation is to be made.

14.2.4 Sample Identification, Handling, and Documentation

Samples will be identified, handled and recorded as described in this SOP and SOP No. 13. The parameters for analysis and preservation will be presented in the project-specific WPs.

14.3 DOCUMENTATION

Each field activity must be properly documented to facilitate a timely and accurate reconstruction of events in the field (see SOP No. 13).

14.3.1 Field Logbook

The most important aspect of documentation is thorough, organized, and accurate record keeping. All information pertinent to the investigation and not documented on the boring log will be recorded in a bound logbook with consecutively numbered pages. All entries in logbooks will be made in waterproof ink and corrections will consist of line-out deletions that are initialed and dated. Entries in the logbook will include the following, as applicable:

- Project name and number
- Sampler's name
- Date and time of trenching activities and sample collection
- Trench and sample number, location, width and depth
- Sampling method
- Trenching equipment make and model number
- Observations at the trenching site
- Unusual conditions
- Information concerning trenching decisions
- Decontamination observations
- Weather conditions
- Names and addresses of field contacts

- Names and responsibilities of field crew members
- Names and titles of any site visitors
- Location, description, and log of photographs (if taken)
- References for all maps and photographs
- Information concerning changes, scheduling modifications, and change orders
- Summary of daily tasks (including costs) and documentation on any cost or scope of work changes required by field conditions
- Signature and date by personnel responsible for observations

Field investigation situations vary widely. No general rules can include each type of information that must be entered in a logbook for a particular site. A site-specific logging procedure will be developed to include sufficient information so that the sampling activity can be reconstructed without relying on the memory of field personnel. The logbooks will be kept in the field team member's possession or in a secure place during the investigation. Following the investigation, the logbooks will become a part of the final project file.

14.3.2 Trench Logs

Qualified personnel (geologist, geological engineer, or geotechnical engineer) will complete trench logs for each trench or series of trenches. The trench log will be recorded in the log book.

Trench logs will include the following information:

- Trench location
- Trench identification
- Excavating agency and equipment operator
- Excavating equipment and method
- Date started and completed
- Completion length, width and depth
- Depth to groundwater if encountered
- Name of person logging hole
- Description of materials encountered by depth including soil or rock type, moisture content, color and Unified Soil Classification
- Field screening results for breathing zone and trench with PID
- Samples collected for laboratory analysis (including sample depth, type, identification and analyses requested).
- Origin of the lithologies (fill, loess, glacial till, glacial outwash, alluvium or colluvium, etc.)

- Other remarks or observations

15.1 PURPOSE AND SCOPE

This document defines the Standard Operating Procedure (SOP) for performing headspace analysis of soil and water samples in the field at Cannon Air Force Base (AFB) and gives the description of equipment and procedures for field screening of soil and water samples. Sample locations and frequency of collection will be presented in the project-specific Work Plan (WP).

Applicable SOPs are listed below:

- SOP No. 4 – Subsurface Drilling and Soil Sampling

15.2 HEADSPACE ANALYSIS

15.2.1 Equipment List

The following equipment is required for headspace analysis:

- Clean glass sample containers with lids
- Paper towels
- Aluminum foil
- Organic vapor analyzer equipped with a photoionization detector (PID)
- Field book
- Waterproof and permanent marking pens

15.2.2 Field Screening Procedures

A portion of each shallow surface soil sample and each subsurface soil sample collected for lithologic logging purposes will be placed in the appropriate glass container for headspace analysis. The container should be filled approximately one-half full. The mouth of the container will be covered with aluminum foil, tightly capped, and the sample matrix will be allowed to equilibrate with the headspace for 30 minutes. Care must be taken in the selection of soils with respect to consistency and sample placement in the container in order to achieve comparability and consistency in the results. The disposition of the sample in the container will be recorded in the field logbook.

The sample headspace in the container shall be analyzed with an organic vapor analyzer by removing the lid and inserting the instrument probe through the foil liner. Care must be taken in the selection of appropriate foil, placement of the foil on the container, and removal of the lid so as not to compromise the integrity of the seal. If the seal has been compromised, this will be recorded appropriately or a new sample taken if possible.

15.2.3 Organic Vapor Analyzer Selection

The selection of the appropriate organic vapor analyzer equipped with either a PID shall be based on contaminants of concern and/or ambient conditions at the respective site. The lamp selected for the PID, where applicable, will be based on the relative ionization potentials of the expected volatile contaminants. The selected instrument will be recorded on the Daily Quality Control Report (DQCR) and in the field logbook. It is anticipated that a PID detector will be used for most or all of the work at Cannon AFB.

15.2.4 Calibration

The instrument(s) selected for use in accordance with data quality objectives and site requirements will be calibrated according to the manufacturer's recommendations and specifications. These requirements include a calibration gas of isobutylene (100ppm) to be applied to the PID on a daily basis, to check accuracy of the instrument.

15.2.5 Documentation

All procedures and field conditions shall be recorded on the sample collection field sheet (SCFS) and in the field logbook. The record shall include a description of the material being screened as well as site conditions such as humidity and the equilibration time and temperature.

16.1 PURPOSE AND SCOPE

This document defines the Standard Operating Procedure (SOP) for abandoning borings at Cannon Air Force Base (AFB) and gives descriptions of equipment and field procedures necessary to abandon borings. Applicable SOPs are listed below:

Applicable SOPs are listed below:

- SOP No. 4 - Subsurface Drilling and Soil Sampling

16.2 BORING ABANDONMENT PROCEDURES

16.2.1 Equipment List

The following is an equipment list for boring abandonment:

- Portland cement (type I or II) and powdered bentonite for grouting
- Potable water
- Drill rig or portable grout station
- Logbook
- Boring log sheets
- Waterproof and permanent marking pens
- Tremie pipe
- Appropriate health and safety equipment

16.2.2 Abandonment Procedures

Following completion of the borings each boring must be abandoned and plugged to provide a low-permeability zone that would retard movement of water through the boring backfill.

The boring will be backfilled with a fluid cement/bentonite grout pumped into the boring. The grout mixture will consist of type 1 or type 2 Portland cement with 6 to 8% by weight bentonite powder added to not more than 7 gallons of potable water. The grout will be prepared in an aboveground rigid container by first thoroughly mixing the cement and water before adding the bentonite powder. Pump the grout mixture into the base of the boring using drill rods or tremie pipe placed through the center of the augers. Initially place the tremie pipe 1 foot above the bottom of the boring. Pump grout into the boring maintaining a positive head of grout within the central core of the augers at all times. Pull the augers and tremie pipe incrementally until the boring is grouted to the ground surface. After the grout has set for 24 hours check the boring for settlement. Add grout as required to refill the boring.

16.2.3 Pavement Repair

Where borings penetrate surface pavements, walkways or sidewalks, it will be necessary to patch the pavement surface following backfilling. Concrete pavements should be filled with low slump (less than 4 inches) concrete mix. Asphaltic concrete pavements should be filled with asphaltic concrete patch mix and thoroughly compacted by ramming. The surface of any patch should be screeded level upon completion. In freezing weather the concrete mix must be protected from freezing for 48 hours after placement.

16.2.4 Documentation

Observations and data acquired in the field during boring abandonment will be recorded to provide a permanent record. These observations will be recorded with waterproof black ink in a bound weatherproof field book with consecutively numbered pages.

A boring log will be completed for each boring with the observations recorded in the field book. A note shall be placed on the boring log that the boring was abandoned and backfilled with hydrated bentonite chips or grouted with a cement/bentonite mixture to the ground surface or the pavement subgrade. The type of material used to patch the pavement surface will also be noted on the boring log and the field book.

17.1 PURPOSE AND SCOPE

This document defines the Standard Operating Procedure (SOP) for obtaining permits and clearances at Cannon Air Force Base (AFB). Permits and clearances are required for underground utilities (drilling, hand augering, excavating, etc.), for plant security, and for use of hot equipment such as welders and steam cleaners.

17.2 CONTRACTORS BADGES, VEHICLE PASSES, AND CAMERA PASSES

17.2.1 Contractor Identification

Prior to the initiation of each field investigation, URS personnel and all subcontractors onsite will be identified to appropriate personnel within the 27th Civil Engineer Squadron's Environmental Flight (27 CES/CEV). 27 CES/CEV will make all arrangements to notify Base personnel and security of the pending field investigation. It is likely that onsite URS personnel and subcontractors will be issued Base visitor passes, which they will be required to have with them at all times while on Base. In addition, all URS personnel and URS subcontractors may be required to attend a safety briefing provided by the Base.

17.2.2 Vehicle Passes

All vehicles that enter the Base must be registered at the Main Gate, and obtain and display a vehicle permit tag from security the Base. The vehicle registration applicant will need to furnish proof of insurance, rental agreement (if applicable), a valid drivers license, and the contract number to register a vehicle. The tag shall be displayed in the lower driver's side corner of the windshield.

17.2.3 Hot Work Permit

Cannon AFB may require "Hot Work" permits for operating equipment such as drill rigs, pavement-coring devices, welding devices, steam cleaners, etc. These permits will be obtained and recorded as required.

17.3 UTILITY CLEARANCES

Digging permits will be obtained for all subsurface drilling activities prior to initiating the work. Digging permits will be obtained through the appropriate U.S. Air Force representative. When any intrusive work is being performed in the vicinity of utility and/or communication cables/lines, Civil Engineering and/or Communication monitoring personnel, as required, will be present. No mechanical digging shall be performed within five feet on each side of utilities and/or communication line(s) until they are physically exposed by hand digging. If a utility and/or communication line is damaged, the designated representative of the U.S. Air Force shall be notified immediately for further directions.

Notice will be given to the monitoring personnel no later than 24 hours prior to work. No work shall start if the required monitoring personnel are not present.

19.1 PURPOSE AND SCOPE

The purpose of this document is to define the Standard Operating Procedure (SOP) for collecting soil samples at Cannon Air Force Base (AFB) using the EnCore® or Terra Core sampling method. This SOP describes the equipment, field procedures, and Quality Assurance/ Quality Control (QA/QC) procedures implemented for the using the EnCore® or Terra Core Sampler.

This SOP is intended to be used together with the project-specific Work Plan (WP) and other appropriate SOPs. Health and safety procedures and equipment for the investigation are detailed in the project Site Safety and Health Plan (SSHP). Applicable SOPs are listed below:

- SOP No. 4 – Subsurface Drilling and Soil Sampling
- SOP No. 11 – Equipment Decontamination

19.2 PROCEDURES FOR SAMPLING USING THE EN CORE® SAMPLER

The EnCore® Sampler is a single use device and cannot be cleaned and/or reused. The EnCore® sampler is designed to store soil. Do not use the EnCore® sampler to store solvent or free product. The samplers to be used are 5-gram samplers.

To ensure sufficient sample volume, three 5-gram EnCore® samplers will be collected from each sampling interval. If the sample from a given interval will undergo laboratory analysis, all three samplers from that interval will be sent to the laboratory. Otherwise, if the sample will not undergo laboratory analysis, all three samplers from that interval will be disposed of as investigation-derived waste.

19.2.1 Equipment List

The following list of equipment will be need to collect soil samples for VOC analysis using the EnCore® Sampler:

- Disposable 5-gram EnCore® samplers in zipper bags
- T-handle Sampler
- Zipper lock-type storage bags
- Sampler label
- Cooler with ice
- Field logbook

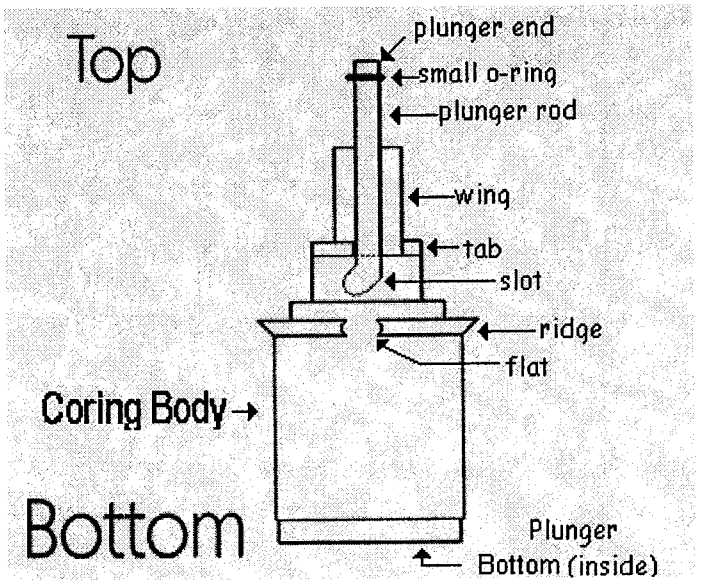
19.2.2 Decontamination

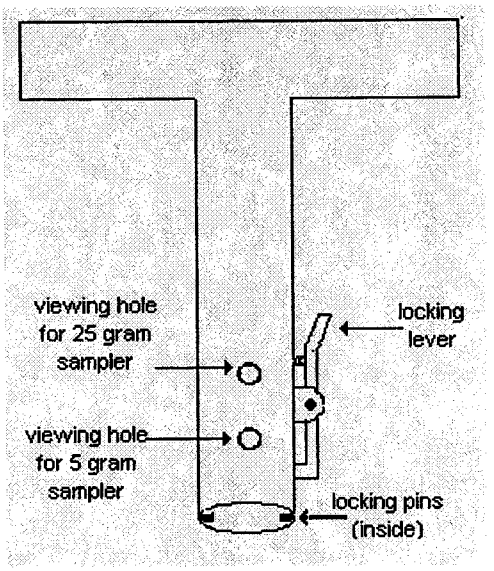
Before sampling begins, the T-handle and any extensions will be decontaminated according to procedures contained in SOP No. 11, Equipment Decontamination. Sampling equipment

(T-handle and extension rods) will also be decontaminated between each sample collected. The plastic EnCore® samplers are intended for single use only and cannot be decontaminated.

19.2.3 Sampling Procedures for Clay Soils

Diagrams showing an EnCore® sampler and the T-handle sampling tool are shown below:

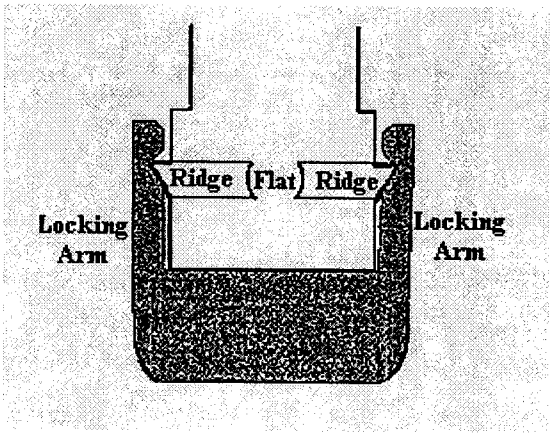




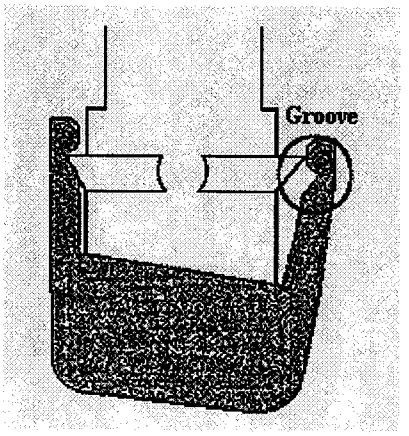
To collect a soil sample using the EnCore® sampler, follow the steps listed below:

- Hold the coring body and push the plunger rod down until the small o-ring rests against the tabs. This will assure that the plunger moves freely.
- Depress the locking lever on the EnCore® T-handle. Place the coring body, plunger end first, into the open end of the T-handle, aligning the two slots on the coring body with the two locking pins in the T-handle. Twist the coring body clockwise to lock the pins in the slots. Check to ensure the sampler is locked in place. The sampler is now ready for use.
- Turn the T-handle with T-up and the coring body down. This positions the plunger bottom flush with the bottom of the coring body (make sure the plunger bottom is in position). Using the T-handle, push the sampler into the soil until the coring body is completely full. When full, the small o-ring will be centered in T-handle viewing hole (see T-handle diagram). Remove the sampler from the soil and wipe excess soil from the coring body exterior.
- Cap the coring body while it is still on the T-handle by pushing the cap the over flat area of the ridge. Push and twist the cap to lock the arm in place. The cap must be seated to seal the sampler (see diagrams below).

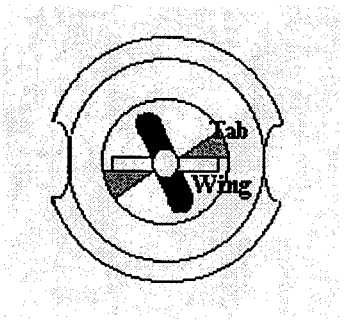
Sampler Correctly Capped: Locking arm grooves are seated over coring body.



Sampler Incorrectly Capped: Cap appears crooked; the locking arm grooves are not fully seated over coring body ridge



- Remove the capped sampler by depressing the locking lever on the T-handle while twisting and pulling the sampler from the T-handle.
- Lock the plunger by rotating the extended plunger rod fully counter-clockwise until the wings rest firmly against the tabs (see the diagram below).



- Attach a completed label (from the EnCore® sampler bag) to the cap on the coring body.
- Return the full EnCore® sampler to zipper bag. Seal the bag, place it inside a Ziploc®-type storage bag, seal the second bag, and place it on ice in the sample cooler.
- Record all appropriate information on the chain-of-custody form and in sample collection field sheet and field logbook.
- Repeat these procedures until three 5-gram samplers have been filled for a given sample.

19.2.4 Sampling Procedures for Sand

The EnCore® sampler cannot be used to directly sample sand. Sand samples must be collected using another sampling method, such as a split-spoon, hand auger or stainless steel spoon. Sand material is then pressed into the EnCore® sampler and capped.

19.3 PROCEDURES FOR SAMPLING USING THE TERRA CORE™ SAMPLER

The Terra Core™ Sampler is a single use device and cannot be cleaned and/or reused. The Terra Core™ sampler is designed to sample and momentarily hold soil before dispensing soil into sample container. The samplers to be used are 5-gram samplers.

To ensure sufficient sample volume, three 5-gram Terra Core™ samplers will be collected from each sampling interval. The soil from each Terra Core™ samplers will be placed in a separate pre-weighed Volatile Organic Analysis (VOA) vial. One VOA will contain methanol, and the other two VOA vials will contain organic free water.

19.3.1 Equipment List

The following list of equipment will be needed to collect soil samples for VOC analysis using the Terra Core™ Sampler:

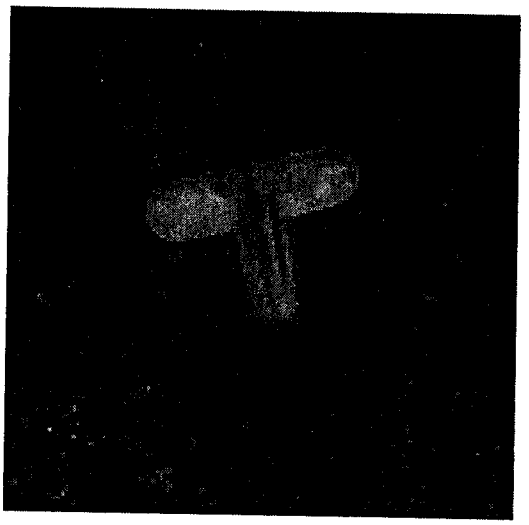
- Disposable 5-gram Terra Core™ samplers with plunger
- Zipper lock-type storage bags
- 3-40 ml pre-weighed VOA vials with magnetic stirring bar, 1 with methanol, and 2 with water
- Sample vial label
- Packing tape to secure label
- Cooler with ice
- Field logbook

19.3.2 Decontamination

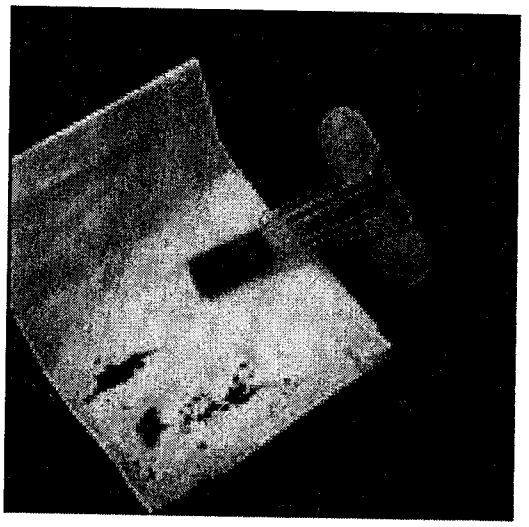
There is no decontamination needed for the Terra Core™ Samplers. The plastic Terra Core™ samplers are intended for single use only and cannot be decontaminated.

19.3.3 Sampling Procedures for Clay Soils

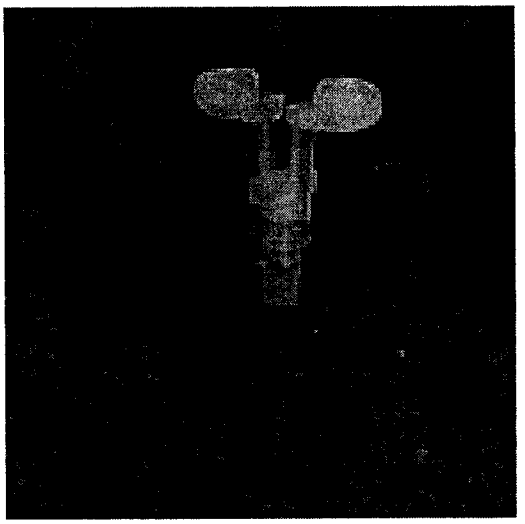
Diagrams showing an Terra Core™ sampler tool and recommended use are shown below:



- **Step 1:** Have ready a 40ml glass VOA vial containing the appropriate solvent. With the plunger seated in the handle, push the Terra Core into freshly exposed soil until the sample chamber is filled. A filled chamber will deliver approximately 5 grams of soil.



- **Step 2**: Wipe all soil or debris from the outside of the Terra Core™ sampler. The soil plug should be flush with the mouth of the sampler. Remove any excess soil that extends beyond the mouth of the sampler



- **Step 3:** Rotate the plunger that was seated in the handle top 90° until it is aligned with the slots in the body. Place the mouth of the sampler into the pre-weighed 40ml VOA vial containing the appropriate solvent, magnetic stirring bar, and extrude the sample by pushing the plunger down. Quickly place the lid back on the 40ml VOA vial.

  Note: When capping the 40ml VOA vial, be sure to remove any soil or debris from the threads of the vial. Also dispense the soil into the vial as not to allow any solvent to splash out of the vial.

- Once the soil has been dispensed into the vial. Affix the appropriate sample label to the vial and cover the label with packing tape.

- Then place the vials in a bubble wrap bag, and place in a cooler with ice.

19.3.4 Sampling Procedures for Sand

The Terra Core™ sampler cannot be used to directly sample sand. Sand samples must be collected using another sampling method, such as a split-spoon, hand auger or stainless steel spoon.

19.4 SAMPLE HOLDING TIMES

The sample holding times for the Encore® and Terra Core™ samplers are different. Both should be shipped priority overnight on the same day as collected and put in coolers with ice.

19.4.1 Encore® Sample Holding Times

The holding time for EnCore® samplers is 48 hours from the time of sample collection to extraction. Therefore, all samples collected using this method must be shipped priority overnight on the same day as collected to ensure meeting the required holding time. Once the samples are properly preserved at the laboratory there is a 14 day holding time until analysis must be completed.

19.4.2 Terra Core™ Sample Holding Times

The holding time for Terra Core™ samplers is 48 hours from the time of sample collection to storage in freezer at the laboratory. The samples should still be shipped priority overnight on the same day as collected for sample integrity, and to ensure proper sample temperatures are maintained. Once the samples are properly preserved at the laboratory there is a 14 day holding time until analysis must be completed