Mel

ENTERED

DEPARTMENT OF THE AIR FORCE
27TH SPECIAL OPERATIONS MISSION SUPPORT GROUP (AFSOC)
CANNON AIR FORCE BASE NEW MEXICO

JAN 1 1 2012

JAN 2012

Colonel David C. Piech
Commander
110 E Sextant Avenue Suite 1098
Cannon AFB NM 88103

Ms. Lane Andress
Hazardous Waste Bureau
New Mexico Environment Department
2905 Rodeo Park Drive East, Bldg 1
Santa Fe NM 87505-6063

Dear Ms. Andress

Attached are response comments to the Notice of Disapproval, Ground Water Monitoring Project Work Plan, May 2011 Melrose Air Force Range, New Mexico, for your review and approval. These responses address comments in a letter (dated 12 Oct 11) from Mr. John Kieling, Acting Chief, Hazardous Waste Bureau, New Mexico Environment Department (NMED). In addition, a revised work plan will follow upon NMED approval of responses.

If you have any questions regarding this submittal, please contact Mr. Ronald Lancaster, Chief, Asset Management Flight, at (575) 784-1146 or Mr. Matthew Higginbotham, Restoration Program Manager at (575) 784-1092.

Sincerely

DAVID C. PIECH, Colonel, USAF

Attachment:
1. Response to NMED Comments

cc:
Environmental Protection Agency, Region VI, Ms. Wendy Jacques w/o Attachments

TRINITY
ANALYSIS & DEVELOPMENT CORP.
Environmental & Engineering Services

1002 N. Eglin Parkway
Shalimar, FL 32579
Office: (850) 613-6800
Fax: (850) 613-6764

January 3, 2011

Mr. Matthew Higginbotham
ERP Manager
27 SOCES/CEAN
506 N DL Ingram Blvd
Cannon AFB, NM 88103-5003

RE: **Response to New Mexico Environment Department Comments**
Ground Water Monitoring Project Work Plan, May 2011
Melrose Air Force Range, New Mexico
USACE Contract No.: W9128F-10-D-0091, Task Order 006

Dear Mr. Higginbotham,

In response to the New Mexico Environment Department (NMED) review of the *Ground Water Monitoring Project Work Plan, May 2011, Melrose Air Force Range, Roosevelt and Curry Counties, New Mexico* and subsequent Notice of Disapproval (NOD) dated October 12, 2011, Trinity Analysis and Development Corp. (TRINITY) has provided the following response to comments.

Comment 1:

"Sections 2.1 (Project Organization and Responsibilities) through 2.1.8 (Personnel Organization and Contact Information), 3.0 (Quality Assurance Project Plan), 4.0 (Site Safety and Health Plan), and Appendices A (Laboratory Quality Assurance Manuals) through E (MSDS Sheets) were not reviewed by NMED. Remove these sections and appendices from the revised GWMWP and format the GWMWP according to the NMED online guidance document *General Reporting Requirements for Routine Groundwater Monitoring at RCRA Sites*, dated February 2003 found at http://www.nmenv.state.nm.us/hwb/dataiGeneral Reporting_Requirements_for%20Routine_GW_Monitoring.pdf for all future GWMWP submittals to NMED."

Response 1:

Sections 2.1 (Project Organization and Responsibilities) through 2.1.8 (Personnel Organization and Contact Information), 3.0, (Quality Assurance Project Plan), 4.0 (Site Safety and Health Plan), and Appendices A (Laboratory Quality Assurance Manuals), D (Activity Hazard Analysis), and E (Material Safety Data Sheets) have been removed from the main section of this Work Plan. However, due to contractual arrangements with the United States Army Corp of Engineers (USACE) and the safety of field sampling personnel it is necessary for TRINITY to include these sections of the report. As such, this information has been moved to a CD labeled "Supporting Documentation" and added as Attachment 1. Additionally, in accordance with NMED's *General Reporting Requirements for Routine Groundwater Monitoring at RCRA Sites,* dated February 2003, report appendices are to include "Field Methods." Therefore, field methodologies including Water Level

Measurement, Ground Water Sampling, and Decontamination Procedures (formerly referred to as Standard Operating Procedures) and applicable field forms are included in Appendices A and B. We understand that NMED will not review these sections of the report.

Comment 2, Section 1.9 (Project Schedule), page 1-23:
"The Permittee provides a bulleted list of scheduled field activities and reporting for the GWMWP. In the revised GWMWP, remove items listed under bullets 6 and 7 and replace text under bullet 6 with 'A *Final Annual Ground Water Monitoring Report for Melrose AFR* will be submitted to the New Mexico Environment Department for review by February 1 of each year, commencing with the report of the 2011 activities.'"

Response 2:

Cannon Air Force Base is ultimately responsible for all submittals to NMED. As such, Cannon has requested that a "Draft" form of the Annual Report be submitted for review prior to submittal of the "Final" Annual Report to NMED. Bullet number six has been updated to reflect the "Draft" document is for internal review. Bullet number seven has been updated to reflect the "Final" document is for submittal to NMED.

Comment 3, Section 2.0 (Field Sampling Activities), page 2-1:

"In Section 2.0, the Permittee provides descriptions of personnel and project organization, in Sections 2.1 (Project Organization and Responsibilities) through 2.1.8 (Personnel Organization and Contact Information). These sections were not reviewed because they do not pertain to the conducted groundwater monitoring. Remove Section 2.1 through 2.1.8 from the revised GWMWP and start Section 2.1 at Non-measurement Data Acquisition (currently Section 2.2) in the revised GWMWP."

Response 3:

Acknowledged, please see Response 1.

Comment 4, Section 2.2 (Non-measurement Date Acquisition), page 2-6:

"Section 2.2, bullet 3 states, '[n]umerous wells are located on Melrose [Air Force Range (AFR)] about which minimal well construction details are known. As additional data is discovered or made available it will be included in summary tables and utilized for the purposes of discussion.' NMED's March 11, 2011 NOD Comment 3 'noted some discrepancies in some reported well diameters and well construction materials data presented in [Table 1 - Well Construction Summary] compared to data in the 2009 Baseline Report.' The Permittee responded that 'during the fall 2010 Semiannual sampling event TRINITY personnel visited each well to collect ground water elevation, observe the condition of the well, and record well construction details. The discrepancies appear to be in the 2009 Baseline Report and not the current [Annual Groundwater Monitoring Report, December 2010]...[d]uring the spring 2011 Semiannual and Annual sampling event, TRINITY will have more time on-site and will continue to refine/correct any discrepancies between the historical table and our table to confirm the well construction details.' The Permittee must submit a complete and accurate table with the well construction details for the 2011 Annual Groundwater Monitoring Report."

Response 4:

To the best of our knowledge the information provided in the 2011 Melrose Ground Water Monitoring Project Work Plan, Table 1 (Well Construction Summary) is accurate. As stated in Section 2.1 of the revised Work Plan, "*Numerous wells are located on Melrose AFR about which minimal well construction details are known. As additional data is discovered or made available it will be included in summary tables and utilized for the purposes of discussion.*"

Comment 5, Section 2.3.1 (Water Level and Total Depth Measurements), page 2-6:

"The Permittee states that '[t]he depth to ground water will be measured from the top of well casing to the nearest 0.01 foot and always from the same reference point or survey mark on the wells casing. If there is no reference mark, the measurement will be from the north side of the casing.' The Permittee must collect all measurements from the highest point on the well casing rather than the north side if there is no reference mark. Revise the GWMWP accordingly."

Response 5:

Acknowledged, Section 2.2.1, Water Level and Total Depth Measurements, and appropriate Field Methods have been updated. If there is no reference mark, the measurement will be from the highest point on the casing.

Comment 6, Section 2.3.3.2 (Sample Collection), page 2-8 through 2-9:

"The Permittee states, '[t]here are several wells within the Annual Ground Water Monitoring Network that are used for cattle stock water supply that have dedicated submersible pumps with associated equipment installed within subsurface vaults. The majority of these wells have pressure tanks (approximately 20 gallons) to aid in providing a constant supply of water for the cattle ... [P]rior to *low-flow* pumping the spigot closest to the pump will be opened and allowed to flow at maximum flow to purge a sufficient volume from the pressure tanks.' The Permittee did not provide enough information to determine the purge volume of the cattle stock wells. The Permittee must submit well construction details, including the pressure tank volumes for the stock wells, for all wells to determine the appropriate purge volume for each well (see Comment 4). For the 2011 sampling events, the Permittee must purge three well volumes from each cattle stock well to ensure that formation water is sampled. Revise the GWMWP accordingly."

Response 6:

As discussed in Comment/Response 4, insufficient well construction details are available to accurately calculate the volume of water needed to be purged from the cattle livestock supply wells. A worse case condition was used to calculate an approximate purge volume. Based on these calculations, approximately 100 to 350 gallons of water was purged from the wells during the most recent sampling events. Additionally, stabilization parameters (dissolved oxygen, conductivity, turbidity, etc.) were collected during purging. As the cattle livestock supply wells are all utilized frequently, representative ground water is typically pumped almost immediately based on the relatively immediate field parameter stabilization.

Comment 7, Section 2.3.3.5 (Decontamination Procedures):

"The Permittee states, '[a]ll reusable equipment that comes in contact with potentially contaminated water or other material will be decontaminated prior to use at each sampling

location. All equipment will be thoroughly decontaminated before use and between sampling locations. [Standard operating procedures (SOPs)] for equipment and personnel decontamination were developed in general accordance with guidance provided by NMED and are detailed in SOP No. 3 (Appendix B).' NMED does not review SOPs. The Permittee must fully describe the proposed decontamination procedures in the appropriate section of the revised GWMWP."

Response 7:

Please see Response 1. Additionally, in accordance with NMED's *General Reporting Requirements for Routine Groundwater Monitoring at RCRA Sites* the Appendix of the report is to include "Field Methods." Appendix A of the 2011 Work Plan has been updated and now refers to Field Methods instead of Standard Operating Procedures.

Comment 8, Section 2.3.4 (Well Abandonment), pages 2-14 through 2-15:

"In Section 2.3.4, the Permittee proposes to abandon six monitoring wells, M117MW001, M117MW002, M117MW003, M117MW004, MA02MW001S, and MA03MW001. The Permittee must submit a work plan to NMED and the New Mexico Office of the State Engineer describing the proposed activities for abandoning the monitoring wells. The monitoring wells must be abandoned in accordance with 19.27.4 NMAC (Rules and Regulations Governing Well Driller Licensing Construction, Repair, and Plugging of Wells). The Permittee must receive approval from both NMED and the New Mexico Office of the State Engineer prior to abandoning the wells."

Response 8:

NMED approved the wells for abandonment as presented in the "*Final Work Plan for Annual Groundwater Monitoring, Melrose Air Force Range, Tidewater 2010.*" Since NMED had requested the wells be abandoned and had approved the work plan, we did not think it was necessary to request additional approval. Permits/permission was obtained from the New Mexico Office of the State Engineer (OSE) and will be included in the "Melrose 2011 Annual Ground Water Monitoring Report". The wells were properly abandoned during recent field activities. The wells were abandoned in accordance with 19.27.4 NMAC (*Rules and Regulations Governing Well Driller Licensing Construction, Repair, and Plugging of Wells*). If additional well abandonment is required in the future, we will request permission from NMED prior to any field activities.

Comment 9, Section 2.6 (Investigation-Derived Wastes), pages 2-20 through 2-22:

"In Section 2.6, the Permittee describes the waste management procedures for the groundwater sampling events. The Permittee must continue to store the groundwater until the Annual Groundwater Monitoring Report has been reviewed and NMED approves the analytical results from the report. Once NMED approves the analytical results, the Permittee will be directed by NMED how to dispose of the purged wastewater. Alternately, the Permittee may dispose of purge water generated from wells where contaminants were not detected during the previous four sampling events as proposed."

Response 9:

Please note that NMED has previously stated that IDW should not be staged for more than 90 days before disposal. IDW generated during the recent groundwater sampling event has been staged on site in a sealed holding tank. Upon approval from NMED the IDW will be

disposed of appropriately. The 2011 Annual Report will be submitted to NMED no later than February 1, 2012 at which point in excess of 90 days will have elapsed. Therefore, a copy of the laboratory data and summary tables will be forwarded to NMED for approval as soon as possible. Ground water generated during previous sampling events was picked up for disposal by Eco-logical Environmental Services, Inc. at the Southwest Landfill in Canyon, Texas. Copies of the waste manifests and disposal records will be included in the 2011Melrose Annual Ground Water Monitoring Report.

Comment 10, Figure 1-5 (Median Ground Water Flow Direction, 2002 to 2003 (USGS)):

"Figure 1-5 depicts groundwater flow directions from water level measurements collected between 2002 through 2003 by USGS. However, Figures 8 (Ground Water Flow Map, 1-14-2009 to 1-16-2009) and 9 (Ground Water Flow Map, 10-24-2010 to 11-3-2010) from the Annual Ground Water Monitoring Report dated December 2010 depict current groundwater flow direction. Combine the information from Figures 8 and 9 to provide a figure with current water level measurements that depicts the current direction of groundwater flow in the revised GWMWP."

Response 10:

It is likely that it was necessary for USGS to provide a ground water flow map with water level measurements collected from various dates between 2002 and 2003 as no one single round of water levels was collected. The ground water flow maps provided in the 2010 Annual Report represent two separate events during which a comprehensive round of water levels was collected from the shortest time period possible. The ground water flow maps provided on Figures 8 and 9 depict the direction of ground water flow at the time of data collection. It would not be practical or beneficial to combine the two flow maps.

Figure 1-5, depicting the groundwater flow direction between 2002 through 2003 was provided as support of the USGS premise that two flow systems are present, one local, and one regional (TRINITY concurs). In the local flow system, ground water in the central and southwestern part of Melrose AFR flows northeast, while regional flow is to the east to southeast across the northern part of Melrose AFR. However, Figure 1-6, Ground Water Flow Map, 10-24-2010 to 11-3-2010 is included in the revised Work Plan and depicts the most recent direction of ground water flow, as requested.

Comment 11, Figure 1-6 (Annual Ground Water Monitoring Well Network Locations):

"Figure 1-6 depicts the monitoring well locations for the annual monitoring well network. The symbols that define the monitoring wells are yellow and gray. The gray symbols define 'water levels only or scheduled for abandonment' and the yellow symbols define 'monitoring wells.' Revise the GWMWP figure to distinguish between monitoring wells as 'water levels only,' 'water levels only and scheduled for abandonment,' and 'monitoring and sampling wells.'"

Response 11:

Acknowledged, Figure 1-6 has been updated with the requested changes.

Comment 12, Figure 4-1 (Hospital Route Map) and Table 4-2 (Project Emergency Contact Information):

"Figure 4-1 and Table 4-2 are associated with Section 4.0 (Site Safety and Health Plan). NMED does not review Site Safety and Health Plans; remove these items from the revised GWMWP."

Response 12:

Acknowledged, please see Response 1.

Comment 13, Table 2-2 (Well Construction Details):

"Table 2-2 summarizes the well construction details for the monitoring wells at the Melrose Air Force Range. Under the footnotes section of the Table, it states that '[w]ells in gray scale are not sampled as part of the Annual or Semiannual Ground Water Quality Network. These wells are utilized for ground water levels or are scheduled for abandonment.' Revise Table 2-2 to distinguish between monitoring wells utilized for groundwater level measurements and those that are scheduled for abandonment."

Response 13:

Table 2-2 incorporates labels and shading to distinguish between monitoring wells utilized for groundwater level measurements and those that are scheduled for abandonment. Please see Table 2-2, column 2 and associated shading.

Comment 14, Table 2-9 (TCLP Regulatory Limits):

"Table 2-9 provides the TCLP regulatory screening levels listed in a table but there is no footnote to reference the screening levels. Provide a reference for the information in the table in the revised GWMWP."

Response 14:

A reference is provided on page 2-21, paragraph 3 citing 40 CFR 261.24. An additional reference has been added to the TCLP Regulatory Limits table, currently Table 2-8.

Upon approval of the above response to comments, TRINITY will be more than pleased to revise and reprint the *Ground Water Monitoring Project Work Plan, May 2011, Melrose Air Force Range, Roosevelt and Curry Counties, New Mexico.* If you have any questions or need further assistance, please do not hesitate to contact me at 850-613-6800.

Sincerely,
TRINITY Analysis & Development Corp.

Richard L. Burdine
Senior Vice President

TRINITY
ANALYSIS & DEVELOPMENT CORP.
Environmental & Engineering Services

1002 N. Eglin Parkway
Shalimar, FL 32579
Office: (850) 613-6800
Fax: (850) 613-6764

March 22, 2012

Mr. Matthew Higginbotham
ERP Manager
27 SOCES/CEAN
506 N DL Ingram Blvd
Cannon AFB, NM 88103-5003

RE**:** **Ground Water Monitoring Project Work Plan, May 2011**
Melrose Air Force Range, New Mexico
USACE Contract No.: W9128F-10-D-0091, Task Order 006

Dear Mr. Higginbotham,

Enclosed for your review is the revised *Ground Water Monitoring Project Work Plan, May 2011, Melrose Air Force Range, Roosevelt and Curry Counties, New Mexico.* We look forward to the New Mexico Environment Department's (NMED) final approval of the document. As discussed in the January 3, 2012 response letter to NMED's Notice of Disapproval (NOD) dated October 12, 2011 the Work Plan has been revised accordingly.

We appreciate the opportunity to work with Cannon Air Force Base and USACE to provide service to Melrose Air Force Range. If you have any questions or need further information, please call me at (850) 613-6800.

Sincerely,
Trinity Analysis & Development Corp.

Richard L. Burdine, PG
Senior Vice President

Attachment

Distribution List

Recipient	Hard Copies	Electronic Copies
Mr. Matthew Higginbotham ERP Manager 27 SOCES/CEAN 506 N DL Ingram Blvd Cannon AFB, NM 88103-5003	3	1
Ms. Karen L. Walker Geologist/GIS Specialist Ageiss, Inc. 12414 Nacogdoches, Suite 200 San Antonio, Texas 78217	0	1
Mr. Hector Santiago Project Manager Attn: CENWO-OD-RF 1616 Capitol Avenue Omaha, NE 68102-4901	0	1
Mr. John Steele Air Force Special Operations Command HQ AFSOC/A7AV 415 Independence Road Hurlburt Field, FL 32544-5244	0	1
Trinity Analysis & Development Corp. 1002 N. Eglin Parkway Shalimar, Florida 32579	0	1

MAY 2011
GROUND WATER MONITORING PROJECT WORK PLAN
MELROSE AIR FORCE RANGE
ROOSEVELT AND CURRY COUNTIES, NEW MEXICO

Prepared For:
Cannon Air Force Base
Air Force Special Operations Command (AFSOC)
27th SOCES/CEANR
Cannon Air Force Base, NM 88103-5003

Prepared By:
Trinity Analysis & Development Corp.
1002 N. Eglin Parkway
Shalimar, FL, 32579
(850) 613-6800

Under Contract To:
United States Army Corps of Engineers (USACE)
Omaha District
1616 Capitol Avenue
Omaha, NE 68102-4901

Contract Number:
W9128F-10-D-0091, Task Order 0006

March 2012

This page intentionally left blank.

CERTIFICATION PAGE

MAY 2011
GROUND WATER MONITORING
PROJECT WORK PLAN
MELROSE AIR FORCE RANGE
ROOSEVELT AND CURRY COUNTIES, NEW MEXICO

Prepared For:
Air Force Special Operations Command
Air Force Special Operations Command (AFSOC)
27th SOCES/CEANR
Cannon Air Force Base, NM 88103-5003

Prepared By:
Trinity Analysis & Development Corp.
1002 N. Eglin Parkway
Shalimar, FL, 32579
(850) 613-6800

Under Contract To:
United States Army Corps of Engineers (USACE)
Omaha District

I hereby submit that this Ground Water Monitoring Project Work Plan, May 2011, for the Melrose Air Force Range was prepared by me.

_____ 3/21/2012
Jonathan M. Kramer Date
Geologist
Trinity Analysis & Development Corp.

I hereby submit the Ground Water Monitoring Project Work Plan, May 2011, for the Melrose Air Force Range was prepared under my supervision and review. To the best of my knowledge, all of the work performed for this report is in accordance with applicable State and federal regulations and accepted professional practices.

_____ 3/21/2012
Richard L. Burdine, P.G. Date
Senior Vice President
Trinity Analysis & Development Corp.

This page intentionally left blank

TABLE OF CONTENTS

CERTIFICATION PAGE ..... **i**

TABLE OF CONTENTS ..... **iii**

LIST OF FIGURES ..... **iv**

LIST OF TABLES ..... **v**

LIST OF APPENDICES ..... **v**

LIST OF ACRONYMS AND ABBREVIATIONS ..... **vi**

1.0 INTRODUCTION **1-1**

1.1 Project Background 1-2
1.2 Project Description 1-3
1.3 Site Description and History 1-4
1.4 SWMU Descriptions & History 1-6
1.4.1 SWMU 114 – Expended Ordnance and Industrial Waste Burial Site 1-6
1.4.2 SWMU 115 – Explosives-Contaminated Burial Site (Arroyo Burial Site) 1-7
1.4.3 SWMU 117 – Domestic Waste Burial Site (Southeast of Main Building) 1-7
1.4.4 SWMU 130 – World War II Cantonment Disposal Site 1-8
1.4.5 SWMU 131 – Domestic Waste Burial Site (East of Fire Station) 1-8
1.4.6 SWMU 132 – Disposal/Burn Site (North Helicopter Pad) 1-9
1.4.7 SWMU 133 – Northwest Munitions Disposal Site (Northwest Corner of Impact Area) 1-10
1.5 Physical Setting 1-10
1.5.1 Geology 1-10
1.5.2 Hydrogeology 1-12
1.5.1 Regional Water Quality 1-14
1.5.2 Topography 1-17
1.5.3 Soils 1-18
1.5.4 Surface Water Drainage Systems 1-18
1.5.5 Climate 1-18
1.6 Potential Site Contaminants of Concern 1-20
1.7 Project Scope and Objectives 1-21
1.8 Applicable Regulations/Standards 1-21

1.9 Project Schedule 1-23
1.10 Work Plan Modifications 1-23
2.0 FIELD SAMPLING PLAN 2-1
2.1 Non-measurement Data Acquisition 2-1
2.2 Field Activities 2-1
2.2.1 Water Level and Total Depth Measurements 2-1
2.2.2 Monitoring Well Inspection 2-2
2.2.3 Ground Water Sampling 2-2
2.2.3.1 Site Specific Requirements 2-2
2.2.3.2 Sample Collection 2-3
2.2.3.3 Field and Laboratory Analysis 2-6
2.2.3.4 Sample Containers and Preservation Techniques 2-8
2.2.3.5 Decontamination Procedures 2-9
2.2.4 Well Abandonment 2-9
2.2.5 Well Head Maintenance 2-10
2.3 Field Operations Documentation 2-11
2.3.1 Field Logbook and/or Sample Field Sheets 2-11
2.3.2 Photographic Records 2-12
2.3.3 Sample Numbering System 2-12
2.3.4 Chain-of-Custody Records 2-12
2.4 Sample Packaging and Shipping Requirements 2-15
2.5 Investigation-Derived Wastes 2-15
3.0 WORKS CITED 3-1

LIST OF FIGURES

Figure 1-1 Site Location Map
Figure 1-2 Aerial Overview
Figure 1-3 Semiannual SWMU Monitoring Well Network Locations
Figure 1-4 Surface Geology of Melrose Air Force Range
Figure 1-5 Median Ground Water Flow Direction, 2002 to 2003 (USGS)
Figure 1-6 Ground Water Flow Map, 10-24-2010 to 11-3-2010
Figure 1-7 Annual Ground Water Monitoring Well Network Locations
Figure 1-8 Log-Log Plot of Sodium/Chloride Concentration Data (Embedded in text)
Figure 1-9 USGS Topographic Map of Site and Vicinity

Figure 1-10 Rainfall Summary (Embedded in text)
Figure 1-11 Wind Speed Summary (Embedded in text)

LIST OF TABLES

Table 1-1 Summary of Previous Testing Events
Table 1-2 Screening Guidelines, Laboratory Method and Reporting Limits, and PARCC Requirements
Table 2-1 Well Construction Details
Table 2-2 Semiannual - SWMU Ground Water Monitoring Network (Embedded in text)
Table 2-3 Annual Ground Water Monitoring Network (Embedded in text)
Table 2-4 Semiannual - SWMU Ground Water Monitoring Network (Embedded in text)
Table 2-5 Annual - Ground Water Monitoring Network (Embedded in text)
Table 2-6 Sample Containers and Preservation (Embedded in text)
Table 2-7 QC Extensions (Embedded in text)
Table 2-8 TCLP Regulatory Limits

LIST OF ATTACHMENTS

Attachment 1 Supporting Documents

LIST OF APPENDICES

Appendix A Forms

Water Level Data Summary
Ground Water Sample Collection Field Sheet
Monitoring Well Inspection Form
Chain-of-Custody

Appendix B Field Methods

FMs No. 1 Water Level Measurement
FMs No. 2 Ground Water Sampling
FMs No. 3 Equipment Decontamination

LIST OF ACRONYMS AND ABBREVIATIONS

°C	Celsius
°F	Fahrenheit
AFB	Air Force Base
AFR	Air Force Range
AFSOC	Air Force Special Operations Command
AOC	Area of Concern
bls	Below land surface
CEA	Asset Management Flight
CEC	cation exchange capacity
COC	chain-of-custody
DO	dissolved oxygen
DoD	Department of Defense
DQO	Data Quality Objective
EPA	Environmental Protection Agency
ERP	Environmental Restoration Program
FMs	Field Methods
ft/day	feet per day
ft/ft	feet per foot
ft/yr	feet per year
GPS	global positioning system
IATA	International Air Transport Association
IDW	investigation-derived waste
MCLs	maximum contaminant levels
mg/L	milligrams per liter
ML	silt
mph	miles per hour
mV	millivolts
NMED	New Mexico Environment Department
ORP	Oxidation Reduction Potential
PPE	personal protective equipment
QA/QC	quality assurance/quality control
RCRA	Resource Conservation and Recovery Act
RFI	RCRA Facility Investigation
RSL	Regional Screening Levels
SC	clayey sand
SC-CL	clayey sand - clay
SDG	Sample Delivery Group
SM	silty sand
SR	State Road
SVOCs	semivolatile organic compounds
SWMU	Solid Waste Management Unit
TCLP	Toxicity Characteristic Leaching Procedure
TDS	total dissolved solids

TRINITY	Trinity Analysis & Development Corp.
US	United States
USACE	US Army Corps of Engineers
USDOT	U.S. Department of Transportation
USGS	United States Geological Survey
UXO	unexploded ordnance
VOCs	volatile organic compounds
WP	Work Plan
WQCC	Water Quality Control Commission
µg/L	micrograms per liter
µm	micron

This page intentionally left blank.

1.0 INTRODUCTION

This Ground Water Monitoring Project Work Plan (WP) for the Melrose Air Force Range (AFR) has been prepared by Trinity Analysis & Development Corp. (TRINITY) on behalf of the Cannon Air Force Base (AFB) 27th Special Operations Wing (SOW) and Air Force Special Operations Command (AFSOC). The primary focus of this Ground Water Monitoring Project Work Plan is the annual and semiannual collection of ground water samples. This document is intended as a replacement for the *Final Work Plan for Annual Groundwater Monitoring, Melrose Air Force Range, New Mexico* (Tidewater, Inc., 2010).

TRINITY performed this work under contract to the US Army Corps of Engineers (USACE), Omaha District, Contract W9128F-10-D-0091, Task Order 0006. The document was prepared for submission to the New Mexico Environment Department (NMED).

In addition to the collection of representative ground water samples major components of work include the following activities:

- Collection of ground water elevations;
- Well head inspection/maintenance; and
- Abandonment of monitoring wells.

This WP describes the goals, methods, procedures, and personnel that will be used. This WP has been prepared in general accordance with the U.S. Army Corps of Engineers, *Requirements for the Preparation of Sampling and Analysis Plans*, EM 200-1-3, February 1, 2001 (U.S. Army Corp of Engineers, 2001). The following, details the format of this WP:

Section 1 – **Introduction** discusses the project authorization, defines the purpose and scope of the project, and provides a brief history and description of the site, including its military use, previous investigations performed at the site, and the types of ordnance reportedly used and recovered during previous investigations and removal actions;

Section 2 – **Field Sampling Plan** summarizes field procedures for the Melrose AFR ground water monitoring program;

Attachment 1 (CD) **Supporting Information** presents:

- **Project Organization and Responsibilities**,
- **Quality Assurance Project Plan** summarizes the data quality objective (DQO) process and describes the project quality assurance/quality control (QA/QC) procedures to be followed in the field and laboratory; and

Site Safety and Health Plan discusses the health and safety requirements and procedures for ground water sampling activities..**Appendix A** presents forms to be used during ground water sampling activities;

Appendix B presents Field Methods (FMs);

Due to contractual arrangements with the United States Army Corp of Engineers and the safety of field sampling personnel it is necessary for TRINITY to include the Project Organization and Responsibilities, Quality Assurance Project Plan, and Site Safety and Health Plan as part of this Work Plan (**Attachment 1**). We understand that NMED will not review these sections of the report.

1.1 Project Background

In 1975, the Department of Defense (DoD) established the Environmental Restoration Program (ERP) to provide guidance and funding for the investigation and remediation of historical releases of hazardous substances, pollutants, or contaminants that pose toxicological risks at military installations that may have contaminated soil, ground water, and/or surface water. The Asset Management Flight (CEA) staff at the Cannon AFB 27th SOW is administratively responsible for oversight of the ERP sites at Melrose AFR.

In accordance with a Resource Conservation and Recovery Act (RCRA) permit issued to Cannon AFB on December 30, 1994, an investigation of potential impacts that may have resulted from seven Solid Waste Management Units (SWMUs) was conducted and included a *Phase I RCRA Facility Investigation for Melrose Air Force Range* (Foster Wheeler, 1996) and a *RCRA Facility Investigation Report Addendum* (Foster Wheeler, 2003) both of which were completed and submitted to NMED. NMED reviewed the documents and provided a response dated February 1, 2006 which requested additional field investigation activities at Melrose AFR.

On May 9, 2007, the Department of the Air Force requested deferral of additional work associated with the RCRA Facility Investigation (RFI) requested by NMED for Melrose AFR. The deferral was based on to the fact that the entire Melrose AFR facility is an "*active bombing or test range*." In a letter to Cannon AFB dated June 19, 2007, NMED approved deferment of additional work stating that "…NMED will prepare a "corrective action-only" permit to be implemented once the range is closed, transferring, or transferred" (New Mexico Environment Department, 2007). When the range is deactivated additional assessment will likely be required.

1.2 Project Description

As an interim measure until the SWMUs are fully investigated, two separate monitoring well networks have been established and are sampled, as follows:

- Semiannual SWMU Ground Water Monitoring Network that currently consists of nine wells; and
- Annual Ground Water Monitoring Network that currently consists of 14 wells.

The primary focus of this Ground Water Monitoring Project Work Plan is to develop appropriate procedures for the collection of ground water samples from these two networks and document the analytical suites for each.

<u>SWMU Ground Water Monitoring Network</u>

Monitoring wells associated with the Semiannual SWMU Ground Water Monitoring Network are sampled on a semiannual basis and include:

- Four ground water monitoring wells at SWMU 114;
- Four ground water monitoring wells at SWMU 130; and
- One ground water monitoring well at SWMU 131.

<u>Annual Ground Water Monitoring Network</u>

Wells associated with the Annual Ground Water Monitoring Network are sampled on an annual basis and include:

- Fourteen wells, consisting of ground water monitoring wells and active/inactive water

supply wells.

The water quality sampling and reporting is being performed to monitor for the presence or absence of potential contaminants, gauge the effectiveness of Melrose AFR's monitoring system, provide the foundation for correction or improvement to the monitoring program as necessary, and to document Melrose AFR's influence, if any, on the area's ground water quality.

1.3 Site Description and History

Melrose AFR is a bombing and air-to-ground gunnery range under management of Cannon AFB within AFSOC. Melrose AFR is also routinely utilized for overflight of military aircraft practicing laser acquisition of ground targets. The Melrose AFR is situated approximately eight miles southwest of the village of Melrose, and located predominately in Roosevelt County with a small parcel in Curry County, New Mexico (**Figure 1-1** and **Figure 1-2**). Access to the range is achieved by traveling south from Melrose on New Mexico State Road (SR) 267 for approximately 9.3 miles, then west on Sundale Valley Road for approximately seven miles to the security gate.

During World War II, the area, described in this WP as Melrose AFR or simply "the range" was used by the United States (US) Army Air Corps (predecessor to the US Air Force) for training. It has been continuously used by the US Air Force since World War II. In 1952, the Air Force leased 7,771 acres of grassland for use as a bombing and air-to-ground gunnery range by the Tactical Air Command. Since 1952, the range has been expanded several times including land purchases and leases and currently comprises 87,925 acres. Current acreage includes Cannon AFB - owned, public domain, and restricted easement land (Foster Wheeler, 2003).

The Impact Area of the range is located northeast of a topographic feature described as the Mesa and consists of grasslands with a grid of access roads and bombing targets. The Impact Area, the area of Melrose AFR that is actively used for bombing and air-to-ground gunnery, is delineated by a historical boundary that previously delineated the extent of the entire range (**Figure 1-2**). In 1990-91, the boundary of the range was expanded through the acquisition of agricultural and range land parcels on all sides. These parcels are currently part of range property but are leased back to the prior owners for continued use as agricultural and ranch land.

Live high explosives-filled ordnance was used on the range prior to 1969. Since then, practice bombs and inert full-scale bombs have been used at the range. Practice bombs and inert bombs are known to contain only small explosive or pyrotechnic spotting charges. Additionally, live gun ammunition has been used continuously on the range for target practice.

Over the years, portions of the Melrose AFR have been used to dispose of a variety of military and industrial wastes from Melrose AFR and nearby Cannon AFB (located approximately 25 miles to the east). Wastes have included unexploded ordnance (UXO), exploded ordnance, scrap metal, paints, solvents, pesticides, herbicides, and putrescible waste (Foster Wheeler, 1996 and Foster Wheeler, 2003). Currently, the Melrose AFR RCRA permit includes seven SWMUs located within the range boundary. Five of these SWMUs have permanent ground water monitoring wells in place while two are located within portions of the Impact Area that precluded the installation of permanent wells (**Figure 1-2**). The SWMUs are described as follows:

SWMU 114 – Expended Ordnance and Industrial Waste Burial Site (Motor Pool Trenches);

SWMU 115 – Explosives-Contaminated Burial Site (Arroyo Burial Site);

SWMU 117 – Domestic Waste Burial Site (Southeast of Main Building);

SWMU 130 – World War II Cantonment Disposal Site (formerly Area of Concern (AOC) 1);

SWMU 131 – Domestic Waste Burial Site (East of Fire Station; formerly AOC 2);

SWMU 132 – Disposal/Burn Site (North Helicopter Pad; formerly AOC 3); and

SWMU 133 – Northwest Munitions Disposal Site (Northwest Corner of Impact Area; formerly AOC 4).

1.4 SWMU Descriptions & History

1.4.1 SWMU 114 – Expended Ordnance and Industrial Waste Burial Site

SWMU 114 is located in the central portion of the range approximately 750 feet north of Range Control (**Figure 1-3**). The site and surrounding area are flat with sparse desert scrub vegetation consisting of prairie grass and cactus.

The military used a series of eight unlined burial trenches at SWMU 114 to dispose of a variety of military and industrial waste from Melrose AFR and Cannon AFB. Trenches were approximately 20 to 40 feet in width, 100 to 200 feet in length and up to 40 feet in depth (Foster Wheeler, 1996 and Foster Wheeler, 2003). One trench, approximately 15 feet deep and 400 feet long is currently still open; however, it has not been used for waste disposal for many years.

Exact dates, quantities, and types of waste disposed at SWMU 114 are unknown. Between 1952 and 1962, however, drummed liquids were poured into the trenches and burned. Drums containing liquid, including possible unusable fuels, paints, sludge, and solvents may have also been placed in the trenches. For an unknown period of time, the military also disposed of an estimated 12,000 to 15,000 pounds per month of scrap metal from practice bombs and munitions in the trenches at SWMU 114. The trenches reportedly have been "cleared of ordnance, backfilled, and closed" (Foster Wheeler, 1996 and Foster Wheeler, 2003).

During the Phase I RFI, ground water was encountered at approximately 150 feet below land surface (bls). Four ground water monitoring wells were installed to assess ground water quality at SWMU 114. No organic compounds were detected at concentrations above applicable ground water standards. Elevated metals (inorganic) concentrations were detected, but attributed to high turbidity and natural conditions. Elevated anion concentrations were also attributed to natural conditions. Migration of metals from the disposal site to ground water was determined to be unlikely due to the high cation exchange capacity (CEC) of the surface and near surface soil and the alkaline nature of the formation. The Phase I RFI concluded that ground water at SWMU 114 had not been impacted by disposal activities at the site (Foster Wheeler, 1996 and Foster Wheeler, 2003).

1.4.2 SWMU 115 – Explosives-Contaminated Burial Site (Arroyo Burial Site)

SWMU 115 site lies within a small arroyo located in the south-central portion of Melrose AFR (**Figure 1-3**). SWMU 115 was used for the disposal and burial of UXO in 1989. UXO and other exploded ordnance were collected from the surrounding areas, pushed into the arroyo, and covered with a thin layer of soil. Storm water flows intermittently down the arroyo during heavy rains.

The ground surface at the site is relatively free of debris. The disposal area was 600 feet long, 15 to 20 feet wide, and 15 to 20 feet deep. The contents of SWMU 115 are believed to consist entirely of UXO and other exploded ordnance, including 750-pound and 2,000-pound bombs covered with a thin layer of soil. During the Phase I RFI, ground water was encountered approximately 25 to 30 feet bls. Ground water samples were collected utilizing direct-push technologies. No organics or explosives-related compounds were detected in ground water at the time. Elevated metals (inorganics) concentrations were attributed to elevated turbidity in the samples. The Phase I RFI concluded that ground water at SWMU 115 had not been impacted by disposal activities at the site (Foster Wheeler, 1996 and Foster Wheeler, 2003). No permanent ground water monitoring wells were installed at this site.

1.4.3 SWMU 117 – Domestic Waste Burial Site (Southeast of Main Building)

SWMU 117 is located southeast of the main Range Control building at the Melrose AFR (**Figure 1-3**). The area is within a slight depression that receives storm water runoff from the surrounding area.

This SWMU was formerly used to dispose of domestic waste from the control building, including such items as food waste and common household items. Other items possibly disposed in this area may have included used oil and grease, solvents, batteries, pesticides, and/or herbicides (Foster Wheeler, 1996 and Foster Wheeler, 2003). Disposal at the site appears to have begun around 1973 as evident in aerial photographs. The area used for disposal at SWMU 117 was approximately 300 feet by 300 feet or approximately two acres. It is a closed site and currently covered by native grasses.

Ground water was not encountered in a four borings drilled to a maximum depth of 182 feet bls during the Phase I RFI. The four borings were backfilled with grout to the top of a potential confining layer (caliche, or sediments which are strongly cemented by calcium carbonate) at approximately 41 feet bls. Ground water monitoring wells were constructed in the borings to intercept potential seasonal or transient ground water. These four wells have been dry since installation. Based on the lack of ground water and the lack of significant contamination in soil samples, it was concluded that contamination of ground water at SWMU 117 was unlikely (Foster Wheeler, 1996 and Foster Wheeler, 2003). These four wells are under contract for abandonment in 2011. The well abandonment methods are described in **Section 2.2.4**.

1.4.4 SWMU 130 – World War II Cantonment Disposal Site

SWMU 130 is located just outside the northern boundary of the Impact Area (**Figure 1-3**). SWMU 130 was formerly referred to as AOC 1. The military used SWMU 130 as a sanitary landfill during World War II, receiving waste from a cantonment area (temporary housing area for troops). No documentation exists for specific wastes disposed at the site; however, it is possible that the waste stream included domestic wastes, motor pool waste, UXO, munitions, batteries, and/or waste oil. The exact location of the disposal site is unknown; however approximately 50 acres were investigated during the Phase I RFI. Ground water was encountered at approximately 140 to 145 feet bls at SWMU 130. Four monitoring wells were installed as part of the Phase I RFI. No organic compounds were detected and only one metal (thallium) was detected at concentrations above applicable ground water standards. The elevated thallium concentration was attributed to natural conditions (Foster Wheeler, 1996 and Foster Wheeler, 2003).

1.4.5 SWMU 131 – Domestic Waste Burial Site (East of Fire Station)

SWMU 131 is located east of the Melrose AFR Fire Station and consists of approximately 0.5 acres (**Figure 1-3**). SWMU 131 was formerly referred to as AOC 2. SWMU 131 was used for disposal and/or burning of wastes; however, the type and volume of wastes is unknown (Foster Wheeler, 2003). The suspected waste stream possibly included spent fuels, motor oil, batteries,

paints, pesticides, and metals, in addition to domestic waste. Waste first appears to have been disposed of at SWMU 131 in approximately 1966.

During the Phase I RFI, two monitoring wells, one shallow and the other deep, were installed to total depths of 50 and 185 feet bls, respectively. The shallow well was installed above a confining layer (caliche) to intercept seasonal or transient ground water. The shallow well has historically been dry and is scheduled for abandonment in 2011 (**Section 2.2.4**). Ground water is present in the deep well at approximately 105 feet bls.

No organic analytes were detected in the ground water samples collected from SWMU 131 during the Phase I RFI. Selenium and thallium were reported at concentrations above applicable ground water standards; however, due to a lack of selenium or thallium in overlying soil samples it was determined that ground water had not been impacted by SWMU 131 (Foster Wheeler 1996 and Foster Wheeler 2003).

1.4.6 SWMU 132 – Disposal/Burn Site (North Helicopter Pad)

SWMU 132 is located north of the former helicopter pad at the Melrose AFR operations area (**Figure 1-3**). SWMU 132 was formerly referred to as AOC 3. This site is less than 0.5 acres. SWMU 132 was reportedly used for burning and/or disposal of unknown wastes types and quantities. Possible wastes included domestic waste, motor oil, metals, and residue from burning. Waste first appears to have been disposed of at SWMU 132 circa 1973.

During the Phase I RFI, ground water was not encountered during drilling to a total depth of 182 feet bls. The boring was backfilled with grout to the top of a potential confining layer (caliche) at approximately 50 feet bls. A ground water monitoring well was installed to intercept seasonal or transient ground water. Due to land-use (helicopter pad) the well was installed flush mounted with the ground surface. During a ground water sampling event in October 2010, it was not possible to locate the monitoring well. Over the years, grading and maintenance of the helicopter pad has resulted in the well being covered. The well was dry during the Phase I RFI (1996) and during the RFI Addendum (2003) and therefore could not be sampled then either. Based on the lack of ground water in other nearby shallow monitoring wells screened at comparable depths, this well is most likely dry. The Phase I RFI concluded that ground water

has not been impacted by the presence of SWMU 132 (Foster Wheeler, 1996 and Foster Wheeler, 2003). An attempt will be made to locate the well with global positioning system (GPS) coordinates and a metal detector, etc. and then abandoned in 2011 (**Section 2.2.4**).

1.4.7 SWMU 133 – Northwest Munitions Disposal Site (Northwest Corner of Impact Area)

SWMU 133 is located in the northwestern corner of the Impact Area. SWMU 133 was formerly referred to as AOC 4 (**Figure 1-3**). The site is flat with native scrub vegetation and areas free of vegetation. SWMU 133 was used from 1952 to 1960 for disposal of exploded ordnance and UXO.

During the Phase I RFI, ground water was encountered at approximately 112 to 127 feet bls. Ground water samples were collected from three of four borings that had been advanced utilizing direct-push technologies (water was not encountered in one of the borings). No organics were detected in the ground water samples. Concentrations of several metals (inorganics) exceeded applicable ground water standards. A pattern of increased concentrations of five of the metals from west to east across the site might suggest impacts from SWMU 133 or from naturally occurring lateral changes in bedrock (Foster Wheeler, 1996) (Foster Wheeler, 2003). Permanent ground water monitoring wells were not installed due to the location of SWMU 133 in an overflight approach route along the northern portion of the active Impact Area.

1.5 Physical Setting

1.5.1 Geology

The stratigraphic units of interest at Melrose AFR for this WP are the Chinle, Ogallala, and Blackwater Draw Formations.

The Chinle Formation (Triassic Period) is composed of red shales with interbedded sands (redbeds) deposited by low-energy streams in floodplains and deltas. The top of the Chinle Formation is marked by an erosional unconformity with up to several hundred feet of relief. It is exposed in the southernmost part of the range (**Figure 1-4**). However, drilling has indicated that the top of the Chinle Formation along the northern margin of Melrose AFR exceeds 182 feet bls

(Foster Wheeler, 1996). Typically, the top of the Chinle Formation is marked with gravel, cobble, or boulder deposits.

The Ogallala Formation (Tertiary Period) overlies the Chinle Formation and is the uppermost formation in the central and southern parts of Melrose AFR. Its thickness varies significantly across the AFR. The middle Ogallala is characterized by unconsolidated fluvial sands, silts, and clays in a fining-upwards sequence; the upper parts of the formation consist of eolian sands and silts (Hart & McAda, 1985). Except where strongly cemented by calcium carbonate (caliche), the near-surface sediments of the Ogallala Formation are loose and friable. Sediments below approximately 50 feet bls become increasingly indurated with depth, resulting in slow drilling rates and poor sample recovery. This high induration appears to have been misinterpreted, during the Phase I RFI (Foster Wheeler, 1996), as sandstone, siltstone, and claystone in areas of Melrose AFR.

Clays are found as trace to abundant matrix minerals in the Ogallala (Lee Wan and Associates, Inc., 1990). Zones of high clay content cause moderate to high CEC values. The Ogallala Formation as a whole has a relatively high CEC value, which commonly inhibits the migration of metals in ionic form.

Caliche is a major feature of the Ogallala Formation, occurring in nearly continuous to discontinuous layers throughout. The uppermost caliche, termed the "climax caliche," is exposed around playas and the bounding escarpments of the Ogallala Formation, and is locally termed "caprock." It is typically three to five feet thick. In the southwest portion of Melrose AFR, a large mesa is capped by the "climax caliche" which forms a resistant layer. Caliches that occur lower in the Ogallala Formation are platy and harder. Caliche is likely to either be thin or absent below playas. A particularly thick layer of caliche occurs between approximately 45 feet and 55 feet bls at Melrose AFR. As noted in **Section 1.4.1** through **Section 1.4.7**, several monitoring wells, all of them dry, have been installed to the top of this layer.

In the vicinity of Melrose AFR, the Ogallala Formation dips gently to the southeast; no faults or buried structural lineaments are known to exist in the area.

The Blackwater Draw Formation (Quaternary Period) overlies the Ogallala Formation in the northern part of Melrose AFR (**Figure 1-4**).

Sediments encountered during Phase I RFI drilling at Melrose AFR were predominately silts and very fine sand. Gravel, cobble, and boulder deposits normally associated with the unconformity between the Chinle and Ogallala Formations and an overlying fining upward sequence in the Ogallala Formation were not identified during RFI drilling. The silts and very fine sand encountered during drilling is likely representative of the eolian sequence of the Ogallala Formation.

1.5.2 Hydrogeology

Melrose AFR is located near the western margin of the Southern High Plains Aquifer of which the Ogallala Formation (described in **Section 1.5.1**) is the primary water-bearing unit (Langman, 2004). The Southern High Plains Aquifer forms the primary aquifer for both potable and irrigation water near Melrose AFR and throughout the eastern New Mexico region. In addition, there are several localized shallow water-bearing zones across the region used for irrigation purposes. No deeper aquifers are known to be in use in the vicinity of Melrose AFR. However, a confined water-bearing zone consisting of poorer ground water quality does occur in the Chinle Formation, underlying the Ogallala. This section describes the Southern High Plains Aquifer and the water-bearing zone in the Chinle Formation.

Within New Mexico, ground water in the Southern High Plains Aquifer is unconfined (Hart & McAda, 1985). The top of the Chinle Formation is the effective base of the High Plains Aquifer. Total aquifer thickness varies greatly in the High Plains Aquifer. In Texas and New Mexico the total aquifer thickness varies from less than 20 feet to more than 500 feet.

The ground water hydrology and water quality of the Southern High Plains Aquifer at Melrose AFR was characterized in *Ground-Water Hydrology and Water Quality of the Southern High Plains Aquifer, Melrose Air Force Range, Cannon Air Force Base, Curry and Roosevelt Counties, New Mexico, 2002-03* (Langman, 2004). Data from this report demonstrated that water levels in the Southern High Plains Aquifer at Melrose AFR declined between 1962 and the end of the study (2003). At 13 wells monitored since 1962, water levels declined between one and 18 feet during varying periods of record. As described in **Section 1.4.3** and **Section 1.4.5**, monitoring wells screened above the localized caliches (local confining unit; approximately 50

feet bls), as part of the Phase I RFI, appear to never have contained ground water (Trinity Analysis & Development Corp., 2010 and URS, June 2009).

On the basis of 1978 data, the regional ground water flow in the Southern High Plains Aquifer of the Ogallala Formation in the Melrose AFR is northeastward, and the depth to ground water ranges from 40 to 120 feet bls from southwest to northeast across the active portion of the range (Hart & McAda, 1985). Depths to ground water measured during the Phase I RFI (Foster Wheeler, 1996) varied from an average of 45 feet bls at SWMU 115 in the central part of Melrose AFR to average depths ranging from 112.5 feet bls to more than 182 feet bls at all other sites. The median ground water surface and flow direction within the regional aquifer based on depth to water measurements in 2002 to 2003 is depicted on **Figure 1-5** (Langman, 2004).

Based on data from limited aquifer testing during the Phase I RFI, hydraulic conductivities in the Southern High Plains Aquifer of the Ogallala Formation ranged from 0.001 to 0.073 feet per day (ft/day) and hydraulic gradients were between 0.007 and 0.014 feet/foot (ft/ft). Assuming an effective porosity of 25 percent, linear flow velocities at Melrose AFR appear to range from 0.01 to less than 5 feet per year (ft/yr) (Foster Wheeler, 1996).

Recharge to the Southern High Plains Aquifer is primarily through precipitation. The recharge rate has been estimated to be very low (0.5 to 0.8 inch/year) and is much lower than the discharge rate (Kearney, 1987). Because of the high evapotranspiration rate and low precipitation, recharge can only occur during cool months, when precipitation may exceed evapotranspiration, or during heavy rainfall events in which the infiltration capacity of the soil is exceeded. When the infiltration capacity of the soil is exceeded, runoff flows to playas. In this instance, the presence of the water in the playas may allow deep percolation to the aquifer. The fact that percolation has occurred is indicated by the presence of clay deposits in playas and the likelihood that caliche is thin or absent directly below the playas. Caliche is soluble in acidic rainwater and over time the solution forms percolation pathways through sediments. Discharge from the Southern High Plains Aquifer occurs through well pumping and springs located along the eroded margins. No discharging springs are known to occur on or near Melrose AFR.

Water level contours for the unconfined Southern High Plains Aquifer indicate ground water flows predominantly to the northeast from the Mesa to the Portales Valley, located in the

northeastern part of the range (**Figure 1-5**). However, the flow direction changes in the Portales Valley, indicating two flow systems are present, one local, and one regional. In the local flow system, ground water in the central and southwestern part of Melrose AFR flows northeast, while regional flow is to the east to southeast across the northern part of Melrose AFR. It appears that the direction of ground water flow reflects the contact between the Ogallala and Chinle formations, which determines ground water gradient and saturated thickness of the Southern High Plains Aquifer. The local flow-system gradient is about 1.3 percent, and the regional flowsystem gradient is about 0.1 percent. The saturated thickness of the aquifer increases as the local and regional flow systems merge. The recent ground water flow direction is depicted on **Figure 1-6**.

1.5.1 Regional Water Quality

Regional water quality in the Southern High Plains Aquifer is generally good, with total dissolved solids (TDS) ranging from 250 to 500 milligrams per liter (mg/L) (Gutentag, 1984) and fluorides ranging from 2.2 to 2.7 mg/L (William Matotan and Associates Inc., 1985). Water quality data collected from the Melrose AFR supply well (screened in the Ogallala Formation) provided by Cannon AFB in September 1995 indicated a TDS concentration of 555 mg/L and fluoride at 2.1 mg/L, indicating similar water quality. The Ogallala Formation is the primary source of water for domestic, municipal and irrigation uses in this region of New Mexico.

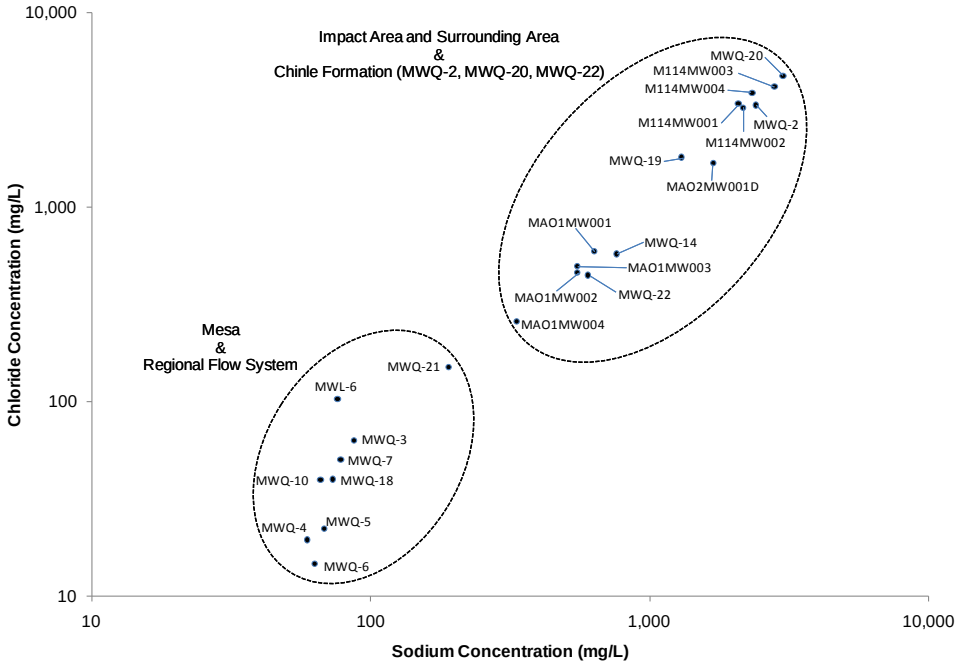
Ground water in the Chinle is of poorer quality than the Ogallala Aquifer and is generally characterized by high concentrations of TDS (<1,000 to 10,000 mg/L) and sodium (in some locales the sodium concentrations are high enough to make the ground water unusable for irrigation purposes). Uranium commonly occurs throughout the Dockum Group of which the Chinle Formation is a member and is the source for commonly elevated radium-226 and radium-228 levels in the ground water (Bradley & Sanjeev, 2003). Three ground water monitoring wells at Melrose AFR are installed in the Chinle Formation and include monitoring wells MWQ-2, MWQ-20, and MWQ-22, which are part of the Annual Ground Water Monitoring Network (**Figure 1-7**).

Results of water quality analysis indicate three areas or sources of different water types at Melrose AFR (Langman, 2004):

1. Local flow system under the Mesa and ephemeral channels;
2. Local flow system under the Impact Area; and
3. Regional flow under the Portales Valley.

Ground water quality near the Mesa was similar to that of the regional flow system and to ground water from the southern part of Melrose AFR. Based on historic and recent ground water quality analysis, ground water in the vicinity of the Melrose AFR Impact Area is a different flow system and not the same quality water as the Regional Flow System. The difference in water quality is likely attributable to the upward potential/migration of poorer quality ground water from the Chinle Formation. When all sodium/chloride concentration data available from 2004 to present is plotted a clear trend is evident. The data is plotted below (log-log scale):

Figure 1-8
Log-Log Plot of Sodium/Chloride Concentration Data



As demonstrated in the plot above, the data plotted very similar to that of the United States Geological Survey (USGS)(Langman, 2004), indicating a higher quality of water in the Mesa area and the Regional Flow System (Portales Valley) than the local flow system beneath the Impact Area.

Additionally, ion concentrations in ground water from the center of the Impact Area were similar to ground water from the underlying Chinle Formation, indicating likely connection with the deeper water-producing zone. Results of monitoring in 2004 showed that higher concentrations of dissolved solids and metals occur in the Impact Area; thereby confirming that ground water in the Impact Area is different from other ground water at Melrose AFR.

No pesticides, explosives, volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), or organic halogens were found in the ground water samples from the 2002-2003 events (Langman, 2004). Perchlorate was detected at estimated concentrations in wells MWQ-14 (2.6 micrograms per liter (µg/L)) and MWQ-15 (also referred to as monitoring well MAO2MW001D) (20 µg/L). Langman attributed the perchlorate results to analytical method interference due to elevated chloride concentrations in these samples (Langman, 2004). However, recent testing during multiple sample events appears to confirm the presence of perchlorate at low levels throughout the monitoring network (Trinity Analysis & Development Corp., 2010).

Perchlorate occurs both naturally and as a manufactured compound. At this time, most naturally occurring perchlorate appear to be geographically limited to arid environments. In contrast, man-made perchlorate sources can be many times more concentrated than most natural sources.

The results of a recent study of wells located throughout the High Plains indicate that perchlorate may be naturally occurring. The results of the study strongly indicate a surface source for the perchlorate concentrations, likely atmospheric deposition in arid and semiarid areas where evaporative concentrations and unsaturated transport may occur (Rajagopalan, Anderson, Fahlquist, Rainwater, Ridley, & Jackson, 2006). No evidence of specific activities associated with a release or discharge of perchlorate are noted, but as Melrose AFB is an active test facility range it cannot be completely precluded, however unlikely. The reported concentrations of perchlorate in monitoring wells at Melrose AFR are well within the background range discussed in the recent study which further substantiates the likelihood of this being naturally occurring (Rajagopalan, Anderson, Fahlquist, Rainwater, Ridley, & Jackson, 2006 and Trumpolt, Crain, Cullison, Flanagan, Siegel, & Lathrop, Winter 2005).

1.5.2 Topography

Melrose AFR is located in the Southern High Plains physiographic region and lies on a large plateau known as the Llano Estacado (Hawley, 1976), a nearly flat plain that slopes gently (typically 10 to 15 feet per mile) to the east and southeast from eastern New Mexico into western Texas. In eastern New Mexico, the Llano exceeds 4,000 feet above sea level (North American Vertical Datum of 1988), and elevations in the vicinity of Melrose AFR range from 4,200 to 4,650 feet above sea level (**Figure 1-9**). Streams in the region are ephemeral, and the regional drainage pattern is poorly developed. The closest named drainages to Melrose AFR are Chapman Draw, approximately two miles west of Melrose AFR, and Cañada del Tule, about two miles southeast of Melrose AFR. Chapman Draw drains to the north, and Cañada del Tule drains to the east. The surface topography of Melrose AFR slopes to the northeast and overland flow and ephemeral drainage from the area of the sites is toward the northeast and not toward either named drainage.

The most prominent geomorphic features in the vicinity of Melrose AFR are two spurs of an escarpment known as the Mesa, which rise about 200 feet above the average elevation of the surrounding surface (**Figure 1-9**). The northern spur, referred to as the West Mesa, which runs near the western side of the active Impact Area, ends in a small butte near the center and overlooks much of the facility. Various observation and communication and control facilities associated with operations at Melrose AFR are located on the butte. The eastward-trending southern spur, which bounds the southern side of the active Impact Area, is referred to as the South Mesa.

The Mesa dominates the southwestern part of Melrose AFR. It is a topographic high and is part of the Western Caprock Escarpment that defines the western boundary of the Southern High Plains Aquifer. The Mesa has a plateau area of about 7,775 acres ranging in altitude from 4,600 to 4,700 feet above sea level and forms the surface basin boundary between the Pecos River Basin to the west and the Portales Valley to the east. The Impact Area gently slopes from southwest to northeast, away from the Mesa.

1.5.3 Soils

According to the soil survey of Curry and Roosevelt Counties (USDA, 2010), surface soil types in the Melrose AFR area include loams, fine sandy loams, and loamy fine sands of the Amarillo-Clovis association and calcareous soils of the Potter-Mansker association. These soils would be classified as fine sandy silt (ML), silty fine sand (SM), clayey sand (SC), and clayey sand to silty, fine sandy clay (SC-CL) under the Unified Soil Classification System, and as aridisols (calciorthids) under the US Department of Agriculture-Soil Conservation Service Comprehensive Soil Classification System. Aridisols are characterized as having very low organic matter content, minimal vegetative production, and limited leaching. These types of soils form in arid or semi-arid climates such as Melrose AFR.

1.5.4 Surface Water Drainage Systems

Relict sand dunes and minor playas are located to the north of Melrose AFR, along the southern side of the US Highway 84, and larger playas with surface areas greater than 1/3 square mile are present one to two miles north of Melrose AFR. During periods of rainfall, the playas collect surface runoff to form ephemeral playa lakes.

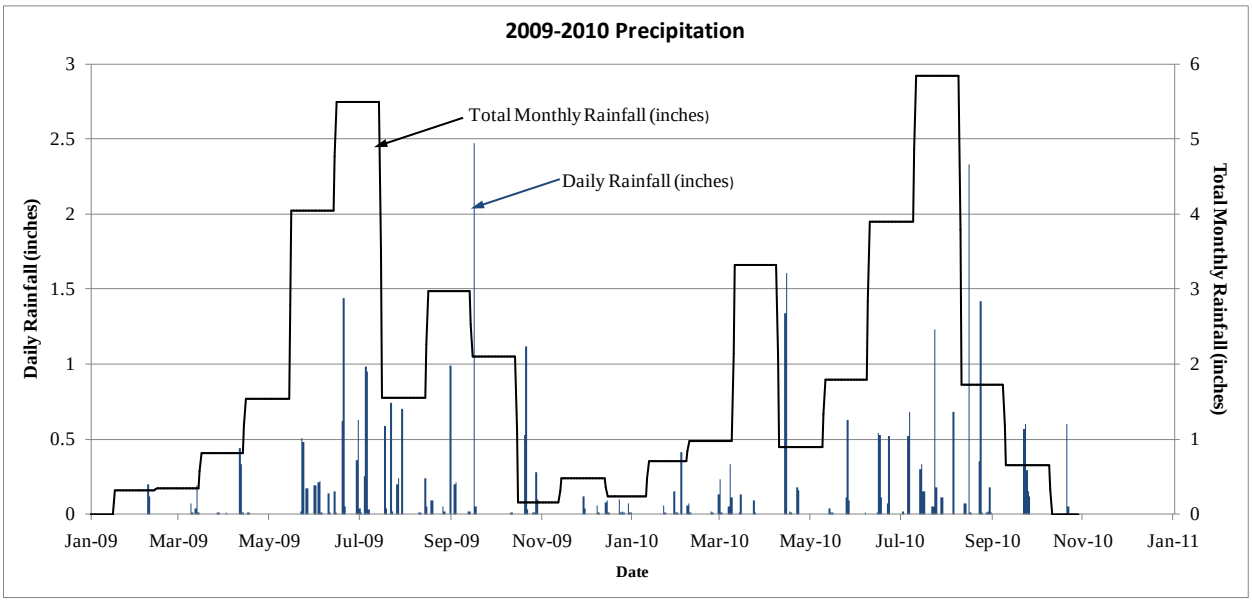
Arroyo drainage rises in the southwest corner of Melrose AFR, at the intersection of the West and South mesas, and extends about four miles to the northeast across the active Impact Area before its surface expression fades out. An impoundment formed by an earthen dam about a mile upstream of the drainage's terminus intermittently stores surface water during periods when precipitation is sufficient to generate flow. During most of the year both the arroyo and impoundment are dry. No other arroyos or other surface water bodies are located within Melrose AFR except minor ephemeral channels which originate at the Mesa and downstream (and off range) become the Chapman Draw and the Cañada del Tule.

1.5.5 Climate

The climate of the east-central New Mexico area is tropical semiarid. Based on data collected from 1914 to 2007 for the village of Melrose, the average annual minimum and maximum temperatures are 42.3 and 72.8 degrees Fahrenheit (°F); the maximum temperatures and

precipitation occur during the summer months. The Melrose area is characterized by highly variable precipitation patterns; the average monthly precipitation ranges from 0.42 inches in January to 2.91 inches in July. The average annual precipitation is 16.37 inches, and most of the precipitation is lost to evaporation. Annual pan evaporation at a weather station in Clovis, New Mexico, is 86.64 inches; evaporation is greatest between May and August (Western Regional Climate Center, 2010). On the figure below, recent local rainfall (daily and monthly) is plotted for Melrose AFR. As is evident from the chart, the site vicinity receives the majority of annual rainfall during the summer months. The total annual rainfall for 2009 and 2010 (to date) was 19.80 and 20.04 inches, respectively. Rainfall in 2009 and 2010 exceeds the annual average for the vicinity of 16.3 inches (Weather Underground, 2010). However, as the area is characterized by highly variable precipitation patterns the apparent greater than normal rainfall may not be altogether atypical.

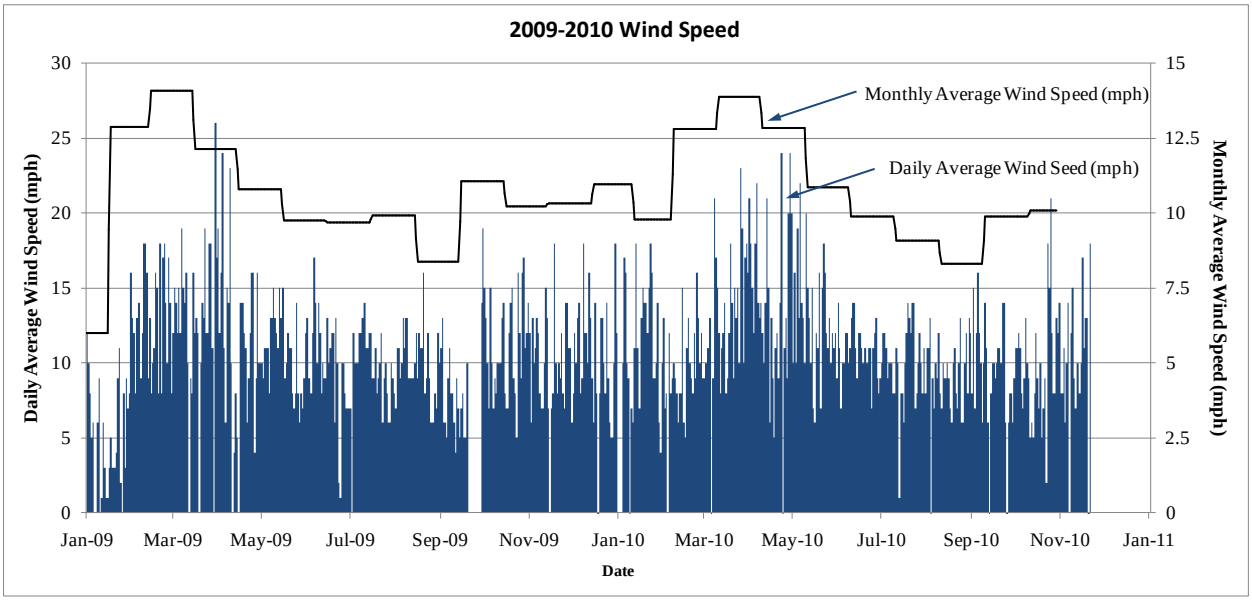
Figure 1-10
Rainfall Summary



Prevailing winds are from the west with an average speed of 8 miles per hour. Windblown dust is generated frequently in this region of the country because the winds are often gusty and the climate is semiarid. The Texas Panhandle/eastern New Mexico area is considered to have the highest dust particulate counts in the continental United States; occasionally, this windblown

dust is of sufficient quantity to restrict visibility. Most of the seasonal dust storms occur in March and April, when the average daily wind speed commonly exceeds 20 to 20 miles per hour (mph) and the average monthly wind speed approaches 15 mph (Weather Underground, 2010).

Figure 1-11
Wind Speed Summary



1.6 Potential Site Contaminants of Concern

The most recent ground water monitoring report, *Annual Ground Water Monitoring Report, December 2010, Melrose Air Force Range, Roosevelt and Curry Counties, New Mexico* discussed water quality data collected since January 2004 (Trinity Analysis & Development Corp., 2010). A summary for the sampling events since this time is presented in **Table 1-1**. It should be noted that this table is not comprehensive of all ground water sampling conducted at Melrose AFR. As additional data is discovered or made available it will be included in future summary tables and utilized for the purposes of discussion.

Based on the previous and current use of Melrose AFR, as discussed in **Section 1.3** and **Section 1.4** of this report, the following analytes are currently identified as potential contaminants of concern (Trinity Analysis & Development Corp., 2010):

- Cyanide;

- Explosives;
- Hexavalent Chromium;
- Metals;
- Nitrate and Nitrite
- Perchlorate; and
- Volatile Organic Compounds.

Additional indicator parameters include:

- Alkalinity;
- Chloride;
- Sulfate;
- TDS; and
- Field Parameters.

1.7 Project Scope and Objectives

The water quality sampling and reporting described in this WP is being performed to monitor for the presence or absence of potential contaminants, gauge the effectiveness of the Semiannual SWMU Ground Water Monitoring Network and the Annual Ground Water Monitoring Network, provide the foundation for correction or improvement to the monitoring program as necessary, and to document the site's influence on the area's ground water quality, if any.

Field activities associated with the water quality monitoring program will include the following:

- Water level and total depth measurements of wells;
- Well head inspection/maintenance;
- Ground water sampling;
- Well Abandonment; and
- Management of investigative derived waste.

1.8 Applicable Regulations/Standards

Applicable regulations and/or standards that pertain to activities associated with this work

plan are detailed below:

- This WP describes the goals, methods, procedures, and personnel that will be used. This WP has been prepared in general accordance with the USACE's *Requirements for the Preparation of Sampling and Analysis Plans* (USACE, 2001).
- Monitoring well abandonment will be conducted in accordance with *NMED, Ground Water Discharge Permit, Monitoring Well Construction, and Abandonment Guidelines, Revision 1.0, July 2008* (New Mexico Environment Department, 2008) and *Well Driller Licensing; Construction, Repair and Plugging of Wells, adopted August 31, 2005*, 19.27.4 NMAC (New Mexico Administrative Code, 2005).
- Sampling methods were developed in general accordance guidance provided by NMED (New Mexico Environment Department, year unknown).
- The following standards will be used to develop action levels for ground water:
    - The Water Quality Control Commission (WQCC) ground water standards, including alternative abatement standards (20.6.2.7.WW and 20.6.2.3103 NMAC)
    - The drinking water maximum contaminant levels (MCLs) adopted by the Environmental Protection Agency (EPA) under the Safe Drinking Water Act (42 U.S.C. §§ 300f to 300j-26),
    - Screening levels for tap water published in the *NMED Technical Background Document for Development of Soil Screening Levels, Revision 5.0* (NMED, 2009)
    - Regional Screening Levels (RSL) (EPA, 2010a; EPA 2010b)

To determine whether potential site-related contaminants exceed ground water screening guidelines the following procedure will be prioritized as follows:

1. WQCC NMAC Title 20 Environmental Protection, Chapter 6 Water Quality, Part 2 Ground and Surface Water Protections, Section 20.6.2.3103 Subsections A, B, and C values will be compared with the EPA Maximum Contaminant Levels for Drinking Water (primary and secondary). The lower value for either of these lists will be applied per analyte.
2. In the absence of a limit under the WQCC or EPA Drinking Water standards, screening levels for tap water as published in the NMED *Technical Background*

Document for Development of Soil Screening Levels, Revision 5 (NMED SSLs)(December 2009) would be applied.

3. In the event that the above lists do not have a value for a contaminant of concern, values found in the *EPA RSLs for Contaminants at Superfund Sites (May 2010)* would be used for evaluation (EPA, 2010a; EPA, 2010b).

Screening guidelines are summarized in **Table 1-2** for all potential contaminants of concern and indicator parameters.

1.9 Project Schedule

The schedule for field activities and reporting are provided below:

- The Annual - Ground Water Quality Well Network sampling will be during the spring (March -April) commencing with the Spring 2011 sampling event;
- Semiannual-SWMU GW Quality Well Network will be sampled and a complete round of water levels will be collected during the spring (March-April) and fall (September-October) commencing with the Spring 2011 sampling event;
- Abandonment of M117MW001, M117MW002, M117MW003, M117MW004, MA02MW001S, and MA03MW001 will occur in 2011;
- Well head maintenance issues will be addressed during in 2011;
- A *"Draft Annual Ground Water Monitoring Report for Melrose AFR"* will be submitted to Cannon AFB 27th SOW and the USACE for review by January 1 of each year, commencing with the report of the 2011 activities.
- A *"Final Annual Ground Water Monitoring Report for Melrose AFR"* will be submitted to Cannon AFB 27th SOW and the USACE for review by February 1 of each year, commencing with the report of the 2011 activities.

1.10 Work Plan Modifications

Changes to the work schedule or the requirement of additional work will be addressed as either an addendum to this Work Plan or as a standalone document that references this document. All

modifications to the Work Plan, including the schedule will be approved by Cannon AFB 27th SOW, USACE, and NMED before implementation.

2.0 FIELD SAMPLING PLAN

2.1 Non-measurement Data Acquisition

This section of the Work Plan describes the data required from non-measurement sources:

- The most recent report, *Annual Ground Water Monitoring Report, December 2010, Melrose Air Force Range, Roosevelt and Curry Counties, New Mexico* discussed accessible water quality data collected since January 2004 (Trinity Analysis & Development Corp., 2010). It should be noted that this is likely not comprehensive of all ground water sampling conducted at Melrose AFR. As additional data is discovered or made available it will be included in summary tables and utilized for the purposes of discussion.
- To aide in discussion, historic rainfall, wind, etc. climate data will be summarized in the Annual Reports. Recent climate data will need to be acquired from Cannon AFB, the Eastern Regional Climate Center, and sites such as Weather Underground.
- Numerous wells are located on Melrose AFR about which minimal well construction details are known. As additional data is discovered or made available it will be included in summary tables and utilized for the purposes of discussion.

2.2 Field Activities

2.2.1 Water Level and Total Depth Measurements

Prior to ground water sampling activities, a round of water levels will be collected from all accessible wells using an electronic water level indicator. Water levels will be measured in the shortest time practical to minimize the effects of water table fluctuations. Water level measurements will be documented in a field logbook and using a Water Level Data Summary (**Appendix A)**. The depth to ground water will be measured from the top of well casing to the nearest 0.01 foot and always from the same reference point or survey mark on the well casing. If there is no reference mark, the measurement will be from the highest point on the casing. The total depth of the well will be measured in the same manner and recorded in the logbook and on the Water Level Data Sheet. Field procedures for water level measurements were developed in

general accordance with guidance provided by NMED (New Mexico Environment Department, year unknown). These procedures are detailed in **FMs Number (No.) 1** (**Appendix B**).

2.2.2 Monitoring Well Inspection

During each sampling event, monitoring well inspections will be conducted to assess the overall condition of the wells located at Melrose AFR. Inspections will be documented using the well inspection form included in **Appendix A**. The following items will be noted on the well inspection forms and in the logbook:

- Verify the identification of the monitoring well by examining markings, sign plates, placards, or other designations;
- Remove the well cover and remove all standing water around the top of the well casing, if applicable, before opening the well cap;
- Inspect pad, bollards, and exterior protective casing (if present and/or applicable) of the monitoring well or supply well for damage and document the results of the inspection if there is a problem;
- Inspect the well lock and determine whether the cap fits tightly. Replace the cap if necessary.

Several existing wells have not been surveyed but may be good water level measurement points; these wells include MWQ-9, MWQ-11, MWQ-12, and MWQ-13. During the next scheduled sampling event, the condition of these wells will be inspected. If deemed adequate, TRINITY will recommend which wells should be surveyed and utilized for future water level measurement points.

2.2.3 Ground Water Sampling

2.2.3.1 Site Specific Requirements

The presence of metals (inorganics) in ground water samples collected from monitoring wells can be natural, anthropogenic in origin, or both. Metals are common, naturally occurring, ubiquitous elements in sediments such as the Ogallala, and in some instances may naturally exceed applicable standards. Elevated metals in ground water samples may be an artifact of the

well installation process. For example, formation damage incurred during drilling may not be sufficiently repaired and/or the well may not be completely developed, which could result in elevated turbidity during well sampling. Additionally and sometimes unavoidably, the targeting of less desirable strata, i.e. placing the screen intake opposite clayey sediment, can also result in the introduction of colloidal clay into samples, which may also produce high metals results.

Sampling protocol can have significant effect on measured concentrations. It is TRINITY's experience that when ground water is collected from wells installed in clastic aquifers, such as the Southern High Plains Aquifer, large discrepancies between total and dissolved metal results are suggestive of 'artificial' influence from the well, when comparing total and dissolved metal results. When similar concentrations for total and dissolved metals are reported during a single sampling event the total result is likely an accurate reflection of the metal concentration in ground water moving through the aquifer, and would suggest that the reported concentrations are ambient in origin, waste related, or both. To date, insufficient data has been collected to accurately determine a relationship between turbidity and elevated metals concentrations in total and dissolved ground water samples.

Previous sampling events conducted at Melrose AFR have included dissolved (filtered) metal results. In the majority of sampling conducted prior to January 2010, only dissolved metal results appear to have been reported. NMED has previously accepted the use of dissolved metals data at Melrose AFR to support the argument that increased turbidity may result in increased metal concentrations.

2.2.3.2 Sample Collection

The selection of the purging technique and equipment is dependent on the hydrogeologic properties of the aquifer, especially depth to ground water and hydraulic conductivity. The intent of proper purging is to stabilize the water level in the well and minimize the hydraulic stress to the hydrogeologic formation. Every attempt must be made to match the pumping rate with the recharge rate of the well before evaluating the purging completion criteria. Based on the low yield of wells at Melrose AFR "low-flow" sampling methodologies are necessary. Therefore a low-flow submersible pump will be used to minimize drawdown in wells without dedicated plumbing (monitoring wells).

There are several wells within the Annual Ground Water Monitoring Network that are used for cattle stock water supply that have dedicated submersible pumps with associated equipment installed within subsurface vaults. The majority of these wells have pressure tanks (approximately 20 to 50 gallons) to aid in providing a constant supply of water for the cattle. It is necessary to ensure that the sampling protocol accounts for the "system volume" when purging the wells. Incorporating, maxiumum expected well and tank parameters, purge volumes will range from approximately 100 to 350 gallons. This is necessary to provide an assurance that the ground water being collected is representative of the ground water in the formation versus potentially stagnant water from the pressure tank. Therefore, prior to collection of stabilization parameters the spigot closest to the pump will be opened and allowed to flow at maximum flow to purge a sufficient volume from the pressure tanks. The flow will then be reduced and stabilization parameters collected, as described below.

A flow-through cell attached to the pump discharge will be used to measure stabilization parameters. Purging will continue until all field parameters have stabilized for three consecutive readings according to the following criteria:

- Turbidity: ≤ 10 NTUs or ± 10% where > 10 NTUs;
- pH: ± 0.1 units;
- Specific Conductance: ± 3% of reading;
- Dissolved Oxygen (DO): ± 0.3 mg/L of reading;
- Oxidation Reduction Potential (ORP): ± 10 millivolts (mV);
- Temperature: ± 10% of reading.

If the well is pumped dry during purging, it will be assumed that the purpose of removing all stagnant water has been accomplished. Once the well has been pumped dry, samples will be collected using a low-flow submersible pump, upon well recahrge. If possible, a complete set of water quality parameters will be measured from water that has recharged into the well. If recovery is very slow, samples may be obtained as soon as a sufficient amount of water recharges into the well.

Field procedures for ground water sampling were developed in general accordance with guidance provided by NMED (New Mexico Environment Department, year unknown) and are detailed in

FMs No. 2 (**Appendix B**). The current ground water monitoring program is summarized below and depicted on **Figure 1-2** and **Figure 1-3**. Additional well construction details are summarized in **Table 2-2**.

Table 2-3
Semiannual - SWMU Ground Water Monitoring Network

SWMU	Monitoring Well ID	Total Depth (ft bls)	Pump Type	Well Type
114	M114MW001	182.0	none	Monitoring Well
	M114MW002	183.3	none	Monitoring Well
	M114MW003	184.4	none	Monitoring Well
	M114MW004	184	none	Monitoring Well
130	MAO1MW001	162.4	none	Monitoring Well
	MAO1MW002	157	none	Monitoring Well
	MAO1MW003	161.6	none	Monitoring Well
	MAO1MW004	162.3	none	Monitoring Well
131	MAO2MW001D	184.5	none	Monitoring Well
Background	MWQ-23	TBD	dedicated submersible	Supply Well

[1]MWQ-23 is the recently proposed background well for the SWMUs. The well is an existing supply well with dedicated submersible pump. The spring 2011 Sampling Event will be the first time this well is sampled, if approved.

Table 2-4
Annual Ground Water Monitoring Network

Monitoring Well ID	Total Depth (ft bls)	Pump Type	Well Type
MWQ-2	245	none	Monitoring Well
MWQ-3	164	dedicated submersible	Supply Well
MWQ-4	unknow n	dedicated submersible	Supply Well
MWQ-5	103	dedicated submersible	Supply Well
MWQ-6	unknow n	dedicated submersible	Supply Well
MWQ-7	101	dedicated submersible	Supply Well
MWQ-10	60	dedicated submersible	Supply Well
MWQ-14	124.9	none	Monitoring Well
MWQ-18	152	none	Monitoring Well
MWQ-19	230	none	Monitoring Well
MWQ-20	299.1	none	Monitoring Well
MWQ-21	66.3	none	Monitoring Well
MWQ-22	154.7	none	Monitoring Well
MWL-6	136	none	Supply Well

[1]During the spring 2011 sampling event the pump will be removed from MWQ-4 and the total depth will be measured and an attempt will be made to measure the total depth of MWQ-6 with the dedicated submersible pump in-place.

On the basis of the discussion in **Section 2.2.3.1**, during the spring 2011 and subsequent periodic ground water sampling, both total and dissolved metals will be analyzed. In addition to a total

metals sample, a ground water sample will be collected for each well and immediately filtered with a 0.45 micron (µm) filter.

2.2.3.3 Field and Laboratory Analysis

The current ground water monitoring program provides for semiannual testing at 10 wells associated with the Semiannual SWMU Ground Water Monitoring Network (**Table 2-3**) and 14 wells associated with the Annual - Ground Water Monitoring Network (**Table 2-4**). A new background monitoring well (MWQ-23), upgradient of the Semiannual SWMU Ground Water Monitoring Network, is currently scheduled to be sampled for the first time as part of the spring 2011 sampling event, if approved. The accompanying tables summarize testing requirements.

Table 2-5
Semiannual - SWMU Ground Water Monitoring Network

Analyte	Field Parameters [1]	VOCs [2]	Explosives [3]	Metals (Total & Diss.)	Chromium (VI)	Cyanide	Mercury	Nitrite, Nitrate	Chloride, Sulfate	Perchlorate	Alkalinity	TDS
Method	**NA**	**8260B**	**8330**	**6010C**	**7196A**	**9012A**	**7470A**	**300.0**	**300.0**	**6860**	**2320B**	**2540C**
M114MW001	x	x	x	x	x	x	x	x	x	x	x	x
M114MW002	x	x	x	x	x	x	x	x	x	x	x	x
M114MW003	x	x	x	x	x	x	x	x	x	x	x	x
M114MW004	x	x	x	x	x	x	x	x	x	x	x	x
MAO1MW001	x	x	x	x	x	x	x	x	x	x	x	x
MAO1MW002	x	x	x	x	x	x	x	x	x	x	x	x
MAO1MW003	x	x	x	x	x	x	x	x	x	x	x	x
MAO1MW004	x	x	x	x	x	x	x	x	x	x	x	x
MAO2MW001D	x	x	x	x	x	x	x	x	x	x	x	x
MWQ-23	x	x	x	x	x	x	x	x	x	x	x	x

[1] Field Parameters: Specific Conductivity, Dissolved Oxygen, ORP, pH, Temperature, Turbidity

[2] VOCs: Volatile Organic Compounds Target Compound List

[3] Explosives: 1,3,5-Trinitrobenzene, 1,3-Dinitrobenzene, 2,4,6-Trinitrotoluene, 2,4-Dinitrotoluene, 2,6-Dinitrotoluene, 2-Amino-4,6-dinitrotoluene, 2-Nitrotoluene, 3-Nitrotoluene, 4-Amino-2,6-dinitrotoluene, 4-Nitrotoluene, HMX, Nitrobenzene, RDX, Tetryl

[4] Methods: 8260B, 8330, 6010C, 7196A, 9012A, 7470A, 2320B, 2540C – adapted from the EPA SW846 Test Methods for Evaluating Solid Waste, Physical/Chemical Methods; 353.2, 300.0, 314.0 – adapted from EPA Drinking Water Methods

Table 2-6
Annual - Ground Water Monitoring Network

Analyte	Field Parameters [1]	Metals (Total & Diss.)	Chromium (VI)	Cyanide	Nitrite, Nitrate	Chloride, Sulfate	Perchlorate	Alkalinity	TDS
Method	**NA**	**6010C**	**7196A**	**9012A**	**300.0**	**300.0**	**6860**	**2320B**	**2540C**
MWQ-2	x	x	x	x	x	x	x	x	x
MWQ-3	x	x	x	x	x	x	x	x	x
MWQ-4	x	x	x	x	x	x	x	x	x
MWQ-5	x	x	x	x	x	x	x	x	x
MWQ-6	x	x	x	x	x	x	x	x	x
MWQ-7	x	x	x	x	x	x	x	x	x
MWQ-10	x	x	x	x	x	x	x	x	x
MWQ-14	x	x	x	x	x	x	x	x	x
MWQ-18	x	x	x	x	x	x	x	x	x
MWQ-19	x	x	x	x	x	x	x	x	x
MWQ-20	x	x	x	x	x	x	x	x	x
MWQ-21	x	x	x	x	x	x	x	x	x
MWQ-22	x	x	x	x	x	x	x	x	x
MWL-6	x	x	x	x	x	x	x	x	x

1 Field Parameters: Conductivity, Dissolved Oxygen, pH, Temperature, Turbidity

The previous WP (Tidewater, 2010) specified collecting ground water samples for metals analysis every sixth year from the Semiannual SWMU Annual - Ground Water Monitoring Networks beginning in 2010. Previous sampling events conducted at Melrose AFR have included only dissolved (filtered) metals results. To date, insufficient data has been collected to accurately determine if any trends in metal concentrations in ground water are evident. Depending on the data, a reasonable estimation of total and dissolved metal trends may be established after four semiannual sampling events. Therefore, TRINITY recommends continuing collection of total and dissolved metals at least for the next two years until accurate trends can be determined.

2.2.3.4 Sample Containers and Preservation Techniques

The primary contract laboratory, GCAL of Baton Rouge, Louisiana, will provide new, certified clean sample bottles for analyses according to previously specified requirements. Sample containers will contain preservatives where applicable in the appropriate sample containers, placed there by the laboratory. Sample container requirements for the analyses anticipated and preservation requirements to be required for this project are summarized below:

Table 2-7
Sample Containers and Preservation

Ground Water				
Anlytical Parameters	**Method**	**Container**	**Preservation**	**Maximum Holding Time**
Alkalinity	2320B	500-mL plastic or glass	Cool 4°C	14 days
Chloride	300.0	500-mL plastic or glass	Cool 4°C	28 days
Chromium (VI)	7196A	500-mL plastic or glass	Cool 4°C	24 hours
Cyanide	9012A	500-mL plastic or glass	Cool, ≤4 °C9, NaOH to pH>12, reducing agent	14 days
Explosives	8330	Tw o 1-liter w ide mouth amber glass bottle, w ith Teflon lined cap	Cool 4°C	7 days until extraction, 40 days after extraction
Mercury	7470A	500-mL plastic or glass	Cool 4°C, HNO3 to pH<2	28 days
Metals (Total & Diss.)	6010C	500-mL plastic or glass	Cool 4°C, HNO3 to pH<2	6 months
Nitrite, Nitrate	300.0	500-mL plastic or glass	Cool 4°C	48 hours
Perchlorate	6860	500-mL plastic or glass	Cool 4°C	28 days
Sulfate	300.0	500-mL plastic or glass	Cool 4°C	28 days
TDS	2540C	500-mL plastic or glass	Cool 4°C	7 days
VOCs	8260B	Three 40-mL glass vials	Cool 4°C, HCL to pH<2	14 days

Samples for chemical analyses will be packed on wet ice in sealed coolers for transport to the laboratory to ensure a temperature of 4±2 degrees Celsius (°C) upon receipt by the contract laboratory. Samples will be shipped by overnight commercial courier to the laboratory. The laboratory will be notified prior to sample shipments. The packaging of each cooler will follow these steps:

1. Ensure sample lids are tight;
2. Wrap glass sample containers and associated QC samples in bubble wrap and place in a water tight plastic bag;
3. Fill cooler with enough packing material to prevent breakage of glass bottles;
4. Make sure the sample cooler has a temperature blank and trip blank (for shipment of

VOC samples), and are properly packed; and

5. Place sufficient ice in cooler to maintain the internal temperature at 4±2 °C during transport. The ice will be double-bagged to prevent contact of the melt water with the samples.

Place associated chain-of-custodies in a waterproof plastic bag, and tape it to the inside lid of the cooler. Upon receipt at the laboratory, the cooler will be opened and the temperature of the cooler will be recorded immediately from the temperature blank.

2.2.3.5 Decontamination Procedures

All reusable equipment that comes into contact with potentially contaminated water or other material will be decontaminated prior to use at each sampling location. All equipment will be thoroughly decontaminated before use and between sampling locations. Standard operating procedures for equipment and personnel decontamination were developed in general accordance with guidance provided by NMED (New Mexico Environment Department, year unknown) and are detailed in **FMs No. 3** (**Appendix B**).

2.2.4 Well Abandonment

TRINITY will abandon up to six wells at Melrose AFR in spring 2011. The six "dry" wells previously approved for abandonment are M117MW001, M117MW002, M117MW003, M117MW004, MAO2MW001S, and MAO3MW001. During 2010 field activities it was not possible to locate the monitoring well MAO3MW001. Due to the land-use (helicopter pad) of the area the well had been installed as a flush mounted well. TRINITY will attempt to locate the well with assistance from Cannon AFB personnel and/or with GPS coordinates, metal detector, etc. during the spring 2011 sampling event.

The wells will be abandoned by a driller licensed in New Mexico. It is not feasible to remove the well casing. In accordance with *NMED, Ground Water Discharge Permit, Monitoring Well Construction, and Abandonment Guidelines, Revision 1.0, July 2008* and *Well Driller Licensing; Construction, Repair and Plugging of Wells, adopted August 31, 2005*, 19.27.4 NMAC the wells will be abandoned by "pumping bentonite-cement grout, neat cement grout, or bentonite grout

(prepared as specified above for annular space seals) from the bottom of the borehole to the ground surface using a tremie pipe." The total weight and volume of grout emplaced versus the volume of the well will be recorded to ensure proper abandonment. The well head will be demolished to below ground surface and the bollards, concrete, protective case, and stickup will be disposed of. Written notification will be supplied to NMED with the date and method of abandonment.

2.2.5 Well Head Maintenance

TRINITY will perform wellhead maintenance, as necessary, following the spring 2011 ground water quality sampling at Melrose AFR, possibly mid-2011. There are several wells identified in previous reports and by TRINITY that require basic maintenance, such as reconstruction of well pads and re-installation of bollards. TRINITY will complete this work at the same time that well abandonment is scheduled and the activities reported to NMED along with the details on well head maintenance (**Section 2.2.2**). A summary of the necessary maintenance issues are summarized below:

- Slight erosion has occurred under the pad and around the base of the bollards at monitoring well MAO1MW004;
- Bollards require re-installation at MAO1MW004, MWQ-18/19 (nested), MWQ-20, and MWQ-21/22 (nested);
- Nine inactive supply wells with abandoned windmills are currently being utilized for the sole purpose of collection of water elevations. Six of these wells are unprotected and open, several of which had apparently been used as scratching posts by cattle; they included MWQ-8, MWL-4, MWL-5, MWL-6, MWL-8, and MWL-9. Proper lids or covers will be installed to eliminate the potential for introduction of foreign debris into the well and aquifer; and
- In previous comments from NMED, it has been recommended that if the total depth of MWQ-4 could not be determined, that ground water sampling from this location should be discontinued. TRINITY recommends that prior to discontinuing use of this well, the pump and drop pipe be removed and the total depth measured to the screen intake depth

within the aquifer. The total depth of MWQ-6 is also unknown. An attempt will also be made to determine the total depth of this well.

2.3 Field Operations Documentation

2.3.1 Field Logbook and/or Sample Field Sheets

During field work, records will be maintained in the field, with digital copies maintained by TRINITY. Records will include daily summary sheets and related field and daily logs (**Appendix A**).

Field logbooks will be maintained to record site activities and field data in a neat, legible manner. Logbooks will be bound and pages consecutively numbered. Personnel will make logbook entries in indelible ink. The following information, at minimum, will be entered during the course of the construction support and other project activities;

- Date and team location;
- Weather;
- Personnel onsite (including subcontractors) and work performed;
- Equipment and instrument checks;
- Injuries and/or illnesses;
- Changes to work instructions;
- Work stoppage;
- Visitors; and
- Other relevant events.

Personnel will supplement logbooks and records by the use of preprinted forms (that is, safety inspection forms and tailgate safety briefings). These forms help to ensure uniformity of activities being conducted, inspected, and reviewed. Project forms are located in **Appendix A**. All handwritten records and logbook entries will be scanned into an acceptable digital form and submitted to Cannon AFB and USACE as part of the digital data package.

2.3.2 Photographic Records

A Photographic Logbook will be maintained by the TRINITY Field Site Manager. The field logbook, described in **Section 2.3.1**, will be used to record all photographs taken on the project site. Photograph information will include the following information:

- Date and time taken;
- Unique identifying number(s) relating to the Photographic Logbook;
- Location photograph was taken including GPS coordinates; and
- Brief description of the subject matter.

2.3.3 Sample Numbering System

Sample containers will be labeled utilizing existing well IDs. The sample identification number will be logged in the field log book and on the chain-of-custody (COC) form.

QC samples are denoted by adding a QC extension at the end of the sample identification number. The extensions are as follows:

Table 2-8
QC Extensions

Order	Extension	Description
1	dis	dissolved phase (field filtered)
2	a	field duplicate
2	b	field split (to quality assurance lab)
2	c	trip blank
2	eqb	equipment blank
2	rin	rinsate
2	e	field blank
3	ms	matrix spike
3	msd	matrix spike duplicate

2.3.4 Chain-of-Custody Records

The purpose of the COC is to provide continuous possession of samples from their origin to completion of analysis and archiving/disposal in the laboratory. This uninterrupted possession is required to maintain integrity of samples. The COC record is the documentation of this uninterrupted possession of the samples. The following method is prescribed for documenting COC.

- To simplify the COC record and eliminate potential litigation problems, as few people as possible should handle the sample or physical evidence during the investigation;
- The field investigator is responsible for the proper handling and custody of the samples collected until they are properly and formally transferred to another person or facility.
- Sample labels shall be completed for each sample using water-proof, non-erasable ink.
- All samples shall be sealed immediately upon collection utilizing the custody seal. This requirement shall be waived if the field investigator keeps the samples in his/her continuous custody from the time of collection until they are delivered to the laboratory analyzing the samples.
- All samples must be documented in bound field log books.
- A COC record will be completed for all samples or materials collected. A separate COC record will be utilized for each final destination or laboratory utilized during the inspection or investigation.
- All samples shall be accompanied by the COC record. The original COC record will be placed in a plastic bag inside the secured shipping container if samples are shipped. One copy of the record will be retained by the field investigator or project leader. The original record will be transmitted to the field investigator or project leader after samples are accepted by the laboratory. This copy will become a part of the project file.

To complete the COC and to maintain an accurate record of sample collection, transport, analysis, and disposal, the following process will be used:

1. Samples will be accompanied by a COC Form at all times;
2. For ease of reporting all samples collected during a single sampling event will be assigned the same Sample Delivery Group (SDG) number, when and where possible. It will be necessary to check with the laboratory to confirm the SDG number prior to shipment.
3. The COC Form will be used by personnel responsible for ensuring the integrity of samples from the time of collection until shipment to the laboratory;
4. The COC Form will be signed by each individual who has the samples in his or her possession;
5. The COC Form will be initialed in the field by the person collecting the sample for every

sample, or the COC may be initiated electronically prior to field activities. Every sample will be assigned a unique identification number, to be entered on the COC Form. Up to 13 samples can be grouped for shipment using a single form, and depending on sample size, any number of COC Forms and related samples can be shipped together;

6. The record will be completed in the field to indicate project, sampling team, etc;
7. The person responsible for samples must sign the "Relinquished by" in the "Custody Transfers Prior to Receipt by the Laboratory" section of the COC prior to releasing to overnight delivery service (FedEx, UPS, or similar services) or hand delivery to the laboratory;
8. If the samples are transported directly to the laboratory, the COC Form will be kept in the possession of the person delivering the samples; and
9. If the samples are shipped to the laboratory by commercial carrier, the COC Form will be sealed in a watertight container and taped on the inside lid, and the shipping container sealed prior to being given to the carrier.

    - For samples shipped by commercial carrier, the waybill will serve as an extension of the COC record between the final field custodian and receipt in the laboratory. The sender's copy of the waybill must be stapled to the sender's copy of the COC Form and filed with the original. The waybill tracking number must be entered into the log book and on the COC;
    - Upon receipt in the laboratory, the sample custodian will open the shipping containers, compare the contents with the COC record, ensure that document control information is accurate and complete, and sign and date the record. Any discrepancies will be documented on the COC Form or on an internal laboratory "condition upon receipt" form or equivalent;
    - In the event of any discrepancies, the samples in question will be segregated from normal sample storage, and the TRINITY Project Chemist will be immediately notified; and
    - The original COC Form will accompany the hardcopy analytical report and will be completed upon receipt by the analytical service laboratory.

2.4 Sample Packaging and Shipping Requirements

Samples will be packed for shipping in waterproof ice chests and coolers. The sample containers must be individually sealed in Ziploc™ or other plastic bags prior to packing them in the cooler with bubble wrap to prevent breakage during shipment. Wet ice, doubled bagged in Ziploc™ or other plastic bags (to inhibit cross contamination of samples by melted water) is placed with the samples in the cooler to maintain the samples at a temperature of 4°C during shipping. Prior to shipment, any melted ice will be drained from the bags, and fresh ice will be added. A temperature blank will also be included in every cooler containing samples shipped for chemical analysis. All samples will be shipped in accordance with International Air Transport Association (IATA) and US Department of Transportation (USDOT) regulations.

The COC form (**Appendix A**) or an equivalent form that identifies the samples is signed as relinquished by the principal sampler or responsible party. A Cooler Receipt Form or an equivalent form must also be completed upon receipt of the shipment for all shipments sent to the contract laboratory for purposes of noting problems in sample packaging, COC, and sample preservation. The COC forms are sealed in a waterproof plastic bag which is then placed inside the cooler, typically by taping the bag to the inside lid of the cooler.

Following packing, the cooler lid is sealed with strapping tape. Two custody seals (signed and dated) are affixed about two corners of the cooler, across the seal of the lid, and additionally covered with clear tape.

2.5 Investigation-Derived Wastes

Investigation-derived waste (IDW) generated during ground water sampling activities will include monitoring well purge water and decontamination water. All IDW collected during ground water sampling will be temporarily containerized in a holding tank, buckets (with lids) or similar containers secured in the bed of the field vehicle. IDW generated from the SWMU Ground Water Monitoring Network will be segregated from the Annual Ground Water Monitoring Network. At the completion of daily field activities, the container(s) will be discharged into 55-gallon drums or bulk liquid storage tanks, which will be marked with the following information:

- Date;
- Site;
- Sampling location (e.g., monitoring well identification);
- Media (purge or decontamination water);
- TRINITY and Cannon AFB personnel contact information and telephone number;
- The statement "Waste Classification Pending Analytical Results"; and
- Drum Number

The drums will be labeled on the lids and sides using weatherproof paint pens, and recorded in the field logbook. The drums will be given a sequential identification number upon being filled. These details will also be recorded in the field logbook. The drums will be stored at location(s) identified by Melrose AFR.

Aqueous IDW from well purging will be contained in a 55-gallon drum. Aqueous IDW from decontamination activities will be segregated from other aqueous IDW and contained in separate drums. Used personal protective equipment (PPE) and disposable sampling materials will be treated as solid waste and disposed of at the installation in a trash receptacle.

The following procedures will be completed during the ground water sampling events:

Monitoring well analytical results from the associated samples will be used to characterize the IDW by applying the "20 Times Rule" (40 CFR 261.24). If analytical results are greater than or equal to 20 times any of the Toxicity Characteristic Leaching Procedure (TCLP) regulatory limits (40 CFR 261.24), then a waste characterization sample will be collected and analyzed for TCLP. TCLP regulatory limits are summarized in **Table 2-9**. The results from these analyses will be compared directly to TCLP regulatory limits. IDW that is characterized as hazardous waste will be sent to Safety-Kleen of Amarillo, Texas or an equivalent waste management service for disposal.

If monitoring well analytical results are less than 20 times any of the TCLP regulatory limits, then ground water screening criteria will be used to characterize IDW. If analytical results are less than the screening values, then IDW will be discharged to the Melrose AFR storm water conveyance system. If analytical results for any site-related contaminants are greater than the

screening values, then the IDW will be handled as non-hazardous RCRA solid waste and disposed offsite at a subtitle D facility.

PPE, decontamination plastic, and similar waste material will be consolidated into contractor trash bags and placed in a solid waste dumpster designated by Melrose AFR or Cannon AFB personnel.

IDW procedures for subsequent (post-spring 2011) annual and semi-annual ground water sampling events will depend on previous ground water sampling results and approval from NMED.

This page intentionally left blank.

3.0 WORKS CITED

Bradley, R. G., & Sanjeev, K. (2003). *Rerport 359: The Groundwater Resources of the Dockum Aquifer in Texas.* Texas Water Development Board.

Department of Defense. (2009). *Department of Defense Quality System Manual Manual for Environmental Laboratories, Version 4.1, Based on NELAC Voted Revision, 6-5-2003.*

EPA. (1983). *Methods for Chemical Analysis of Water and Wastes.*

EPA. (2010a). *Mid-Atlantic Risk Assessment*. Retrieved 2010, from U.S. Environmental Protection Agency: http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/pdf/soil2gw_sl_table_run_NOVEMBER2010.pdf

EPA. (2010b). *Regional Screening Level (RSL) Chemical-specific Parameters Supporting Table November 2010.*

EPA. (2004a). *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW-846.*

EPA. (2004b). *USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review.* Washington, DC 20460: Office of Superfund Remediation and Technology Innovation (OSRTI) U.S. Environmental Protection Agency.

EPA. (1999). *USEPA Contract Laboratory Program National Functional Guidelines for Organic Data Review*. Washington, DC 20460: Office of Emergency and Remedial Response U.S. Environmental Protection Agency.

EPA. (2008). *USEPA Contract Laboratory Program National Functional Guidelines for Organic Data Review*. Washington, DC 20460: Office of Emergency and Remedial Response U.S. Environmental Protection Agency.

Fetter, C. (1994). Applied Hydrology. Upper Saddle River, New Jersey: Prentice Hall.

Foster Wheeler. (1996). *Phase I RCRA Facility Investigation for Melrose Air Force Range, Cannon Air Force Base, Clovis, New Mexico.*

Foster Wheeler. (2003). *RCRA Facility Investigation Report Addendum For Melrose Bombing Range, Cannon Air Force Base, New Mexico.*

Gustavson, T. (1996). *Fluvial and eolian depositional systems, paleosols, and paleoclimate of the upper Cenozoic Ogallala and Blackwater Draw Formations, Southern High Plains, Texas and New Mexico: Report of Investigations No. 239.* Bureau of Economic Geology, University of Texas at Austin.

Gutentag, E. D. (1984). *Geohydrology of the High Plains in Parts of Colorado, Kansas, Nebraska, New Mexico, Okalhoma, South Dakota, Texas, and Wyoming. USGS Professional Paper 1400-B.* United States Geological Survey.

Hart, D., & McAda, D. (1985). *Geohydrology of the High Plains aquifer in southeastern New Mexico: U.S. Geological Survey Hydrologic Investigations Atlas HA-679.* United States Geological Survey.

Hawley, J. e. (1976). *Geohydrology of the High Plains Aquifer in Southeastern New Mexico. Hydologic Investigation Atlas HA-679.* United States Geological Survey.

Hubbell, C. (2010, November 3). Personal comunication. (J. Kramer, & T. Schmucker, Interviewers)

Kearney, A. (1987). *Preliminary Review/VSI Report, RCRA Facility Assessment CAFB, New Mexico. Radian Corporation, Final Report for period 9/84-4-85, Vol. 1 and 2, Appendicies A-M.*

Langman, J. G. (2004). *Ground-water hydrology and water quality of the Southern High Plains aquifer, Melrose Air Force Range, Cannon Air Force Base, Curry and Roosevelt Counties, New Mexico, 2002-03: U.S. Geological Survey Scientific Investigations Report 2004-5158.* United States Geological Survey.

Lee Wan and Associates, Inc. (1990). *1990 RCRA Facility Investigation Work Plan, CAFB, New Mexico, Prepared for 27 CSG/DEC CAFB, New Mexico. Vols. I and II.*

New Mexico Administrative Code. (2005). Well Driller Licensing; Construction, Repair and Plugging of Wells, adopted August 31, 2005, 19.27.4 NMAC.

New Mexico Environment Department. (2007). *Deferment for the Submittal of the Revised RCRA Facility Investigation Work Plan for Melrose Air Force Range.*

New Mexico Environment Department. (2008). *Ground Water Discharge Permit, Monitoring Well Construction, and Abandonment Guidelines, Revision 1.0, July 2008.*

New Mexico Environment Department. (year unknown). *How to Sample A Monitoring Well.*

New Mexico Environment Department. (2009). *Review of Initial Baseline Groundwater Monitoring.*

New Mexico Environment Department. (2001). *Use of Low-Flow and Other Non-Traditional Sampling Techniques for RCRA Compiant Groundwater Monitoring.*

New Mexico Environment Department, Hazardous Waste Bureau and Ground Water Quality Bureau Voluntary Remediation Program. (2009). *Technical Background Document for Development of Soil Screening Levels, Revision 5.0.*

Rajagopalan, S., Anderson, T., Fahlquist, L., Rainwater, K., Ridley, M., & Jackson, A. (2006). Widespread Presence of Naturally Occuring Perchlorate in High Plains of Texas and New Mexico. *Environmental Science & Technology , 40,* 3156-3162.

Tidewater, Inc. (2010a). *Draft Report, Annual Groundwater Monitoring, Melrose Air Force Range, New Mexico.*

Tidewater, Inc. (2010b). *Final Work Plan for Annual Groundwater Monitoring, Melrose Air Force Range.*

Trinity Analysis & Development Corp. (2010). *December 2010 Annual Ground Water Monitoring Report, Melrose Air Force Range, Roosevelt and Curry Counties, New Mexico.*

Trumpolt, C., Crain, M., Cullison, G., Flanagan, S., Siegel, L., & Lathrop, S. (Winter 2005). *Perchlorate: Sources, Uses, and.* Remediation.

U.S. Army Corp of Engineers. (2001). *Requirements for Preparation of Sampling and Analysis Plan, EM 200-1-3, February 1, 2001.*

URS. (June 2009). *Final Report, Initial Baseline Groundwater Monitoring, Melrose Air Force Range, New Mexico.*

USDA. (2010). *Web Soil Survey*. Retrieved November 25, 2010, from United States Department of Agriculture, Natural Resources Conservation Service: http://websoilsurvey.nrcs.usda.gov/app/HomePage.htm

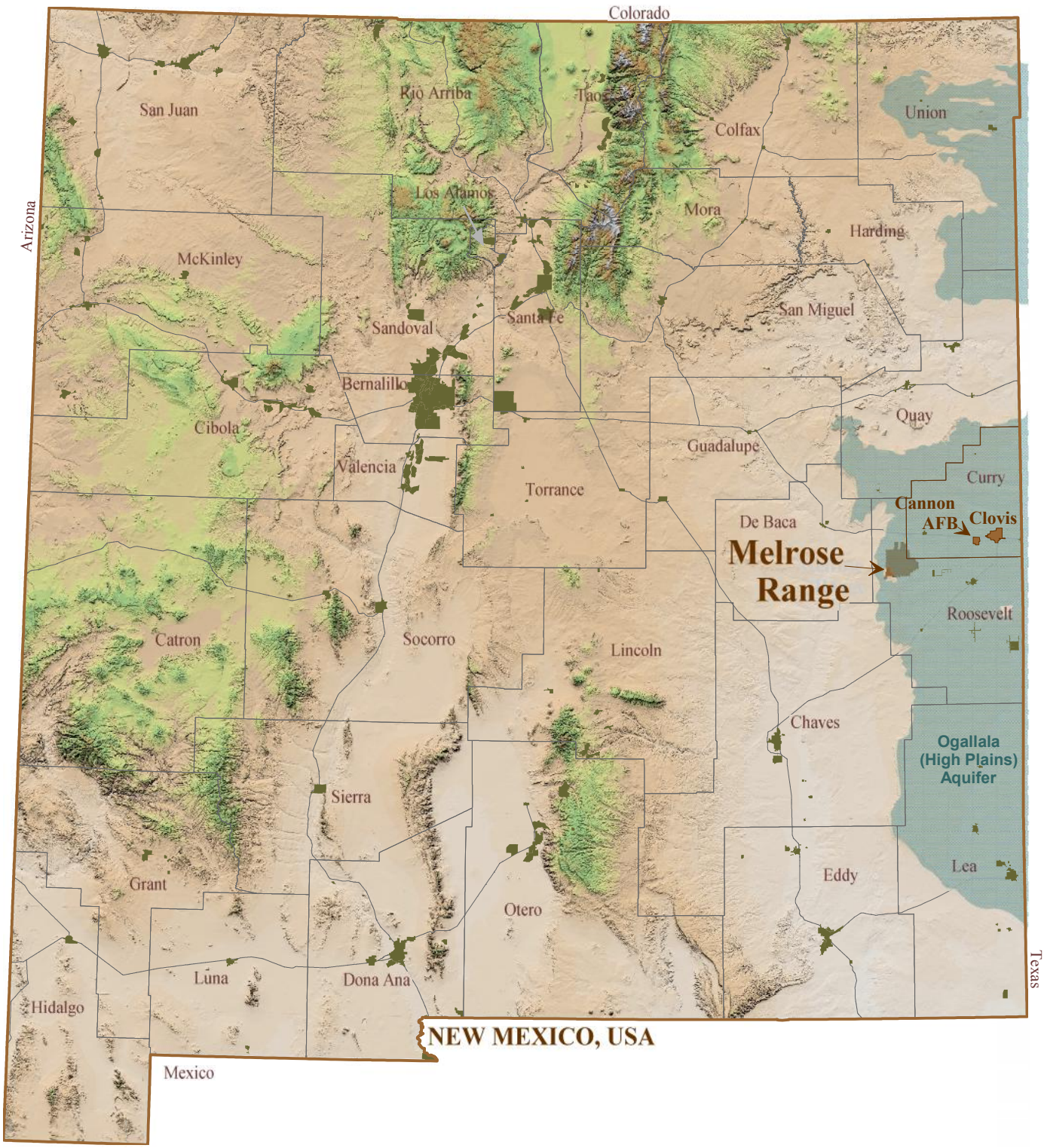
Weather Underground. (2010). Retrieved December 1, 2010, from Weather Undergound: http://www.wunderground.com/weatherstation/WXDailyHistory.asp?ID=MMRRN5

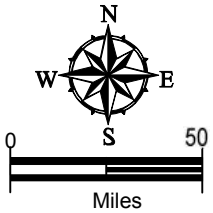
Western Regional Climate Center. (2010). *Western Regional Climate Center, Historical Climate Information*. Retrieved December 1, 2010, from Western Regional Climate Center: http://www.wrcc.dri.edu/CLIMATEDATA.html

William Matotan and Associates Inc. (1985). *Water Well Master Plan Survey. Prepared for the Air Force, Cannon Air Force Base, New Mexico.*

FIGURES

This page intentionally left blank.





Source files: New Mexico Resource Geographic Information System Program

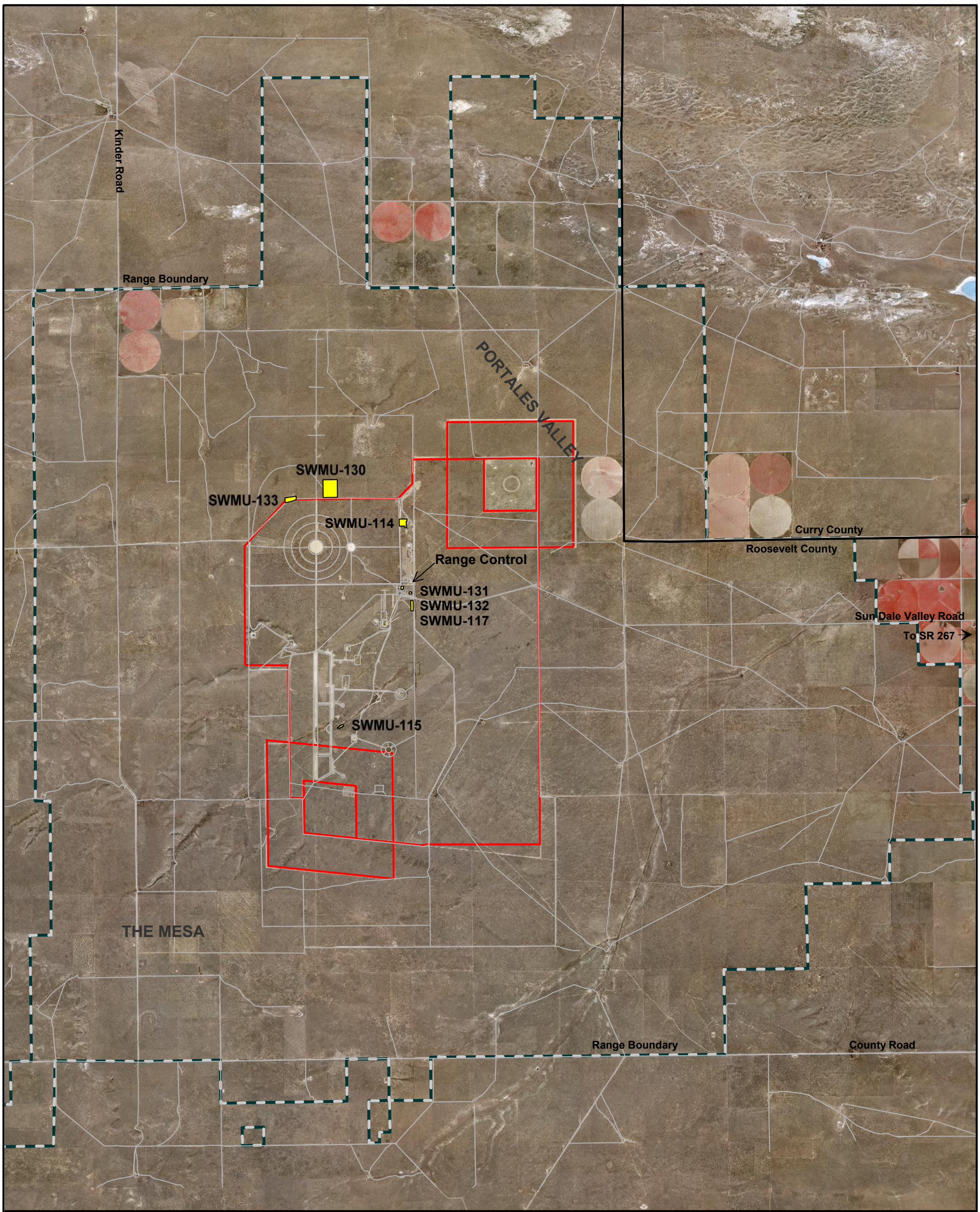
FIGURE 1-1

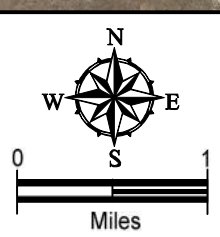
SITE LOCATION MAP

Melrose Air Force Range

Roosevelt and Curry Counties, New Mexico

Trinity Analysis and Development Corp.





Source: Digital data files; GeoBase/CAFB
Aerial photography flown by 3DI West for USAF, April, 2009

Solid Waste Management Unit
Impact Area
Range Boundary
Road

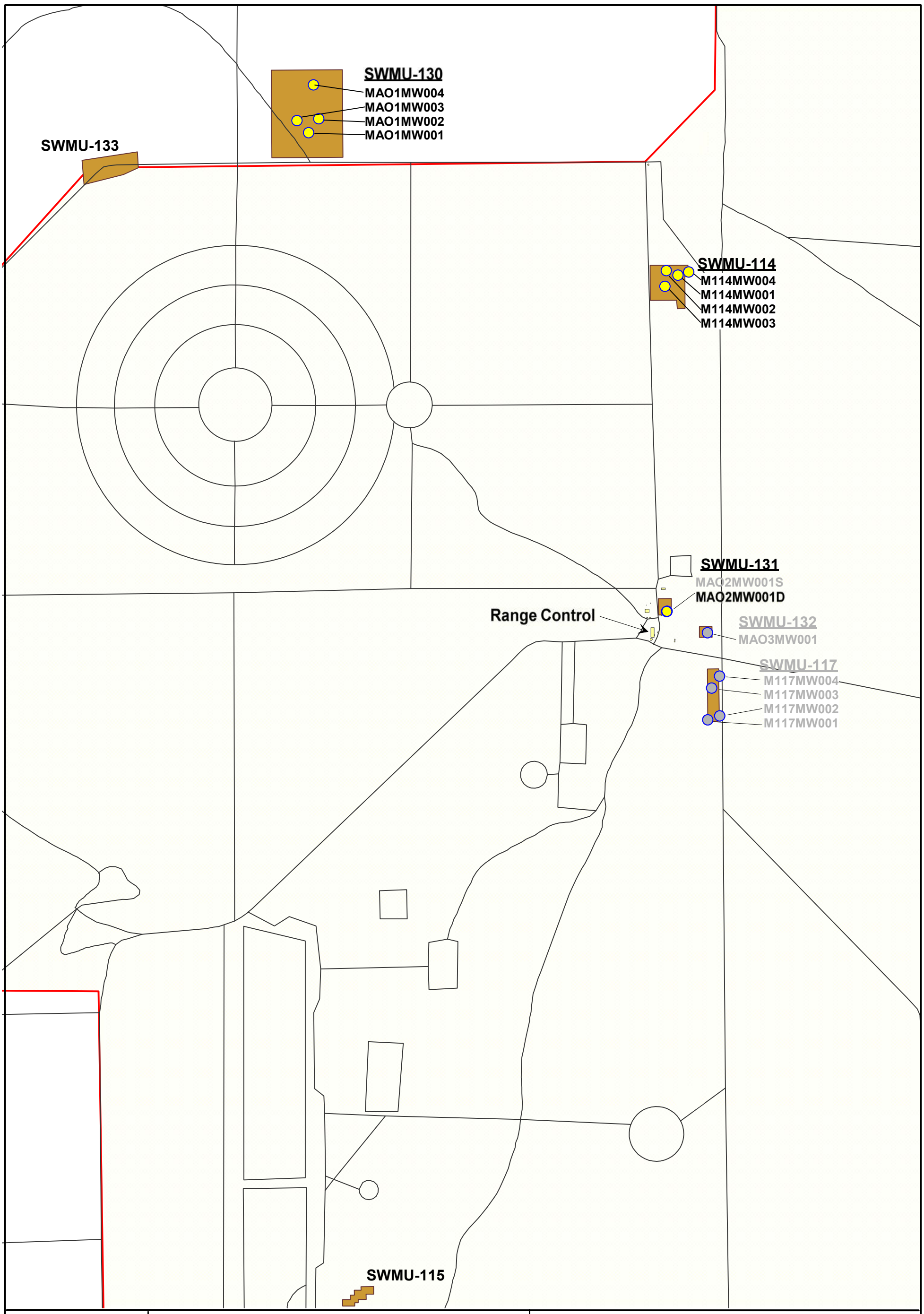
FIGURE 1-2

AERIAL OVERVIEW

Melrose Air Force Range

Roosevelt and Curry Counties, New Mexico

Trinity Analysis and Development Corp.



N
W E
S
0 1000
Feet

Source files: Digital data files; GeoBase/CAFB

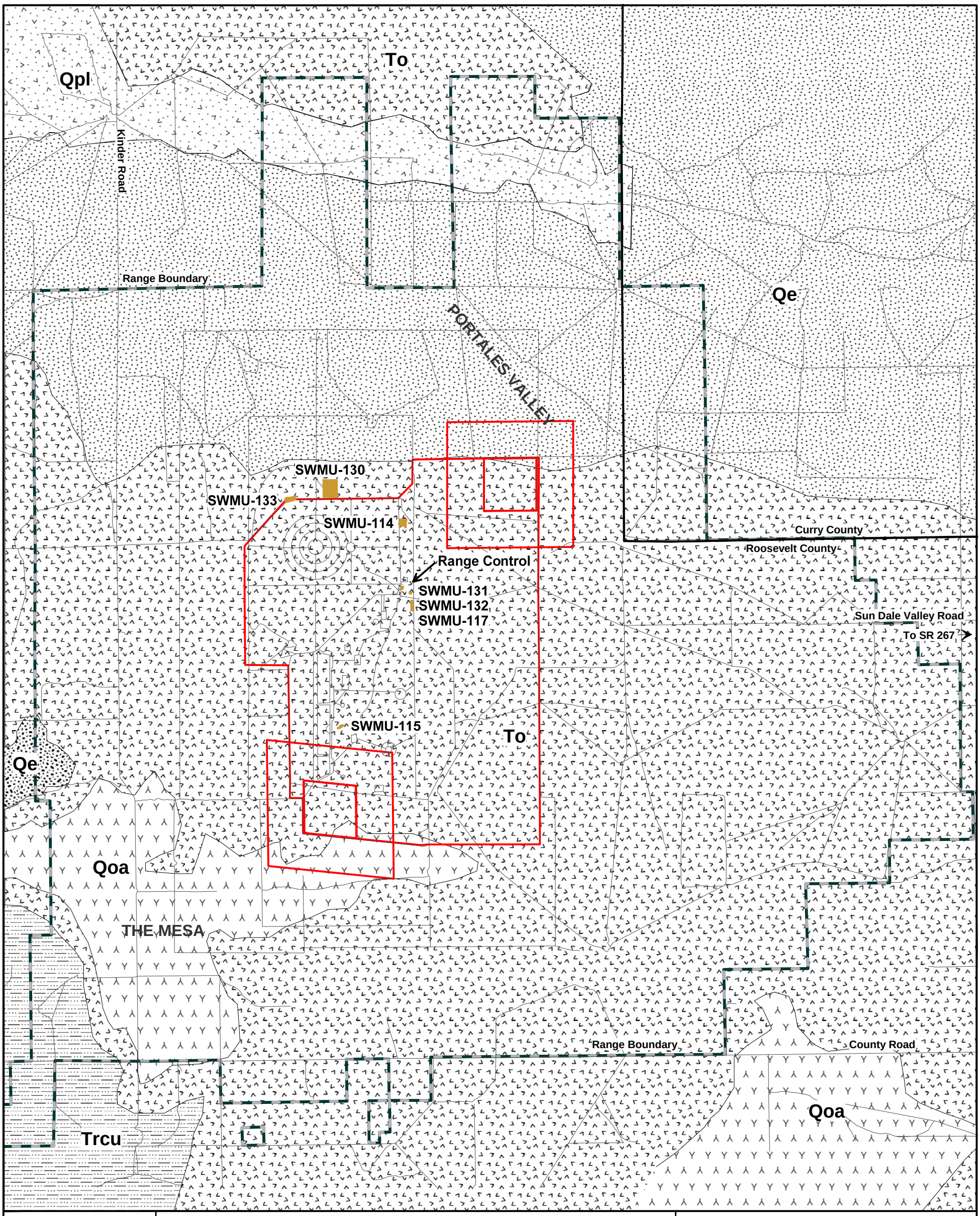
Solid Waste Management Unit
Impact Area
Road
Monitoring Well
Dry Monitoring Well; Scheduled for Abandonment

FIGURE 1-3
SEMIANNUAL SWMU MONITORING WELL NETWORK LOCATIONS

Melrose Air Force Range
Roosevelt and Curry Counties, New Mexico

LEGEND

- Qe - Eolian deposits, including Blackwater Draw Formation - Quaternary
- Qpl - Lacustrine and playa deposits, including Blackwater Draw Formation - Quaternary
- Qoa - Eolian deposits, including Blackwater Draw Formation - Quaternary
- To - Alluvial and eolian deposits, including Ogallala Formation - Tertiary
- Trcu - Chinle Formation, undivided - Triassic

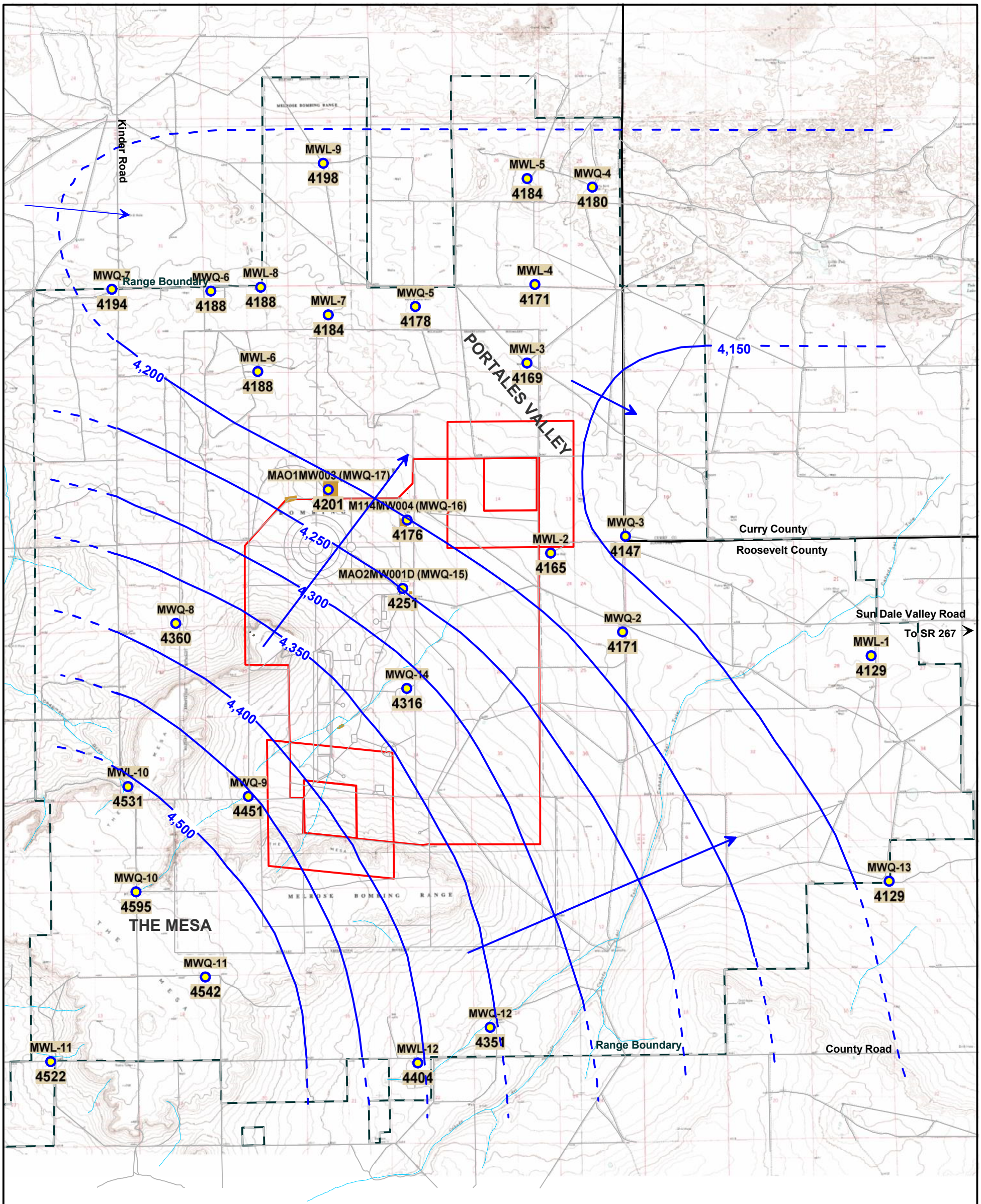


Sources: Digital data files; GeoBase/CAFB
Map is drawn after Figure 2 from USGS Scientific Investigations Report 2004-5158; Ground-Water Hydrology and Water Quality of the Southern High Plains Aquifer, Melrose Air Force Range, Cannon Air Force Base, Curry and Roosevelt Counties, New Mexico, 2002-03.

- Solid Waste Management Unit
- Impact Area
- Range Boundary
- Road

FIGURE 1-4
SURFACE GEOLOGY OF MELROSE AFR
Melrose Air Force Range
Roosevelt and Curry Counties, New Mexico

Trinity Analysis and Development Corp.



N
W E
S
0 1
Miles

Map is modeled after Figure 8 from USGS Scientific Investigations Report 2004-5158; Ground-Water Hydrology and Water Quality of the Southern High Plains Aquifer, Melrose Air Force Range, Cannon Air Force Base, Curry and Roosevelt Counties, New Mexico, 2002-03. Ground water contours are in feet NAVD and reflect a median altitude of water table, 2002-2003

Line files from GeoBase/CAFB
USGS Topographic map from TerraServer

Solid Waste Management Unit

MWL-11 / 4522 — Water level measuring point. Elevation in feet above sea level (NAVD1988)

—4,500— Water Table Contour Interval = 50 feet

Range Boundary

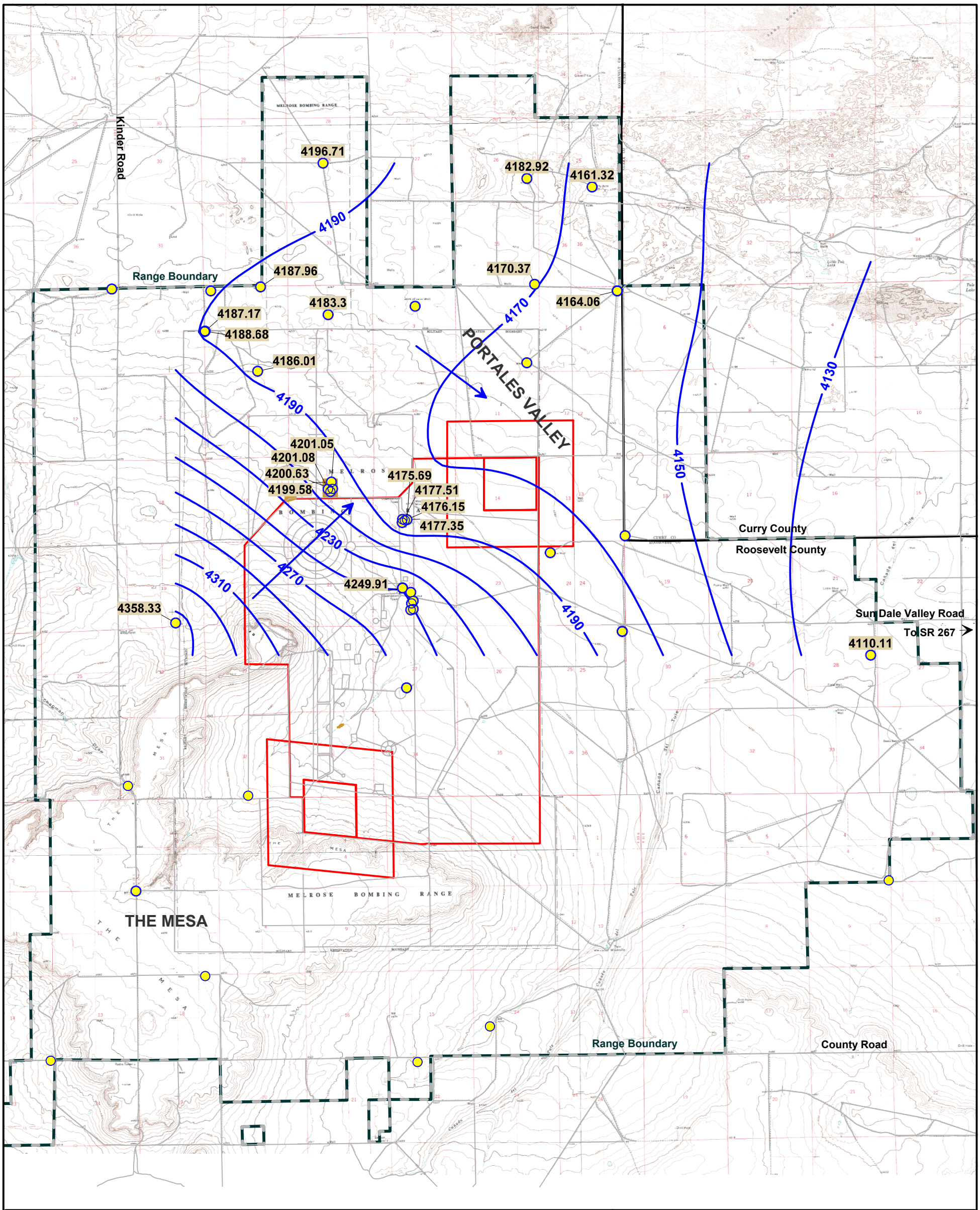
Road

Impact Area

FIGURE 1-5
MEDIAN GROUND WATER FLOW DIRECTION, 2002 to 2003 (USGS)

Melrose Air Force Range
Roosevelt and Curry Counties, New Mexico

Trinity Analysis and Development Corp.



N
W E
S
0 1
Miles

Posted ground water elevations and contours in feet NGVD.
All water levels utilized for map development are posted.
Water levels collected by TRINITY during semiannual sampling event.

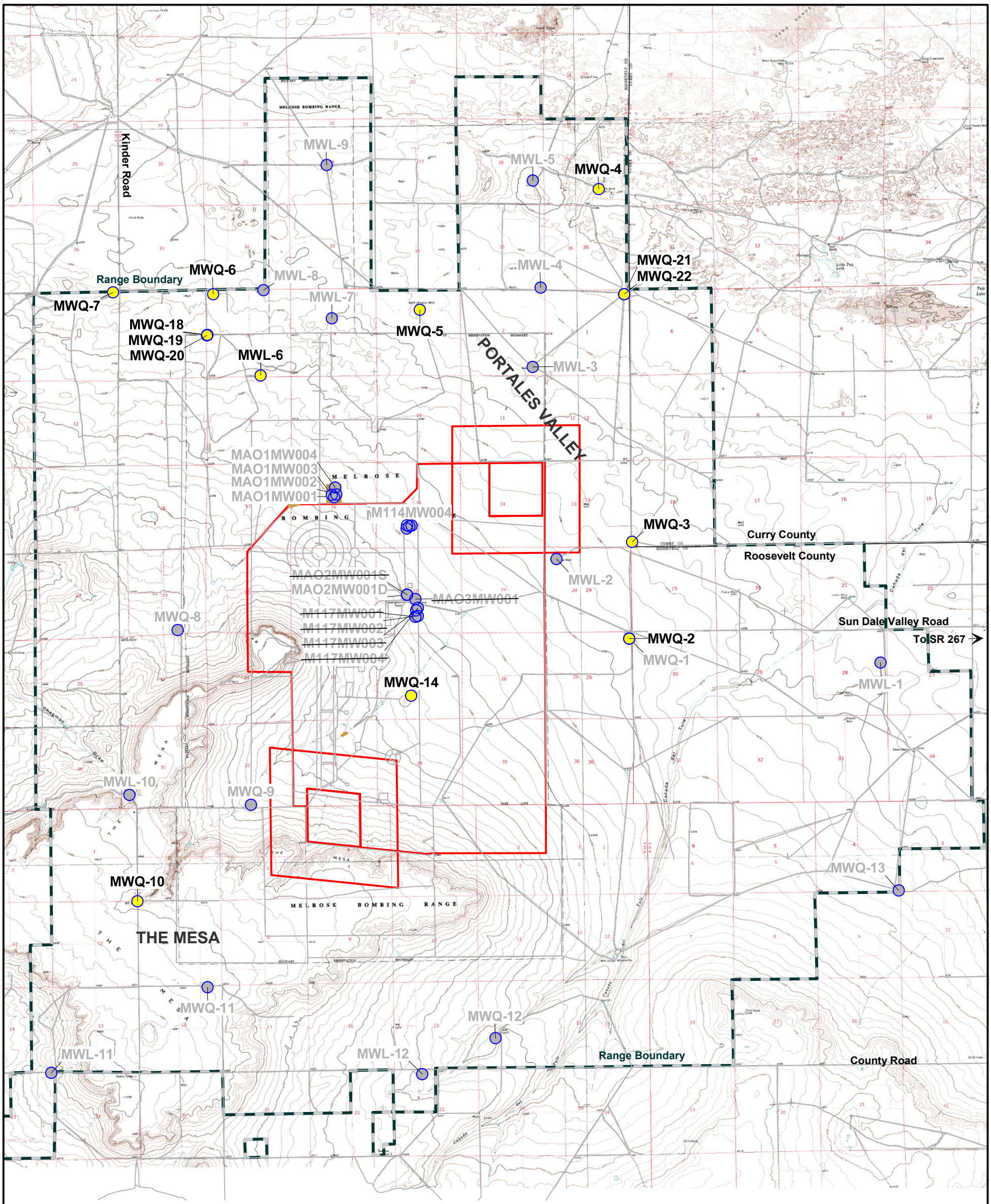
Data files from GeoBase/CAFB

USGS Topographic map from TerraServer

- Water level measuring point
- Environmental Restoration Area
- Impact Area
- Range Boundary
- Road

FIGURE 1-6
GROUND WATER FLOW MAP
10-24-2010 to 11-3-2010
Melrose Air Force Range
Roosevelt and Curry Counties, New Mexico

Trinity Analysis and Development Corp.



N
W E
S
0 1
Miles

Data files from GeoBase/CAFB

USGS Topographic map from TerraServer

MWQ-12 Water level only

M117MW001 Water level only and scheduled for abandonment

MWQ-14 Monitoring & Sampling Well

Solid Waste Management Unit

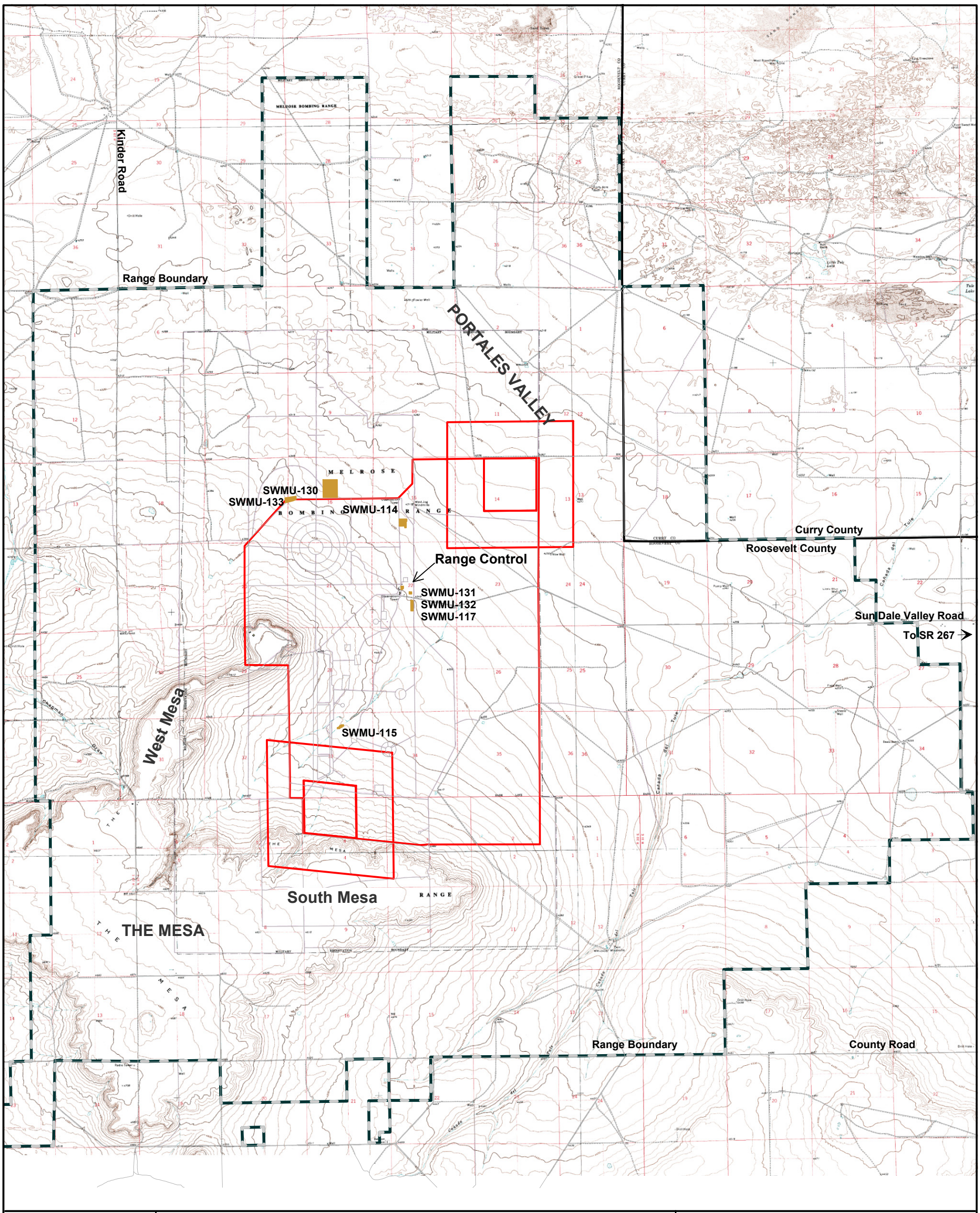
Impact Area

Range Boundary

Road

FIGURE 1-7
ANNUAL GROUND WATER MONITORING WELL NETWORK LOCATIONS
Melrose Air Force Range
Roosevelt and Curry Counties, New Mexico

Trinity Analysis and Development Corp.



N
W E
S
0 1
Miles

Source: Digital data files; GeoBase/CAFB
USGS 1:24,000 Topographic Maps:
Krider; Melrose; Tolar; Tule Lake;
Gammil Well; and Gammil Well NE Quadrangles

Solid Waste Management Unit
Impact Area
Range Boundary
Road

FIGURE 1-9
USGS TOPOGRAPHIC MAP OF SITE AND VICINITY
Melrose Air Force Range
Roosevelt and Curry Counties, New Mexico

Trinity Analysis and Development Corp.

TABLES

This page intentionally left blank.

Sampling Event			USGS January 2004 [1]	USGS July 2004 [2]	USGS July 2005 [1]	USGS June 2007 [2]	Initial Baseline Ground Water Monitoring [3, 4]	2010 Spring Semiannual & Annual Sampling Event [4,5]	2010 Fall Semiannual Sampling Event [5]
Sample Dates		Start	1/12/2004	7/19/2004	7/18/2005	7/18/2007	1/20/2009	1/26/2010	10/25/2010
		End	1/15/2004	7/21/2004	7/20/2005	7/22/2007	2/3/2009	3/4/2010	10/29/2010
Semiannual - SWMU Ground Water Monitoring Well Network	SWMU 114	M114MW001	---	---	---	---	x	x	x
		M114MW002	---	---	---	---	x	x	x
		M114MW003	x	x	x	x	x	x	x
		M114MW004	---	---	---	---	x	x	x
	SWMU 117	M117MW001	---	---	---	---	DRY	DRY	DRY
		M117MW002	---	---	---	---	x	DRY	DRY
		M117MW003	---	---	---	---	DRY	DRY	DRY
		M117MW004	---	---	---	---	DRY	DRY	DRY
	SWMU 130	MAO1MW001	---	---	---	---	x	x	x
		MAO1MW002	---	---	---	---	x	x	x
		MAO1MW003	x	x	---	---	x	x	x
		MAO1MW004	---	---	---	---	x	x	x
	SWMU 131	MAO2MW001D	x	x	x	x	x	x	x
		MAO2MW001S	---	---	---	---	DRY	DRY	DRY
	SWMU 132	MAO3MW001 [6]	---	---	---	---	---	---	---
Annual - Ground Water Quality Well Network	MWQ-2		x	x	x	x	x	x	---
	MWQ-3		x	x	x	x	x	x	---
	MWQ-4		---	---	---	x	x	x	---
	MWQ-5		x	x	x	x	x	x	---
	MWQ-6		x	x	---	x	x	x	---
	MWQ-7		---	---	---	x	x	x	---
	MWQ-8		---	---	---	x	DRY	DRY	---
	MWQ-10		x	x	x	x	x	x	---
	MWQ-14		x	x	x	x	x	x	---
	MWQ-18		---	---	x	x	x	x	---
	MWQ-19		---	---	---	---	x	x	---
	MWQ-20		---	---	x	x	x	x	---
	MWQ-21		---	---	x	x	x	x	---
	MWQ-22		---	---	x	x	x	x	---
	MWL-6		---	---	x	x	---	x	---

[1] Filtered ground-water samples were analyzed for explosives, metals, nitrate plus nitrite, ammonia as nitrogen, phosphorus , anions (bromide, chloride, fluoride, and sulfate), sulfide, organic carbon, alkalinity, dissolved solids, and perchlorate.
[2] Filtered ground-water samples were analyzed for volatile organic compounds, semi-volatile organic compounds, organochlorine pesticides, organophosphorus pesticides, metals, anions (bromide, chloride, fluoride, and sulfate), alkalinity, dissolved solids, organic carbon, phosphorus, sulfide, ammonia, nitrate plus nitrite, and perchlorate.
[3] 2009 Semiannual samples were collected and analyzed for VOCs, SVOCs, organochlorine pesticides, metals, hexavalent chromium, perchlorate, bromide, chloride, fluoride, sulfate, explosives, TOC, phosphate, and ammonia.
[4] Annual samples were collected and analyzed for metals, TDS, hexavalent chromium, alkalinity, TOC, phosphate, ammonia, and nitrate/nitrite.
[5] 2010 Semiannual samples were collected and analyzed for VOCs, explosives, metals, chloride, sulfate, nitrate, nitrite, total dissolved solids, alkalinity, cyanide, perchlorate, and hexavalent chromium.

TABLE 1-1
SUMMARY OF PREVIOUS TESTING EVENTS

Analytical Parameters and Methods					Screening Guidelines [1]				Gulf Coast Analytical Laboratories, Inc.				Accutest Laboratories, Inc.			
					1		2	3								
					WQCC (NMAC Section 20.6.2.3103)	USEPA Drinking Water Maximum Contaminant Levels (May 2010)	NMED SSLs - Tap Water Screening Levels (Dec 2009)	Regional Screening Levels for Chemical Contaminants at Superfund Sites (May 2010)								
	Parameters	CAS Number	Unit	Method	The lower value for either of these lists will be applied per analyte		Applied in the absence of a limit under the WQCC or USEPA Drinking Water standards	Applied in the event that the WQCC, USEPA, or NMED SSLs do not have a value	MDL	RL	Accuracy (%R)	Precision (RPD)	MDL	RL	Accuracy (%R)	Precision (RPD)
Alkalinity, Anions, & TDS	Alkalinity	14280-30-9 (Hydroxide); 71-52-3 (Bicarbonate); 3812-32-6 (Carbonate)	mg/L	2320B	600	**250**	---	---	0.5	1.0	90-110	11	2.5	5	90-113	20
	Chloride	16887-00-6	mg/L	300.0	**250**	250	---	---	0.036	0.1	90-110	25	1	2	90-110	20
	Nitrate as N	84145-82-4	mg/L	300.0	---	**1**	3.65	1	0.0026	0.01	90-110	25	0.05	0.1	90-110	20
	Nitrite	14797-65-0	mg/L	300.0	**10**	10	58.4	10	0.0033	0.01	90-110	25	0.05	0.1	90-110	20
	Sulfate	18785-72-3	mg/L	300.0	---	---	---	---	0.091	0.2	90-110	25	0.1	0.2	90-110	20
	Total Dissolved Solids	67-16-3	mg/L	2540C	1,000	**500**	---	---	10	10	80-120	5	10	10	80-120	5
Explosives	1,3,5-Trinitrobenzene	99-35-4	ug/L	8330	---	---	---	---	0.139	0.5	65-140	30	0.08	0.2	85-127	21
	1,3-Dinitrobenzene	99-65-0	ug/L	8330	---	---	---	---	0.252	1	45-160	30	0.097	0.2	84-123	23
	2,4,6-Trinitrotoluene	118-96-7	ug/L	8330	---	---	**18.3**	---	0.303	1	50-145	30	0.08	0.2	71-128	21
	2,4-Dinitrotoluene	121-14-2	ug/L	8330	---	---	**2.17**	---	0.125	0.5	60-135	30	0.08	0.2	77-116	26
	2,6-Dinitrotoluene	606-20-2	ug/L	8330	---	---	---	---	0.108	0.5	60-135	30	0.08	0.2	84-133	23
	2-Amino-4,6-dinitrotoluene	35572-78-2	ug/L	8330	---	---	---	---	0.125	0.5	50-155	30	0.08	0.2	78-117	28
	2-Nitrotoluene	88-72-2	ug/L	8330	---	---	**3.05**	---	0.089	0.5	45-135	30	0.08	0.2	76-120	30
	3-Nitrotoluene	99-08-1	ug/L	8330	---	---	**730**	---	0.107	0.5	50-130	30	0.08	0.2	74-124	32
	4-Amino-2,6-dinitrotoluene	35572-78-2	ug/L	8330	---	---	---	---	0.108	0.5	55-155	30	0.082	0.2	84-123	27
	4-Nitrotoluene	99-99-0	ug/L	8330	---	---	**42**	---	0.116	0.5	50-130	30	0.08	0.2	81-125	34
	HMX	2691-41-0	ug/L	8330	---	---	**1830**	---	0.035	0.2	80-115	30	0.08	0.2	74-152	21
	Nitrobenzene	98-95-3	ug/L	8330	---	---	**14.9**	---	0.136	0.5	50-140	30	0.084	0.2	76-128	28
	RDX	121-82-4	ug/L	8330	---	---	**6.11**	---	0.066	0.2	50-160	30	0.08	0.2	80-124	20
	Tetryl	479-45-8	ug/L	8330	---	---	---	---	0.2	0.5	20-175	30	0.08	0.2	62-117	28
Expl. Surr.	1,2-Dinitrobenzene	528-29-0	ug/L	8330	---	---	---	---	na	na	30-150	na	na	na	na	na
	3,4-Dinitrotoluene	610-39-9	ug/L	8330	---	---	---	---	na	na	na	na	na	na	70-136	na
Metals (Total and Dissolved)	Aluminum	7429-90-5	ug/L	6010C	5000	**200**	3650	---	43.9	200	80-120	20	25	200	80-120	20
	Antimony	7440-36-0	ug/L	6010C	---	**6**	14.6	6.0	4.03	60	80-120	20	2	6	80-120	20
	Arsenic	7440-38-2	ug/L	6010C	100	**10**	0.448	10	2.53	10	80-120	20	2	10	80-120	20
	Barium	7440-39-3	ug/L	6010C	**1000**	2000	7,300	2,000	0.11	10	80-120	20	5	200	80-120	20
	Beryllium	7440-41-7	ug/L	6010C	---	**4**	73.0	4	0.114	5	80-120	20	1	4	80-120	20
	Cadmium	7440-43-9	ug/L	6010C	10	**5**	18.3	5	0.11	5	80-120	20	1	5	80-120	20
	Calcium	7440-70-2	ug/L	6010C	---	---	---	---	25.6	100	80-120	20	100	1000	80-120	20
	Chromium	7440-47-3	ug/L	6010C	**50**	100	---	100	0.344	10	80-120	20	1	10	80-120	20
	Chromium (IV)	18540-29-9	ug/L	7196A	---	100	110	---	2.8	10	80-120	20	4	10	85-115	20
	Cobalt	7440-48-4	ug/L	6010C	**50**	---	---	---	0.396	10	80-120	20	1	50	80-120	20
	Copper	7440-50-8	ug/L	6010C	**1,000**	1,000	1,460	1,300	1.37	10	80-120	20	2	25	80-120	20
	Cyanide	57–12–5	ug/L	9012A	**200**	200	730	200	550	5000	80-120	20	5	10	90-110	10
	Iron	7439-89-6	ug/L	6010C	1000	**300**	2560	---	37.7	100	80-120	20	35	300	80-120	20
	Lead	7439-92-1	ug/L	6010C	50	**15**	---	15	1.39	15	80-120	20	1	5	80-120	20
	Magnesium	7439-95-4	ug/L	6010C	---	---	---	---	14.4	100	80-120	20	100	5000	80-120	20
	Manganese	7439-96-5	ug/L	6010C	200	**50**	876	---	1.23	15	80-120	20	1	15	80-120	20
	Mercury	7439-97-6	ug/L	7470A	**2**	2	0.562	2	0.0813	0.2	80-120	20	0.071	1	80-120	20
	Molybdenum	7439-98-7	ug/L	6010C	**1,000**	---	183	---	0.871	50	80-120	20	2	50	80-120	20
	Nickel	7440-02-0	ug/L	6010C	**200**	---	730	---	0.96	40	80-120	20	2	40	80-120	20
	Potassium	7440-09-7	ug/L	6010C	---	---	---	---	52.6	500	80-120	20	500	10000	80-120	20
	Selenium	7782-49-2	ug/L	6010C	**50**	50	183	50	4.34	40	80-120	20	2	10	80-120	20
	Silver	7440-22-4	ug/L	6010C	**50**	100	183	---	0.599	10	80-120	20	1	10	80-120	20
	Sodium	7440-23-5	ug/L	6010C	---	---	---	---	51.4	1000	80-120	20	1900	10000	80-120	20
	Thallium	7440-28-0	ug/L	6010C	---	**2**	2.41	2	1.75	20	80-120	20	1.9	10	80-120	20
	Titanium	7440-32-6	ug/L	6010C	---	---	---	---	0.372	100	80-120	20	2	10	80-120	20
	Vanadium	7440-62-2	ug/L	6010C	---	---	**183**	---	0.818	20	80-120	20	1	50	80-120	20
	Zinc	7440-66-6	ug/L	6010C	10,000	**5,000**	11,000	---	2.72	20	80-120	20	5	20	80-120	20

TABLE 1-2
SCREENING GUIDELINES, LABORATORY METHOD AND REPORTING LIMITS, AND PARCC REQUIREMENTS

Analytical Parameters and Methods					Screening Guidelines [1]				Gulf Coast Analytical Laboratories, Inc.				Accutest Laboratories, Inc.			
					1		2	3								
					WQCC (NMAC Section 20.6.2.3103)	USEPA Drinking Water Maximum Contaminant Levels (May 2010)	NMED SSLs - Tap Water Screening Levels (Dec 2009)	Regional Screening Levels for Chemical Contaminants at Superfund Sites (May 2010)								
	Parameters	CAS Number	Unit	Method	The lower value for either of these lists will be applied per analyte		Applied in the absence of a limit under the WQCC or USEPA Drinking Water standards	Applied in the event that the WQCC, USEPA, or NMED SSLs do not have a value	MDL	RL	Accuracy (%R)	Precision (RPD)	MDL	RL	Accuracy (%R)	Precision (RPD)
VOCs and Perchlorate	1,1,1,2-Tetrachloroethane	630–20–6	ug/L	8260B	---	---	**5.24**	---	0.113	5	80-130	30	0.2	1	81-119	10
	1,1,1-Trichloroethane	71–55–6	ug/L	8260B	**60**	200	9130	200	0.106	5	65-130	30	0.2	1	79-133	11
	1,1,2,2-Tetrachloroethane	79–34–5	ug/L	8260B	10	---	0.671	---	0.0728	5	65-130	30	0.23	1	71-120	11
	1,1,2-Trichloroethane	79–00–5	ug/L	8260B	10	**5**	2.42	500	0.0951	5	75-125	30	0.22	1	80-114	11
	1,1-Dichloroethane	75–34–3	ug/L	8260B	25	---	24.2	---	0.0305	5	70-135	30	0.25	1	82-127	10
	1,1-Dichloroethene	75–35–4	ug/L	8260B	**5**	7	340	700	0.164	5	70-130	30	0.23	1	75-133	13
	1,1-Dichloropropene	563–58–6	ug/L	8260B	---	---	---	---	0.067	5	75-130	30	0.28	1	87-127	10
	1,2,3-Trichlorobenzene	87-61-6	ug/L	8260B	---	---	---	---	0.11	5	55-140	30	0.5	1	64-126	16
	1,2,3-Trichloropropane	96–18–4	ug/L	8260B	---	---	**960**	---	0.1	5	75-125	30	0.3	2	77-115	12
	1,2,4-Trichlorobenzene	120–82–1	ug/L	8260B	---	**70**	8.16	70	0.119	5	65-135	30	0.5	1	68-123	11
	1,2,4-Trimethylbenzene	95-63-6	ug/L	8260B	---	---	---	---	0.0273	5	75-130	30	0.27	2	82-120	10
	1,2-Dibromo-3-chloropropane	96–12–8	ug/L	8260B	---	**0.2**	0.00803	0.2	0.0823	5	50-130	30	0.5	2	61-118	15
	1,2-Dibromoethane	106–93–4	ug/L	8260B	**0.1**	---	0.0653	0.05	0.0468	5	80-120	30	0.37	1	80-115	10
	1,2-Dichlorobenzene	95–50–1	ug/L	8260B	---	**7**	370	600	0.0789	5	70-120	30	0.25	1	85-115	9
	1,2-Dichloroethane	107–06–2	ug/L	8260B	10	**5**	1.49	5	0.086	5	70-130	30	0.2	1	76-122	11
	1,2-Dichloropropane	78–87–5	ug/L	8260B	---	**5**	3.86	5	0.0641	5	75-125	30	0.25	1	81-120	11
	1,3,5-Trimethylbenzene	108-67-8	ug/L	8260B	---	---	---	---	0.021	5	75-130	30	0.21	2	83-123	10
	1,3-Dichlorobenzene	541–73–1	ug/L	8260B	---	---	---	---	0.0988	5	75-125	30	0.2	1	86-115	9
	1,3-Dichloropropane	142–28–9	ug/L	8260B	---	---	---	---	0.0415	5	75-125	30	0.2	1	81-113	11
	1,4-Dichlorobenzene	106–46–7	ug/L	8260B	---	**75**	4.27	75	0.118	5	75-125	30	0.23	1	87-113	10
	2,2-Dichloropropane	594–20–7	ug/L	8260B	---	---	---	---	0.117	5	70-135	30	0.44	1	77-138	12
	2-Butanone	78–93–3	ug/L	8260B	---	---	**7060**	---	0.0933	5	30-150	30	2	5	61-127	13
	2-Chlorotoluene	95-49-8	ug/L	8260B	---	---	---	---	0.0448	5	75-125	30	0.22	1	84-121	10
	2-Hexanone	591–78–6	ug/L	8260B	---	---	---	---	0.503	5	55-130	30	4	10	58-125	14
	4-Chlorotoluene	106-43-4	ug/L	8260B	---	---	---	---	0.0523	5	75-130	30	0.2	1	84-120	10
	4-Methyl-2-pentanone	108–10–1	ug/L	8260B	---	---	---	---	0.0654	5	60-135	30	2	5	62-125	13
	Acetone	67–64–1	ug/L	8260B	---	---	**18.8**	---	1.15	25	40-140	30	10	25	59-134	14
	Benzene	71–43–2	ug/L	8260B	10	**5**	4.13	5	0.0542	5	80-120	30	0.2	1	83-124	11
	Bromobenzene	108-86-1	ug/L	8260B	---	---	---	---	0.0844	5	75-125	30	0.25	1	83-115	10
	Bromochloromethane	74–97–5	ug/L	8260B	---	---	---	---	0.0945	5	65-130	30	0.22	1	78-112	10
	Bromodichloromethane	75–27–4	ug/L	8260B	---	---	**1.47**	80	0.0531	5	75-120	30	0.2	1	76-116	10
	Bromoform	75–25–2	ug/L	8260B	---	---	**85.1**	80	0.104	5	70-130	30	0.2	1	68-128	11
	Bromomethane	74–83–9	ug/L	8260B	---	---	**8.66**	---	0.264	5	30-145	30	0.5	2	55-151	21
	Carbon disulfide	75–15–0	ug/L	8260B	---	---	**1040**	---	0.143	5	35-160	30	0.5	2	67-147	12
	Carbon tetrachloride	56–23–5	ug/L	8260B	10	**5**	1.99	5	0.148	5	65-140	30	0.25	1	74-139	13
	Chlorobenzene	108–90–7	ug/L	8260B	---	**100**	91.3	100	0.0274	5	80-120	30	0.2	1	87-115	9
	Chloroethane	75–00–3	ug/L	8260B	---	---	**20900**	---	0.351	5	60-135	30	0.5	2	54-166	20
	Chloroform	67–66–3	ug/L	8260B	100	---	1.93	80	0.0565	5	65-135	30	0.22	1	85-123	10
	Chloromethane	74–87–3	ug/L	8260B	---	---	**17.8**	---	0.0886	5	40-125	30	0.5	2	55-173	22
	cis-1,2-Dichloroethene	156–59–2	ug/L	8260B	---	**70**	365	---	0.0613	5	70-125	30	0.26	1	81-114	10
	cis-1,3-Dichloropropene	10061–01–5	ug/L	8260B	---	---	---	---	0.0312	5	70-130	30	0.2	1	83-119	10
	Dibromomethane	74–95–3	ug/L	8260B	---	---	**365**	---	0.184	5	75-125	30	0.5	2	81-116	10
	Dichlorodifluoromethane	75–71–8	ug/L	8260B	---	---	**395**	---	0.096	5	30-155	30	2	2	34-158	22
	Ethylbenzene	100–41–4	ug/L	8260B	750	**700**	14.8	700	0.0627	5	75-125	30	1	1	87-118	10
	Hexachlorobutadiene	87–68–3	ug/L	8260B	---	**50**	---	---	0.69	5	50-140	30	2	2	71-133	12
	Isopropylbenzene	98-82-8	ug/L	8260B	---	---	**679**	---	0.0347	5	75-125	30	0.2	1	87-131	10

TABLE 1-2
SCREENING GUIDELINES, LABORATORY METHOD AND REPORTING LIMITS, AND PARCC REQUIREMENTS

Analytical Parameters and Methods					Screening Guidelines [1]				Gulf Coast Analytical Laboratories, Inc.				Accutest Laboratories, Inc.			
					1		2	3								
					WQCC (NMAC Section 20.6.2.3103)	USEPA Drinking Water Maximum Contaminant Levels (May 2010)	NMED SSLs - Tap Water Screening Levels (Dec 2009)	Regional Screening Levels for Chemical Contaminants at Superfund Sites (May 2010)								
Parameters		CAS Number	Unit	Method	The lower value for either of these lists will be applied per analyte		Applied in the absence of a limit under the WQCC or USEPA Drinking Water standards	Applied in the event that the WQCC, USEPA, or NMED SSLs do not have a value	MDL	RL	Accuracy (%R)	Precision (RPD)	MDL	RL	Accuracy (%R)	Precision (RPD)
VOCs and Perchlorate (continued)	m & p-Xylene	m-Xylene - 108-38-3	ug/L	8260B	---	---	**1430**	---	0.0583	5	75-130	30	0.32	2	86-121	10
		p-Xylene - 106-42-3			---	---	---	---	0.0583	5	75-130	30	0.32	2	86-121	10
	Methyl tert-butyl ether	1634-04-4	ug/L	8260B	---	---	**125**	---	0.0517	5	65-125	30	0.34	1	75-116	10
	Methylene chloride	75–09–2	ug/L	8260B	**100**	---	48	5	0.327	10	55-140	30	2	5	69-125	11
	n-Butylbenzene	104-51-8	ug/L	8260B	---	---	---	---	0.0368	5	70-135	30	0.26	1	84-124	10
	n-Propylbenzene	103-65-1	ug/L	8260B	---	---	---	---	0.0543	5	70-130	30	0.2	1	86-125	10
	Naphthalene	91–20–3	ug/L	8260B	---	---	**1.43**	---	0.0817	5	55-140	30	1	5	59-125	15
	o-Xylene	95-47-6	ug/L	8260B	---	---	**143**	---	0.0274	5	80-120	30	0.2	1	83-121	10
	Perchlorate	14797-73-0	ug/L	6860	---	---	---	**15**	0.066	0.5	74-126	30	0.0329	0.2	74-126	20
	p-Isopropyltoluene	99-87-6	ug/L	8260B	---	---	---	---	0.0372	5	75-130	30	0.21	1	83-125	9
	sec-Butylbenzene	135-98-8	ug/L	8260B	---	---	---	---	0.0266	5	70-125	30	0.22	1	86-127	10
	Styrene	100–42–5	ug/L	8260B	---	**100**	1620	100	0.0507	5	65-135	30	0.2	1	78-118	11
	tert-Butylbenzene	98-06-6	ug/L	8260B	---	---	---	---	0.0776	5	70-130	30	0.27	1	83-126	10
	Tetrachloroethene	127–18–4	ug/L	8260B	---	**5**	1.08	5	0.121	5	45-150	30	0.25	1	80-131	12
	Toluene	108–88–3	ug/L	8260B	**750**	1000	2280	1000	0.059	5	75-120	30	0.2	1	86-116	10
	trans-1,2-Dichloroethene	156–60–5	ug/L	8260B	---	**100**	107	100	0.107	5	60-140	30	0.35	1	82-126	10
	trans-1,3-Dichloropropene	10061–02–6	ug/L	8260B	---	---	---	---	0.0542	5	55-140	30	0.2	1	87-123	10
	Trichloroethene	79–01–6	ug/L	8260B	---	**5**	16.5	5	0.0618	5	70-125	30	0.26	1	85-124	10
	Trichlorofluoromethane	75–69–4	ug/L	8260B	---	---	**1290**	---	0.123	5	60-145	30	0.5	2	66-156	15
	Vinyl chloride	75–01–4	ug/L	8260B	**1**	2	0.0861	2	0.093	5	50-145	30	0.22	1	57-153	22
	Xylenes, total	1330-20-7	ug/L	8260B	**620**	10000	203	10000	0.058	10	75-130	30	0.52	3	75-130	30
VOC Surrogates	1,2-Dichloroethane-d4	17060-07-0	ug/L	8260B	---	---	---	---	na	na	70-120	na	na	na	76-127	na
	4-Bromofluorobenzene	460-00-4	ug/L	8260B	---	---	---	---	na	na	75-120	na	na	na	84-120	na
	Toluene-d8	2037-26-5	ug/L	8260B	---	---	---	---	na	na	85-120	na	na	na	86-112	na
	Dibromofluoromethane	1868-53-7	ug/L	8260B	---	---	---	---	na	na	85-115	na	na	na	87-116	na

Notes:

1 To determine whether potential site-related contaminants exceed ground water screening guidelines the following procedure will be prioritized as follows:

1. WQCC NMAC Title 20 Environment Protection, Chapter 6 Water Quality, Part 2 Ground and Surface Water Protections, Section 20.6.2.3103 Subsections A, B, and C values will be compared with the EPA Maximum Contaminant Levels for Drinking Water (primary and secondary). The lower value for either of these lists will be applied per analyte.
2. In the absence of a limit under the WQCC or USEPA Drinking Water standards, screening levels for tap water as published in the NMED Technical Background Document for Development of Soil Screening Levels, Revision 5 (NMED SSLs)(December 2009) would be applied.
3. In the event that the above lists do not have a value for a contaminant of concern, values found in the USEPA RSLs for Contaminants at Superfund Sites (May 2010) would be used for evaluation.

- Based on the above criteria the accepted standard is in bold
- --- indicates that there is no standard.
- na - not applicable.
- The accuracy and precision values are applicable to MS/MSD and LCS/LCSD samples.
- %R - Percent recovery.
- LCS/LCSD - Laboratory control sample/Laboratory control sample duplicate.
- MS/MSD - Matrix spike/Matrix spike duplicate.
- RPD - Relative Percent Difference.
- Gulf Coast Analytical Laboratories, Inc. will subcontract perchlorate analysis to Empirical Labs in Tennessee.
- Accutest Laboratories, Inc. will subcontract perchlorate analysis to ALS-DataChem in Utah.

TABLE 1-2
SCREENING GUIDELINES, LABORATORY METHOD AND REPORTING LIMITS, AND PARCC REQUIREMENTS

QUALIFIER	DATA QUALIFIER DEFINITIONS (ORGANIC)
U	The analyte was analyzed for, but was not detected at a level greater than or equal to the level of the adjusted Reporting Limit (RL) for sample and method
J	The analyte was positively identified and the associated numerical value is the approximate concentration of the analyte in the sample (due either to the quality of the data generated because certain QC criteria were not met, or the concentration of the analyte was below the RL.
NJ	The analysis indicates the presence of an analyte that has been "tentatively identified" and the associated numerical value represents its approximate concentration.
UJ	The analyte was not detected at a level greater than or equal to the adjusted RL. However, the reported adjusted RL is approximate and may be inaccurate or imprecise.
R	The sample results are unusable due to the quality of the data generated because certain criteria were not met. The analyte may or may not be present in the sample.
QUALIFIER	**DATA QUALIFIER DEFINITIONS (INORGANIC)**
U	The analyte was analyzed for, but was not detected at a level greater than or equal to the level of the adjusted Reporting Limit (RL) for sample and method
J	The result is an estimated quantity. The associated numerical value is the approximate concentration of the analyte in the sample.
J+	The result is an estimated quantity, but the result may be biased high.
J-	The result is an estimated quantity, but the result may be biased low.
R	The data are unusable. The sample results are rejected due to serious deficiencies in meeting QC criteria. The analyte may or may not be present in the sample.
UJ	The analyte was analyzed for, but was not detected. The reported RL is approximate and may be inaccurate or imprecise.

TABLE 2-1
LISTS OF QUALIFIERS

Contaminant	Regulated Level (µg/l)
Arsenic (As)	0.005
Barium (Ba)	0.1
Benzene	0.0005
Cadmium (Cd)	0.001
Carbon Tetrachloride	0.0005
Chlordane	0.00003
Chlorobenzene	0.1
Chloroform	0.006
Chromium (Cr)	0.005
o-Cresol	0.2
m-Cresol	0.2
p-Cresol	0.2
Cresol	0.2
2,4-D	0.01
1,4-Dichlorobenzene	0.0075
1,2-Dichloroethane	0.0005
1,1-Dichloroethylene	0.0007
2,4-Dinitrotoluene	0.00013
Endrin	0.00002
Heptachlor	0.000008
Hexachlorobenzene	0.00013
Hexachlorobutadiene	0.0005
Hexachloroethane	0.003
Lead (Pb)	0.005
Lindane	0.0004
Mercury (Hg)	0.0002
Methoxychlor	0.01
Methyl ethyl ketone	0.2
Nitrobenzene	0.002
Pentachlorophenol	0.1
Pyridine	0.005
Selenium (Se)	0.001
Silver (Ag)	0.005
Tetrachloroethylene	0.0007
Toxaphene	0.0005
Trichloroethylene	0.0005
2,4, 5-Trichlorophenol	0.4
2,4,6-Trichlorophenol	0.002
2,4,5-TP (Silvex)	0.001
Vinyl Chloride	0.0002

Monitoring well analytical results from the associated samples will be used to characterize the IDW by applying the “20 Times Rule” (40 CFR 261.24). If analytical results are greater than or equal to 20 times any of the Toxicity Characteristic Leaching Procedure (TCLP) regulatory limits (40 CFR 261.24)

TABLE 2-8
TCLP REGULATORY LIMITS

ATTACHMENT 1

Included on CD

This page intentionally left blank.

MAY 2011
GROUND WATER MONITORING
PROJECT WORK PLAN – SUPPORTING DOCUMENTS
MELROSE AIR FORCE RANGE
ROOSEVELT AND CURRY COUNTIES, NEW MEXICO

Prepared For:
Cannon Air Force Base
Air Force Special Operations Command (AFSOC)
27th SOCES/CEANR
Cannon Air Force Base, NM 88103-5003

Prepared By:
Trinity Analysis & Development Corp.
90 NW Beal Parkway, Suite A2
Ft. Walton Beach, FL, 32548
(850) 243-0072

Under Contract To:
United States Army Corps of Engineers (USACE)
Omaha District
1616 Capitol Avenue
Omaha, NE 68102-4901

Contract Number:
W9128F-10-D-0091, Task Order 0006

November 2011

This page intentionally left blank.

TABLE OF CONTENTS

TABLE OF CONTENTS i

LIST OF FIGURES iv

LIST OF TABLES iv

LIST OF APPENDICES iv

LIST OF ACRONYMS AND ABBREVIATIONS vi

1.0 Project Organization and Responsibilities 1-1

1.1 U.S. Army Corps of Engineers, Omaha District 1-2
1.2 Cannon Air Force Base 1-2
1.3 Trinity Analysis & Development Corp. 1-3
1.4 Gulf Coast Analytical Laboratories 1-4
1.5 Accutest Laboratories, Inc. 1-4
1.6 Environmental Data Professional, LLC 1-4
1.7 Subcontractors 1-4
1.8 Personnel Organization and Contact Information 1-5

2.0 QUALITY ASSURANCE PROJECT PLAN 2-1

2.1 Project Laboratory Organization and Responsibilities 2-1
2.1.1 Project Laboratory 2-1
2.1.2 Data Assessment Organization and Responsibilities 2-2
2.2 Data Quality Objectives 2-3
2.2.1 Data Use Background 2-3
2.2.1 Chemical Data Measurement Quality Objectives 2-3
2.2.2 Sample Receipt, Handling, Custody and Holding Time 2-4
2.3 Laboratory Quality Control Checks 2-6
2.3.1 Laboratory Control Sample 2-6
2.3.2 Matrix Spike/Matrix Spike Duplicates 2-7
2.3.3 Surrogates 2-8
2.3.4 Internal Standards 2-9
2.3.5 Interference Check Sample 2-10
2.3.6 Method Blank 2-10
2.4 Calibration Procedures and Frequency 2-11
2.4.1 Analytical Sequence QC 2-11

2.4.2 Batch/Matrix-Specific/Performance-Based QC 2-12
2.5 Data Quality Indicators 2-12
2.5.1 Precision 2-12
2.5.2 Accuracy 2-13
2.5.3 Representativeness 2-14
2.5.4 Completeness 2-15
2.5.5 Comparability 2-15
2.5.6 Sensitivity 2-16
2.5.6.1 Method Detection Limit 2-16
2.5.6.2 Reporting Limit 2-17
2.6 Evaluation of Project Specific Method and Reporting Limits 2-17
2.7 Data Reduction/Data Review 2-17
2.8 Laboratory Data Validation Procedures 2-18
2.8.1 Laboratory Data Qualifiers 2-19
2.8.2 Laboratory Report Certificates 2-19
2.8.3 Laboratory Operations Documentation 2-20
2.8.4 Sample Management Records 2-20
2.8.5 Data Reporting Procedures 2-20
2.8.5.1 Data Package Format and Contents 2-21
2.9 Preventative Maintenance 2-22
2.10 Performance and System Audits 2-23
2.11 Nonconformance/Corrective Actions 2-23
2.12 Field Activities 2-25
2.12.1 Quality Control for Field Analysis 2-25
2.12.2 Field Quality Control Samples 2-26
2.12.2.1 Trip Blank 2-26
2.12.2.2 Equipment Rinsate Blank 2-26
2.12.2.3 Temperature Blank 2-27
2.12.2.4 Field Duplicate Samples 2-27
2.12.2.5 Field Split 2-28
2.13 Electronic Deliverables 2-28
2.13.1 ERPIMS Data Reporting 2-29
2.14 Data Assessment Procedures 2-29
2.14.1 Data Verification 2-29
2.14.2 QC Data Review 2-30
2.14.3 Data Validation 2-30
2.15 DQO Reconciliation 2-30

2.16 Project Completeness Assessment 2-31

3.0 SITE SAFETY AND HEALTH PLAN 3-1

3.1 Responsibilities 3-2
3.1.1 Project Manager (TRINITY) 3-2
3.1.2 Site Health and Safety Officer (TRINITY) 3-3
3.1.3 Corporate Health and Safety Officer (TRINITY) 3-4
3.1.4 Site Guide/Escort (Cannon AFB) 3-4
3.1.5 Project Personnel (TRINITY) 3-4
3.1.6 Subcontractor's Safety Representative 3-5
3.2 Medical Surveillance 3-5
3.2.1 Medical Examination 3-5
3.3 Training 3-6
3.3.1 HAZWOPER Training and Medical Surveillance 3-6
3.3.2 Behavior Based Safety 3-7
3.3.3 Daily Safety Meeting 3-7
3.4 Personal Protective Equipment/Action Levels 3-8
3.5 Activity Hazard Analysis 3-8
3.6 Physcial, Chemical, and Biological Hazards 3-9
3.6.1 General 3-9
3.6.2 Chemical Hazards 3-9
3.6.2.1 Chemicals Brought On Site 3-10
3.6.2.2 Hazard Communication Materials 3-10
3.6.3 Electrical Hazards 3-11
3.6.4 Physical Hazards 3-11
3.6.4.1 Laser (Lasing) Activities 3-11
3.6.4.2 Heat/Cold Stress Recognition and Control 3-12
3.6.4.3 Slip/Trip/Fall Hazards 3-15
3.6.4.4 Lifting Hazards 3-15
3.6.5 Biological Hazards 3-16
3.6.5.1 Bees, Hornets and Wasps 3-16
3.6.5.2 Ticks 3-17
3.6.5.3 Mites (Chiggers) 3-18
3.6.5.4 Black Widow Spider 3-19
3.6.5.5 Snakes 3-20
3.6.5.6 Scorpions 3-23
3.6.5.7 Other Animals 3-23
3.6.5.8 Plants Causing Skin and Tissue Injury 3-24

3.6.6 Radiological 3-24
3.6.7 Explosive Ordnance and Explosives 3-25
3.7 Site Control Measures 3-25
3.8 Emergency Information 3-25
3.9 Emergency Response and Contingency Procedures 3-25
3.9.1 Places of Refuge 3-26
3.9.2 Fire 3-26
3.9.3 Communication 3-27
3.9.4 Medical Emergencies Response Plan 3-28
3.9.5 Incident Report 3-29
3.9.6 Spill or Hazardous Material Release 3-30
4.0 WORKS CITED 4-1

LIST OF FIGURES

Figure 1-1 Organizational Structure (Imbedded in text)
Figure 1-2 Line of Authority for Site Activities and Contact Information (Imbedded in text)
Figure 3-1 Africanized Honey Bee (Imbedded in text)
Figure 3-2 Tick (Imbedded in text)
Figure 3-3 Mites (Chiggers) (Imbedded in text)
Figure 3-4 Black Widow Spider (Imbedded in text)
Figure 3-5 Western Diamondback (Imbedded in text)
Figure 3-6 Western (Prairie) Rattlesnake (Imbedded in text)
Figure 3-7 Black-Tailed Rattlesnake (Imbedded in text)
Figure 3-8 Massasauga Rattlesnake (Imbedded in text)
Figure 3-9 Scorpion (Imbedded in text)
Figure 3-10 Hospital Route Map

LIST OF TABLES

Table 1-1 Lists of Qualifiers
Table 2-1 QC Check Frequency (Imbedded in text)
Table 3-1 Permissible Heat Exposure Threshold Limit Value (Imbedded in text)
Table 3-2 Project Emergency Contact Information

LIST OF APPENDICES

Appendix A Laboratory Quality Assurance Manuals

Appendix B Forms

Safety Compliance Agreement and Medical Emergency Contact Sheet
Tailgate Safety Meeting Form
USACE Accident Investigation and Reporting Form

Appendix C Activity Hazard Analysis

Appendix D MSDS Sheets

LIST OF ACRONYMS AND ABBREVIATIONS

%R	percent recovery
°C	Celsius
°F	Fahrenheit
AFB	Air Force Base
AFCEE	Air Force Center for Engineering and the Environment
AFR	Air Force Range
AFSOC	Air Force Special Operations Command
AHA	Activity Hazard Analysis
AOC	Area of Concern
bls	Below land surface
CCV	continuing calibration verifications
CDC	Center for Disease Control
CEA	Asset Management Flight
CEAN	Environmental Element
CEC	cation exchange capacity
COC	chain-of-custody
CPR	cardiopulmonary resuscitation
DHL	DHL Analytical, Inc.
DO	dissolved oxygen
DoD	Department of Defense
DoD-QSM	Department of Defense-Quality System Manual
DQO	Data Quality Objective
ECA	External Certificate Authority
eDatapro	Environmental Data Professional LLC
EDDs	electronic data deliverables
ELAP	Environmental Laboratory Accreditation Program
EPA	Environmental Protection Agency
ERP	Environmental Restoration Program
ERPIMS	Environmental Restoration Program Information Management System
FD	Fire Department
FM	Field Manager
ft/day	feet per day
ft/ft	feet per foot
ft/yr	feet per year
GC/MS	gas chromatograph/mass spectrophotometer
GCAL	Gulf Coast Analytical Laboratories, Inc.
GPS	global positioning system
HPLC	high performance liquid chromatography
HSO	Health and Safety Officer
IATA	International Air Transport Association
ICP	inductively coupled plasma
ICS	interference check sample
IDW	investigation-derived waste
ISs	Internal standards

LCS	laboratory control sample
LCSD	laboratory control sample duplicate
LCS/ LCSD	laboratory control sample/ laboratory control sample duplicate
MCLs	maximum contaminant levels
MDL	method detection limit
MEC	munitions and explosives of concern
mg/L	milligrams per liter
mL	milliliter
ML	silt
mph	miles per hour
MPPEH	Material Potentially Presenting an Explosive Hazard
MS	matrix spike
MQOs	measurement quality objectives
MSD	matrix spike duplicates
MS/MSD	matrix spike/ matrix spike duplicate
MSDS	Material Safety Data Sheet
mV	millivolts
NELAC	National Environmental Laboratory Accreditation Conference
NFG	National Functional Guidelines
NMAC	New Mexico Administrative Code
NMED	New Mexico Environment Department
NIST	National Institute of Standards and Technology
No.	number
ORP	Oxidation Reduction Potential
OSHA	Occupational Safety & Health Administration
PARCC	precision, accuracy, representativeness, comparability, and completeness
PE	Performance evaluation
PM	Project Manager
PPE	personal protective equipment
PQL	practical quantitation limit
QA/QC	quality assurance/quality control
QAPP	Quality Assurance Project Plan
QAM	Quality Assurance Manual
QC	quality control
RCO	Range Control Officer
RCRA	Resource Conservation and Recovery Act
RFI	RCRA Facility Investigation
RL	reporting limit
RMSF	Rocky Mountain Spotted Fever
RPD	relative percent difference
RSD	relative standard deviation
RSL	Regional Screening Levels
SAAR	System Authorization Access Request Form
SATOC	Single Award Task Order Contract
SC	clayey sand
SC-CL	clayey sand - clay

SDG	Sample Delivery Group
SM	silty sand
SOW	Special Operations Wing
SOP	Standard Operating Procedure
SR	State Road
SSHO	Site Safety and Health Officer
SSHP	Site Safety & Health Plan
SSL	Soil Screening Level
SSR	Subcontractor's Safety Representative
SVOCs	semivolatile organic compounds
SWMU	Solid Waste Management Unit
TCLP	Toxicity Characteristic Leaching Procedure
TDS	total dissolved solids
TLV	Threshold Limit Value
TRINITY	Trinity Analysis & Development Corp.
US	United States
USACE	US Army Corps of Engineers
USDOT	U.S. Department of Transportation
USGS	United States Geological Survey
UXO	unexploded ordnance
VOCs	volatile organic compounds
WP	Work Plan
WQCC	Water Quality Control Commission
µg/L	micrograms per liter
µm	micron

1.0 PROJECT ORGANIZATION AND RESPONSIBILITIES

The project team consists of the Cannon AFB, the USACE, and TRINITY. The roles of these team members are described below. The basic team organization for this project is provided in the figures below:

Figure 1-1
Organizational Structure

1.1 U.S. Army Corps of Engineers, Omaha District

The USACE - Omaha District is the contracting and financial agency for this project. This project was awarded September 30, 2010. In early February 2011, TRINITY was notified that technical project management responsibility would be transferred from the USACE – Omaha District to the USACE – Albuquerque District. USACE – Omaha would retain contract officer authority and financial obligations.

USACE – Omaha Project Manager (Mr. Hector Santiago) – Review Progress Reports, verify work accomplished in accordance with USACE – Albuquerque requests.

USACE – Albuquerque Project Manager (Mr. Walter Midgal) – Technical Project Manager.

1.2 Cannon Air Force Base

Cannon AFB is the ultimate customer for the project and thus Cannon Environmental, Base Safety, Engineering, etc. will be involved and kept apprised of all aspects of the project. Cannon AFB has responsibility for review of project plans and documents, and supporting TRINITY in obtaining site access and coordinating with state and local regulatory agencies. CEA staff associated with this project includes:

CEA Flight Chief (Mr. Ronald Lancaster).

CEA – Environmental Element (CEAN), Chief, Conservation Section (Mr. Rick Crow).

CEA – CEAN, Interim Environmental Restoration Program Manager (Ms. Anita Lafuente).

Ageiss, Inc. – Program Manager/Geologist/GIS Specialist (Ms. Karen Walker).

CEA – CEAN, Melrose Range Technician (Mr. Kerry Hubbell) – Mr. Hubbell is the Site Guide/Escort and is responsible for coordination with the Melrose AFR Range Control Officer (RCO).

1.3 Trinity Analysis & Development Corp.

Program Manager (Mr. Richard L. Burdine, Senior Vice President, P.G.) – Mr. Burdine as the TRINITY Program Manager is the Principal-in-Charge for TRINITY, and has overall responsibility to the Omaha District for execution of the delivery order under TRINITY's Single Award Task Order Contract (SATOC).

Project Manager (Mr. Richard L. Burdine, Senior Vice President, P.G.) – Mr. Burdine will serve as the TRINITY Project Manager. Mr. Burdine will be responsible for complete coordination of the work, including adequate internal controls and review procedures to eliminate conflicts, errors, and to verify technical accuracy. In addition, Mr. Burdine is responsible for overseeing activities involving sampling and performance of audits

Health and Safety Officer (Mr. Alec Macbeth, P.G.) – Mr. Macbeth will serve as the TRINITY Health and Safety Officer (HSO). Mr. Macbeth is responsible for the development, oversight, and enforcement of the Site Safety & Health Plan (SSHP); and overall management of the health and safety program for the project.

Project Chemist & Data Validation Manager (Ms. Judy Soloman) – Ms. Soloman will serve as the Project Chemist and Data Validation Manager. Ms. Soloman will ensure that the work performed is in accordance with the Quality Assurance Project Plan (QAPP), this Work Plan, appropriate SOPs, and other pertinent analytical procedures. She will be responsible for sample tracking, data management, laboratory coordination, data interpretation, analytical electronic data deliverables (EDDs), and reports.

Field Site Manager & Site Safety and Health Officer (Mr. Jonathan Kramer) – Mr. Kramer is responsible for supporting the TRINITY PM by leading and coordinating the day-to-day field activities of the various resource specialists under his supervision. The TRINITY Field Manager (FM) and Site Safety and Health Officer (SSHO) will report directly to the TRINITY PM. Mr. Kramer will supervise the field activities relevant to this project and will have direct responsibility for site-specific activities and decisions regarding the immediate safety of investigation personnel and will report directly to the PM and HSO.

1.4 Gulf Coast Analytical Laboratories

Gulf Coast Analytical Laboratories, Inc. (GCAL), Baton Rouge, LA is the primary contract laboratory for the analysis of ground water samples collected as part of this Work Plan. GCAL is accredited in accordance with the National Environmental Laboratory Accreditation Conference (NELAC) (Certificate Number 01955), and the DoD Environmental Laboratory Accreditation Program (ELAP) (Certificate Number 1482).

Considering the low method detection limits required for perchlorate, GCAL will outsource this analysis to DHL Analytical, Inc. (DHL), Round Rock, TX. DHL is accredited in accordance with NELAC (Certificate Number T104704211-11-6), and ELAP (Certificate Number ADE-1416). QAMs for GCAL and DHL are provided in **Appendix A**.

1.5 Accutest Laboratories, Inc.

Accutest Laboratories, Inc., Orlando, FL is the secondary contract laboratory for the analysis of field split ground water samples collected as part of this Work Plan. Accutest is accredited in accordance with the NELAC (Certificate Number 83510), and the DoD ELAP (Certificate Number 2229). Accutest's QAM is provided in **Appendix A**.

1.6 Environmental Data Professional, LLC

Analytical data validation will be conducted by third party Environmental Data Professional, LLC (eDATApro), Lake Charles, LA or equivalent. Data will be validated using the latest versions of the EPA's National Functional Guidelines (NFG) for both organic and inorganic methods, where applicable. Based on the NFG, eDATApro will assign specific qualifiers to the data that will aid in usability. Lists of qualifiers that will be used for this project are provided in **Table 2-1**.

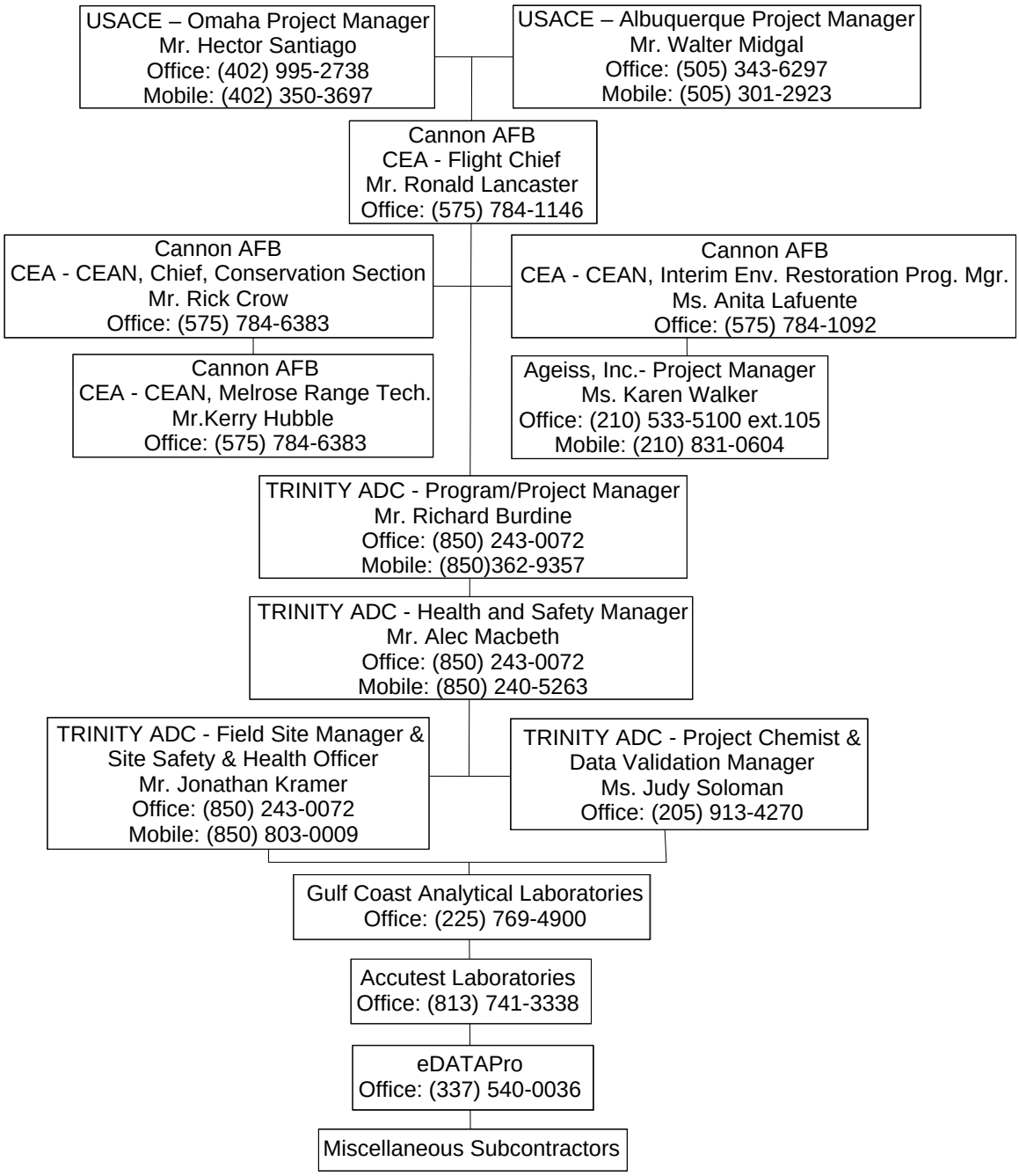
1.7 Subcontractors

TRINITY will be responsible for oversight and coordination with all subcontractors.

1.8 Personnel Organization and Contact Information

Summarized below, in **Figure 1-2**, is the hierarchy of personnel associated with this project and their respective contact information.

Figure 1-2
Line of Authority for Site Activities and Contact Information



This page intentionally left blank.

2.0 QUALITY ASSURANCE PROJECT PLAN

TRINITY has prepared this QAPP to describe the laboratory and field QA/QC program for field activities associated with this Work Plan. This QAPP was developed in general accordance with the *Requirements for the Preparation of Sampling and Analysis Plans*, Engineer Manual 200-1-3 (February 1, 2001) (U.S. Army Corp of Engineers, 2001).

The purpose of this QAPP is to define the policies, organization, SOPs, analytical methods, and QA/QC procedures required to achieve the project-specific DQOs. The project-specific DQOs are discussed in more detail within **Section 2.2** below.

Implementation of the procedures described in this QAPP is required to ensure that sample collection, analyses, and evaluations are legally and scientifically defensible. This QAPP contains the site specific information for the field work outlined in **Section 2.0** of the Work Plan, and outlines Trinity's process for completion of the quality assurance portion of the Melrose project.

2.1 Project Laboratory Organization and Responsibilities

2.1.1 Project Laboratory

The project laboratory was selected based on methodology requirements, data deliverables, responsiveness, and cost effectiveness. Contract requirements for this project include the selected laboratory to have NELAC and DoD accreditation. Based on these criteria, Gulf Coast Analytical Laboratories, Inc. in Baton Rouge, Louisiana (DoD ELAP Certification ADE-1482) has been chosen to be the primary laboratory that will provide analytical services for samples collected as part of this project. GCAL will perform the majority analysis of the definitive samples. (Refer to the Organizational Structure in **Section 1.0** above). GCAL's laboratory contact information is presented below:

- Ms. Dana Merrill
  Project Manager
  Gulf Coast Analytical Laboratories
  7979 GSRI Avenue
  Baton Rouge, LA 70820
  225-214-7044 Direct

In addition to GCAL, Accutest Laboratories, Inc. will also perform definitive data analysis on the field split samples. Accutest Laboratories' contact information is as follows:

- Ms. Sue Bell
  Project Manager
  Accutest Laboratories
  Orlando, FL
  813-741-3338 Direct

Accutest Laboratories is also NELAC certified (Certificate Number 83510), in addition to being DoD ELAP certified (Certificate Number 2229)

Both laboratories QAMs and SOPs have been reviewed by Trinity and found to meet all the requirements for this project, with a few exceptions regarding reporting limits. The QAMs are included in **Appendix A** and SOPs are available for further review if required.

2.1.2 Data Assessment Organization and Responsibilities

TRINITY personnel will review all screening level data, i.e. data collected in the field. Data validation will be conducted by Trinity's Project Chemist or a third party validation firm. The data validation will be independent of the laboratories' data review and evaluation. The analytical data will be validated against the laboratories' QA/QC limits using the guidelines and practices promulgated in the EPA Contract Laboratory Program National Functional Guidelines for Superfund Organic Methods Data Review (EPA, June 2008, p. 46) and EPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review (EPA, October 2004) Trinity will evaluate the usability of all laboratory data.

Trinity will compare the results to the following ground water criteria, in the order specified below:

1. WQCC NMAC Title 20 Environmental Protection, Chapter 6 Water Quality, Part 2 Ground and Surface Water Protections, Section 20.6.2.3103 Subsections A, B, and C values will be compared with the EPA Maximum Contaminant Levels for Drinking Water (primary and secondary). The lower value for either of these lists will be applied per analyte.
2. In the absence of a limit under the WQCC or EPA Drinking Water standards, screening

levels for tap water as published in the NMED *Technical Background Document for Development of Soil Screening Levels, Revision 5 (NMED SSLs) (December 2009)* would be applied.

3. In the event that the above lists do not have a value for a contaminant of concern, values found in the *EPA RSLs for Contaminants at Superfund Sites (May 2010)* would be used for evaluation (EPA, 2010a; EPA 2010b).

2.2 Data Quality Objectives

DQOs specify the data type, quality, quantity, and uses needed to make decisions and are the basis for designing data collection activities. The following sections define the intended use of the data, and any specific conditions, criteria, or limits to be applied to the data based upon this use.

2.2.1 Data Use Background

The data quality is crucial in aiding numerous decisions such as the safety of project workers, protection of the environment, continued investigation needs, the need for additional ground water monitoring wells, waste characterization, waste disposal options, and final site disposition decisions. Therefore, it is critical that the data meet strict requirements so that when compared to health and/or regulatory action standards, the data can be used by all stakeholders with confidence to make intelligent decisions moving forward.

2.2.1 Chemical Data Measurement Quality Objectives

To ensure that quality data are continuously produced during analysis and allow the eventual compliance review, systematic quality control (QC) checks are incorporated into the sampling and analyses to show that procedures and test results remain reproducible and that the analytical method is actually measuring the quantity of target analytes without unacceptable bias. Systematic QC checks include the scheduled analyses of field and laboratory replicates, standards, surrogates, spiked samples, and blanks. Measurement quality objectives (acceptance criteria or ranges) or MQOs for these systematic QC checks are summarized in **Table 1-2** of the Work Plan for the analyses being performed in support of this project. Frequency requirements

for field QC samples are summarized below and discussed in more detail in **Sections 2.3.2** and **Section 3.5** of this WP.

Table 2-1
QC Check Frequency

QC Checks	Frequency
Equipment Rinsate	one for every ten environmental samples
Field Duplicate	one for every ten environmental samples
Field Split	one for every 20 environmental samples
Matrix Spike/Matrix Spike Duplicate (extra volume for lab)	one for every 20 environmental samples
Temperature Blank	each cooler
Trip Blank	Each cooler containing environmental samples for VOC analysis

2.2.2 Sample Receipt, Handling, Custody and Holding Time

The requirements for sample receipt condition verification, sample storage and/or handling requirements, any intra-laboratory custody requirements, and analytical parameter holding times will be discussed in this section. All notifications, customer correspondence, and corrective actions for incoming samples must be thoroughly documented and available for review. See **Section 2.2.3.4** of the Work Plan for a summary of the sample containers, preservation, and holding times for this project.

A COC record will be initiated at the sampling stage and maintained throughout the analysis and reporting stages of the process. Sample reports will be easily traceable to COC records. All documentation pertaining to sample receipt or analysis will be included in the laboratory's data report.

In addition to the COC requirements found in **Section 2.3.4** of the Work Plan, the following procedures should be performed when samples arrive at the laboratories:

- Verification that the custody seal on the cooler is intact and that the samples have not been tampered with;
- Verification of completed documentation of all samples (sample ID, time, date, analyses requested, etc.) are included on the COC;

- Verification of the appropriate type and number of containers for the indicated analyses received by the laboratory;
- Use the proper laboratory documentation to note missing or damaged sample containers;
- Measure the temperature of the samples for those analyses that will require thermal preservation (using the temperature blank included in the cooler).

All findings will be documented by the laboratory on a cooler receipt form and become part of the final data package. Any deviations found during the sample log-in procedure will be documented on the cooler receipt form and the Trinity Project Chemist will be notified as soon as possible. The laboratory will not proceed with the processing and analysis of any problem samples without approval by the Trinity Project Chemist. If the Trinity Project Chemist determines that the issues may impact the quality or usability of the data she will notify the Trinity Project Manager to determine if further action such as re-collecting the sample is required. All analyses will be performed using standard EPA laboratory methods as presented in *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW-846* (EPA, 2004a), and in EPA's *Methods for Chemical Analysis of Water and Wastes* (EPA, 1983). Refer to **Sections 2.2.3.2** and **2.2.3.3** of the Work Plan for a summary of the methods used to generate field parameters, and for a summary of the methods used to generate definitive data. The contract laboratories used under this QAPP generating environmental data shall hold NELAC and DoD ELAP certification. The QAPP defines the QA program for oversight of field and laboratory activities and for the review of the environmental data. The QA program is a system of documented checks, which ensures the authenticity, and validity of environmental data generated from site investigations. QC includes the tools provided in the QA program for performing the data assessment and validation processes. The activities associated with the collection of physical and chemical data include sampling, analysis, and data management. The activities that generate data will follow a QA program, which adheres to the EPA and DoD requirements. These requirements are defined by the use of Data Quality Objectives.

GCAL and Accutest maintain written, approved laboratory-specific SOPs for all methods and general operations. Copies of the laboratories QAMs are included in **Appendix A**. Laboratory-specific SOPs include the actual procedures and documentation used to implement performance-

based methods. Copies of the SOPs are readily available to the appropriate laboratory personnel and maintained at the laboratory.

GCAL SOPs are assigned a unique serial number. These SOPs are controlled documents and reviewed annually and updated as necessary or whenever procedure or method changes are made and a new version number is assigned. Retired SOPs are maintained on file by the laboratory in case data quality questions arise later. The analytical methods used in support of the Melrose AFR project are presented in **Sections 2.2.3.2** and **2.2.3.3** of the Work Plan.

2.3 Laboratory Quality Control Checks

Both GCAL and Accutest have QC programs in place to ensure the reliability and validity of the analysis performed at their respective laboratories. All analytical methods are documented in written SOPs which have been approved/certified by NELAC and ELAP. Each SOP includes a QC section, which addresses the minimum requirements for the procedure. The sections below describe the QC samples required for Melrose AFR. Partial evaluation criteria for data review and validation are included in **Table 1-2** of the Work Plan.

Laboratory overall method performance shall be monitored by the inclusion of various internal QC checks that allow an evaluation of method control (batch QC), and the effect of the sample matrix on the data being generated (matrix-specific QC). Batch QC is based on the analysis of a laboratory control sample to generate precise and accurate data, including method blank data, to assess the potential for cross contamination into the field samples. Matrix-specific QC shall be based on the use of an actual environmental sample for precision and accuracy determinations from the analysis of matrix spikes (MSs), MS duplicates (MSDs), matrix duplicates, and surrogate spikes, etc. The overall quality objectives are to implement procedures for laboratory analysis and reporting of data that are indicative of the degree of quality consistent with their intended use.

2.3.1 Laboratory Control Sample

The laboratory control samples (LCSs) are analyte-free water (for aqueous analyses) or reagents and glassware only (for soil analysis) and spiked with all target analytes of interest for each

analytical method. The LCS is analyzed to assess general method performance by the laboratories ability to recover analytes from a control matrix. The spiking level must be greater than the lowest concentration standard used for calibration and less than or equal to the midpoint of the linear range calibrated. The LCS results are evaluated in conjunction with other related QC information to determine the acceptability of the data generated for the associated samples.

The LCS shall be carried through the complete sample preparation and analysis procedure. The LCS cannot be used as the continuing calibration verification (CCV). One LCS shall be included in every analytical batch. The performance of the LCS is evaluated against the QC acceptance limits (provided in **Table 1-2**) for the purpose of data validation only. The laboratory shall use acceptance criteria based on laboratory practice to establish the internal lab limits and to identify non-conformances as prescribed in SW-846. This evaluation will include the use of control charts for establishing the internal lab limits and for identifying nonconformance.

Whenever an analyte in a LCS is outside the acceptance limit, corrective action shall be performed. After the system problems have been resolved and system control has been reestablished, all samples in the analytical batch shall be reanalyzed for only the out-of-control analyte(s). When an analyte in an LCS exceeds the upper or lower control limit and no corrective action is performed or the corrective action was ineffective, the appropriate validation flag shall be applied to all affected results.

2.3.2 Matrix Spike/Matrix Spike Duplicates

The MS is used to access the performance of the method as applied to a particular matrix. MS and MSD are aliquots of samples spiked with known amounts of all target analytes. Additional volume will be collected in the field for laboratory analysis. The spiking occurs prior to sample preparation and analysis. The spiking level must be greater than the lowest concentration standard used for calibration and less than or equal to the midpoint of the linear range calibration.

Ideally, the laboratory should use the same spike solution used for the LCS. Only project-specific samples shall be used as matrix spike/ matrix spike duplicate (MS/MSD) samples. The MS/MSD is designated on the COC form. The MS/MSD is used to document the bias of a

method due to sample matrix. These sample results should not be used to control the analytical process. A minimum of one MS/MSD sample set shall be analyzed for every 20 site samples.

The performance of the MS and MSD is evaluated against the QC acceptance limits (provided in **Table 1-2** of the Work Plan) for the purpose of data validation only. The laboratory shall use acceptance criteria based on laboratory practice to establish the internal lab limits and to identify non-conformances as prescribed in SW-846.

If either the MS or the MSD is outside the QC acceptance limits, the analytes in all related samples may be qualified; however it is not recommended to qualify data based solely on MS/MSD anomalies. If performance criteria are not being met by the MS and MSD samples, the analytical procedures and methods must be re-evaluated for appropriateness and correctness. For example, clean-up procedures may be needed to remove matrix interferences. Sampling locations selected for the purpose of assigning an MS/MSD should consist of areas anticipated to be free from or have low concentrations of targeted analytes. Ground water samples from wells containing free product or having a history of high concentrations of targeted analytes should be avoided for MS/MSD.

2.3.3 Surrogates

Surrogates are organic compounds that are similar to the target analyte(s) in chemical structure and chemical behavior in the analytical process, but that are not normally found in environmental samples. The surrogate results are used to evaluate accuracy, method performance, and extraction efficiency. These surrogate compounds are spiked in environmental samples, control samples, and blank samples per the method requirements. The surrogate should be spiked at a concentration less than or equal to the midpoint of the linear range calibrated.

The performance of surrogate recoveries is evaluated against the QC acceptance criteria (provided in **Table 1-2** of the Work Plan). The surrogate recovery acceptance criteria are based on actual laboratory practice to establish internal lab limits. When the acceptance criteria of a surrogate recovery are not met, corrective action must be performed. Once the system problems have been resolved and system control has been reestablished, the sample is re-prepared and re-analyzed. If corrective actions are not performed or are ineffective, the appropriate validation

flag shall be applied to the sample results. Additionally, all surrogates for all methods must yield a minimum of 10% recovery, regardless of method criteria or surrogate recovery limits based on laboratory practice. If surrogate recovery is less than 10%, the sample must be re-extracted and re-analyzed. If the surrogate recovery is less than 10% of the re-extracted and re-analyzed sample, discussion of the anomaly must be referenced in the case narrative (i.e., observed matrix interference). Less than 10% surrogate recovery for gas chromatograph/mass spectrophotometer (GC/MS) methods will be handled on a case-by-case basis. If a dilution factor is greater than a 1:5 dilution, surrogate recovery will not be reported as the dilution error may contribute to bias high or low surrogate recovery. The laboratory should report "DIL" in the surrogate recovery field on the Level III report, indicating the surrogate was diluted out due to high analyte concentration or non-target matrix interference.

2.3.4 Internal Standards

Internal standards (ISs) are known amounts of certain compounds added after preparation or extraction of a sample. These compounds are used in an IS calibration method to correct sample results affected by column injection losses, purging losses, or viscosity effects. ISs shall be added to environmental samples, control samples, and blanks in accordance with the method requirements.

When the IS results are outside of the acceptance limits, corrective actions shall be performed. If ISs are used for GC or high performance liquid chromatography (HPLC) methods and the peak is interfered with by matrix effect, then external standard calibration shall be employed. The dilution of a sample for the purpose of IS calibration for GC or HPLC methods due to matrix effect is unacceptable as the result will be unnecessarily elevated: therefore, external calibration must be employed. After the system problems have been resolved and system control has been reestablished, all samples analyzed while the system was malfunctioning shall be reanalyzed. If corrective actions are not performed or are ineffective, the appropriate validation flag shall be applied to the sample results.

2.3.5 Interference Check Sample

The interference check sample (ICS), used in inductively coupled plasma (ICP) analyses only, contains both interfering and analyte elements of known concentrations. The ICS is used to verify background and interelement correction factors and is run at the beginning and end of each run sequence.

When the ICS results are outside of the acceptance limits as prescribed in the method, corrective action shall be performed. After the system problems have been resolved and system control has been reestablished, re-analyze the ICS. If the ICS result is acceptable, re-analyze all affected samples. If corrective action is not performed or the corrective action was ineffective, the appropriate validation flag shall be applied to all affected results.

2.3.6 Method Blank

The method blank is an analyte-free matrix to which all reagents are added in the same volumes or proportions as used in sample processing; it is carried through the complete sample preparation and analytical procedure. The purpose of this sample is to document contamination resulting from the analytical process. A method blank shall be included in every analytical batch.

The detection of analytes in a method blank should not exceed the method detection limit (MDL). Corrective action shall be performed by the laboratory to eliminate the source of contamination prior to proceeding with analysis. After the source of contamination has been eliminated, all samples in the preparation batch shall be re-prepared and reanalyzed. Corrective action is not required if the associated environmental samples do not contain the analyte/analytes that exceed the screening in the method blank. Analytical data are not corrected for the presence of analytes in blanks. When an analyte is detected in the method blank and in the associated samples and corrective actions are not performed or are ineffective, the appropriate validation flag shall be applied to the sample results.

2.4 Calibration Procedures and Frequency

Calibration procedures that are to be used by the subcontractor laboratories will be discussed in this section of the QAPP. Analytical instruments shall be calibrated in accordance with the analytical methods. All analytes reported shall be present in the initial and continuing calibrations, and these calibrations shall meet the acceptance criteria specified the method. All results reported shall be within the calibration range. Results outside the calibration range are unsuitable for quantitative work and will only give an estimate of the true concentration. Records of standard preparation and instrument calibration shall be maintained. Records shall unambiguously trace the preparation of standards and their use in calibration and quantitation of sample results. Calibration standards shall be traceable to known standard reference materials (e.g. National Institute of Standards and Technology (NIST)).

Instrument calibration shall be checked using all of the analytes listed in **Table 1-2** of this QAPP, for the respective methods. All calibration criteria shall satisfy Department of Defense Quality System Manual (DoD-QSM) requirements, given that the laboratories used for this project are ELAP certified (Department of Defense, 2009). The initial calibration shall be checked at the frequency specified in the guidance using materials prepared independently of the calibration standards. Multipoint calibrations shall contain the minimum number of calibration points specified in the method 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 shall be included in the initial calibration. The only exception to this rule applies to a standard that has been statistically determined as being an outlier. If this situation exists, the standard can be dropped from the calibration, providing the requirement for the minimum number of standards is met. Acceptance criteria for the calibration check will be as required in the DoD-QSM.

2.4.1 Analytical Sequence QC

The analysis sequence shall be defined as samples that are analyzed together within the same time period or in continuous time periods on one instrument under the control of one continuing calibration verification. Analysis sequences are bracketed by the appropriate continuing calibration verification standards and other QC samples as defined by the analytical method.

Each analysis sequence shall contain the requisite number and type of calibration solutions, QC samples, and regular analytical samples as defined by the analytical method.

Analytical sequence QC shall include calibration blanks, CCVs, and any other special analytical sequence QC required by the method.

2.4.2 Batch/Matrix-Specific/Performance-Based QC

Internal QC methods require performance on a sample batch basis and include analyses of method blanks, LCSs, and actual environmental samples as duplicates, MSs, and MSDs. The basic unit for application of laboratory QC is the batch. Samples shall be prepared, analyzed, and reported in batches and be traceable to their respective batches. Batch sizes are normally limited to 20 field samples of a similar matrix but can exceed this by incorporating additional QC samples. Field QC samples, i.e., trip blanks shall not knowingly be used for batch QC purposes

Batch QC samples shall include method blanks, surrogates, LCSs, MSs, and MSDs, along with any other special batch QC samples required by the method.

2.5 Data Quality Indicators

Data quality indicators are defined in terms of precision, accuracy, representativeness, comparability, completeness, and sensitivity (PARCCS). The basis for assessing each of these elements of data quality is discussed in the following subsections.

2.5.1 Precision

Precision measures the reproducibility of measurements or the closeness of agreement between individual test results obtained under prescribed conditions. Precision reflects the random error and may be affected by systematic error. Precision can be further defined as the degree of mutual agreement among independent measurements as the result of repeated application of the same process under similar conditions. Analytical precision is the measurement of the variability associated with duplicate (two) or replicate (more than two) analyses. Characterization of the natural variation in the sample matrix, how the contaminant exists or varies within that matrix, as well as procedural deviations in field and laboratory handling of samples, can be determined by

evaluation of precision data. In order to assess the affect these variables have on total precision of the data, both field and laboratory replicates must be acquired. Laboratory precision is commonly determined by the analysis of laboratory duplicate samples (i.e. Laboratory Control Samples/Laboratory Control Sample Duplicates (LCS/LCSD)).

Total precision is the measurement of the variability associated with the entire sampling and analysis process. It is determined by analysis of duplicate or replicate field samples and measures variability introduced by both the field operations and the laboratory. Field duplicate samples and MS/MSD samples shall be analyzed to determine precision. The relative percent difference (RPD) between the duplicate sample results and the original sample will be calculated to determine precision. .

$$RPD = \frac{Original\ Sample\ Concentration - Duplicate\ Sample\ Concentration}{(Original\ Sample\ Concentration + Duplicate\ Sample\ Concentration)/2} \times 100$$

For replicate analyses, the relative standard deviation (RSD) is determined.

$$RSD = \frac{Standard\ Deviation\ (\sigma) of\ Duplicate\ Samples}{Average\ Results\ of\ Duplicate\ Samples} \times 100$$

Precision control limits for the Melrose AFR project chemical data are provided in **Table 1-2** of the Work Plan.

2.5.2 Accuracy

Accuracy is the measure of the closeness of an observed value to the "true" or actual value (e.g., theoretical or reference value, or population mean). Accuracy includes a combination of random error and systematic error (bias) components that result from sampling and analytical operations.

It therefore reflects the total error associated with a measurement. Sources of error are inherent in the sample matrix, the sampling process, and field contamination, preservatives, handling, sample preparation, and analytical techniques. Analytical accuracy may be accessed through the use of known and unknown QC samples, spike samples, and split samples. A measurement is accurate when the value reported does not differ from the true value or known concentration of the spike or standard, within a certain calculated range. Analytical accuracy is measured by comparing the percent recovery (%R) of analytes spiked into LCS, to a known control limit. For

Volatile and Semi-Volatile organic compounds, surrogate compound recoveries are also used to assess accuracy and method performance for each sample analyzed. Surrogate compounds have known concentrations and are required to be injected into each organic laboratory and field blanks, laboratory QC samples and environmental field samples.

Accuracy values can be presented in a variety of ways. The average error is one way. However, more commonly, accuracy is presented as percent bias or %R. Percent bias is a standardized average error; that is, the average error divided by the actual or spiked concentration and converted to a percentage. %R provides the same information as percent bias. Accuracy control limits for surrogates and are presented in **Table 1-2** of the Work Plan. Percent recovery for MS and MSD results is determined according to the following equation:

$$\%R = \frac{Amount\ in\ Spiked\ Sample - Amount\ in\ Sample}{Amount\ of\ Spike\ Added} \times 100$$

The %R for LCS and surrogate compound results is determined according to the following equation:

$$\%R = \frac{Amount\ found\ in\ Spiked\ Sample}{Amount\ of\ Spike\ Added} \times 100$$

2.5.3 Representativeness

Representativeness expresses the degree to which sample data accurately and precisely represent characteristic of a population, parameter variations at a sampling point, or an environmental condition. Representativeness is a qualitative parameter that is most concerned with the proper design of the sampling program. The representativeness criterion is best satisfied by making certain that sampling locations are selected properly, and a sufficient number of samples are collected.

Representativeness is addressed by describing sampling techniques and the rationale used to select sampling locations. Sampling locations can be biased (based on existing data, instrument surveys, and observations) or unbiased (completely random or stratified random approaches). Whether biased or unbiased, the rationale used to determine sampling locations must be explicitly explained.

Representativeness can be assessed by the use of duplicate samples. By definition, duplicate samples are collected so that they are equally representative of a given point in space and time. In this way, they provide both precision and representativeness information. Trip blanks can also be used to assess representativeness of sample results. For example, a contaminated trip blank may indicate that the sample results may not be representative of site conditions.

The representativeness criterion is best satisfied in the laboratory by making certain that all sub samples taken from a given sample are representative of the sample as a whole. This would include sample premixing/homogenizing prior to and during decanting procedures. Samples requiring volatiles analysis should not undergo any premixing or homogenization, as this process may result in loss of volatile compounds, thereby not representing the true result of the sample. Representativeness can be assessed by a review of the precision obtained from the field and laboratory duplicate samples. In this way, they provide both precision and representativeness information.

2.5.4 Completeness

Completeness is defined as the percentage of measurements made which are valid measurements (i.e., for individual analytical parameters). Completeness will be calculated by method, matrix, and number of samples. The completeness goal is essentially the same for all data uses in that a sufficient amount of valid data is generated. Critical samples are defined as samples necessary to meet the DQOs. It is important that critical samples are identified and valid data obtained. Valid data are those which are not assigned an 'R' qualifying identifier as rejected during the validation process or data which is determined to be unusable. The completeness goal is 95% for aqueous samples, and is calculated as follows:

$$Completeness = \frac{Number\ of\ Valid\ Measurements}{Total\ Number\ of\ Measurements} \times 100$$

2.5.5 Comparability

Comparability is a qualitative parameter expressing the confidence with which one data set can be compared with another. Sample data should be comparable with other measurement data for similar samples and sample conditions. Comparability is limited to the other PARCC

parameters, because only when precision and accuracy are known can data sets be compared with confidence. 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 analyses, 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 shall support the assessment of comparability. Analysis of Performance Evaluation (PE) samples and reports from audits shall also be used to provide additional information for assessing the comparability of analytical data produced among subcontracting laboratories. Historical comparability shall be achieved through consistent use of methods and documentation procedures throughout the project.

2.5.6 Sensitivity

There are several ways in which to ascertain the sensitivities of laboratory instrumentation. For this project, the sensitivities will be measured by the MDLs and Reporting Limits which are described below.

2.5.6.1 Method Detection Limit

The MDL is the minimum amount of an analyte that can be routinely identified using a specific method and instrument, measured, and reported with 99% confidence that the analyte concentration is greater than zero. MDLs are operationally determined as 3 times the standard deviation of seven replicate spiked samples run according to the complete method. Since this estimate includes sample preparation effects, the procedure is more accurate than reported IDLs. However, the evaluation is routinely completed on reagent grade water. MDL studies are routinely carried out by both GCAL and Accutest, and as a result, are subject to change over time.

For this project, MDLs will be reported as the lowest achievable limits per compound/analyte, for the particular method. The contract laboratory participating in this work will demonstrate the MDLs for each instrument, including confirmatory columns, method of analysis, analyte, and matrix (i.e., water or soil). The least sensitive MDL of each instrument/detector is to be used for reporting purposes, and MDLs are presented in **Table 1-2** of the Work Plan for each laboratory.

2.5.6.2 Reporting Limit

The reporting limit (RL) is a threshold value below which the laboratory reports results as non-detected, "<" or "ND." RLs may be based upon project-specific concentrations of concern, regulatory action levels, or sensitivity capabilities of the method and instrumentation. The laboratories participating in this project will verify RLs by including a standard at the practical quantitation limit (PQL) as the lowest point on the calibration curve. RLs are PQLs adjusted based on the sample matrix, necessary sample dilutions, inadequate sample volume/mass, and/or clean-up procedures.

The RL will also be adjusted for dry weight correction based on the percent moisture found in soil and sediment samples. Because of this, soil and sediment samples containing high percent moisture will have higher RLs than samples with low percent moisture. Sample matrix effects, volume/mass, clean-up procedures (if required), and percent moisture may often elevate the RL above project-specific data evaluation standards and should be considered.

The contract laboratories will report all analytical results at or above the RL. Specifically, to denote a non-detect on the laboratory analytical reports, the RL will be the numeric value that is assigned a "U" data qualifier or flag. If an analyte is detected at a concentration at or below the RL, but greater than or equal to the MDL, then the result for that analyte will be reported as estimated (i.e., assigned a "J" flag). The RLs from both GCAL and Accutest are presented in **Table 1-2** of the Work Plan.

2.6 Evaluation of Project Specific Method and Reporting Limits

MDLs and RLs from the contract laboratories were evaluated against ground water criteria specified in **Section 1.8** of the Work Plan and **2.1.2** of this document and are summarized in **Table 1-2** of the Work Plan.

2.7 Data Reduction/Data Review

Data reduction procedures, whether performed by the instrument or manually, shall follow methodologies outlined within the laboratory SOP or analytical method. All analytical data generated by the laboratory shall be extensively reviewed prior to report release to assure the

validity of the reported data. This internal data evaluation process shall cover the areas of data generation, reduction, and a minimum of three levels of documented review.

For each level, the review process shall be documented using an appropriate checklist that is signed and dated by the reviewer. The analyst who generates the analytical data has the prime responsibility for the correctness and completeness of the data. Each step of this review process involves evaluation of data quality based on both the results of the QC data and the professional judgment of those conducting the review. This application of technical knowledge and experience to the data evaluation is essential in ensuring that data of known quality are generated consistently. All data generated and reduced shall follow well-documented in-house protocols. Each analyst reviews the quality of his/her work based on an established set of guidelines. The review criteria as established in each method or within the laboratory shall be used. This review includes, but is not limited to, verifying that MQOs meet protocol criteria, calibration criteria are met, appropriate detection limits were used, data was reduced correctly, and that any non-conformance or corrective action was documented properly. The analyst will perform a primary review of 100% of the data generated.

The secondary review shall be performed by a supervisor, another analyst, or data review specialist who has documentation that supports demonstration of performance for all areas for which he/she provides review. The function of this review is to provide an independent, complete peer review of the analytical batch data package. This review shall also be conducted according to an established set of guidelines and will include calibration criteria, QC, compound identification, reporting limits, and level of documentation.

The final reviews are performed by the technical director or designee at the laboratory. This review shall provide a total overview of the data package, including sample receipt, to ensure its consistency and compliance with project-specific requirements. All errors noted shall be corrected and documented.

2.8 Laboratory Data Validation Procedures

Validation of all definitive laboratory analytical data collected during this project will be performed to assure that the quality procedures have been followed. The validation will also

demonstrate that quantity of data (completeness) will adequately support the intended use of the data as described in this QAPP. The QA/QC evaluation will determine whether the data requirements are met and will include a validation of the laboratory data. The validation process has been designed to meet the DQO requirements for generation of definitive, critical data. The analytical data will be validated (including a review of the data to assess the accuracy, precision, and completeness. Analytical data validation will involve reviewing all of the definitive data to confirm the analytical method, sample preparation procedures, detection limits, and units.

2.8.1 Laboratory Data Qualifiers

Data qualifiers shall be added by the laboratory during the data generation/review process. These qualifiers would be applied when method quality objectives defined above were not met and corrective action was not successful or when corrective action was not performed. All flags used by the laboratory shall be defined completely within the chemical data reportable package.

Additional laboratory specific qualifiers may be used on an as need basis to explain various types of data anomalies. These flags should also identify any suspected bias in the data, either low or high, and whether the estimation is related to the suspected identification (qualitative) or whether the value reported is an approximation (quantitative). The Project Manager or appropriate technical personnel shall be notified as soon as possible to discuss possible corrective actions should data be qualified. Additional data flagging may be performed by the Trinity Project Chemist or third party data validation firm, based upon overall project-specific requirements, through the use of external data review or validation.

2.8.2 Laboratory Report Certificates

Upon receipt, a review of the completeness of laboratory records will be conducted to ensure the following:

- All samples and analyses required by the QAPP have been processed;
- A complete record exists for each analysis and the associated QC samples; and
- The analytical procedures required by the project have been implemented.

The results of the completeness check must be documented, and environmental data affected by incomplete records must be identified. If deficiencies exist, the analytical laboratory contact must be notified and the problems resolved immediately. If critical samples are not analyzed or the data are unusable, sample representativeness may decrease for identification of false negatives and estimation of average concentrations. If the capacity of the laboratory is exceeded, matrix problems occur during analysis, holding time violation occurs, or samples are violated, completeness will be affected. Samples must be analyzed in a way that represents the properties of the field samples so that representativeness is maintained.

2.8.3 Laboratory Operations Documentation

The reporting package format, contents, reporting schedule, data archival, and records retention requirements should be identified. Any electronic data deliverables format and technical content must be identified here also. For projects that involve a substantial number of samples, or projects that require semi-annual monitoring, the use of interim data deliverables for reporting is recommended. These deliverables should be submitted after a proposed milestone instead of at the project completion.

2.8.4 Sample Management Records

These types of records include the documentation accompanying the samples (for example, original chain-of-custody record, shipping document, laboratory notification sheets), records generated by the laboratory which detail the condition of the samples upon receipt at the laboratory (for example, sample cooler receipt forms, and telephone conversation records), and any records generated to document sample custody, transfer, analysis, and disposal.

2.8.5 Data Reporting Procedures

The chemistry data packages will contain enough information to demonstrate that the project data quality objectives have been fulfilled. In general, this will allow a reviewer to determine the precision, accuracy, representativeness, comparability, and completeness of the data from information contained in the data package. The amount of information required to demonstrate

attainment of DQOs depends upon the acceptable level of uncertainty for the intended data use. Specifically, the type of data packages required from the laboratories will be Definitive data.

2.8.5.1 Data Package Format and Contents

For this project, raw data packages will not be required. Level III reporting shall be required from the analytical laboratories. The definitive data package format allows for the review of the data by an independent organization. However, this data package does not allow for complete independent reconstruction of the analytical data. Definitive data are produced using rigorous analytical methods, such as EPA standard reference methods (e.g., SW-846, Contract Laboratory Program). Analyte presence and quantitation are confirmed through extensive QC procedures at the laboratory, which may be onsite or offsite.

At a minimum, all definitive data packages should include the following information:

- Cover Sheet. Including name and location of laboratory or laboratories, client name and address, site name and location, laboratory project number and Statement of data authenticity, and official signature and title of person authorizing report release.
- Table of Contents. In a format that allows for easy sample identification and retrieval of information.
- Case Narrative. Including listing of samples included in the data package, the correlation between field sample identification and laboratory sample identification, and any deviation from analytical methods, holding times, associated QC limits, or any other information that could affect the sample results.
- Analytical Results. Including sample identification, matrix, collection date and time, extraction data and time, analysis date and time, method, preparation batch number, analytical batch number, analyte or parameter, and analytical result.
- Laboratory Reporting Limits. Including both the laboratory reporting limit and method detection limit.
- Sample management records. Including chain of custodies, shipping documents, laboratory sample receipt forms, and any records generated to document sample custody, transfer, analysis, and disposal.
- QA/QC Information. The minimum data package must include the internal laboratory

QA/QC data with their respective acceptance criteria. The data package should also include the laboratory's method quantitation limits for project-specific parameters. All calibration deviations shall be discussed within the case narrative. The data package should correlate the method QC data with the corresponding environmental samples on a per preparation batch basis with batch numbers clearly shown. Method QC data must include all spike target concentration levels, the measured spike concentration, calculated recoveries, and any associated precision data. Laboratory performance information such as results for method blanks, recoveries for LCSs, surrogates recoveries and matrix-specific information such as MD RPDs, MS and MSD recoveries, and MS/MSD RPDs must be reported. At a minimum, internal quality control samples should be analyzed and reported at rates specified by the applicable analytical method. Any deviations from the method quality objectives should be foot noted on the analytical report and discussed in the case narrative.

2.9 Preventative Maintenance

The laboratories preventive maintenance plans that will be implemented to minimize downtime of laboratory instruments will be discussed in this section. The laboratories follow well defined programs to prevent the failure of laboratory equipment or instrumentation during use. Their programs of preventative maintenance help avoid delays due to instrument failure.

Routine preventative maintenance procedures and frequency, such as lubrication, cleaning, and replacements are preformed according to the procedures and frequencies outlined in the manufacturers' manuals. These manuals are located near the instrument or in a central location within the department. An instrument maintenance logbook will be used for documenting instrument problems, instrument repair and instrument maintenance for all major pieces of laboratory equipment. Documentation will include all major maintenance activities such as contracted preventative maintenance and service and in house activities, such as the replacement of electrical components, lamps, tubing, valves, columns, detectors, cleaning, and adjustments. Maintenance logbook entries will include the data, name of the person performing the maintenance, and when appropriate a statement that the instrument has returned to control and is available for use. When maintenance is performed by an outside vendor, service receipts

detailing the service performed can be stapled into the logbook adjacent to the pages describing the maintenance performed.

Qualified laboratory personnel may also perform maintenance when there is evidence of degradation of peak resolution, a shift in the calibration curve, loss of sensitivity, or failure to meet one the of the laboratory QC criteria. Specific maintenance procedures are documented in the laboratories Quality Assurance Manuals.

2.10 Performance and System Audits

The laboratory audits are typically conducted internally by the laboratory QA staff, as well as by external agencies.

Internal annual laboratory audits shall be conducted internally by the laboratory for each analytical area to verify at a minimum the following:

- Procedures are compliant with SOPs;
- Documentation practices are complete and traceable to a certified source(s);
- Data reviews are complete, well-documented, and effective;
- Data reporting practices, including electronic or manual data transfer and client report generation, are accurate and complete.

All audit findings, any corrective actions, root cause determination, etc., shall be fully documented in QA reports to management. The laboratory QA officer shall document that all corrective actions necessary are verified complete within a reasonable time frame.

Before any samples are analyzed by the laboratories in support of this project, the laboratories will have undergone ELAP audits and received a current certification for all methods used for analysis of samples from this project. Additional external audits may be performed before or during the project by either the USACE or Trinity, at their discretion.

2.11 Nonconformance/Corrective Actions

When errors, deficiencies, or out-of-control situations exist, the laboratory's QA program includes a system of QC activities that measure the system performance to verify that it meets stated requirements and objectives. When the analytical system performance does not meet

defined standards, the laboratory employs systematic procedures, called corrective actions, to resolve problems and restore proper functioning to the analytical system(s).

Corrective actions are often handled at the bench level by the analyst, who reviews the sample preparation procedures for possible errors and checks the instrument calibration, spike, calibration mixes, instrument sensitivity, and so on. If the problem persists or cannot be identified, the matter is referred to the laboratory supervisor, manager, or QA department for further investigation.

- Problems noted during sample receipt shall be documented on an appropriate form (the Cooler Receipt Form). The Trinity Project Chemist or appropriate technical personnel shall be contacted immediately for problem resolution.
- If samples cannot be prepared or analyzed within the method required holding times, the Project Chemist or appropriate technical personnel shall be immediately notified so that an appropriate corrective action plan can be generated. If holding times are exceeded and results reported, the resulting data shall be flagged, and a discussion of the impact included within the case narrative.
- Each preparatory batch and analysis sequence must include the appropriate batch and matrix-specific QC samples and standards (i.e., method blanks, LCSs, MSs, MDs, MSDs, surrogate spikes, and other method-specified QC). All QC shall meet the appropriate project-specific MQOs and associated corrective actions. Failure of method QC shall result in the review of all affected data. If no errors can be noted, the affected sample(s) may need to be reanalyzed or re-prepared and reanalyzed within method holding times, if possible.
- Reports shall be reissued if calculation or reporting errors are noted with any given data package. The case narrative shall clearly state the reason(s) for re-issuance of the report.

In all cases, any necessary corrective actions will be documented and discussed in the case narrative.

2.12 Field Activities

The Field Site Manager will review the procedures being implemented in the field for consistency with the established protocols. Sample collection, preservation, documentation, labeling, and shipping will be checked for accuracy and completeness. Where procedures are not strictly in compliance with the established protocol, the deviations will be documented and reported to the Trinity Project Manager. Corrective actions will be defined by the Field Site Manager, Project Manager, and QA Manager. Upon implementing the corrective action, the Field Site Manager will provide the Project Manager with a written memorandum documenting field implementation. The memorandum will become part of the project file.

2.12.1 Quality Control for Field Analysis

In addition to laboratory analyses, field analyses will be conducted during this project. This section summarizes the QC procedures for the field analyses. Detailed discussions that describe the collection methodologies for these field analyses/parameters are discussed in the FSP. A brief summary of the project-specific field analyses is presented below, followed by discussions of the associated QC procedures.

During ground water sampling, water quality parameters will be collected in the field using portable instrumentation or test kits. Field procedures for ground water sampling and the collection of water quality parameter measurements were developed in general accordance with guidance provided by NMED (New Mexico Environment Department, year unknown). The instruments will be calibrated according to the manufactures guidelines. These parameters and the associated methods are as follows:

- pH, specific conductivity, temperature, DO, and ORP measurements will be collected using a multi-function water quality meter;
- Turbidity using standalone turbidity meter.

The type of field QC samples and the frequency of use of these samples are discussed below and in the method-specific subsections of **Section 2.12.2** of this document.

2.12.2 Field Quality Control Samples

This section defines the quality control requirements for field sampling activities including QC sample identification and evaluation criteria limits. QC samples are selected for each project based on the project DQOs, project-sampling procedures, and established analytical method requirements. Field QC samples anticipated for the investigation will include trip blanks, equipment blanks, temperature blanks, field duplicates, and field split samples.

2.12.2.1 Trip Blank

The trip blank consists of a VOC sample vial filled in the laboratory with ASTM Type II reagent grade water, transported to the sampling site, handled like an environmental sample, and returned to the laboratory for analysis. These samples are not opened in the field and are submitted to the laboratory only when samples are collected for VOC.

Trip blanks are used to assess the potential introduction of contaminants from sample containers or during the transportation, field exposure, and storage procedures. When an analyte is detected in the trip blank, the appropriate validation flag shall be applied to all sample results from samples in the cooler with that trip blank.

For this project, one trip blank will accompany each cooler that contains VOC samples for analysis by the laboratory.

2.12.2.2 Equipment Rinsate Blank

An equipment blank, sometimes referred to as a rinsate blank, is a sample of ASTM Type II reagent grade water poured through the sampling device and collected in a sample container for analysis. The results from these blanks are used to assess the effectiveness of equipment decontamination procedures. If sampling devices used do not require decontamination, then an equipment blank is not required for that particular device.

For this project, the collection frequency for equipment blanks will be one equipment blank for every ten environmental samples collected. The equipment blank will be collected immediately after the equipment has been decontaminated. The equipment blank shall be analyzed using the

same methods as the normal environmental sample collected by a particular sampling device, at the same sampling location. If an analyte is detected in the equipment blank and the detection is determined not to be a result of a laboratory anomaly, the appropriate validation flag shall be applied to the environmental samples collected, which were collected with the sampling device that was decontaminated.

2.12.2.3 Temperature Blank

A temperature blank is a container of water that is packed and shipped with the field samples to the laboratory. The temperature blank should be a 100-milliliter (mL) plastic bottle filled with water and placed in a representative position inside the cooler. Upon arrival at the laboratory, the laboratory measures the temperature of the blank. This temperature reading is used to represent the conditions of the field samples. This information is used by both the laboratory and the independent data validator. If the temperature blank exceeds criteria, the laboratory must notify the Trinity Project Chemist immediately for guidance. All samples associated with the temperature blank exceeding criteria shall have the appropriate validation flag applied to samples contained in the associated cooler. One temperature blank will accompany each cooler.

2.12.2.4 Field Duplicate Samples

A field duplicate sample is a second sample collected at the same location as the original sample. These samples are collected simultaneously or in immediate succession, using identical recovery techniques, and treated in an identical manner during storage, transportation, and analysis. The field duplicate's sample identification is assigned an extension that identifies the sample as a field duplicate to the sample collector but is blind to the laboratory; see **Section 2.3.3** of the Work Plan for nomenclature details. The results from duplicate samples are used to assess precision of the sample collection process.

The frequency of collection for field duplicates is one field duplicate for every ten environmental samples collected. The RPD is only calculated when the detection of the analyte of interest is greater than or equal to the MDL in both the parent and duplicate sample. The calculated RPD between the parent sample and the field duplicate will be presented in final analytical summary

tables; the impact of the field duplicate results on the overall data set will be evaluated. The RPD precision goal between the field duplicate and the parent sample will be 30.

2.12.2.5 Field Split

A field split sample, also called a replicate sample, is a single sample divided into two equal parts for analysis. In the case of low-flow ground water sampling, split samples for VOC analysis will be collected immediately following the associated VOC grab samples. The sample containers are assigned an identification number in the field so they cannot be identified as replicate samples by the laboratory(s) personnel performing the analysis. Specific locations are designated for collection of field replicate samples prior to the beginning of sample collection. The sample results are used to assess precision.

The split samples will be collected from each matrix of concern where the anticipated concentrations of contaminants are near the cleanup target level (if this information is known). The frequency of collection for field split samples is one every 20 samples collected. The field split samples shall be analyzed by the same methods as the environmental samples which are sent to the primary laboratory

Field split samples should be delivered to Accutest Laboratories, Inc., Orlando, FL.

2.13 Electronic Deliverables

In order to facilitate use and interpretation of results, generation of tables, and archival of laboratory data, EDDs will be supplied from the laboratories in formats compatible with Trinity's in-house database. These EDDs will contain the same information as described for the hard copy deliverables. The EDDs use a common syntax for terms used to describe diverse laboratory activities and report analytical data. The EDDs should also provide sufficient input parameters to allow users to link analytical data to underlying laboratory activities, full traceability for data, and a means for reporting complex analytical relationships. EDDs will be provided by the laboratories in the most recent version of EnviroData, in addition to Acrobat Adobe files.

2.13.1 ERPIMS Data Reporting

Environmental Restoration Program Information Management System (ERPIMS) is the Air Force system for validation and management of data from environmental projects at all Air Force bases. This data contains analytical chemistry samples, tests, and results, as well as hydrogeological information, site location descriptions, and monitoring well characteristics. Trinity is required to report electronic deliverables to Air Force Center for Engineering and the Environment (AFCEE) using the latest version of ERPIMS, i.e. ERPTooLS X. ERPTools X is a web-based software package that requires the user to purchase an External Certificate Authority (ECA), to aid with the submissions of the electronic data. Once the ECA has been obtained, registration with AFCEE is required. Following registration a System Authorization Access Request Form (SAAR) and an Acceptable Use Policy Statement form must be completed. Security Awareness training will also be conducted for all ERPIMS users. Because the ERPTools X is relatively new web-based software, Trinity personnel who will utilize ERPTools X will attend the required training.

ERPTools X data submissions will be required at the end of each sampling event, or as required by the contract. Additionally, ERPTools X will be used by the laboratories to upload analytical project data in a timely manner to the ERPIMS website.

2.14 Data Assessment Procedures

To ensure the validity of the definitive data, a data review, verification, and validation process is required. The DQO reconciliation process and the effect that it has on the final assessment of project completeness will be discussed. When chemical data are generated, their quality must be assessed prior to use. The type and degree of assessment required depends upon the project DQOs. Several different levels of data assessment exist, including data review, data verification, and data validation.

2.14.1 Data Verification

Data verification is the most basic assessment of data. Data verification is a process for evaluating the completeness, correctness, consistency, and compliance of a data package against

a standard or contract. In this context, "completeness" means all required laboratory deliverables are present, when compared to the samples received by the laboratory based on the COC. Data verification will be performed by the Trinity Project Chemist or their designee for screening and definitive laboratory deliverables, and will be conducted on 100% of the data.

2.14.2 QC Data Review

QC data review is the next step in the data assessment hierarchy. QC data review includes an assessment of summary QC data provided by the laboratory. QC data review may include examination of laboratory data and the internal QC and QA sample results to ascertain the effects on the laboratories' data. Data qualifiers will be applied by the Trinity Project Chemist as appropriate, to alert the data user of data deficiencies. The results of the review will be documented in a Quality Control Report. QC data review will be performed by the Trinity Project Chemist or their designee under the supervision of the Project Chemist on 100% of the screening and definitive laboratory data.

2.14.3 Data Validation

Data validation is a process of data assessment in accordance with EPA regional or National Functional Guidelines, or project-specific guidelines (EPA 2004b). Data validation may include an assessment of the whole raw data package from the laboratory. Data validation will be performed on all definitive data generated in support of this project. Data validation will be a process of data assessment in accordance with current EPA National Functional Guidelines for organic and inorganic analyses using the laboratory generated QC limits. Data qualifiers will be applied as appropriate to alert the data user of deficiencies in the data. Trinity's Project Chemist or a third party validation firm will perform the data validation. The results of the data validation process will be documented in a formal data validation report.

2.15 DQO Reconciliation

After the completion of field activities and the review and validation of the final analytical reports from the laboratory, the following will be reviewed to determine if the project met the

specified DQOs. Verifying the attainment of the DQO statements should be performed as follows:

- Verification should generally be done by the data user perspective(s) that will be using the data;
- Verification of DQO attainment must be completed before the data are used by the data users;
- All data quality requirements of a DQO statement should be verified; and
- Verification of DQO attainment is typically required to ensure contract compliance.

2.16 Project Completeness Assessment

Following completion of all field work and laboratory analyses, the data completeness for the entire project will be assessed. Completeness goals, as defined for individual sampling and analytical protocols, are combined to assess the expectations of the project as a whole. Completeness is the percentage of measurements that are judged to be usable (i.e., which meet project-specific requirements) compared to the total number of measurements planned. The target for project completeness on the Melrose AFR project is 95 percent.

This page intentionally left blank.

3.0 SITE SAFETY AND HEALTH PLAN

The provisions of this SSHP are mandatory for all TRINITY employees.

Changing and/or unanticipated site conditions may require modification of this SSHP in order to maintain a safe and healthful work environment. Any proposed changes to this plan should be reviewed with the SSHO prior to implementation. If this is not feasible, the TRINITY safety representative as delegated by the TRINITY Corporate Health and Safety Officer may modify the plan and record all changes in the field logbook; under no circumstances will modifications to this plan conflict with federal, state, or other governmental health and safety regulations.

TRINITY will provide a copy of this plan to each site subcontractor, as necessary, in order to fulfill its obligation under 29 CFR 1910.120(b) to inform subcontractors of site hazards. Each subcontractor is required to provide a SSHP that complies with 29 CFR 1910.120 and addresses the activities of its employees relative to this project. A description of the facility, its history, previous investigations, and environmental setting are presented in **Section 1** of the Work Plan.

This section presents the SSHP for the Ground Water Monitoring Program at Melrose AFR. The activities covered by the SSHP include ground water sampling, water level measurement, well maintenance, well abandonment, handling of potentially contaminated media, decontamination procedures, and general activities associated with working at Melrose AFR, including the potential for munitions and explosives of concern (MEC) avoidance.

This SSHP establishes guidelines and requirements for the safety of field personnel during completion of field activities at Melrose AFR. All employees of TRINITY involved in this project are required to abide by the provisions of the SSHP. They are required to read this plan and to sign a Safety Compliance Agreement and Medical Emergency Contact Sheet (**Appendix B**) prior to beginning work activities. All TRINITY personnel performing field activities associated with ground water monitoring at Melrose AFR are required to have 40-hour Occupational Safety & Health Administration (OSHA) HAZWOPER training and current annual 8-hour HAZWOPER refresher training.

The health and safety guidelines and requirements presented within are based on a review of available information and an evaluation of potential hazards. This SSHP outlines the health and

safety procedures and equipment required for activities at Melrose AFR in order to minimize the potential for harmful exposures to field personnel.

3.1 Responsibilities

TRINITY will have health and safety oversight and coordination responsibilities for TRINITY personnel; each subcontractor, if any, will be held accountable for the safe and healthful performance of work by each of their employees, subcontractors, or support personnel who may enter the site. TRINITY will strictly adhere to the provisions of the SSHP, along with any other applicable regulations issued by governmental entities.

3.1.1 Project Manager (TRINITY)

The PM (Mr. Richard L. Burdine, Senior Vice President, P.G.) will direct TRINITY operations. The PM may delegate all or part of these duties to a properly qualified TRINITY SSHO. During fieldwork, the PM assisted by the SSHO, has primary responsibility for the following:

- Ensuring that appropriate personal protective equipment and monitoring equipment is available and properly utilized by all on-site TRINITY employees;
- Establishing that TRINITY personnel are aware of the provisions of this plan, are instructed in the work practices necessary to ensure safety, and are familiar with planned procedures for dealing with emergencies;
- Establishing that all TRINITY personnel have completed a minimum of 40 hours of health and safety training and have appropriate medical clearance as required by 29 CFR 1910.120;
- Seeing that TRINITY personnel are aware of the potential hazards associated with site operations;
- Monitoring the safety performance of all TRINITY personnel to see that the required work practices are employed;
- Correcting any TRINITY work practices or conditions that may result in injury or exposure to hazardous substances;
- Preparing any accident/incident reports for TRINITY activities, and ENG 3394 ;
- Halting TRINITY site operations, if necessary, in the event of an emergency or to correct

unsafe work practices;

- Seeing that utility clearances are obtained prior to the commencement of intrusive activities; and
- Reviewing and approving this project SSHP.

3.1.2 Site Health and Safety Officer (TRINITY)

The TRINITY SSHO (Mr. Jonathan Kramer) will be present during field activities. The SSHO is responsible for:

- Implementing project SSHP and reporting any deviations from the anticipated conditions described in the plan to the PM and, if necessary, the Corporate Health and Safety Officer;
- Determining that monitoring equipment is used properly by TRINITY personnel and is calibrated in accordance with manufacturer's instructions or other standards, and that results are properly recorded and filed;
- Checking to assure that TRINITY personnel have current medical clearance and training;
- Assuming any other duties as directed by the PM and TRINITY Corporate Health and Safety Officer;
- Coordinating with TRINITY health and safety professionals to identify TRINITY personnel for whom special PPE, exposure monitoring, or work restrictions may be required;
- Conducting daily site inspections prior to the start of each shift. All inspections must be documented (preferably in a bound field logbook);
- Providing ongoing review of the protection level needs as project work is performed, and informing the PM of any need to upgrade/downgrade protection levels;
- Seeing that decontamination procedures described in **Section 2.2.3.5** of this document are followed by TRINITY personnel;
- Establishing monitoring of TRINITY personnel and recording results of exposure evaluations;
- Halting TRINITY site operations, if necessary, in the event of an emergency or to correct

unsafe work practices; and

- Maintaining the visitor log

3.1.3 Corporate Health and Safety Officer (TRINITY)

The Corporate HSO (Mr. Alec Macbeth, P.G.) is responsible for:

- Determining the need for periodic audits of field operations to evaluate compliance with this plan
- Providing health and safety support as requested by the SSHO and PM

3.1.4 Site Guide/Escort (Cannon AFB)

The Site Guide/Escort (Mr. Kerry Hubbell) is responsible for:

- Acting as intermediary between TRINITY field personnel and the CEA – CEAN Conservation Section (Mr. Rick Crow);
- Scheduled and arranging for access to Melrose AFR with the RCO;
- Escorting project personnel at all times while on Melrose AFR;
- Two-way radio communication between project personnel in the field and Melrose AFR RCO; and
- Informing project personnel of lasing activities and the need to don laser safety glasses.

3.1.5 Project Personnel (TRINITY)

Project personnel involved in investigations and operations are responsible for:

- Taking all reasonable precautions to prevent injury to themselves and to their fellow employees;
- Performing only those tasks that they believe can be done safely, and immediately reporting any accidents and/or unsafe conditions to the SSHO or PM;
- Implementing the procedures set forth in the SSHP, and reporting any deviations from the procedures described in the plan to the SSHO or PM for action;
- Notifying the PM and SSHO of any special medical problems (e.g., allergies) and seeing

that all on-site TRINITY personnel are aware of such problems; and

- Reviewing this project SSHP and signing a Safety Plan Compliance Agreement.

3.1.6 Subcontractor's Safety Representative

Each subcontractor is requested to designate a Subcontractor's Safety Representative (SSR) who is the subcontractor supervisor. The SSR is responsible for the safe and healthful performance of work by his work force and subcontractors. During subcontractor activities on-site, the SSR will perform continuing work area inspections, and conduct safety meetings and safety orientations for all new employees. The SSR will attend periodic safety meetings with the SSHO. The SSR will also investigate accidents and overexposures involving subcontractor personnel.

3.2 Medical Surveillance

3.2.1 Medical Examination

Site workers will satisfactorily complete a comprehensive medical examination by or under the supervision of a licensed physician, preferably by one knowledgeable in occupational medicine prior to the initiation of field work. Medical examinations and consultations will comply with the protocols of 29 CFR 1926.65 and 29 CFR 1910.134 and will be provided according to the following schedule:

- At least annually for employees covered by the program (biennially with the approval of the occupational physician);
- At termination of employment or reassignment to an area where the employee had not been examined within the past 6 months;
- As soon as possible after the development of signs or symptoms that may indicate an overexposure to hazardous substances or health hazards; and
- More frequently if the physician deems such examination necessary to maintain employee health.

Documentation for compliance with 29 CFR 1926.65 will be onsite. Further documentation for UXO Technicians is maintained in EA's Office of Human Resources (410-584-7000). The

records shall be complete and accurate and be kept on file for at least 30 years after termination of employment. A minimum of the following information shall be kept:

- Name and social security number;
- Physician's written opinions, recommendations, limitations, and test results;
- Employee medical complaints related to hazardous waste operations; and
- Information provided to the physician by the employee concerning possible exposures, accidents, etc.

This examination will meet the requirements of 29 CFR 1910.120 (f) for hazardous waste site operations. The medical surveillance provided to the employees includes a judgment by the medical examiner of the ability of the employee to use either positive or negative pressure respiratory equipment in accordance with 29 CFR 1910.134. Any employee found to have a medical condition that could directly or indirectly be aggravated by exposure to chemical substances or by the use of respiratory equipment will not be employed for any project requiring clearance under the Respiratory Protection Program. A copy of the medical examination is provided at the employee's request.

The employee will be informed of any medical conditions that would result in work restriction or that would prevent them from working at hazardous waste sites.

Contractors will certify that all their employees have successfully completed a physical examination by a qualified occupational health physician and will supply certification of medical clearance for each on-site employee.

3.3 Training

3.3.1 HAZWOPER Training and Medical Surveillance

All TRINITY 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 Health and Safety Officers

- Three days of work activity under the supervision of a trained and experienced supervisor
- At all times, at least two of the fieldworkers will have current first aid and cardiopulmonary resuscitation (CPR) certification.

All TRINITY 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 TRINITY personnel are maintained by the headquarters office. A list of site personnel and their training certificates will be provided prior to the start of fieldwork. Required training is further described in TRINITY's Corporate Health and Safety Manual.

3.3.2 Behavior Based Safety

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

3.3.3 Daily Safety Meeting

Before the Daily Safety Meeting can commence it is necessary for the Site Guide/Escort to check in with the Melrose AFR RCO and for all personnel to check in utilizing the automated check in system, which is located at Melrose Range Command. After check in is completed and prior to initiating work each day, the SSHO will lead a Daily Safety Meeting. A Daily Tailgate Safety Meeting form is included in **Appendix B**. Current conditions will be evaluated compared to conditions anticipated and hazards found in the applicable AHA for the activity (i.e., job or task) to be performed that day. If the current AHA does not adequately address unanticipated hazards, the AHA will be updated and approved by the TRINITY Corporate HSO. AHA is further discussed in **Section 4.5** below.

3.4 Personal Protective Equipment/Action Levels

The minimum PPE for site personnel will be Level D which includes:

- Safety vest;
- Hardhat (when overhead hazards exist);
- Safety glasses with side shields (or impact-resistant goggles);
- Safety boots;
- Ear protection in the vicinity of noisy equipment; and
- Work gloves and/or chemical-resistant gloves.

3.5 Activity Hazard Analysis

An AHA has been developed for operations involving a type of work presenting hazards not experienced in previous project operations or where a new work crew or subcontractor is to perform work. The AHAs define the activity being performed, sequence of work, specific safety and health hazards anticipated, control measures, equipment, inspection requirements, training requirements, and the competent person in charge of that phase of work. The following AHAs are included as **Appendix C:**

- Mobilization to the site from Clovis, New Mexico to Melrose AFR
- Demobilization from Melrose AFR to Clovis, New Mexico
- Water level and total depth measurements;
- Well head inspection/maintenance;
- Ground water sampling;
- Well Abandonment; and
- Management of IDW.

Additional information regarding site history, target chemicals, and scope of field activities is located in **Section 1.0** and **Section 2.0** of the Work Plan.

3.6 Physcial, Chemical, and Biological Hazards

There is a risk of injury from physical, chemical, and biological hazards at Melrose AFR. Personnel should be aware of the fact that when protective equipment is worn, visibility, hearing, and manual dexterity are impaired. Slips, trips, and falls are the most common causes of injuries. Organized housekeeping of onsite activities is essential in the reduction of slips, trips, and falls. TRINITY employees are to maintain the cleanliness of the site, and inspect work areas for slip and trip hazards. Damage to retina (eye) from laser activities conducted on Melrose AFR is also possible and is discussed in more detail in **Section 3.6.4.1** below.

3.6.1 General

The primary hazards of concern associated with this project are as follows:

- Safety hazards associated with equipment operation, possible falls working on uneven terrain and activities requiring manual labor;
- Chemical hazards: dermal contact from ground water and chemicals brought onsite;
- Electrical hazards: generators, and electric submersible pumps;
- Physical hazards: cold stress during the winter and heat stress during summer/fall, tripping or falling on debris or range residue, and heavy lifting;
- Biological hazards: including contact with plants, insects, snakes, spiders, and other wildlife in the wooded areas and underbrush;
- Ionizing Radiation hazards: are not anticipated to be encountered during this project; and
- Explosive Ordnance and Explosives: MEC/UXO/Material Potentially Presenting an Explosive Hazard (MPPEH) may be encountered. Avoidance procedures and techniques will be utilized.
- Damage to retina (eye) from laser activities

3.6.2 Chemical Hazards

The TRINITY Hazard Communication Program described in TRINITY's Corporate Health and Safety Manual provides personnel with information and training about safety and health hazards

associated with the chemicals they might encounter in the workplace. Exposure to chemical hazards can present a risk of serious injury. This SSHP provides the basis to avoid occupational exposure to chemical hazards by using PPE to avoid exposure to chemical hazards.

The greatest risk of chemical exposure is likely to occur during ground water sampling activities. The potential routes of exposure include dermal contact and inhalation. Dermal contact is expected to be the most significant exposure route. The potential for exposure by ingestion is expected to be low. Appropriate PPE will be used to help minimize the exposure through these routes. Personnel will be expected to use good personal hygiene practices and appropriate PPE to minimize the potential for incidental ingestion of environmental media and their associated chemicals. A summary of potential contaminants of concern are discussed in greater detail in **Section 1.6** of this report.

3.6.2.1 Chemicals Brought On Site

The following chemicals will be brought, used, and stored at Melrose AFR. A MSDS sheet for each chemical is presented in **Appendix D**.

- Gasoline and diesel (equipment fuel)
- Liquinox (decontamination)
- Hydrochloric acid (sample preservative)
- Sulfuric acid (sample preservative)
- Sodium hydroxide (sample preservative)
- Zinc acetate (sample preservative)

3.6.2.2 Hazard Communication Materials

Materials that are considered hazardous chemicals under the OSHA Hazard Communication Standard (29 CFR 1910.1200) will be used during this project. In accordance with the TRINITY Hazard Communication Program, MSDSs for hazardous materials are included in **Appendix D** of this document. The SSHO will make copies of these MSDSs available to all personnel, including subcontractors, if any, on this project.

3.6.3 Electrical Hazards

The primary electrical hazards are the use of generators and electrical submersible pumps that are run off automotive batteries. The danger from electrical hazard will be minimized by following:

- Keep electric generators and pumps properly maintained;
- Follow manufacturer's instructions;
- Ensure a proper ground to all equipment;
- Turn off all equipment when not in use; and
- Do not touch live electrical parts.

3.6.4 Physical Hazards

The following physical hazards may be encountered during this project:

- Laser activities;
- Excessive heat or cold;
- Lifting;
- Site conditions that may cause slips, trips, and falls.

3.6.4.1 Laser (Lasing) Activities

Melrose AFR is routinely utilized for overflight of military aircraft practicing laser acquisition of ground targets. During the daily safety briefing conducted each morning at Melrose AFR Range Command the RCO will discuss scheduled lasing activities with the Site Field/Escort and project personnel. If lasing activities are scheduled for the day lasing safety glasses will be issued for all personnel. The Site Field/Escort will be notified by two-way radio during the day when lasing activities are imminent and instruct project personnel to don safety glasses. The safety glasses are not to be removed until RCO has notified the Site Field/Escort that lasing activities have terminated.

3.6.4.2 Heat/Cold Stress Recognition and Control

It is the responsibility of the SSHOs and each employee to ensure that temperature stress controls are adequate for the site conditions and tasks. All employees, and specifically the SSHOs, are empowered and expected to stop or modify work and take any precautionary measures to prevent temperature related illnesses.

Heat stress hazards can occur even in temperatures not commonly considered 'hot" due to the level of physical activity, the level of PPE the worker is wearing, or the physical condition of the worker. Illness resulting from exposure to extreme heat is possible during field operations. Personnel, especially those in impermeable clothing (i.e. chemical suits), will be familiar with the signs and symptoms of heat stress, including:

- Heat Cramps - Muscle spasms in the abdomen or limbs. Frequent rest periods and fluid intake are appropriate measures to prevent or reduce heat cramps.
- Heat Exhaustion - Severe dehydration; pale, clammy skin; profuse sweating; dizziness, light-headedness; slurred speech; rapid pulse; confusion; fainting; fatigue; cool skin; nausea. Affected personnel will be escorted from the site, decontaminated promptly, set in cool, shaded area, and given fluids slowly.
- Heat Stroke - Life-threatening condition occurring when the body's temperature-regulating system improperly functions. Hot dry skin; rapid, deep breathing; lack of perspiration; delirium; high fever (often 106ºF or more), nausea; unconsciousness. Brain damage and/or death may occur, if body temperature is not reduced. Provide fluids, use cooling devices (hose-down or shower), call emergency medical services, or transport to hospital immediately.

Some preventive measures to avoid heat stress include:

- Frequent resting in cool or shaded areas; and
- Prevent heat stress by resting frequently in a shaded area and consuming large quantities of fresh potable water (more than amount needed to simply "quench thirst"). Drink at least 8 oz of water or diluted Gatorade every 2 hours when temperatures exceed 75ºF – do not consume alcoholic beverages to combat dehydration or heat stress.

Heat stress monitoring will be conducted in a manner that anticipates and prevents the onset of heat stress symptoms [i.e., OSHA work-rest regimens]. Non-acclimated workers and workers wearing full body impermeable chemical protective clothing shall be monitored when the work area temperature is greater than 70ºF. The worker's heart rate will be measured at the start of a rest break, and the work period will be decreased so that after 1 minute of rest, a worker's heart rate does not exceed 110 beats per minute. A suggested work-rest regimen is listed below.

Table 3-1
Permissible Heat Exposure Threshold Limit Value (TLV)

Work/Rest Regimen	Light	Moderate	Heavy
Continuous work	30.0°C (86°F)	26.7°C (80°F)	25.0°C (77°F)
75% Work, 25% rest, each hour	30.6°C (87°F)	28.0°C (82°F)	25.9°C (78°F)
50% Work, 50% rest, each hour	31.4°C (89°F)	29.4°C (85°F)	27.9°C (82°F)
25% Work, 75% rest, each hour	32.2°C (90°F)	31.1°C (88°F)	30.0°C (86°F)
*Values are in °C and °F, WBGT.			

If a worker's heart rate is greater than 110 beats per minute, the next work period will be shortened by 33 percent, while the length of the rest period stays the same. If the heart rate is 110 beats per minute at the beginning of the next rest period, the following work cycle will be shortened by 33 percent. When ambient temperatures are expected to exceed 75˚F, the resting heart rate of each worker will be measured prior to the start of onsite activities.

Other factors, such as a worker's level of acclimation, level of physical fitness, and age, may increase or decrease his susceptibility to heat stress. Before assigning a task to an individual worker, these factors will be taken into account to ensure that the task will not endanger the worker's health.

If a heat-related illness is suspected or observed, the affected person will be moved to a cool or shaded area and given plenty of liquids to consume. If symptoms of a heat stroke are observed, the victim will be cooled immediately and emergency medical services will be called immediately.

The TLV's listed in table above apply to physically fit and acclimatized individuals wearing light summer clothing. If heavier clothing that impedes sweat or has a higher insulation value is required, the work-rest periods may require adjustment.

Cold stress hazards are most likely to occur at low temperatures or low wind chill factors, with wet, windy conditions contributing to risk. Workers will be familiar with the signs and symptoms of cold stress, which include:

Hypothermia – Cold related decreasing of the core body temperature that produces shivering, numbness, drowsiness, and muscular weakness. If severe enough, it can lead to unconsciousness and death.

Frostbite - Constriction of blood vessels in the extremities and decreasing the supply of warming blood may result in formation of ice crystals in the tissues, causing tissue damage. Condition may range from frostnip, which is a numbing of extremities, to deep-freezing tissue beneath the skin. Symptoms include white or grayish skin, blisters, numbness, mental confusion, failing eyesight, fainting, shock, and cessation of breathing. Death may occur from heart failure.

Pain in the extremities may be the first warning of cold stress, and precautions will be taken to reduce exposure. Maximum severe shivering will be taken as a sign of immediate danger to the worker, and exposure to cold will be immediately terminated. Personnel exhibiting signs and symptoms of cold stress will be removed from the site, decontaminated, and given appropriate First Aid. Emergency medical services will be contacted if symptoms are severe (e.g., more than numbness of the extremities or shivering). When air temperatures are less than 36ºF (including wind chill), workers who become immersed in water or whose clothing becomes wet will be immediately provided a change of clothing and be treated for hypothermia.

As a precautionary measure, employees will wear layers of loose-fitting clothing including insulated coveralls, head cover (perhaps a liner beneath a hard hat), and boots when temperatures fall below 40°F, including wind chill. Protection of the hands, feet, and head is particularly important because these are likely to be injured first by cold. However, actual injury to hands, feet, and head is not likely to occur without prior development of early signs of hypothermia such as numbing and shivering. Bare skin contact with cold surfaces (below 32ºF) will be avoided. Personnel will wear wind resistant outer shell to decrease wind chill effects.

A temperature-dependant work regimen limiting lengthy periods of outdoor activity may be necessary. Workers entering heated shelters will remove the outer layer of clothing and loosen remaining clothing to permit the evaporation of perspiration. Workers will avoid dehydration by drinking water or other decaffeinated beverages, including warm drinks and soups; excluding alcoholic beverages.

3.6.4.3 Slip/Trip/Fall Hazards

Personnel should exercise caution when walking around the site to avoid fall and trip hazards. If there are holes or uneven terrain in the work area that could cause site personnel to fall or trip, they must be covered, flagged, or marked to warn personnel. If conditions become slippery, personnel 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 slipperiness. Personnel should watch where they are walking and walk only in areas of good stability.

3.6.4.4 Lifting Hazards

The following guidelines will be followed whenever lifting equipment such as portable generators, coolers filled with samples, any other objects that are of odd size or shape, or that weigh over 40 pounds. Safe lifting procedures are described in TRINITY's Corporate Health and Safety Manual.

- Get help when lifting heavy loads. Portable generators will only be lifted using a two-person lift;
- When moving heavy objects such as drums or containers, use a dolly or other means of assistance;
- Plan the lift. If lifting a heavy object, plan the route and where to place the object. In addition, plan the communication signals to be used (e.g., "1, 2, 3, lift," etc.);
- Wear sturdy shoes in good conditions that supply traction when performing lifts;
- Keep your back straight and head aligned during the lift and use your legs to lift the load—do not twist or bend from the waist. Keep the load in front of you—do not lift or carry objects from the side; and
- Keeping the heavy part of the load close to your body will help maintain your balance.

3.6.5 Biological Hazards

Biological hazards, which may be found on-site, include plants, insects, and animals. Several varieties of snakes and other wildlife are also common hazards in this area. Employee awareness and the safe work practices outlined in the following paragraphs should reduce the risk associated with these hazards to acceptable levels.

3.6.5.1 Bees, Hornets and Wasps

Contact with stinging insects like bees, hornets, and wasps may result in site personnel experiencing adverse health effects that range from mild discomfort to life threatening instances. Therefore, stinging insects present a serious hazard to site personnel, and extreme caution must be exercised whenever site and weather conditions increase the risk of encountering stinging insects. Some of the factors that are related to stinging insects that increase the degree of risk associated with accidental contact are as follows:

- The nests for these insects are frequently found in wooded and grassy areas;
- The nests can be situated in trees, rocks, and bushes or in the ground, and are usually difficult to see;
- Accidental contact with these insects is highly probable, especially during warm weather conditions when the insects are most active;
- If a site worker accidentally disturbs a nest, the worker may be inflicted with multiple stings, causing extreme pain and swelling which can leave the worker incapacitated and in need of medical attention; and
- Some people are hypersensitive to the toxins injected by a sting, and when stung, experience a violent and immediate allergic reaction resulting in a life-threatening condition known as anaphylactic shock. Anaphylactic shock manifests itself very rapidly and is characterized by extreme swelling of the body, eyes, face, mouth, and respiratory passages.

The hypersensitivity needed to cause anaphylactic shock can, in some people, accumulate over time and exposure; therefore, even if someone has been stung previously, and has not

experienced an allergic reaction, there is no guarantee that they will not have an allergic reaction upon receipt of another sting.

Africanized Honey Bees (aka Killer Bees) have been positively identified in New Mexico and are a serious potential hazard. While the sting of one Africanized Honey Bee generally contains slightly less venom than that of the common European Honey Bee, the Africanized Honey Bee is much more aggressive and up to ten times as many bees may respond to a disturbance of the hive. Such a disturbance need not be targeted at the hive itself, as vehicle vibrations, proximity to the hive's territory, and wearing dark colors or scented toiletry items have all been known to provoke attacks from hives. If field personnel have been stung by a bee, the stinger needs to be removed immediately:

Figure 3-1 Africanized Honey Bee

- Use tweezers or something to scrape across the affected area (e.g., credit card) to remove the stinger.
- Once the stinger is removed, wash area with soap and water and apply ice.
- Monitor the affected area for any allergic reaction.
- If field personnel are allergic to bee stings or if an allergic reaction is noticed after a sting, administer doctor prescribed epinephrine (commonly found in an Epi pen) shot after the sting occurs and seek medical attention immediately. The Epinephrine can only be administered to the field member in a manner prescribed by a doctor.
- Seek medical attention

3.6.5.2 Ticks

The Center for Disease Control (CDC) has noted the increase of Lyme Disease and Rocky Mountain Spotted Fever (RMSF) which are caused by bites from infected ticks that live in and near wooded areas, grass, and brush. Ticks are small, ranging from the size of a comma up to about one quarter inch. They are sometimes difficult to see. When embedded in the skin, they may look like a freckle. The tick season extends from spring through summer.

Lyme disease has occurred in 49 states, with the heaviest concentrations in the Northeast (Connecticut, Massachusetts, New Jersey, New York, and Pennsylvania), the upper Midwest (Minnesota and Wisconsin), and along the northern California coast. It is caused by deer ticks and the lone star ticks which have become infected with spirochetes. Female deer ticks are about one quarter inch in size, and are black and brick red in color. Male deer ticks are smaller, and completely black. Lone star ticks are larger and chestnut brown in color.

Figure 3-2 Tick

RMSF has occurred in at least 36 states, with the heaviest concentrations in Oklahoma, North Carolina, South Carolina, and Virginia. It is caused by Rocky Mountain wood ticks and dog ticks that have become infected with rickettsia. Both are black in color.

The first symptoms of either disease are flu like chills, fever, headache, dizziness, fatigue, stiff neck, and bone pain. If immediately treated by a physician, most individuals recover fully in a short period of time. If not treated, more serious symptoms can occur. If you believe you have been bitten by a tick, or if any of the signs and symptoms noted above appears, contact the HSO, who will authorize you to visit a physician for an examination and possible treatment.

3.6.5.3 Mites (Chiggers)

Chiggers are small mites that are usually a yellowish to bright red color. Chiggers may live year-round but are especially active during spring and summer. The larval chigger is the active stage that bites animals and humans, attaching themselves tightly. After secreting digestive enzymes that break down the skin cells, the mite feeds on the liquefied cells. The rash and intense itching associated with chiggers is an allergic reaction to the mite's salivary secretions. Preventive measures used

Figure 3-3 Mites (Chiggers)

against mosquitoes are generally effective against chiggers. Treatments to ease itching include ointments such as calamine lotion, hydrocortisone, and benzocaine.

3.6.5.4 Black Widow Spider

The Black Widow spider is not generally aggressive unless agitated when guarding her egg sac. They live in a variety of natural and domestic habitats such as under rocks, wooden boards and in dense plant growth. The female spider is glossy black and marked with a characteristic red hourglass on the underside of the abdomen. The female has a body length of about ½" with a total length of about 1 ½".

Figure 3-4 Black Widow Spider

The male, which is rarely seen, is smaller and has four pairs of red marks along the sides of the abdomen.

Young black widow spiders are tan-to-gray in color and have orange and white "racing stripes" on their abdomens. Black widow spider venom affects the nervous system. The venom causes pain in the lymph nodes. Other symptoms of a severe bite include nausea, elevated blood pressure, sweating, tremors and increased white blood cell counts. The wound may appear as a bluish red spot, surrounded by a whitish area.

Victims of a black widow bite may exhibit the following signs or symptoms:

- Sensation of pinprick or minor burning at the time of the bite; and
- Appearance of small punctures (but sometimes none are visible).

After 15 to 60 minutes, intense pain is felt at the site of the bite which spreads quickly, and is followed by profuse sweating, rigid abdominal muscles, muscle spasms, breathing difficulty, slurred speech, poor coordination, dilated pupils, and generalized swelling of face and extremities.

Protective Measures: With these things in mind and with the high probability of contact with stinging insects, all site personnel will comply with the following safe work practices:

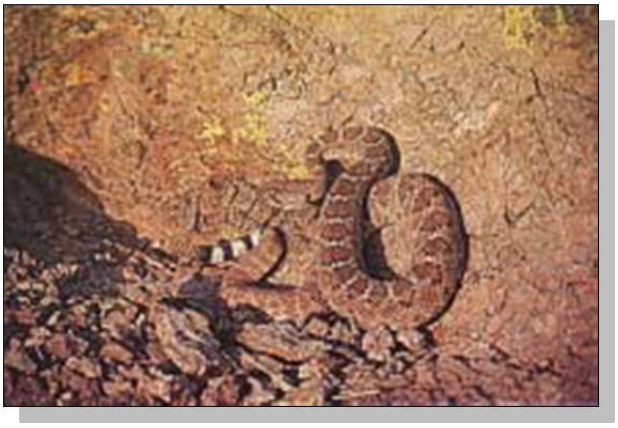
- If a worker knows that he is hypersensitive to bee, wasp or hornet stings, he must inform the SSHOs of this condition prior to participation in site activities;
- All site personnel will be watchful for the presence of stinging insects and their nests, and will advise the SSHOs that a stinging insect nest or presence of a swarm of bees is located or suspected in the area;
- Any nests located on-site will be flagged and site personnel will be notified of its presence;
- If stung, site personnel will immediately report to the SSHOs to obtain treatment and to allow the SSHO to observe them for signs of allergic reaction; and
- Site personnel with a known hypersensitivity to stinging insects will keep required emergency medication on or near their person at all times, and will inform their supervisor of the medication and how to administer it in an emergency.

3.6.5.5 Snakes

Depending on the time of year of the field work, snakes could be encountered. Personnel should be aware of their surroundings and take particular care when traversing areas that may be inhabited by snakes, such as near rocks, logs, crevices and in holes or pipes. New Mexico is home to rattlesnakes. The primary way to distinguish a rattlesnake from other snakes is the presence of a rattle, a series of horny rings formed of keratin. The rings scrape against each other in pulses to cause a rattling sound. The rattle begins with a single, soundless button on small snakes and grows with age, a new segment being added every time the snake sheds. The venom of these snakes is haemotoxic, that is, it destroys the red blood cells and the walls of the blood vessels of the victim. New Mexico has seven species of rattlesnakes that vary in size and color. The color of a rattlesnake's scales often matches the environment— brown, gray, green, red, pink, or yellow. Four of which could be present at Melrose AFR. They include:

- The western diamondback rattlesnake (Crotalus atrox) is found throughout much of New Mexico. It is the most frequently sighted rattlesnake in the state. It lives in flat plains and rocky canyons, from grassland deserts to pine-oak forests. The western diamondback is one of the largest of all rattlesnake species and the largest found in New Mexico. The color is most often gray-brown, although color often depends on the matching background color. Many New Mexico snakes have reddish to pinkish gray color. This species has black and white rings on its tail, so it is commonly called the coon-tail" rattlesnake.

Figure 3-5 Western Diamondback



- The western (prairie) rattlesnake (Crotalus viridis) is distributed across New Mexico, much of the western U.S. and into Canada. It lives in a variety of habitats, from grassland desert to pineoak forest. This species is generally more active after dark, except at high altitudes. Western prairie rattlesnakes are often greenish gray or pale brown, with a series of light-colored rings in the tail that darken with maturity.

Figure 3-6 Western (Prairie) Rattlesnake

- The black-tailed rattlesnake (Crotalus molossus) is distributed in southwestern and central New Mexico. It lives mostly in rocky, mountainous areas and is found occasionally in lower desert habitat. It is often colored greenish or steel gray, but can be sulfur yellow or rust. The tail is dark brown or black. Generally

Figure 3-7 Black-Tailed Rattlesnake

considered mild-mannered, this rattlesnake can nonetheless be quick to rattle and raise its head. It has been seen several feet off the ground in trees.

- The massasauga (Sistrurus catenatus) is distributed across southern, central, and eastern New Mexico where it occupies desert grassland, often very sandy areas. The snake is relatively small and pale brown and generally has pairs of spots on its head.

Figure 3-8 Massasauga Rattlesnake

Although not usually fatal to humans, bites can be extremely painful. Very few people die from a venomous snakebite. The key to preventing problems after snakebite is rapid first aid, transport, and professional medical treatment. The effects of a venomous bite vary considerably and depend on the species of snake, its size, the amount of venom injected, and the age and health of the victim. Therefore, all bites should be treated as serious. If bitten follow these general guidelines:

- Move the victim to safety and try to safely identify the species of snake;
- Keep the victim calm. Minimize any movement to slow the body's circulation;
- Remove jewelry or clothing that may become tight if swelling occurs;
- Apply a pad or sterile dressing to the wound. Immobilize the limb below heart level;
- Wrap a flat band (such as an elastic bandage or sock) a few inches above the bite and between the bite and the heart). Be sure you can slip a finger under the band. Do not cut off the victim's circulation, but keep the band in place until you get to a medical facility; and
- Seek immediate medical attention.

DO NOT do the following activities:

- DO NOT wash the wound. Medical professionals can use venom at the wound site to identify the type of venom;
- DO NOT bleed the wound. This may lead to further complications such as blood poisoning or severe bleeding;

- DO NOT try to suck out the venom with your mouth. Some snakebite kits include a vacuum pump device for removing venom. These devices can help if they are used correctly within 5 minutes of the bite;
- DO NOT use a constrictive bandage or tourniquet. The idea is to stop the spread of venom through the lymphatic system, not to stop the blood flow; and
- DO NOT try to catch or kill the snake. You will waste time and can receive another bite.

3.6.5.6 Scorpions

Figure 3-9 Scorpion

Of the many scorpion species in New Mexico, only the sting of the Arizona Bark Scorpion (*Centruroides sculpturatus*) is of medical importance. The venom of the Arizona Bark Scorpion may produce severe pain (but rarely swelling) at the site of the sting, numbness, frothing at the mouth, difficulties in breathing (including respiratory paralysis), muscle twitching, and convulsions. As with spiders, the possibility of allergies to the venom greatly increases the danger, since people are not usually aware of such allergies until they have been stung. Therefore, all scorpions should be regarded as a serious potential hazard. Care should be taken with lifting or moving or disturbing possible scorpion habitats, such as debris, rocks, or other objects that could provide cover.

3.6.5.7 Other Animals

Ground squirrels, rock squirrels, various rats, mice, and other mammals have been known to harbor fleas carrying bubonic plague. Their bites can also transmit rabies and other infections. Some animals pose a special problem because people tend to try to feed them or pet them; this type of increased contact brings a greater potential for danger. Avoid wildlife whenever possible. Seek medical attention for any bites.

3.6.5.8 Plants Causing Skin and Tissue Injury

Contact with sharp leaves, nettles, thorns, or needles such as cactus are of special concern to site personnel. This concern stems from the fact that punctures, cuts and even minor scrapes caused by accidental contact may result in non-infectious skin lesions, and the introduction of fungi or bacteria through the skin or eye. This is especially important in light of the fact that the warm moist environment created inside protective clothing is ideal for the propagation of fungal and bacterial infection. Personnel receiving any of the injuries listed above, even minor scrapes will report it immediately to an SSHO for initial and continued observation and care of the injury. Keeping the skin covered as much as possible (i.e., long pants and long sleeved shirts) in areas where these plants are known to exist will limit much of the potential exposure. If the rash is scratched, secondary infection can occur. The rash usually disappears in one to two weeks in cases of mild exposure and up to three weeks when exposure is severe.

Preventative Measures: The hazardous plants of greatest concern are those varieties found in the project area having the ability to cause redness, blisters, swelling, and intense burning and itching due to punctures, scrapes, or lacerations. Improper treatment of an injury can cause secondary infections to occur. Preventive measures that can prove effective for most site personnel are:

- Avoid contact with any hazardous plants on-site;
- Remove gloves prior to touching face, neck, or other exposed areas of the body;
- Wash hands, face or other exposed areas at the beginning of each break period and at the end of each workday; and
- Keeping the skin covered as much as possible (i.e., long pants and long sleeved shirts) in areas where these plants are known to exist will limit some of the potential exposure.

3.6.6 Radiological

There are no known radiological hazards associated with the project site.

3.6.7 Explosive Ordnance and Explosives

MEC and MEC-related items may be encountered at the site. Personnel should be alert for UXO and UXO-related scrap or MPPEH. All project personnel will adhere to safe work procedures. The following general precautions with regards to MEC/UXO will be observed at all times:

- Always ASSUME ordnance items contain a LIVE CHARGE until it can be ascertained otherwise; and
- If ordnance items are identified, notify the escort and the RCO and leave the area until the area has been deemed safe by the appropriate personnel.

3.7 Site Control Measures

The SSHO will verify that all site visitors sign the visitors' log. In addition, all TRINITY personnel and site visitors entering the work area must present evidence of their participation in a medical surveillance program and completion of health and safety training programs that fulfill the requirements of this plan.

The SSHO will provide site hazard and emergency action information to all site visitors before they enter the site. This can be done by providing a copy of this SSHP to the visitor.

3.8 Emergency Information

Project emergency contact information is presented in **Table 4-2** and is printed on red paper for quick access. The hospital route maps are presented as **Figure 4-10**. A copy of the hospital route maps must be readily available in each site vehicle that may be used to transport accident victims to the hospital. The emergency route map and contact list will be discussed at each morning tailgate meeting.

3.9 Emergency Response and Contingency Procedures

Illnesses, injuries, and accidents occurring on site must be attended to immediately. The USACE Accident Investigation and Reporting form is included in **Appendix B**. The form must be

completed and submitted to the TRINITY Corporate HSO within 24 hours of the reported incident for medical treatment cases and within 5 days for other incidents.

With the exception of first aid activities, TRINITY will not act as a responder to emergencies. Emergency contact information is presented in **Table 4-2**. The route to the hospital is presented on **Figure 4-10**.

3.9.1 Places of Refuge

In the event of a site emergency requiring evacuation, all personnel will evacuate to a pre-designated area located a safe distance from any health or safety hazard. The SSHO (in cooperation with a facility representative) will designate a primary assembly area prior to the start of work each day. The daily pre-designated assembly area may have to be re-designated by the SSHO in the event of an emergency where the area of influence affects the primary assembly area. Once assembled, the SSHO shall take a head count. The SSHO will evaluate the assembly area to determine if the area is outside the influence of the situation; if not, the SSHO will redirect the group to a new assembly area where a new head count will be taken.

During any site evacuation, all employees shall be instructed to observe wind direction indicators. Employees will be instructed to travel upwind or crosswind of the area of influence. The SSHO will provide specific evacuation instructions, via the site emergency radio if necessary, to site personnel regarding the actual site conditions.

3.9.2 Fire

Fire prevention procedures are described in TRINITY's Corporate Health and Safety Manual. To protect against fires, the following special precautions must be taken:

- Any hot work conducted at Melrose AFR will require a permit to be obtained through the fire department;
- A detailed inspection of the work area will be conducted to determine if potential fire sources exist;
- The fire sources must be removed to at least 35 feet away before work can commence;
- Type ABC fire extinguishers will be available on site to contain and extinguish small

fires; and

- The local or facility fire department shall be summoned in the event of any fire on site.

3.9.3 Communication

A communication network must be set up to alert site personnel of emergencies and to summon outside emergency assistance. Site personnel should be trained on the use of the site emergency communication network. Emergency phone numbers shall be posted at the phone or radio used for outside communication. The SSHO is responsible for establishing the communication network prior to the start of work, and for explaining it to all site personnel during the site safety briefing. Where voice communication is not feasible an alarm system (i.e., sirens, horns, etc.) should be set up to alert employees of emergencies. Radio communication may also be used to communicate with personnel. All two-way radio communication between the Melrose AFR RCO and field personnel will be handled by the Site Guide/Escort unless the Site Guide/Escort is incapacitated. In the event of an emergency:

- Using the two-way radio, contact the Melrose AFR RCO, identify yourself, location, and nature of the emergency;
- Follow the Melrose AFR RCO's instructions;
- Should a Cannon AFB Fire Department (FD) contingent be on-site, they will probably respond immediately and, depending on the nature and severity of the event, a Melrose and/or Clovis response team(s) will follow; and
- Once a response team arrives, and regardless of the origin, on-site control of the event will be assumed by the responding Crew Chief, Incident Commander, or other person in charge.

All 911 calls made from cellular phones are answered by CLOVIS Dispatch. (Land line 911 calls with a 784 exchange are answered by the Cannon AFB FD Dispatch, but the response process is similar.)

- When making a 911 cell phone call it is important to identify your location as Melrose AFR;
- Supply the Dispatcher with requested information and Dispatcher will pass the

information to the appropriate response group;

- Follow the Dispatcher's instructions;
- Depending on the nature and severity of the event, the Melrose Emergency Fire or Ambulance and/or Cannon AFB FD will arrive first and the Clovis response team(s) will follow; and
- Once a response team arrives, and regardless of the origin, on-site control of the event will be assumed by the responding Crew Chief, Incident Commander, or other person in charge.

In the event of an emergency, when voice communications are not feasible, personnel will use the hand signals:

• Hands clutching throat indicates	Out of air/can't breathe
• Hands on top of head indicates	Need assistance
• Thumbs up indicates	OK/I'm alright/I understand
• Thumbs down indicates	No/negative
• Arms waving upright indicates	Send back support
• Grip partner's wrist indicates	Exit area immediately

3.9.4 Medical Emergencies Response Plan

At least two TRINITY employees will hold a current certificate in American Red Cross Standard First Aid and CPR. This training provides six and one-half hours of Adult CPR and Basic First Aid. If a medical emergency exists, consult the emergency phone number list and request an ambulance immediately. Perform First Aid/CPR as necessary, stabilize the injured, decontaminate if necessary, and extricate only if the environment they are in is dangerous or unsafe and only if the rescuers are appropriately protected from potential hazards they may encounter during the rescue. When emergency services personnel arrive, communicate all first aid activities that have occurred. Transfer responsibility for care of the injured/ill to the emergency services personnel.

Injured person(s) will likely be transported to Plains Regional Medical Center (575-769-2141) near the intersection of Martin Luther King Jr. Blvd. and 21st Street in Clovis (Cannon AFB's

clinic has limited capabilities). Site personnel are expected to have quick access to emergency contact information for every person in their charge.

The following items and emergency response equipment will be located within easy access at all times:

- First Aid Kit
- Bee Sting and Snake Bite Kit
- Eyewash – A 15-minute eyewash (required if corrosives are present) or an appropriate amount of portable sterile eyewash bottles will be available on site for flushing foreign particles or contaminants out of eyes. The SSHO will demonstrate the proper operation of the unit(s) prior to the start of work.
- Emergency phone numbers list
- Portable radios for emergency communications in remote areas
- Drugs, inhalants, or medications shall not be included in the First Aid Kit.

Supplies should be re-ordered as they are used.

3.9.5 Incident Report

All site injuries and illnesses must be reported to the SSHO and PM immediately following first-aid treatment. Work is to be stopped until the PM or SSHO and Corporate Health and Safety Officer have determined the cause of the incident and have taken the appropriate action to prevent reoccurrence. Any injury or illness, regardless of severity, is to be reported. Within two working days of any reportable accident, a TRINITY Accident Notification Form (**Appendix B**) will be completed. Additionally, USACE Accident Investigation and Reporting Form (**Appendix B**) must also be completed. Mr. Hugh Hanson will be notified with 24 hours at (575) 784-6031.

In case of an accident, the PM will notify the Contracting Officer as soon as practical, but not later than [four hours], after any accident meeting the definition of recordable injuries or illnesses or high visibility accidents with property damage equal to or greater than $2,000.

Information shall include contractor name; contract title; type of contract; name of activity, installation, or location where accident occurred; date and time of accident; names of personnel injured; extent of property damage, if any; extent of injury, if known, and a brief description of the accident. Preserve the conditions and evidence on the accident site until a Government investigation team arrives on site and the Government investigation is conducted.

3.9.6 Spill or Hazardous Material Release

Small spills are immediately reported to the SSHO and are dealt with according to the chemical manufacturer's recommended procedures found on MSDSs. Steps will be taken to contain and/or collect small spills for approved storage and disposal.

4.0 WORKS CITED

Bradley, R. G., & Sanjeev, K. (2003). *Rerport 359: The Groundwater Resources of the Dockum Aquifer in Texas.* Texas Water Development Board.

Department of Defense. (2009). *Department of Defense Quality System Manual Manual for Environmental Laboratories, Version 4.1, Based on NELAC Voted Revision, 6-5-2003.*

EPA. (1983). *Methods for Chemical Analysis of Water and Wastes.*

EPA. (2010). *Mid-Atlantic Risk Assessment*. Retrieved 2010, from U.S. Environmental Protection Agency: http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/pdf/soil2gw_sl_table_run_NOVEMBER2010.pdf

EPA. (2010). *Regional Screening Level (RSL) Chemical-specific Parameters Supporting Table November 2010.*

EPA. (2004). *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW-846.*

EPA. (2004). *USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review.* Washington, DC 20460: Office of Superfund Remediation and Technology Innovation (OSRTI) U.S. Environmental Protection Agency.

EPA. (1999). *USEPA Contract Laboratory Program National Functional Guidelines for Organic Data Review.* Washington, DC 20460: Office of Emergency and Remedial Response U.S. Environmental Protection Agency.

EPA. (2008). *USEPA Contract Laboratory Program National Functional Guidelines for Organic Data Review.* Washington, DC 20460: Office of Emergency and Remedial Response U.S. Environmental Protection Agency.

Fetter, C. (1994). Applied Hydrology. Upper Saddle River, New Jersey: Prentice Hall.

Foster Wheeler. (1996). *Phase I RCRA Facility Investigation for Melrose Air Force Range, Cannon Air Force Base, Clovis, New Mexico.*

Foster Wheeler. (2003). *RCRA Facility Investigation Report Addendum For Melrose Bombing Range, Cannon Air Force Base, New Mexico.*

Gustavson, T. (1996). *Fluvial and eolian depositional systems, paleosols, and paleoclimate of the upper Cenozoic Ogallala and Blackwater Draw Formations, Southern High Plains, Texas and New Mexico: Report of Investigations No. 239.* Bureau of Economic Geology, University of Texas at Austin.

Gutentag, E. D. (1984). *Geohydrology of the High Plains in Parts of Colorado, Kansas, Nebraska, New Mexico, Okalhoma, South Dakota, Texas, and Wyoming. USGS Professional Paper 1400-B.* United States Geological Survey.

Hart, D., & McAda, D. (1985). *Geohydrology of the High Plains aquifer in southeastern New Mexico: U.S. Geological Survey Hydrologic Investigations Atlas HA-679.* United States Geological Survey.

Hawley, J. e. (1976). *Geohydrology of the High Plains Aquifer in Southeastern New Mexico. Hydologic Investigation Atlas HA-679.* United States Geological Survey.

Hubbell, C. (2010, November 3). Personal comunication. (J. Kramer, & T. Schmucker, Interviewers)

Kearney, A. (1987). *Preliminary Review/VSI Report, RCRA Facility Assessment CAFB, New Mexico. Radian Corporation, Final Report for period 9/84-4-85, Vol. 1 and 2, Appendicies A-M.*

Langman, J. G. (2004). *Ground-water hydrology and water quality of the Southern High Plains aquifer, Melrose Air Force Range, Cannon Air Force Base, Curry and Roosevelt Counties, New Mexico, 2002-03: U.S. Geological Survey Scientific Investigations Report 2004-5158.* United States Geological Survey.

Lee Wan and Associates, Inc. (1990). *1990 RCRA Facility Investigation Work Plan, CAFB, New Mexico, Prepared for 27 CSG/DEC CAFB, New Mexico. Vols. I and II.*

New Mexico Administrative Code. (2005). Well Driller Licensing; Construction, Repair and Plugging of Wells, adopted August 31, 2005, 19.27.4 NMAC.

New Mexico Environment Department. (2007). *Deferment for the Submittal of the Revised RCRA Facility Investigation Work Plan for Melrose Air Force Range.*

New Mexico Environment Department. (2008). *Ground Water Discharge Permit, Monitoring Well Construction, and Abandonment Guidelines, Revision 1.0, July 2008.*

New Mexico Environment Department. (year unknown). *How to Sample A Monitoring Well.*

New Mexico Environment Department. (2009). *Review of Initial Baseline Groundwater Monitoring.*

New Mexico Environment Department. (2001). *Use of Low-Flow and Other Non-Traditional Sampling Techniques for RCRA Compiant Groundwater Monitoring.*

New Mexico Environment Department, Hazardous Waste Bureau and Ground Water Quality Bureau Voluntary Remediation Program. (2009). *Technical Background Document for Development of Soil Screening Levels, Revision 5.0.*

Rajagopalan, S., Anderson, T., Fahlquist, L., Rainwater, K., Ridley, M., & Jackson, A. (2006). Widespread Presence of Naturally Occuring Perchlorate in High Plains of Texas and New Mexico. *Environmental Science & Technology , 40*, 3156-3162.

Tidewater, Inc. (2010). *Draft Report, Annual Groundwater Monitoring, Melrose Air Force Range, New Mexico.*

Tidewater, Inc. (2010). *Final Work Plan for Annual Groundwater Monitoring, Melrose Air Force Range.*

Trinity Analysis & Development Corp. (2010). *December 2010 Annual Ground Water Monitoring Report, Melrose Air Force Range, Roosevelt and Curry Counties, New Mexico.*

Trumpolt, C., Crain, M., Cullison, G., Flanagan, S., Siegel, L., & Lathrop, S. (Winter 2005). *Perchlorate: Sources, Uses, and.* Remediation.

U.S. Army Corp of Engineers. (2001). *Requirements for Preparation of Sampling and Analysis Plan, EM 200-1-3, February 1, 2001.*

URS. (June 2009). *Final Report, Initial Baseline Groundwater Monitoring, Melrose Air Force Range, New Mexico.*

USDA. (2010). *Web Soil Survey*. Retrieved November 25, 2010, from United States Department of Agriculture, Natural Resources Conservation Service: http://websoilsurvey.nrcs.usda.gov/app/HomePage.htm

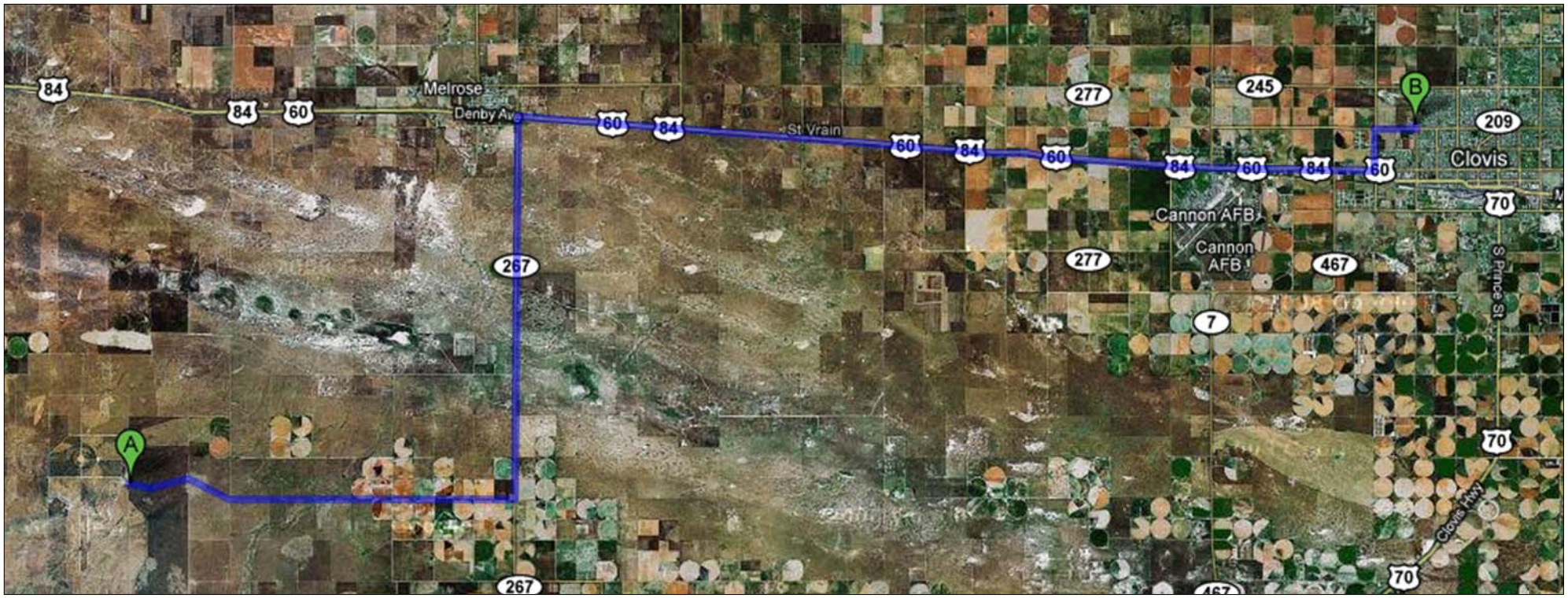
Weather Underground. (2010). Retrieved December 1, 2010, from Weather Undergound: http://www.wunderground.com/weatherstation/WXDailyHistory.asp?ID=MMRRN5

Western Regional Climate Center. (2010). *Western Regional Climate Center, Historical Climate Information*. Retrieved December 1, 2010, from Western Regional Climate Center: http://www.wrcc.dri.edu/CLIMATEDATA.html

William Matotan and Associates Inc. (1985). *Water Well Master Plan Survey. Prepared for the Air Force, Cannon Air Force Base, New Mexico.*

FIGURES

This page intentionally left blank.



HOSPITAL DIRECTIONS:

From Melrose AFR Sundale Valley Road security gate travel east approximately 9.3 miles; turn left on SR NM-267 and travel 9.4 miles;
turn right onto US-60 and travle 21.0 miles;
turn left at North Wheaton Street and travel 1.0 miles;
turn right on West 21st Street and travel 1.0 miles;
trun left at North Martin Luther King Jr. Bloulevard travel 0.1 miles;
take the 1st left.

FIGURE 3-10

HOSPITAL ROUTE MAP

Melrose Air Force Range

Roosevelt and Curry Counties, New Mexico

TABLES

This page intentionally left blank.

		Office	Cell
Ambulance:		**911**	
Fire:		**911**	
Sheriff:		**911**	
Hospital: Plains Regional Medical Center 2100 North Martin Luther King Jr. Boulevard Clovis, New Mexico 88101		(575) 769-2141	
Interim Environmental Restoration Program Mgr/ TSCA Specialist	Mr. Matthew Higginbotham, CEAN	(575) 784-1092	na
Chief, Conservation Section	Mr. Rick Crow, CEANC	(575) 784-6383	na
USACE Project Manager:	Mr. Hector Santiago	(402) 995-2738	(402) 350-3697
USACE Project Manager:	Mr. Walter Migdal, CESPA-PM-ME	(505) 343-6297	(505) 301-3923
TRINITY Project Manager:	Mr. Richard Burdine	(850) 243-0072	(850) 362-9357
TRINITY Site Health and Safety Officer:	Mr. Alec Macbeth	(850) 243-0072	(850) 240-5263

All 911 calls made from cellular phones are answered by CLOVIS Dispatch. (Land line 911 calls with a 784 exchange are answered by the Cannon AFB FD Dispatch, but the response process is similar.)
1. When making a 911 cell phone call it is important to identify your location as Melrose AFR;
2. Supply the Dispatcher with requested information and Dispatcher will pass the information to the appropriate response group;
3. Follow the Dispatcher's instructions;
4. Depending on the nature and severity of the event, the Melrose Emergency Fire or Ambulance and/or Cannon AFB FD will arrive first and the Clovis response team(s) will follow;
5. Once 911 has been contacted, if the Site Guide/Escort has not contacted Melrose AFR RCO by two-way radio then initiate contact and supply the RCO with requested information.
6. Once a response team arrives, and regardless of the origin, on-site control of the event will be assumed by the responding Crew Chief, Incident Commander, or other person in charge.

HOSPITAL DIRECTIONS:

From Melrose AFR Sundale Valley Road security gate travel east approximately 9.3 miles; turn left on SR NM-267 and travel 9.4 miles;
turn right onto US-60 and travel 21.0 miles;
turn left at North Wheaton Street and travel 1.0 miles;
turn right on West 21st Street and travel 1.0 miles;
turn left at North Martin Luther King Jr. Boulevard travel 0.1 miles;
take the 1st left.

The route to the hospital is depicted on **Figure 3-10**.
A copy of the hospital route map is available in all site vehicles.
Additional information concerning emergency procedures is included in the **Attachment** of the Work Plan

TABLE 3-2
PROJECT EMERGENCY CONTACT INFORMATION

QUALIFIER	DATA QUALIFIER DEFINITIONS (ORGANIC)
U	The analyte was analyzed for, but was not detected at a level greater than or equal to the level of the adjusted Reporting Limit (RL) for sample and method
J	The analyte was positively identified and the associated numerical value is the approximate concentration of the analyte in the sample (due either to the quality of the data generated because certain QC criteria were not met, or the concentration of the analyte was below the RL.
NJ	The analysis indicates the presence of an analyte that has been "tentatively identified" and the associated numerical value represents its approximate concentration.
UJ	The analyte was not detected at a level greater than or equal to the adjusted RL. However, the reported adjusted RL is approximate and may be inaccurate or imprecise.
R	The sample results are unusable due to the quality of the data generated because certain criteria were not met. The analyte may or may not be present in the sample.
QUALIFIER	**DATA QUALIFIER DEFINITIONS (INORGANIC)**
U	The analyte was analyzed for, but was not detected at a level greater than or equal to the level of the adjusted Reporting Limit (RL) for sample and method
J	The result is an estimated quantity. The associated numerical value is the approximate concentration of the analyte in the sample.
J+	The result is an estimated quantity, but the result may be biased high.
J-	The result is an estimated quantity, but the result may be biased low.
R	The data are unusable. The sample results are rejected due to serious deficiencies in meeting QC criteria. The analyte may or may not be present in the sample.
UJ	The analyte was analyzed for, but was not detected. The reported RL is approximate and may be inaccurate or imprecise.

TABLE 1-1
LISTS OF QUALIFIERS

APPENDIX A

LABORATORY QUALITY ASSURANCE MANUALS

This page intentionally left blank.

Quality Systems Manual

Volume XI, Revision I: December 2010

Effective Date: _December 07, 2010

Document Control Number: _____

_____
Harry Behzadi, Ph.D., VP Southeast Operations

_____
Norman D. Farmer, Regional Technical Director

_____
Rick Watkins, Laboratory Manager, Technical Director

_____
Svetlana Izosimova, Ph.D., Quality Assurance Officer

Accutest Laboratories Southeast, Inc.
4405 Vineland Road, Suite C-15
Orlando, Florida 32811
407.425.6700

This document is the exclusive property of Accutest Laboratories. Reproduction without the expressed written permission of Accutest Laboratories is prohibited

INTRODUCTION

The Accutest Laboratories Southeast, Inc. (Accutest SE) Quality Assurance Program, detailed in this plan, has been designed to meet the quality program requirements of the National Environmental Laboratories Accreditation Conference (NELAC), DoD QSM Ver 4.1, 2009 and ISO 17025. The plan establishes the framework for documenting the requirements of the quality processes regularly practiced by the Laboratory. The Quality Assurance Officer is responsible for changes to the Quality Assurance Program, which are appended to the LQSM as they occur. The plan is reviewed annually for compliance purposes by the Laboratory Director and Technical Director and edited if necessary. Changes that are incorporated into the plan are summarized in the plan introduction. Changes to the plan are communicated to the general staff in a meeting conducted by the Quality Assurance Officer following the plan's approval.

The Accutest SE plan is supported by standard operating procedures (SOPs), which provide specific operational instructions on the execution of each quality element and assure that compliance with the requirements of the plan are achieved. Accutest SE employees are responsible for knowing the requirements of the SOPs and applying them in the daily execution of their duties. These documents are updated as changes occur and the staff is trained to apply the changes.

At Accutest, we believe that satisfying client requirements and providing a product that meets or exceeds the standards of the industry is the key to a good business relationship. However, client satisfaction cannot be guaranteed unless there is a system that assures the product consistently meets its design requirements and is adequately documented to assure that all procedural steps are executed and are traceable.

This plan has been designed to assure that this goal is consistently achieved and the Accutest product withstands the rigors of scrutiny that are routinely applied to analytical data and the processes that support its generation.

Accutest Laboratories Southeast is a permanent location facility and is part of Accutest Laboratories, Inc.

Summary of Changes
Accutest SE Quality System Manual –Nov 2010

Section	**Description**	Page #
Title Page	new revision number	Title
OrgChart	Updated Organizational structure	i, 5
2.2	Key Management appointed deputies list	6
4.1	Location of personnel detailed job descriptions	18
9.11	VOC vials disposal procedure added	24
9.11	Water disposal procedure reviewed	24
14.1	Review of accreditation status	58
App II	3060A – Digestion for Hexavalent Chromium	83
App II	Corrosivity to Steel EPA 1110 removed	82
App II	EPA methods removed (per MUR 2007)	80, 83
App II	Nitrate, Nitrite, Chloride added	80
App V	SOPs GN107, GN123, GN191 added	98
App III	Replaced 1997 ICP with 2010 ICP	88
App III	Added location to equipment list, Ser # corrected	87
App IV	State of Alaska added UST-088	90
App IV	DoD Certification replaced USCOE	90
App V	SOP List – new QA SOP added, table of contents amended accordingly	96

Table of Contents

Section	Title	Page
1.0	Quality Policy	5
2.0	Organization	6
3.0	Quality Responsibilities of the Management Team	9
4.0	Job Descriptions Of Key Staff	16
5.0	Signatory Approvals	20
6.0	Documentation & Document Control	22
7.0	Reference Standard Traceability	27
8.0	Test Procedures, Method References, & Regulatory Programs	29
9.0	Sample Management, Login, Custody, Storage & Disposal	33
10.0	Laboratory Instrumentation and Measurement Standards	40
11.0	Instrument Maintenance	43
12.0	Quality Control Parameters, Procedures, and Corrective Action	44
13.0	Corrective Action System	53
14.0	Procedures For Executing Client Specifications	56
15.0	Client Complaint Resolution Procedure	60
16.0	Control of Non-Conforming Product	61
17.0	Confidentiality Protection Procedures	62
18.0	Quality Audits And Quality System Reviews	64
19.0	Health and Safety	66

Appendices

I	Glossary of Terms	69
II	Analytical Capabilities	77
III	Equipment List	85
IV	Certification Summary	89
V	Standard Operating Procedures (SOP) List	91

1.0 QUALITY POLICY

1.1 ***Accutest Mission***:

Accutest Laboratories provides analytical services to commercial and government clients in support of environmental monitoring and remedial activities as requested. The Laboratory's mission is dedicated to providing reliable data that satisfies clients requirements as explained in the following: "Provide easy access, high quality, analytical support to commercial and government clients which meet or exceeds data quality objectives and provides them with the data needed to satisfy regulatory requirements and/or make confident decisions on the effectiveness of remedial activities."

These services are provided impartially and are not influenced by undue commercial or financial pressures, which might impact the staff's technical judgment. Coincidentally, Accutest does not engage in activities that endanger the trust in our independent judgment and integrity in relation to the testing activities performed.

1.2 ***Policy Statement*:**

The management and staff of Accutest Laboratories share the responsibility for product quality. Accordingly, Accutest's quality assurance program is designed to assure that all processes and procedures, which are components of environmental data production, meet established industry requirements, are adequately documented from a procedural and data traceability perspective, and are consistently executed by the staff. It also assures that analytical data of known quality, meeting the quality objectives of the analytical method in use and the data user's requirements, is consistently produced in the laboratory. This assurance enables the data user to make rational, confident, cost-effective decisions on the assessment and resolution of environmental issues.

The laboratory Quality System also provides the management staff with data quality and operational feedback information. This enables them to determine if the laboratory is achieving the established quality and operational standards, which are dictated by the client or established by regulation, such as NELAC, ISO 17025 or DoD QSM. The information provided to management, through the QA program, is used to assess operational performance from a quality perspective and to perform corrective action as necessary.

All employees of Accutest Laboratories participating in environmental testing receive quality system training and are responsible for knowing and complying with the system requirements. The entire staff shares Accutest's commitment to good professional practice.

Harry Behzadi, Ph.D.
VP Southeast Operations

2.0 ORGANIZATION

2.1 ***Organizational Entity***. Accutest Laboratories, Inc. is a testing laboratory founded in 1956 and registered as a New Jersey Corporation. In 2007 the laboratory has changed ownership to Accutest Holdings, Inc. Operations, staff and physical locations were not affected by the change. The laboratory headquarters are located in Dayton, New Jersey where it has conducted business since 1987. Satellite laboratories are maintained in Marlborough, Massachusetts; Orlando, Florida; San Jose, California ; Denver, Colorado, and Houston, Texas.

2.2 ***Management Responsibilities***

Requirement: Each laboratory facility will have an established chain of command. The duties and responsibilities of the management staff are linked to the President/CEO of Accutest Laboratories who establishes the agenda for all company activities.

President/CEO*.* Primarily responsible for all operations and business activities. Delegates authority to laboratory directors, general managers, and quality assurance director to conduct day-to-day operations and execute quality assurance duties. Each of the three operational entities (New Jersey, Florida and Massachusetts) reports to the President/CEO.

Corporate Quality Assurance Director*.* Responsible for design, oversight, and facilitation of all quality assurance activities established by the Quality Program. Directly reports to the President/CEO.

Vice President Operations/Laboratory Director*.* There is Laboratory Director assigned to each of the operational entities: New Jersey, Massachusetts and Florida. Executes day-to-day responsibility for laboratory operations including technical aspects of production activities and associated logistical procedures. Directly reports to the President/CEO.

Quality Assurance Officer *(on location).* Responsible for oversight, implementation and facilitation of all quality assurance activities established by the Quality Program. Directly reports to the Laboratory Director. Also exchanges information with and submits laboratory performance data (PE scores, audit reports, accreditation changes, etc.) to Corporate QA Director. Takes program directions from Corporate QA Director.

Technical Director. Responsible for oversight and implementation of technical aspects of production activities in the environmental testing laboratory. In the event that the technical director, quality assurance director, or laboratory manager is absent for a period of time that exceeds 15 consecutive calendar days, the designated appointees shall temporarily perform the technical director, quality assurance director, or laboratory manager's job function. If this absence exceeds 65 consecutive calendar days, the Accreditation Body(ies), including DoD ELAP, is to be notified in writing.

Current list of appointed deputies located in restricted access controlled document directory

Department Managers. Executes day-to-day responsibility for specific laboratory areas including technical aspects of production activities and associated logistical procedures. Directly report to the Laboratory Director.

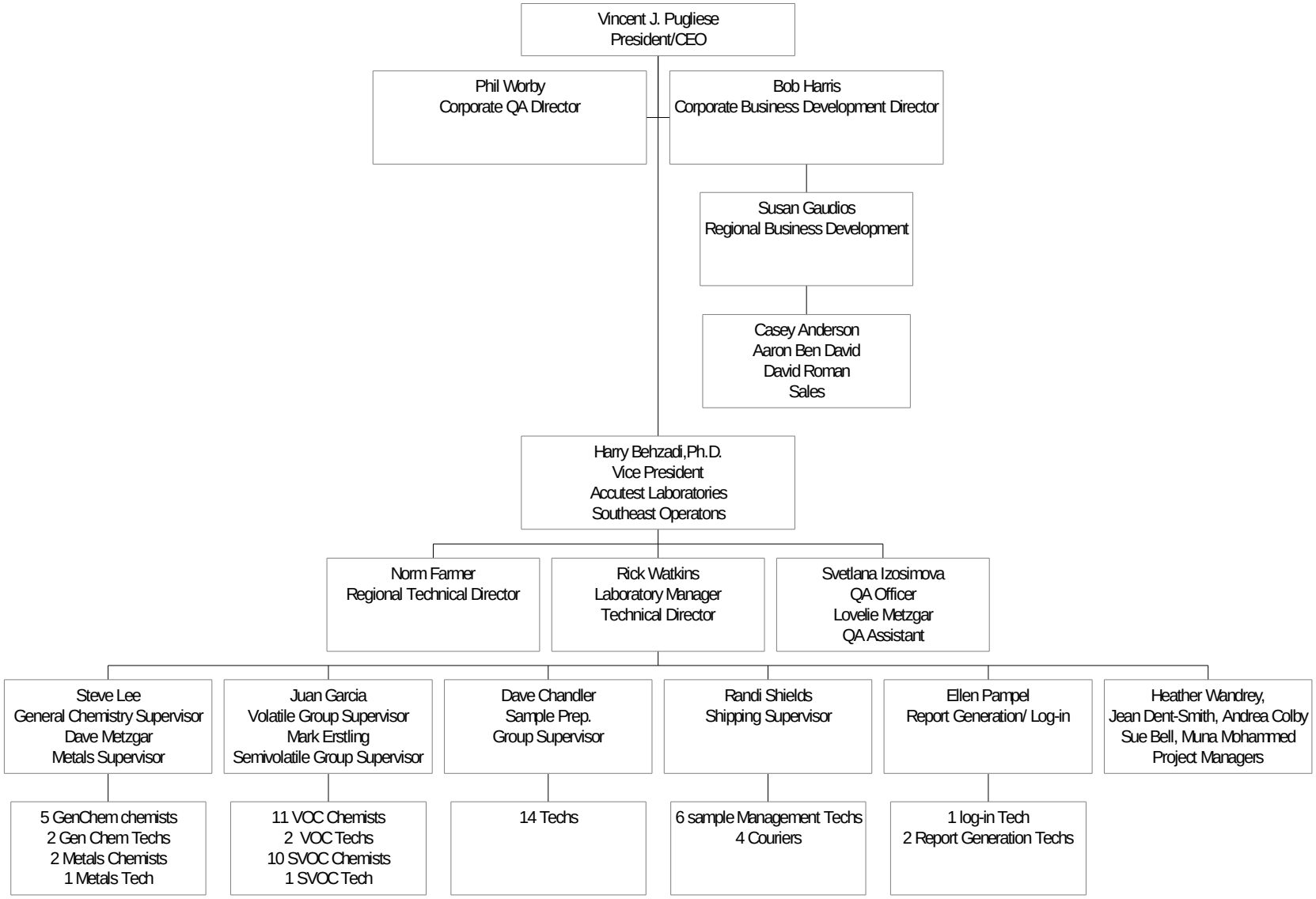
Section Supervisors. Executes day-to-day responsibility for specific laboratory units including technical aspects of production activities and associated logistical procedures. Directly report to the Department Manager.

2.3 ***Chain of Command***

The responsibility for managing all aspects of the Company's operation is delegated to specific individuals, who have been assigned the authority to act in the absence of the senior staff. These individuals are identified in the following Chain of Command:

Harry Behzadi, Ph.D., VP, Southeast Operations
Norm Farmer, Regional Technical Director
Rick Watkins, Laboratory Manager (Operations and IT) ***and*** Heather Wandrey, Project Manager (Client Services)

Accutest Laboratories Southeast Organizational Chart



3.0 QUALITY RESPONSIBILITIES OF THE MANAGEMENT TEAM

3.1 ***Requirement*:** Each member of the management team has a defined responsibility for the Quality Program. Program implementation and operation is designated as an operational management responsibility. Program design and implementation is designated as a Quality Assurance Responsibility.

President/CEO*:* Primary responsibility for all quality activities. Delegates program responsibility to the Quality Assurance Director. Serves as the primary alternate in the absence of the Quality Assurance Director. Has the ultimate responsibility for implementation of the Quality Program.

Vice President Operations/Laboratory Director*.* Responsible for implementing and operating the Quality Program in all laboratory areas. Responsible for the design and implementation of corrective action for defective processes. Has the authority to delegate Quality Program implementation responsibilities.

Corporate Quality Assurance Director*.* Responsible for design, implementation support, training, and monitoring of the quality system. Identifies product, process, or operational defects using statistical monitoring tools and processes audits for elimination via corrective action. Empowered with the authority to halt production if warranted by quality problems. Monitors implemented corrective actions for compliance.

Quality Assurance Officer *(on location).* Responsible for design support, implementation support, and monitoring support of the quality system. Training personnel in various aspects of quality system. Conducts audits and product reviews to identify product, process, or operational defects using statistical monitoring tools and processes audits for elimination via corrective action. Empowered with the authority to halt production if warranted by quality problems. Monitors implemented corrective actions for compliance.

Technical Director. Responsible for oversight and implementation of technical aspects of Quality System as they are integrated into method applications and employed to assess analytical controls on daily basis. The Technical Director reviews and acknowledges the technical feasibility of proposed quality system involving technical applications.

Department Managers*.* Responsible for applying the requirements of the Quality Program in their section and assuring subordinate supervisors and staff apply all program requirements. Initiates, designs, documents, and implements corrective action for quality deficiencies.

Group Leaders*.* Responsible for applying the requirements of the Quality Program to their operation and assuring the staff applies all program requirements. Initiates, designs, documents, and implements corrective action for quality deficiencies.

Bench Analysts. Responsible for applying the requirements of the Quality Program to the analyses they perform, evaluating QC data and initiating corrective action for quality control deficiencies within their control. Implements global corrective action as directed by superiors.

3.2 ***Program Authority***:

Authority for program implementation on corporate level originates with the President/CEO who bears ultimate responsibility for program design, implementation, and enforcement of requirements. This authority and responsibility is delegated to the Director of Quality Assurance who performs quality functions independently without the encumbrances or biases created by operational or production responsibilities to ensure an honest, independent assessment of quality issues.

Laboratory Director and Quality Assurance Officer mirror this authority on location.

3.3 ***Data Integrity Policy***:

The Accutest Data Integrity Policy reflects a comprehensive, systematic approach for assuring that data produced by the laboratory accurately reflects the outcome of the tests performed on field samples and has been produced in a bias free environment by ethical professionals. The policy includes a commitment to technical ethics, staff training in ethics and data integrity, an individual attestation to data integrity and procedures for evaluating data integrity. Senior management assumes the responsibility for assuring compliance with all technical ethics elements and operation of all data integrity procedures. The staff is responsible for compliance with the ethical code of conduct and for practicing data integrity procedures.

The Accutest Data Integrity Policy is as follows:

"Accutest Laboratories is committed to producing data that meets the data integrity requirements of the environmental regulatory community. This commitment is demonstrated through the application of a comprehensive data integrity program that includes ethics and data integrity training, data integrity evaluation procedures, staff participation and management oversight. Adherence to the specifications of the program assures that data provided to our clients is of the highest possible integrity and can be used for decision making processes with high confidence."

Data Integrity Responsibilities

***Management*.** Senior management retains oversight responsibility for the data integrity program and retains ultimate responsibility for execution of the data integrity program elements. Senior management is responsible for providing the resources required to conduct ethics training and operate data integrity evaluation procedures. They also include responsibility for creating an environment of trust among the staff and being the lead advocate for promoting the data integrity policy and the importance of technical ethics.

***Staff*.** The staff is responsible for adhering to the company ethics policy as they perform their duties and responsibilities associated with sample analysis and reporting. By executing this responsibility, data produced by Accutest Laboratories retains its high integrity characteristics and withstands the rigors of all data integrity checks.

The staff is also responsible for adhering to all laboratory requirements pertaining to manual data edits, data transcription and data traceability. These include the application of approved manual peak integration and documentation procedures. It also includes establishing traceability for all manual results calculations and data edits.

***Ethics Statement*.** The Accutest ethics statement reflects the standards that are expected for businesses that provide environmental services to regulated entities and regulatory agencies on a commercial basis. The Ethics Policy is comprised of key elements that are essential to organizations that perform chemical analysis for a fee. As such, it focuses on elements related to personal, technical and business activities.

Accutest Laboratories provides analytical chemistry services on environmental matters to the regulated community. The data the company produces provides the foundation for determining the risk presented by a chemical pollutant to human health and the environment. The environmental industry is dependent upon the accurate portrayal of environmental chemistry data. This process is reliant upon a high level of scientific and personal ethics.

It is essential to the Company that each employee understands the ethical and quality standards required to work in this industry. Accordingly, Accutest has adopted a code of ethics, which each employee is expected to adhere to as follows:

- Perform chemical and microbiological analysis using accepted scientific practices and principles.
- Perform tasks in an honest, principled and incorruptible manner inspiring peers & subordinates.
- Maintain professional integrity as an individual.
- Provide services in a confidential, honest, and forthright manner.
- Produce results that are accurate and defensible.

- Report data without any considerations of self-interest.
- Comply with all pertinent laws and regulations associated with assigned tasks and responsibilities.

Data Integrity Procedures.

Four key elements comprise the Accutest data integrity system. Procedures have been implemented for conducting data integrity training and for documenting that employees conform to the Accutest Data Integrity and Ethics policy.

The data integrity program consists of routine data integrity evaluation and documentation procedures to periodically monitor and document data integrity. These procedures are documented as SOPs. SOPs are approved and reviewed annually following the procedures employed for all Accutest SOPs. Documentation associated with data integrity evaluations is maintained on file and is available for review.

Data Integrity Training, .Accutest employees receive technical ethics training during new employee orientation. Employees are also required to attend annual ethics refreshment training and sign an ethical conduct agreement annually, which verifies their understanding of Accutest's ethics policy and their ethical responsibilities. The agreement is refreshed annually and appended to each individual's training file.

The training focuses on the reasons for technical ethic training, explains the impact of data fraud on human health and the environment, and illustrates the consequences of criminal fraud on businesses and individual careers. Accutest's ethics policy and code of ethics are reviewed and explained for each new employee. Employees receive Accutest brochure for further review.

Training on data integrity procedures are conducted by individual departments for groups involved in data operations. These include procedures for manual chromatographic peak integration, standards traceability.

Data Integrity Training Documentation. Records of all data integrity training are maintained in individual training folders. Attendance at all training sessions is documented and appended to the training file.

Accutest Data Integrity and Ethical Conduct Agreement. All employees are required to sign a Data Integrity and Ethical Conduct Agreement annually. This document is archived in individual training files, which are retained for duration of employment.

The Data Integrity and Ethical Conduct Agreement is as follows**:**

I. *I understand the high ethical standards required of me with regard to the duties I perform and the data I report in connection with my employment at Accutest Laboratories.*

II. *I have received formal instruction on the code of ethics that has been adapted by Accutest Laboratories and agree to comply with these requirements.*

III. *I have received formal instruction on the elements of Accutest Laboratories' Data Integrity Policy and have been informed of the following specific procedures:*

   a. *Routine data integrity monitoring is conducted on sample data, which may include an evaluation of the data I produce,*

   b. *Formal procedures for the confidential reporting of data integrity issues are available, which can be used by any employee,*

   c. *A data integrity investigation is conducted when data issues are identified that may negatively impact data integrity.*

IV. *I am aware that data fraud is a punishable crime that may include fines and/or imprisonment upon conviction.*

V. *I also agree to the following:*

   a. *I shall not intentionally report data values, which are not the actual values observed or measured.*

   b. *I shall not intentionally modify data values unless the modification can be technically justified through a measurable analytical process.*

   c. *I shall not intentionally report dates and times of data analysis that are not the true and actual times the data analysis was conducted.*

   d. *I shall not condone any accidental or intentional reporting of inauthentic data by other employees and immediately report it's occurrence to my superiors.*

   e. *I shall immediately report any accidental reporting of inauthentic data by myself to my superiors.*

Data Integrity Monitoring. Several documented procedures are employed for performing data integrity monitoring. These include regular data review procedures by supervisory and management staff (Section 12.7), supervisory review and approval of manual integrations and periodic reviews of GALP audit trails from the LIMS and all computer controlled analysis.

Data Review. All data produced by the laboratory undergoes several levels of review, which includes two levels of management review. Detected data anomalies that appear to be related to data integrity issues are isolated for further investigation. The investigation is conducted following the procedures described in this section.

Manual Peak Integration Review and Approval. Routine data review procedures for all chromatographic processes includes a review of all manual chromatographic peak integrations. This review is performed by the management staff and consists of a review of the machine integration compared to the manual integration. Manual integrations, which have been performed in accordance with Accutest's manual peak integration procedures are approved for further processing and release. Manual integrations which are not performed to Accutest's specifications are set aside for corrective action, which may include analyst retraining or further investigation as necessary.

GALP Audit Trail Review. Good Automated Laboratory Practice (GALP) audits are comprehensive data package audits that include a review of raw data, process logbooks, processed data reports and GALP audit trails from individual instruments and LIMS. GALP audit trails, which record all electronic data activities, are available for the majority of computerized methodology and the laboratory information management system (LIMS). These audit trails are periodically reviewed to determine if interventions performed by technical staff constitute an appropriate action. The review is performed on a recently completed job and includes interviews with the staff who performed the analysis. Findings indicative of inappropriate interventions or data integrity issues are investigated to determine the cause and the extent of the anomaly.

Confidential Reporting Of Data Integrity Issues. Data integrity concerns may be raised by any individual to their supervisor. Employees with data integrity concerns should always discuss those concerns with their immediate supervisors as a first step unless the employee is concerned with the confidentiality of disclosing data integrity issues or is uncomfortable discussing the issue with their immediate supervisors. The supervisor makes an initial assessment of the situation to determine if the concern is related to a data integrity violation. Those issues that appear to be violations are documented by the supervisor and referred to the Director of Quality Assurance for investigation.

Documented procedures for the confidential reporting of data integrity issues in the laboratory are part of the data integrity policy. These procedures assure that laboratory staff can privately discuss ethical issues or report items of ethical concern without fears of repercussions with senior staff.

Employees with data integrity concerns that they consider to be confidential are directed to the Corporate Human Resources Manager in Dayton, New Jersey. The HR Manager acts as a conduit to arrange a private discussion between the employee and the Corporate QA Director or a local QA Officer.

During the employee - QA discussion, the QA representative evaluates the situation presented by the employee to determine if the issue is a data integrity concern or a

legitimate practice. If the practice is legitimate, the QA representative clarifies the process for the employee to assure understanding. If the situation appears to be a data integrity concern, the QA representative initiates a Data Integrity Investigation following the procedures specified in SOP EQA059.

Data Integrity Investigations. Follow-up investigations are conducted for all reported instances of ethical concern related to data integrity. Investigations are performed in a confidential manner by senior management according to a documented procedure. The outcome of the investigation is documented and reported to the company president who has the ultimate responsibility for determining the final course of action in the matter. Investigation documentation includes corrective action records, client notification information and disciplinary action outcomes, which is archived for a period of five years.

The investigations are conducted by the senior staff and supervisory personnel from the affected area. The investigation team includes the Laboratory Director and the Quality Assurance Director. Investigations are conducted in a confidential manner until it is completed and resolved.

The investigation includes a review of the primary information in question by the investigations team. The team performs a review of associated data and similar historical data to determine if patterns exist. Interviews are conducted with key staff to determine the reasons for the observed practices.

Following data compilation, the investigations team reviews all information to formulate a consensus conclusion. The investigation results are documented along with the recommended course of action.

Corrective Action, Client Notification & Discipline. Investigations that reveal systematic data integrity issues will go through corrective action for resolution and disposition (Section 13). If the investigation indicates that an impact to data has occurred and the defective data has been released to clients, client notification procedures will be initiated following the steps in Section 17.6.

In all cases of data integrity violations, some level of disciplinary action will be conducted on the responsible individual. The level of discipline will be consistent with the violation and may range from retraining and/or verbal reprimand to termination.

4.0 JOB DESCRIPTIONS OF KEY STAFF

4.1 ***Requirement*:** Descriptions of key positions within the organization must defined to ensure that clients and staff understand duties and the responsibilities of the management staff and the reporting relationships between positions.

President/Chief Executive Officer. Responsible for all laboratory operations and business activities. Establishes the company mission and objectives in response to business needs. Direct supervision of the Vice President of Operations, each laboratory director, client services, management information systems, and quality assurance.

Vice President, Operations/Laboratory Director. Reports to the company president. Establishes regional laboratory operations strategy and business development. Authorized to enter into contractual agreements on Company's behalf.

Director, Quality Assurance. Reports to the company president. Establishes the company quality agenda, develops quality procedures, provides assistance to operations on quality procedure implementation, coordinates all quality control activities monitors the quality system and provides quality system feedback to management to be used for process improvement.

Chief Information Officer (CIO) Reports to the company president. Develops the MIS software and hardware agenda. Provides system strategies to compliment company objectives. Maintains all software and hardware used for data handling.

Client Services, Sales, Account Manager(s). Reports to the company president. Establishes and maintains communications between clients and the laboratory pertaining to client requirements which are related to sample analysis and data deliverables. Initiates client orders and supervises sample login operations.

Quality Assurance Officer *(on location)*. Reports to the Laboratory Director. Develops quality procedures, provides assistance to operations on quality procedure implementation, coordinates all quality control activities, monitors the quality system, and provides quality system feedback to management to be used for process improvement. In the event of prolonged absence QAO also designated a Deputy Technical Director, unless otherwise specified by internal memo from Laboratory Director.

Manager Client Services *(on location)*. Reports to the Laboratory Director. Establishes and maintains communications between clients and the laboratory pertaining to client requirements which are related to sample analysis and data deliverables. Initiates client orders and supervises sample login operations.

Technical Director (On Location). Reports to the laboratory director. Establishes laboratory operations strategy. Direct supervision of organic chemistry and inorganic chemistry. Directs the operations, preparation and instrumental analysis. Responsible

for following Quality Program requirements. Assumes operational responsibilities of Lab Director in his absence.

Laboratory Manager. Reports to the Laboratory Director. Directs the day-to day operations of entire laboratory, direct supervision of organic chemistry, inorganic chemistry, field services, and sample management.
Oversees daily work schedule as developed by respective departments. Supervises method implementation. Responsible for following Quality Program requirements. Maintains laboratory instrumentation in an operable condition.

Supervisors, Shipping and Receiving Departments. Reports to the Laboratory Manager. Develops, maintains and executes all procedures required for transport and receipt of samples, verification of preservation, and chain of custody documentation. Responsible for maintaining and documenting secure storage, delivery of samples to laboratory units on request, and disposal following completion of all analytical procedures.

Supervisor, Wet Chemistry. Reports to the Laboratory Manager. Directs the operations of the wet chemistry group. Establishes and executes daily work schedule. Supervises method implementation, application, and data production. Supervises the analysis of samples for wet chemistry parameters using valid, documented methodology. Maintains instrumentation in an operable condition. Reviews data for compliance to quality and methodological requirements. Responsible for following Quality Program requirements.

Supervisor, Metals. Reports to the Laboratory Manager. Directs the operations of the metals group. Establishes and executes daily work schedule. Supervises method implementation, application, and data production. Supervises the analysis of samples for metallic elements using valid, documented methodology. Documents all procedures and data production activities. Maintains instrumentation in an operable condition. Reviews data for compliance to quality and methodological requirements. Responsible for following Quality Program requirements

Supervisor, Organic Preparation. Reports to the Laboratory Manager. Directs the operations of the sample preparation group. Establishes and executes daily work schedule. Supervises method implementation, and application. Supervises the preparation of samples for organic compounds using valid, documented methodology. Documents all procedures and data production activities. Maintains laboratory equipment in an operable condition. Reviews records for compliance to quality and methodological requirements. Responsible for following Quality Program requirements.

Volatile and Semivolatie Supervisors, Organics. Reports to the Laboratory Manager. Directs the operations of the respective organics group. Establishes and executes daily work schedule. Supervises method implementation, application, and data production. Supervises the analysis of samples for organic compounds using valid, documented methodology. Documents all procedures and data production activities. Maintains instrumentation in an operable condition. Reviews data for

compliance to quality and methodological requirements. Responsible for following Quality Program requirements

Report Generation Supervisor. Reports to Laboratory Manager. Oversees report generation and fulfillment of client specifications as applied to data deliverables. Responsible for data delivery in timely manner.

Detailed Job descriptions of lab personnel are found in training folders

4.2 ***Employee Screening, Orientation, and Training***.

All potential laboratory employees are screened and interviewed by human resources and technical staff prior to their hire. The pre-screen process includes a review of their qualifications including education, training and work experience to verify that they have adequate skills to perform the tasks of the job. Minimum qualifications for non-technical personnel require High School diploma (couriers also shall posses clean driving record), technical personnel must also demonstrate basic laboratory experience, such as balance and syringe use, aseptic practices, etc. College-level science coursework is favored.

Newly hired employees receive orientation training beginning the first day of employment by the Company. Orientation training consists of initial health and safety training and a detailed review of the personal protection policies, technical ethics training and data integrity procedures and quality assurance program training (including Company's goals, objectives, mission, and vision).

All technical staff receives training to develop and demonstrate proficiency for the methods they perform. New analysts work under supervision until the supervisory staff is satisfied that a thorough understanding of the method is apparent. Organics/Inorganics analysts are required to demonstrate method proficiency through a precision and accuracy study. Data from the study is compared to method acceptance limits. If the data is unacceptable, additional training is required. The analyst must also demonstrate the ability to produce acceptable data through the analysis of an independently prepared proficiency sample.

Proficiency is demonstrated annually. Data from initial and continuing proficiency demonstration is archived in the individual's training folder. In the instance where analyte can not be spiked in the clean matrix, such as TSS or pH, the results of an external Performance Evaluation (PE) sample may be used to document analyst's proficiency.

Minimum training required for administrative staff consists of laboratory safety and ethical conduct.

4.3 ***Training Documentation***. The QA Officer prepares a training file for every new employee. All information related to qualifications, experience, external training courses, and education are placed into the file. Verification documentation for

orientation, health & safety, quality assurance, and ethics training is also included in the file.

Additional training documentation is added to the file as it occurs. This includes data for initial and continuing demonstrations of proficiency, performance evaluation study data and notes and attendance lists from group training sessions.

The Quality Assurance Department maintains the employee training database. This database is a comprehensive inventory of training documentation for each individual employee. The database enables supervisors to obtain current status information on training data for individual employees on a job specific basis. It also enables the management staff to identify training documentation in need of completion.

Employee specific database records are created by human resources on the date of hire. Data base fields for job specific requirements such as SOP documentation of understanding and annual demonstration of analytical capability are automatically generated when the supervisor assigns a job responsibility. Employees acknowledge that their SOP responsibilities have been satisfied using a secure electronic process, which updates the database record. Reports are produced which summarize the qualifications of individual employees or departments.

5.0 SIGNATORY APPROVALS

Requirement: Procedures are required for establishing the traceability of data and documents. The procedure consists of a signature hierarchy, indicating levels of authorization for signature approvals of data and information within the organization. Signature authority is granted for approval of specific actions based on positional hierarchy within the organization and knowledge of the operation that requires signature approval. A log of signatures and initials of all employees is maintained for cross-referencing purposes.

5.1 *Signature Hierarchy*.

President/Chief Executive Officer. Authorization for contracts and binding agreements with outside parties. Approval of final reports, quality assurance policy, SOPs, project specific QAPs, data review and approval in lieu of technical managers. Contract signature authority resides with Company Officers only, which include the President/CEO, CFO and VP Administration.

Vice President, Operations/Laboratory Director. Approval of final reports and quality assurance policy in the absence of the President. Approval of SOPs, project specific QAPs, data review and approval in lieu of technical managers. Technical policy.

Technical Director (on location): Approval of final reports and quality assurance policy in the absence of the Laboratory Director. Approval of SOPs, project specific QAPs, data review and approval in lieu of technical managers. Technical policy review. In the event of prolonged absence Technical Director also designated a Deputy QAO, unless otherwise specified by internal memo from Laboratory Director.

Director, Quality Assurance. Approval of final reports and quality assurance policy in the absence of the President. Approval of SOPs, project specific QAPs, data review and approval in lieu of technical managers.

Quality Assurance Officer (on location). Approval of final reports and quality assurance policy in the absence of the Laboratory Director. Approval of SOPs, project specific QAPs, data review and approval in lieu of technical managers. In the event of prolonged absence refer to list or appointed deputies – see sec. 2.2.

Director, Management Information Systems (MIS). Department specific supplies purchase. MIS policy.

Manager, Sample Management. Initiation of laboratory sample custody and acceptance of all samples. Approval of department policies and procedures. Department specific supplies purchase. Waste manifesting and disposal.

Manager Client Services. QAP and sampling and analysis plan approval. Project specific contracts, pricing, and price modification agreements. Approval and acceptance of incoming work, Client services policy.

Supervisors, Technical Departments. Methodology and department specific QAPs. Data review and approval, department specific supplies purchase. Technical approval of SOPs.

Supervisors, Technical Departments. Data review approval, purchasing of expendable supplies.

5.2 ***Signature Requirements***. All laboratory activities related to sample custody and generation or release of data must be approved using either initials or signatures. The individual, who applies his signature or initial to an activity or document, is authorized to do so within the limits assigned to them by their supervisor. All signatures and initials must be applied in a readable format that can be cross-referenced to the signatures and initials log if necessary.

5.3 ***Signature and Initials Log***. *The QA Officer maintains a signature and initials log. New Employee signatures and initials are appended to the log on the first day of employment. Signature of individuals no longer employed by the company are retained***.**

6.0 DOCUMENTATION and DOCUMENT CONTROL

Requirement: Document control policies have been established which specify that any document used as an information source or for recording analytical or quality control information must be managed using defined document control procedures. Accordingly, policies and procedures required for the control, protection, and storage of any information related to the production of analytical data and the operation of the quality system to assure its integrity and traceability have been established and implemented in the laboratory. The system contains sufficient controls for managing, archiving and reconstructing all process steps, which contributed to the generation of an analytical test result. Using this system, an audit trail for reported data can be produced, establishing complete traceability for the result.

6.1 Administrative Records. The Quality Assurance Officer manages Administrative (non-analytical) records. These records consist of electronic documents that are retained in a limited access electronic directory , which are released to the technical staff upon specific request.

Form Generation & Control. The Quality Assurance Officer approves all forms used as either stand-alone documents or in logbooks to ensure their traceability. Forms are generated as computer files only and maintained in a limited access master directory. Access to the electronic forms and applications is granted to QA Officer, Laboratory Manager and Technical Director(s) (local and regional). Approved forms must display the date of current revision and initials of person who revised the form. Modifications to existing forms are approved by QA, obsolete forms moved to archive directory and retained for minimum of five years.

New forms must include Accutest SE identification and appropriate spaces for signatures of approvals and dates. Further design specifications are the responsibility of the originating department.

Technical staff is required to complete all forms to the maximum extent possible. If information for a specific item is unavailable, the analyst is required to cross out the information block. The staff is also required to cross out the uncompleted portions of a logbook or logbook form if the day's analysis does not fill the entire page of the form.

Logbook Control. All laboratory logbooks are controlled documents that are comprised of approved forms used to document specific processes. Logbook control is maintained by QA staff.

New logs are numbered and issued to a specific individual who is assigned responsibility for the log. Supervisor performs periodical review of the logbooks. Old logs are returned to QA for entry into the document archive system where they are retained for minimum of five (5) years. Laboratory staff may hold a maximum of two consecutively dated logbooks of the same type in the laboratory, not including the most recently issued book to simplify review of recently completed analysis.

Controlled Documents. Key laboratory documents are designated for controlled document status to assure that identities of individuals receiving copies and the number of copies that have been distributed are known. Controlled status simplifies document updates and **retrieval** of outdated documents. Control is maintained through a document numbering procedure and document control logbook designating the individual receiving the controlled document. Document control is also maintained by pre-designating the numbers of official copies of documents that are placed into circulation within the laboratory.

Quality Systems Manual (QSM). All QSMs are assigned a number prior to distribution. The QSMs are distributed as controlled documents i.e. ones that will be collected back and replaced with next version (documents distributed to the Accutest Inc. staff). QSMs distributed to outside entities are considered tracked documents – since there is no possibility of collecting them back and ensuring that current revision is in use. These situation include bid submissions, client requests, etc. These copies are watermarked as “Uncontrolled Documents” The control/tracking number, date of distribution, and identity of the individual receiving the document are recorded in the document control spreadsheet. QA staff maintains tracking spreadsheet. The numbering system is continuous.

Standard Operating Procedures (SOPs). SOPs are maintained by pre-designating the numbers of official copies of documents that are placed into circulation within the laboratory. Official documents are printed and placed into the appropriate laboratory section as follows:

Sample Management: One copy for the sample receiving file
Bottle preparation area – One copy for shipping area
Organics Laboratories: One for the affected laboratory area.
Inorganics Laboratories: One for the affected laboratory area.

The original, signed copy of the SOP is maintained in the master SOP binder by the QA staff.

Documents are controlled using an “Official Copy” stamp in red ink. Additional copies could be issued to individuals for training purposes. Distribution is documented on SOP cover page. Superceded copies collection is conducted accordingly to cover page distribution list.

SOPs distributed to clients as part of bid submission, pre-audit evaluation, etc. are watermarked as “Proprietary Information”.

Quick reference cards: These documents are compiled for lab staff convenience and are based on current SOP revision and/or recent regulatory updates. These one- or two-sided documents are footnoted with reference to SOP/regulatory standard, stamped with “Official Copy” stamp in red ink and laminated for durability. *Use of these quick references does not substitute reading and acknowledging the parent SOP.*

6.2 ***Technical Records***. All records related to the analysis of samples and the production of an analytical result are archived in secure document storage or on electronic media and contain sufficient detail to produce an audit trail, which re-creates the analytical result. These records include information related to the original client request, bottle order, sample login and custody, storage, sample preparation, analysis, data review and data reporting.

Records that can not be maintained on electronic media are considered irretrievable records, segregated into separate secured storage and access controlled with access log maintained by QA Staff. Examples of such records are employee training files, obsolete SOPs and acknowledgement form originals, training files, logbooks, etc.

Each department involved in this process maintains controlled documents, which enable them to maintain records of critical information relevant to their department's process.

6.3 ***Quality Assurance Directory.*** All Quality Assurance documentation and quality control limit data is stored in a restricted QA directory on the network server. The directory has been designated as read only. The QA staff, technical director and the laboratory manager have write capability in this directory. Information on this directory is backed-up daily.

This directory contains all current and archived Quality System Manuals, SOPs, control limits, MDL studies, precision and accuracy data, internal and external audit reports, official forms, Health and Safety materials, PT scores, State Certifications and metrics calibration information.

6.4 ***Analytical Records***. All data related to the analysis of field samples are retained as either paper or electronic records that can be retrieved to compile a traceable audit trail for any reported result. All information is linked to the client job and sample number, which serves as a reference for all sample related information tracking.

Critical times in the life of the sample from collection through analysis to disposal are documented. This includes date and time of collection, receipt by the laboratory, preparation times and dates, analysis times and dates and data reporting information. Analysis times are calculated in hours for methods where holding time is specified in hours (≤72 hours).

Sample preparation information is recorded in a separate controlled logbook. It includes sample identification numbers, types of analysis, preparation and cleanup methods, sample weights and volumes, reagent lot numbers and volumes and any other information pertinent to the preparation procedure.

Information related to the identification of the instrument used for analysis is permanently attached to the electronic record. The record includes an electronic data file that indicates all instrument conditions employed for the analysis, including the type of analysis conducted. The analyst's identification is electronically attached to the record. The instrument tuning and calibration data is electronically linked to the sample

or linked though paper logs, which were used in the documentation of the analysis. Quality control and performance criteria are permanently linked to the paper archive or electronic file.

Paper records for the identity, receipt, preparation and evaluation of all standards and reagents used in the analysis are documented in prepared records and maintained in controlled documents or files. Lot number information linking these materials to the analysis performed is recorded in the logbooks associated with the samples in which they were used.

Manual calculations or peak integrations that were performed during the data review are retained as paper or electronically generated PDF documents and included as part of the electronic archive. Signatures for data review are retained on paper or as electronic stamps on PDF versions of the paper record for the permanent electronic file.

6.5 ***Confidential Business Information (CBI).*** Operational documents including SOPs, Quality Manuals, personnel information, internal operations statistics, and laboratory audit reports are considered confidential business information. Strict controls are placed on the release of this information to outside parties.

Release of CBI to outside parties or organizations may be authorized upon execution of a confidentiality agreement between Accutest and the receiving organization or individual. CBI information release is authorized for third party auditors and commercial clients in electronic mode as Adobe Acrobat .PDF format only.

6.6 ***Software Change Documentation & Control.*** Changes to software are documented as text within the code of the program undergoing change. Documentation includes a description of the change, reason for change and the date the change was placed into effect. Documentation indicating the adequacy of the change is prepared following the evaluation by the user who requested the change.

6.7 ***Report and Data Archiving***. Accutest Laboratories maintains electronic image file copies of original reports in archive for a minimum period of five (5) years. After five years, the files are automatically discarded unless contractual arrangements exist which dictate different requirements. Client specific data retention practices are employed for government organizations such as the Department of Defense Agencies and MA DEP that require a retention period of ten (10) years, as well as commercial clients upon contractual requirements agreement.

Complete date and time stamped client repots are generated from LIMS using the source documents archived on Document server. These source documents are maintained on document server and backed up to primary and clone tapes. Accutest archives the original report (organized by job number) and the organic and inorganic support data. Organic support data is archived according to instrument batch numbers. All organics data is backed up to the tape or archive drive via Networker Backup software and/or AccuBack backup software. Data from the archive drive is then written to tape at periodic intervals.

Wet chemistry support data is archived by Analytical Batch (GN). Metals support data is archived by instrument batch (MA…). Metals digestion data is archived as digestion logbooks.

The reports generation group electronically scans completed reports and stores them by job number on the document server. The document server is backed up daily to a digital tape. Copies of these files remain active on the document server for easy review access. The digital tapes remain in secure storage for the remainder of the archive period.

6.8 ***Training***. The company maintains a training record for all employees that documents that they have received instruction on administrative and technical tasks that are required for the job they perform. Training records for individuals employed by the company are retained for a period of five years following their termination of employment.

Training File Origination. The Quality Assurance Officer (QAO) initiates training files. Quality Assurance officer retains the responsibility for the maintenance and tracking of all training related documentation in the file. The file is begun on the first day of employment. Information required for the file includes a copy of the individual's most current resume, detailing work experience and a copy of any college diplomas or transcript(s). Information added on the first day includes documentation of health and safety training and a signed Ethics and Data Integrity agreement. These two constitute minimal necessary training for Project Management and Administrative staff. Training documentation, training requirements, analyst proficiency information and other training related support documentation is tracked using a customized database application. Database extracts provide an itemized listing of specific training requirements by job function. Training status summaries for individual analysts portray dates of completion for job specific training requirements.

Technical Training. The supervisor of each new employee is responsible for developing a training plan for each new employee. The supervisor updates the outline, adding signatures and dates as training elements are completed at regular frequency. Supporting documentation, such as precision and accuracy studies, which demonstrate analyst capability for a specific test, are added as completed. When analyte can not be spiked, such as pH or TSS, external PE sample is purchased and analyzed. Where no external PE sample is available, sample duplicates must be successfully analyzed. Method review records are retained where analysis of duplicates is not possible. Employees and supervisors verify documentation of understanding (DOU) for all assigned standard operating procedures in the training database. Certificates or diplomas for any off-site training are added to the file.

7.0 REFERENCE STANDARD TRACEABILITY

Requirement: Documented procedures, which establish traceability between any measured value and a national reference standard, must be in place in the laboratory. All metric measurements must be traceable to NIST reference weights or thermometers that are calibrated on a regular schedule. All chemicals used for calibration of a quantitative process must be traceable to an NIST reference that is documented by the vendor using a certificate of traceability. The laboratory maintains a documentation system that establishes the traceability links. The procedures for verifying and documenting traceability must be documented in standard operating procedures.

7.1 ***Traceability of Metric Measurements - Thermometers***. Accutest uses NIST-traceable thermometers to calibrate commercially purchased working laboratory thermometers prior to their use in the laboratory and annually thereafter for liquid in glass thermometers or quarterly for electronic temperature measuring devices. If necessary, these working thermometers are assigned correction factors that are determined during their calibration using an NIST-traceable thermometer as the standard. The correction factor is documented in a thermometer log and on a tag attached to the working thermometer. The correction factor is applied to temperature measurements before recording the measurement in the temperature log. The NIST-traceable reference thermometer is checked for accuracy by an outside vendor minimum every five (5) years following the specifications for NIST-traceable thermometer calibration verification detailed in the United States Environmental Protection Agency's "Manual for the Certification of Laboratories Analyzing Drinking Water", Fifth Edition, January 2005. Currently the NIST thermometer is verified by outside vendor on triennial basis due to contract-specific requirements. Calibration log and Certificate(s) of calibration are maintained on file with QAO.

7.2 ***Traceability of Metric Measurements – Calibration Weights***. Accutest uses calibrated weights, which are traceable to NIST standard weights to calibrate all balances used in the laboratory. Balances must be calibrated to specific tolerances within the intended use range of the balance. Calibration checks are required on each day of use. If the tolerance criteria are not achieved, corrective action specified in the balance calibration SOP must be applied before the balance can be used for laboratory measurements. All weights are recalibrated by outside vendor every five years following the specifications for weight calibration verification detailed in the United States Environmental Protection Agency's "Manual for the Certification of Laboratories Analyzing Drinking Water", Fifth Edition, January 2005. Certificate(s) of calibration are maintained on file with QAO. Balances are inspected and maintained by professional service technicians annually. Certificate(s) of inspection are maintained with QAO.

7.3 ***Traceability of Chemical Standards and Reagents***. All chemicals and reagents, with the exception of bulk dry Na2SO4 and solvents purchased as reference standards for use in method calibration must establish traceability to NIST referenced material through a traceability certificate. Process links are established that enable a

calibration standard solution to be traced to its NIST reference certificate. Solvents, acids and other supplies are being tested to verify their suitability for the analytical process.

7.4 ***Assignment Of Reagent and Standard Expiration Dates.*** Expiration date information for all purchased standards and reagents is provided to Accutest with all prepared standard solutions and unstable reagents as a condition of purchase. Neat materials and inorganic reagents are not required to be purchased with expiration dates. Certified prepared solutions are labeled with the expiration date provided by the manufacturer. In-house prepared solutions are assigned expiration dates that are consistent with the method that employs their use unless documented experience indicates that an alternate date can be applied. If alternate expiration dates are employed, their use is documented in the method SOP. Expiration dates for prepared inorganic reagents, which have not exhibited instability, are established at two years form the date of preparation for tracking purposes. All containers shall be labeled with the date of preparation and expiration date clearly indicated.

The earliest expiration date is always the limiting date for assigning expiration dates to prepared solutions. Expiration dates that are later than the expiration date of any derivative solution or material are prohibited.

7.5 ***Documentation of Traceability***. Traceability information is documented in individual logbooks designated for the measurement process in use. The QA Officer maintains calibration documentation for metric references in pertinent folders and logbooks.

Balance calibration verification is documented in logbooks that are assigned to each balance. The individual conducting the calibration is required to initial and date all calibration activities. Any defects that occur during calibration are also documented along with the corrective action applied and a demonstration of return to control. Annual service reports and certificates retained on file with QA staff.

Temperature control is documented in logbooks assigned to the equipment being monitored. A calibrated thermometer is assigned to each individual item. Measurements are recorded along with date and initials of the individual conducting the measurement on a daily or as used basis. Corrective action, if required, is also documented including the demonstration of return to control.

Initial traceability of chemical standards and reagents is documented via a vendor-supplied certificate (see also 7.3) that includes lot number and expiration date information. Solutions prepared using the vendor supplied chemical standard are documented in logbooks assigned to specific analytical processes. Alternatively, documentation may be entered into the electronic standards and reagent tracking log The documentation includes links to the vendors lot number, an internal lot number, dates of preparation, and the preparer's initials. Standards received without certificate of analysis can not be used for calibration or calibration verification and are rejected.

Supervisors conduct regular reviews of logbooks, which are verified using a word "rev'd", signature and date. QA Staff monitors the process and documents it in the same manner.

8.0 TEST PROCEDURES, METHOD REFERENCES, AND REGULATORY PROGRAMS

Requirements: The laboratory must use client specified or regulatory agency approved methods for the analysis of environmental samples. The laboratory maintains a list of active methods, which specifies the type of analysis performed, and cross-references the methods to applicable environmental regulation. Routine procedures used by the laboratory for the execution of a method must be documented in a standard operating procedure. Method performance and sensitivity must be demonstrated annually where required. Defined procedures for the use of method sensitivity for data reporting purposes must be established by the Director of Quality Assurance and used consistently for all data reporting purposes.

8.1 ***Method Selection.*** Accutest employs methods for environmental sample analysis that are consistent with the client's application, which are appropriate and applicable to the project objectives. Accutest informs the client if the method proposed is inappropriate or outdated and suggests alternative approaches.

Accutest employs documented, validated regulatory methods in the absence of a client specification and informs the client of the method selected. These methods are available to the client and other parties as determined by the client. Documented and validated in-house methods may be applied if they are appropriate to the project. The client is informed of the method selection.

8.2 ***Method Validation***. Standard methods from regulatory sources are primarily used for all analysis. Standard methods do not require validation by the laboratory. Non-standard, in-house methods are validated prior to use. Validation is also performed for standard methods applied outside their intended scope of use. Validation is dependent upon the method application and may include analysis of quality control samples to develop precision and accuracy information for the intended use. A final method validation report is generated, which includes all data in the validation study. A statement of adequacy and/or equivalency is included in the report. A copy of the report is archived in the quality assurance directory of the company server.

Non-standard methods are validated prior to use. This includes the validation of modified standard methods to demonstrate comparability with existing methods. Demonstrations and validations are performed and documented prior to incorporating technological enhancements and non-standard methods into existing laboratory methods used for general applications. The demonstration includes method specific requirements for assuring that significant performance differences do not occur when the enhancement is incorporated into the method. Validation is dependent upon method application and may include the analysis of quality control samples to develop precision and accuracy information for intended use.

The study procedures and specifications for demonstrating validation include comparable method sensitivity, calibration response, method precision, method accuracy and field sample consistency for several classes of analytical methods are

detailed in this document. These procedures and specifications may vary depending upon the method and the modification.

8.3 ***Standard Operating Procedures***. Standard operating procedures (SOP) are prepared for routine methods executed by the laboratory and processes related to sample or data handling. The procedures describe the process steps in sufficient detail to enable an individual, who is unfamiliar with the procedure to execute it successfully. SOPs are reviewed annually and edited if necessary. SOPs can be edited on a more frequent basis if systematic errors dictate a need for process change or the originating regulatory agency promulgates a new version of the method. Procedural modifications are indicated using a revision number. SOPs are available for client review at the Accutest facility upon request.

8.4 ***Method Detection Limit Determination***. Annual method detection limit (MDL) studies are performed as appropriate for routine methods used in the laboratory. MDL studies are also performed when there is a change to the method that affects how the method is performed or when an instrumentation change that impacts sensitivity occurs. The procedure used for determining MDLs is described in 40 CFR, Part 136, Appendix B. Studies are performed for each method on water, soil and air matrices for every instrument that is used to perform the method. MDLs are established at the instrument level. The highest MDL of the pooled instrument data is used to establish a laboratory MDL. MDLs are experimentally verified through the analysis of spiked quality control samples at 2-4 times the concentration of the experimental MDL. The verification is performed on every instrument used to perform the analysis. The quality assurance staff manages the annual MDL determination process and is responsible for retaining MDL data on file. Approved MDLs are appended to the LIMS and used for data reporting purposes.

8.5 ***Method Reporting Limit.*** The method reporting limit is established at the lowest concentration calibration standard in the calibration curve. The low calibration standard is selected by department managers as the lowest concentration standard that can be used while continuing to meet the calibration linearity criteria of the method being used. The validity of the Method Reporting Limits is confirmed via analysis of a spiked quality control sample at the Method reporting limit concentration.

By definition, detected analytes at concentrations below the low calibration standard cannot be accurately quantitated and must be qualified accordingly.

8.6 ***Reporting of Quantitative Data.*** Analytical data for all methods is reported without qualification to the reporting limit established for each method. Data may be reported to MDL depending upon the client's requirements provided that all qualitative identification criteria for the parameter have been satisfied. All parameters reported at concentrations between the reporting limit and MDL are qualified as an estimated concentration.

Measured concentrations of detected analytes that exceed the upper limit of the calibration range are either diluted into the range and reanalyzed or qualified as an estimated value. The only exception to this applies to ICP and ICP/MS analysis, which

can be reported to the upper limit of the experimentally determined linear range without qualification.

8.7 ***Estimated Uncertainty.*** A statement of the estimated uncertainty of an analytical measurement accompanies the test result when required. Estimated uncertainty is derived from the performance limits established for spiked samples of similar matrices. The degree of uncertainty is derived from the negative or positive bias for spiked samples accompanying a specific parameter. When the uncertainty estimate is applied to a measured value, the possible quantitative range for that specific parameter at that measured concentration is defined. Well recognized regulatory methods that specify values for the major sources of uncertainty and specify the data reporting format do not require a further estimate of uncertainty.

8.8 ***Precision and Accuracy Studies***. Annual precision and accuracy (P&A) studies, which demonstrate the laboratories ability to generate acceptable date, are performed for all routine methods used in the laboratory. The procedure used for generating organic P&A data is referenced in the majority of the regulatory methodology in use. The procedure requires quadruplicate analysis of a sample spiked with target analytes at a concentration in the working range of the method. This data may be compiled from a series of existing blank spikes or laboratory control samples. Accuracy (percent recovery) of the replicate analysis is averaged and compared to established method performance limits. Values within method limits indicate an acceptable performance demonstration. (See also Sec 4, Training, Demonstration of capability)

8.9 ***Method Sources, References and Update Mechanism.*** The Quality Assurance Staff maintains a list of active methods used for the analysis of samples. This list includes valid method references such as EPA, American Society of Testing and Materials (ASTM) or Standard Methods designations and the current version and version date.

Updated versions of approved reference methodology are placed into use as changes occur. The Quality Assurance Director informs operations management of changes in method versions as they occur. The operations management staff selects an implementation date. The operations staff is responsible for completing all method requirements prior to the implementation date. This includes modification to SOPs, completion of MDL and precision and accuracy studies and staff training. Documentation of these activities is provided to the QA staff who retains this information on file. The updated method is placed into service on the implementation date and the old version is de-activated.

Multiple versions of selected methods may remain in use to satisfy client specific needs. In these situations, the default method version becomes the most recent version. Client specific needs are communicated to the laboratory staff using method specific analytical codes method, which clearly depict the version to be used. The old method version is maintained as an active method until the specified client no longer requires the use of the older version.

Accutest will not use methodology that represents significant departures from the reference method unless specifically directed by the client. In cases where clients

direct the laboratory to use a method modification that represents a significant departure from the reference method, the request will be documented in the project file. The LQSM lists active methods used for the analysis of samples in Table 8.1. This list includes valid method references from sources such as USEPA, ASTM or Standard Methods designations and the current version and version date.

8.10 ***Analytical Capabilities***. Appendix II provides a detailed listing of the methodology employed for the analysis of test samples.

9.0 SAMPLE MANAGEMENT, LOGIN, CUSTODY, STORAGE AND DISPOSAL

Requirement: A system to ensure that client supplied product is adequately evaluated, acknowledged, and secured upon delivery to the laboratory must be practiced by the laboratory. The system must assure that chain of custody is maintained and that sample receipt conditions and preservation status are documented and communicated to the client and internal staff. The login procedure must assign, document, and map the specifications for the analysis of each unique sample to assure that the requested analysis is performed on the correct sample and enables the sample to be tracked throughout the laboratory analytical cycle. The system must include procedures for reconciling defects in sample condition or client provided data, which occur at sample arrival. The system must specify the procedures for proper sample storage, transfer to the laboratory, and disposal after analysis. The system must be documented in a standard operating procedure.

9.1 ***Order Receipt and Entry***. New orders are initiated and processed by the client services group (See Chapter 14, Procedures for Executing Client Specifications). The new order procedure includes mechanisms for providing sampling containers to clients. These containers must meet the size, cleanliness, and preservation specifications for the analysis to be performed.

For new orders, the project manager prepares a bottle request form, which is submitted to sample management. This form provides critical project details to the sample management staff, which are used to prepare and assemble the sample bottles for shipment to the client prior to sampling.

The bottle order is assembled using bottles that meet USEPA specifications for contaminant free sample containers. Accutest-SE uses a combination of pre-cleaned bottles, which are purchased from commercial suppliers and bottles that are checked for cleanliness. Precleaned bottle certificates are reviewed by both the analyst and sample management technician. Results of bottle analyses are retained for 5 years.

All preservative solutions are prepared in the laboratory and are checked to assure that they are free of contamination from analytes of interest before being released for use. Sample management department retains a copy of the documentation of in-house contamination checks.

Reagent water for trip and field blanks is poured into appropriately labeled containers. Sample bottleware is labeled with durable labels printed on waterproof printing medium with indelible laser or heat transfer printer ink. All bottles are packed into ice chests with blank chain of custody forms and the original bottle order from. Completed bottle orders are delivered to clients using Accutest couriers or commercial carriers for use in field sample collection.

9.2 ***Sample Receipt and Custody***. Samples are delivered to the laboratory using a variety of mechanisms including Accutest couriers, commercial shippers, and client self-delivery. Documented procedures are followed for arriving samples to assure that

custody and integrity are maintained and that handling and preservation requirements are documented and continued.

Sample custody documentation is initiated when the individual collecting the sample collects field samples. Custody documentation includes all information necessary to provide an unambiguous record of sample collection, sample identification, and sample collection chronology. Initial custody documentation employs either Accutest or client generated custody forms.

Accutest generates a Sample Receipt Confirmation form in situations where the individuals who collected the sample did not generate custody documentation in the field. Accutest SE Project Manager then contacts the client for the CoC information to be faxed or e-mailed from the client to the lab.

Accutest defines sample custody as follows:

T The sample is in the actual custody or possession of the assigned responsible person,

T The sample is in a secure area.

The Accutest facility is defined as a secure facility. Perimeter security has been established, which limits access to authorized individuals only. Visitors enter the facility through the building lobby and must register with the receptionist prior to entering controlled areas. While in the facility, visitors must be accompanied by their hosts at all times. After hours, building access is controlled using a computerized pass-key reader system. This system limits building access to individuals with a pre-assigned authorization status. After hours visitors are not authorized to be in the building. Clients delivering samples after hours must make advanced arrangements through client services and sample management to assure that staff is available to take delivery and maintain custody.

Upon arrival at Accutest, the sample custodian reviews the chain of custody Or Sample Receipt Confirmation form for the samples received to verify that the information on the form corresponds with the samples delivered. This includes verification that all listed samples are present and properly labeled, checks to verify that samples were transported and received at the required temperature, verification that the sample was received in proper containers, verification that sufficient volume is available to conduct the requested analysis, and a check of individual sample containers to verify test specific preservation requirements including the absence of headspace for volatile compound analysis.

9.3 Sample conditions and other observations are documented on the chain of custody by the sample custodian prior to completing acceptance of custody. The sample custodian accepts sample custody upon verification that the custody document is correct. Discrepancies or non-compliant situations are documented, flagged and communicated to the Accutest project manager, who contacts the client for resolution.

The resolution is documented and communicated to sample management for execution.

9.4 ***Laboratory preservation of Improperly preserved field samples.*** Accutest extends every effort to preserve samples, which were received without proper field preservation.

Field/Equipment negative controls also receive the same amount of preservation as incorrectly preserved samples, and record made in the preservation logbook.

9.5 ***Sample Tracking Via Status Change.*** An automated, electronic LIMS procedure records sample exchange transactions between departments and changes in analytical status. This system tracks all preparation, analytical, and data reporting procedures to which a sample is subjected while in the possession of the laboratory. Each individual receiving samples must acknowledge the change in custody and operational status in the LIMS. This step is required to maintain an accurate electronic record of sample status, dates of analytical activity, and custody throughout the laboratory.

Sample tracking is initiated at login where all chronological information related to sample collection dates and holding times are entered into the LIMS. This information is entered on an individual sample basis

9.6 ***Sample Acceptance Policy***. Incoming samples must satisfy Accutest's sample acceptance criteria before being logged into the system. Sample acceptance is based on the premise that clients have exercised proper protocols for sample collection. This includes sufficient volume, proper chemical preservation, temperature preservation, sample container sealing and labeling, and appropriate shipping container packing.

The sample management staff will make every attempt to preserve improperly preserved samples upon arrival. However, if preservation is not possible, the samples may be refused unless the client authorizes analysis. No samples will be accepted if holding times have been exceeded or will be exceeded before analysis can take place unless the client authorizes analysis.

Sample acceptance criteria include proper custody and sample labeling documentation. Proper custody documentation includes an entry for all physical samples delivered to the laboratory with an identification code that matches the sample bottle and a date and signature of the individual who collected the sample and delivered them to the laboratory. Labeling is done using durable waterproof labels printed with indelible heat-transfer ink.

Accutest reserves the right to refuse any sample which in its sole and absolute discretion and judgement is hazardous, toxic and poses or may pose a health, safety or environmental risk during handling or processing. The company will not accept samples for analysis using methodology that is not performed by the laboratory or for methods that lab does not hold valid accreditation unless arrangements have been made to have the analysis conducted by a qualified subcontractor.

9.7 ***Assignment of Unique Sample Identification Codes***. Unique identification codes must be assigned to each sample bottle to assure traceability and unambiguously identify the tests to be performed in the laboratory.

The sample identification coding process begins with the assignment of a unique alphanumeric job number. A job is defined as a group of samples received on the same day, from a specific client pertaining to a specific project. A job may consist of groups of samples received over multi-day period. The first character of the job number is an alpha-character that identifies the laboratory facility. The next characters are numeric and sequence by one number with each new job.

Unique sample numbers are assigned to each bottle collected as a discrete entity from a designated sample point. This number begins with the job number and incorporates a second series of numbers beginning at one and continuing chronologically for each point of collection. The test to be performed is clearly identified on the bottle label.

Alpha suffixes may be added to the sample number to identify special designations such as subcontracted tests, in-house QC checks, or re-logs. Multiple sample bottles for a specific analysis are labeled Bottle 1, Bottle 2, etc.

9.8 ***Subcontracted Analysis***. Subcontract laboratories are employed to perform analysis not performed by Accutest. The quality assurance staff evaluates subcontract laboratories to assure their quality processes meet the standards of the environmental laboratory industry prior to engagement. Throughout the subcontract process, Accutest follows established procedures to assure that sample custody is maintained and the data produced by the subcontractor meets established quality criteria.

Accutest network laboratories are considered primary subcontractors.

*Subcontracting Procedure***.** Subcontracting procedures are initiated through several mechanisms, which originate with sample management. Samples for analysis by a subcontractor are logged into the Accutest system using regular login procedures. If subcontract parameters are part of the project or sample management has received subcontracting instructions for a specific project, a copy of the chain of custody is given to the appropriate project manager with the subcontracted parameters highlighted. This procedure triggers the subcontract process at the project management level. The Sample Management supervisor contacts an approved subcontractor to place the subcontract order.. Subcontract chain of custody is processed in Sample Management Department and copy is filed with the original CoC. Sample management signs the subcontract chain of custody and ships the sample(s) to the subcontractor. The subcontract COC is filed with the original COC and the request for subcontract. Copies are distributed to the login department, the project manager, and sample management.

Client is verbally notified by Project Manager of the requirement to subcontract to the outside laboratory as soon as need Is identified by the Accutest staff. Client notification

must be verified in writing, i.e. by e-mail. Client notification may take place during the initial project set-up, or at the time of sample receipt and login.

Subcontractor data packages are reviewed by the QA Staff to assess completeness and quality compliance. If completeness defects are detected, the subcontractor is asked to immediately upgrade the data package. If data quality defects are detected, the package is forwarded to the QA staff for further review. The QA staff will pursue a corrective action solution before releasing data to the client.

Approved subcontract data is entered into the laboratory information management system (LIMS) if possible and incorporated into the final report. All subcontract data is footnoted to provide the client with a clear indication of its source. Copies of original subcontract data are always included in the data report whether in hardcopy or PDF file, depending on the data submission requirements.

*Subcontract Laboratory Evaluation***.** The QA staff evaluates subcontract laboratories prior to engagement. As a minimum, the subcontract laboratory must provide Accutest with proof of a valid certification to perform the requested analysis for the venue where they were collected, QC criteria summary (LOD/LOQ, LCS, MS/MSD, %RPD, etc.), copy of the most recent regulatory agency audit report, and a copy of the laboratory's Summary of Qualifications (SOQ). Other beneficial materials are QSM, copies of SOPs used for the subcontracted analysis, a copy of the most recent performance evaluation study for the subcontracted parameter, and copies of the most recent third party accreditor's audit report.

Certification verification must be submitted to Accutest annually. If possible, the QA staff may conduct a site visit to the laboratory to inspect the quality system. Accutest Laboratories Southeast assumes the responsibility for the performance of all subcontractors who have successfully demonstrated their qualifications. When selecting a subcontractor for analysis not performed by Accutest, assure qualifications of the subcontractor through local QA officer.

Qualification process of a subcontract laboratory may be bypassed if the primary client directs Accutest to employ a specific subcontractor

Subcontract Laboratory Database. Accutest Laboratories Inc. maintains centralized database of preferred contractors in order to optimize sample handling and data submission process, as well as obtain competitive priced services of uniform quality throughout the network. Individual Accutest laboratories are assigned "Center of Expertise" status according to unique capabilities.

9.9 ***Sample Storage***. Following sample custody transfer, samples are assigned to various refrigerated storage areas by the sample management staff depending upon the test to be performed and the matrix of the samples. The location (refrigerator and shelf) of each sample is entered into sample location database on the line corresponding to each sample number. Samples remain in storage until the laboratory technician retrieves them into the laboratory for analysis.

Samples for volatile organics analysis are placed in storage in designated refrigerators by the sample management staff and immediately transferred to the organics group control. Sample custody is transferred to the VOC department staff. These samples are segregated according to matrix to limit opportunities for cross contamination to occur.

Organics staff is authorized to retrieve samples from these storage areas for analysis. When analysis is complete, the samples are placed back into storage.

9.10 ***Sample Login***. Following sample custody transfer to the laboratory, the documentation that describes the clients analytical requirements are delivered to the sample login group for coding and entry to the Laboratory Information management System (LIMS). This process translates all information related to collection time, turnaround time, sample analysis, and deliverables into a code which enables client requirements to be electronically distributed to the various departments within the laboratory for scheduling and execution.

The technical staff is alerted to client or project specific requirements through the use of a unique project code that is electronically attached to the job during login. The unique project code directs the technical staff to controlled specifications documents detailing the unique requirements.

9.11 ***Sample Retrieval for Analysis***. It is a responsibility of individual analyst to retrieve samples for analysis. Sample Management employs a program to facilitate sample placement and retrieval. Sample is traced around the laboratory using Status feature of LIMS.

After sample analysis has been completed, the analyst places the sample back into the storage and updates sample status.

9.11 ***Sample Disposal***. Accutest retains all samples under proper storage for a minimum of 30 days following completion of the analysis report. Longer storage periods are accommodated on a client specific basis if required. Samples may also be returned to the client for disposal.

Accutest disposes of all laboratory wastes following the requirements of the Resource Conservation and Recovery Act (RCRA). The Company has obtained and maintains a waste generator identification number, FLR00001263309002 (FLR designates State of Florida).

Sample management generates a sample disposal dump sheet from the LIMS tracking system each week, which lists all samples whose holding period has expired. Data from each sample is compared to the hazardous waste criteria established by the Florida Department of Environmental Protection (FDEP).

Samples containing constituents at concentrations above the criteria are labeled as hazardous and segregated into the following waste categories for disposal as follows:

Chlorinated Waste (Closed Top Steel Drum)- Methylene Chloride

Non-Chlorinated Waste (Closed Top Steel Drum)- Hexane, Methanol, and mixed solvents

Sodium Sulfate/Used Charcoal (Open Top Steel Drum)- Charcoal and paper filters used in the filtering of samples.

Non Hazardous Aqueous Vials (Open Top Polypropylene Drum)- Primarily Acid Vials.

Hazardous Flammable Vials (Open Top Polypropylene Drum)- Methylene Chloride, Hexane.

Hazardous Aqueous waste (Closed Top Polypropylene Drum)- High Odor Samples, Lachat Waste.

Non Hazardous Soil (Open Top Steel Drum)- Soils.

Hazardous Solid Waste- (Open Top Steel Drum).

Non-Aqueous/Oil Samples- (Closed Top Steel Drum)

Difference between Open and Closed type of drums is whether it is possible to remove entire lid or just threaded stopper. Drums are closed at all times while in storage.

Non-hazardous aqueous samples are neutralized and collected in HDPP 500 Gal holding tank to be removed by waste company.

Non-hazardous solids are drummed and disposed of by waste company. Sample bottles are disposed of as recyclable waste in order to crush the bottles and destroy the labels. VOC vials are crushed on site using PRODEVA glass crusher. Supernatant liquid is siphoned off into the HDPP holding tank and solid residue drummed separately.

Laboratory wastes are collected by waste stream in designated areas throughout the laboratory. Waste streams are consolidated twice a week by the waste custodian and transferred to stream specific drums for disposal through a permitted waste management contractor. Filled, consolidated drums are tested for hazardous characteristics and scheduled for removal from the facility for appropriate disposal based on the laboratory data.

10.0 LABORATORY INSTRUMENTATION AND MEASUREMENT STANDARDS

Requirement: Procedures, which assure that instrumentation is performing to a pre-determined operational standard prior to the analysis of any samples, must be established by the laboratory. In general, these procedures will follow the regulatory agency requirements established in promulgated methodology. The instrumentation selected to perform specified analysis is capable of providing the method-specified uncertainty and sufficient sensitivity of measurement needed. These procedures must be documented and incorporated into the standard operating procedures for the method being executed. ALSE Equipment List attached as Appendix III.

10.1 ***Mass Tuning – Mass Spectrometers***. The mass spectrometer tune and sensitivity must be monitored to assure that the instrument is assigning masses and mass abundances correctly and that the instrument has sufficient sensitivity to detect compounds at low concentrations. This is accomplished by analyzing a specific mass tuning compound at a fixed concentration. If the sensitivity is insufficient to detect the tuning compound, corrective action must be performed prior to the analysis of standards or samples. If the mass assignments or mass abundances do not meet criteria, corrective action must be performed prior to the analysis of standards or samples.

10.2 ***Wavelength Verification – Spectrophotometers***. Spectrophotometer detectors are checked on a regular schedule to verify proper response to the wavelength of light needed for the test in use. If the detector response does not meet specifications, corrective action (detector adjustment or replacement) is performed prior to the analysis of standards or samples.

10.3 ***Inter-element Interference Checks (Metals)***. Inductively Coupled Plasma Emission Spectrophotometers (ICP) are subject to a variety of spectral interferences, which can be minimized or eliminated by applying interfering element correction factors and background correction points. Interfering element correction factors are checked on a specified frequency through the analysis of check samples containing high levels of interfering elements. Analysis of single element interferent solutions is also conducted at a specified frequency.

If the check indicates that the method criteria has not been achieved for any element in the check standard, the analysis is halted and data from the affected samples are not reported. Sample analysis is resumed after corrective action has been performed and the correction factors have been re-calculated.

New interfering element correction factors are calculated and applied whenever the checks indicate that the correction factors are no longer meeting criteria. At a minimum, correction factors are replaced once a year.

10.4 ***Calibration and Calibration Verification***. Many tests require calibration using a series of reference standards to establish the concentration range for performing quantitative analysis. Method specific procedures for calibration are followed prior to any sample analysis.

Calibration is performed using a linear or quadratic regression calculation or calibration factors calculated from the curve. The calibration must meet method specific criteria for linearity or precision. If the criteria are not achieved, corrective action (instrument maintenance or re-calibration) is performed. The instrument must be successfully calibrated before analysis of samples can be conducted.

Initial calibration for metals analysis performed using inductively coupled plasma (ICP) employs the use of two standards and a calibration blank to establish linearity. The calibration blank contains all reagents that are placed into the calibration standard with the exception of the target elements. Valid calibration blanks must not contain any target elements.

Initial calibrations must be initially verified using a single concentration calibration standard from a second source (i.e. separate lot or different provider). The continuing validity of an existing calibration must be regularly verified using a single concentration calibration standard. The response to the standard must meet pre-established criteria that indicate the initial calibration curve remains valid. If the criteria are not achieved corrective action (re-calibration) is performed before any additional samples may be analyzed.

10.5 ***Linear Range Verification and Calibration*** Linear range verification is performed for all ICP instrumentation and select General Chemistry methods. The regulatory program or analytical method specifies the verification frequency. A series of calibration standards are analyzed over a broad concentration range. The data from these analyses are used to determine the valid analytical range for the instrument.

Some methods or analytical programs require a low concentration calibration check to verify that instrument is sufficient to detect target elements at the reporting limit. The analytical method or regulatory program defines the criteria used to evaluate the low concentration calibration check. If the low calibration check fails criteria, corrective action is performed and verified through reanalysis of the low concentration calibration check before continuing with the field sample analysis.

In accordance with NELAC standards minimum number of calibration points in the absence of method-specific requirements is two calibration points and a blank.

10.6 ***Retention Time Verification (GC/HPLC/IC)***. Chromatographic retention time windows are developed for all analysis performed using gas chromatographs with conventional detectors. An initial experimental study is performed, which establishes the width of the retention window for each compound. The retention time range of the window defines the time ranges for elution of specified target analytes on the primary and

confirmation columns. Retention time windows are established upon initial calibration, applying the retention time range from the initial study to each target compound. Retention times are regularly confirmed through the analysis of an authentic standard during calibration verification. If the target analytes do not elute within the defined range during calibration verification, the instrument must be recalibrated and new windows defined. New studies are performed when major changes, such as column replacement are made to the chromatographic system.

11.0 INSTRUMENT MAINTENANCE

***Requirement*.** Procedures must be established for equipment maintenance. The procedure may include a maintenance schedule if required or documentation of daily maintenance related activities. All instrument maintenance activities must be documented in instrument specific logbooks. All equipment out of service (both analytical and auxiliary) must be clearly marked "Out of Order".

11.1 ***Routine, Daily Maintenance***. Routine, daily maintenance is required on an instrument specific basis. It is performed each time the instrument is used. Daily maintenance traditionally includes activities to insure a continuation of good analytical performance. In some cases, they include performance checks that indicate whether non-routine maintenance is required. If the performance check indicates a need for higher level maintenance, the equipment is taken out of service until maintenance is performed. Analysis cannot be continued until the performance checks meet established criteria. Document return to control. Daily maintenance is the responsibility of the individual assigned to the instrument used for the analysis he is performing.

11.2 ***Non-routine Maintenance***. Non-routine maintenance is reserved for catastrophic occurrences such as instrument failure. The need for non-routine maintenance is indicated by failures in general operating systems, that result in an inability to conduct required performance checks or calibration. Equipment in this category are taken out of service and repaired before attempting further analysis. Analysis cannot continue until the instrument meets all performance check criteria and is capable of being calibrated. Section supervisors are responsible for identifying non-routine maintenance episodes and initiating repair activities to bring the equipment on-line. This may include initiating telephone calls to maintenance contractors if necessary. They are also responsible for documenting all details related to the occurrence and the repair.

11.3 ***Scheduled Maintenance***. Modern laboratory instrumentation rarely requires regular preventative maintenance. Where required, the equipment is placed on a schedule, which dictates when maintenance is required. Examples include annual balance calibration by an independent provider and optical alignment of the ICP. Section supervisors are responsible for initiating scheduled maintenance on equipment that requires scheduled preventative attention. Scheduled maintenance is documented using routine documentation practices.

11.4 ***Maintenance Documentation***. Routine and non-routine maintenance activities are documented in logbooks assigned to instruments and equipment used for analytical measurements. The logbooks contain preprinted forms, which specify the maintenance activities required with each use. Accutest Laboratories Southeast has adopted a problem – action – follow-up format to conduct instrument maintenance. The analyst or supervisor who performs or initiates the maintenance activity is required to check the activity upon its completion, verify complete statement of return to normal conditions and initial the form. Non-routine maintenance (i.e. repairs, upgrades, etc.) is documented in a separate service log.

12.0 QUALITY CONTROL PARAMETERS, PROCEDURES, AND CORRECTIVE ACTION

Requirement: All procedures used for test methods must incorporate quality control parameters to monitor elements that are critical to method performance. Each quality parameter includes acceptance criteria that have been established by regulatory agencies for the methods in use. Criteria may also be established through client dictates or through the accumulation and statistical evaluation of internal performance data. Data obtained from these parameters must be evaluated by the analyst, and compared to established method criteria. If the criteria are not achieved, the procedures must specify corrective action and conformation of control before proceeding with sample analysis. QC parameters, procedures, and corrective action must be documented within the standard operating procedures for each method. In the absence of client specific objectives the laboratory must define qualitative objectives for completeness and representativeness of data.

12.1 ***Procedure***. Bench analysts are responsible for methodological quality control and sample specific quality control. Each method specifies the control parameters to be employed for the method in use and the specific procedures for incorporating them into the analysis. These control parameters are analyzed and evaluated with every designated sample group (batch).

The data from each parameter provides the analyst with critical decision making information on method performance. The information is used to determine if corrective action is needed to bring the method or the analysis of a specific sample into compliance. These evaluations are conducted throughout the course of the analysis. Each parameter being indicative of a critical control feature. Failure of a methodological control parameter is indicative of either instrument or batch failure. Failure of a sample control parameter is indicative of control difficulties with a specific sample or samples.

Sample Batch. All samples analyzed in the laboratory are assigned to a designated sample batch, which contains all required quality control samples and a defined maximum number of field samples that are prepared and/or analyzed over a defined time period. The maximum number of investigative and field QC samples in the batch is 20. Accutest has incorporated the NELAP batching policy as the sample-batching standard. This policy incorporates the requirement for blanks and spiked blanks as a time based function as defined by NELAP. The typical batch contains a blank, laboratory control sample (LCS or spiked blank), matrix spike and matrix spike duplicate. Batch documentation includes lot specifications for all reagents and standards used during preparation of the batch.

12.2 ***Methodological Control Parameters and Corrective Action***. Prior to the analysis of field sample the analyst must determine that the method is functioning properly. Specific control parameters indicate whether critical processes meet specified requirements before continuing with the analysis. Method specific control parameters must meet criteria before sample analysis can be conducted. Each of these

parameters is related to processes that are under the control of the laboratory and can be adjusted if out of control.

Method Blank. A method blank is analyzed during the analysis of any field sample. The method blank is defined as a sample. It contains the same standards (internal standards, surrogates, matrix modifiers, etc.) and reagents that are added to the field sample during analysis, with the exception of the sample itself. If the method blank contains target analyte(s) at concentrations that exceed method or client requirements (typically defined as 1/2 RL concentrations), the source of contamination is eliminated before proceeding with sample analysis. Systematic contamination is documented for corrective action and resolved following the established corrective action procedures. In specific cases, contamination detected in the method blank may be acceptable if the concentrations do not exceed regulatory limits or client defined reporting limits.

Laboratory Control Samples (LCS or Spiked Blanks). A laboratory control sample (spiked blank or commercially prepared performance evaluation sample) is analyzed along with field samples to demonstrate that the method accuracy is within acceptable limits. These spike solutions are derived from different sources than the solutions used for method calibration. The performance limits are derived from published method specifications or from statistical controls generated from laboratory method performance data. Spiked blanks are blank matrices (reagent water or clean sand) spiked with the targeted parameters and analyzed using the same method used for samples. Accuracy data is compared to laboratory experimentally derived limits to determine if the method is in control. Laboratory control samples (LCS) are commercially prepared spiked samples in an inert material. Performance criteria for recovery of spiked analytes is pre-established by the commercial entity preparing the sample. This sample is analyzed in the laboratory as an external reference.

Accuracy data is compared to the applicable performance limits. If the spike accuracy exceeds the performance limits, corrective action, as specified in the SOP for the method is performed and verified before continuing with a field sample analysis. In some cases, decisions are made to continue with sample analysis if performance limits are exceeded; provided the unacceptable result has no negative impact on the sample data.

Marginal exceedance (ME) values are calculated for methods containing more than eleven (11) targeted analytes. The ME is calculated as $\pm$ 4 standard deviations about the mean. MEs are considered for multi-analyte methods because of the increased likelihood of LCS failure as the number of analytes in the method increase. The number of allowable MEs is based on the number of target analytes in the method. Analytes that regularly fall into the ME category are treated as systematic problems, which are resolved using established trend monitoring and corrective action procedures. Marginal Exceedances are not applied to parameters that are detected in field samples. Routine corrective action is initiated for all cases where LCS spike accuracy criteria is beyond the established control limits and the parameter is detected in field samples corresponding to the unacceptable LCS.

Blanks and spikes are routinely evaluated before samples are analyzed. However, in situations where sample analysis is performed using an autosampler, they may be evaluated after sample analysis has occurred. If the blanks and spikes do not meet criteria, sample analysis is repeated.

Proficiency Testing. Performance evaluation samples (PEs) are single or double blind spikes, introduced to the laboratory to assess method performance. PEs may be introduced as double blinds submitted by commercial clients, single or double blinds from regulatory agencies, or internal blinds submitted by the QA group.

A minimum of two single blind studies must be performed each year for every parameter in aqueous and solid matrices for each field of testing for which the laboratory maintains accreditation. Proficiency samples must be purchased as blinds from an A2LA accredited vendor. Data from these studies are provided to the laboratory by the vendor and reported to accrediting agencies. If unsatisfactory performance is noted, corrective action is performed to identify and eliminate any sources of error. A new single blind must be analyzed to demonstrate continuing proficiency.

PE samples performed for accrediting agencies or clients, which do not meet performance specifications, require a written summary that documents the corrective action investigation, findings, and corrective action implementation.

Single or double blind proficiency test samples are employed for self-evaluation purposes. Data from these analyses are compared to established performance limits. If the data does not meet performance specifications, the system is evaluated for sources of acute or systematic error. If required, corrective action is performed and verified before initiating or continuing sample analysis.

Trend Analysis for Control Parameters. Accuracy data for selected spiked parameters from the laboratory control sample (LCS) is statistically evaluated daily for trends. Data from selected LCS parameters and surrogates are pooled on a method, matrix, and instrument basis. This data is evaluated by comparison to existing control and warning limits. Trend analysis is performed automatically as follows:

- Any point outside the control limit
- Any three consecutive points between the warning and control limits
- Any eight consecutive points on the same side of the mean
- Any six consecutive points increasing or decreasing

The results of the trend analysis are printed for supervisory evaluation prior to sample analysis. Trends that indicate the potential loss of statistical control are further evaluated to determine the impact on data quality and to determine if corrective action is necessary. If corrective action is indicated, the supervisor informs the analysts of

the corrective actions to be performed. Return to control is demonstrated before analysis resumes.

12.3 ***Sample Control Parameters and Corrective Action***. The analysis of samples can be initiated following a successful demonstration that the method is operating within established controls. Additional controls are incorporated into the analysis of each sample to determine if the method is functioning within established specifications for each individual sample. Sample QC data is evaluated and compared to established performance criteria. If the criteria are not achieved the method or the SOP specifies the corrective action required to continue sample analysis. In many cases, failure to meet QC criteria is a function of sample matrix and cannot be remedied. Each parameter is designed to provide quality feedback on a defined aspect of the sampling and analysis episode.

Duplicates. Duplicate sample analysis is used to measure analytical precision. This can also be equated to laboratory precision for homogenous samples. Precision criteria are method dependent. If precision criteria are not achieved, corrective action or additional action may be required. Recommended action must be completed before sample data can be reported.

Laboratory Control Duplicate, Spikes & Spiked Duplicates. Spikes and spiked duplicates are used to measure analytical precision and accuracy for the sample matrix selected. Precision and accuracy criteria are method dependent. If precision and accuracy criteria are not achieved, corrective action or additional action may be required. Recommended action must be completed before sample data can be reported.

Serial Dilution (Metals). Serial dilutions of metals samples are analyzed to determine if analytical matrix effects may have impacted the reported data. If the value of the serially diluted samples does not agree with the undiluted value within a method-specified range, the sample matrix may be causing interference, which may lead to either a high or low bias. If the serial dilution criterion is not achieved, it must be flagged to indicate possible bias from matrix effects. *Accutest-SE uses this procedure as opposed to post-digestion spike unless contractual obligations absolutely require latter*

Post Digestion Spikes. Digested samples are spiked and analyzed to determine if matrix interferences are creating biases in the results. It may also be used to determine potential interferences per client's specification. Spike concentration is determined as per analytical method. No action is necessary if the post digestion spike is outside of the method criteria, unless a preparation problem is suspected with the spike, in which case the post digestion spike should remade and reanalyzed.

Surrogate Spikes (Organics). Surrogate spikes are organic compounds that are similar in behavior to the target analytes but unlikely to be found in nature. They are added to all quality control and field samples to measure method performance for each individual sample. Surrogate accuracy limits are derived from published method

specifications or by statistical evaluation of laboratory generated surrogate accuracy data. Accuracy data is compared to the applicable performance limits. If the surrogate accuracy exceeds performance limits, corrective action, as specified in the method or SOP is performed before sample data can be reported.

Internal Standards (Organic Methods). Internal standards are retention time and instrument response markers added to every sample to be used as references for quantitation. Their response is compared to reference standards and used to evaluate instrument sensitivity on a sample specific basis. Internal standard retention time is also compared to reference standards to assure that target analytes are capable of being located by their individual relative retention time.

If internal standard response criteria are not achieved, corrective action or additional action may be required. The recommended action must be completed before sample data can be reported.

If the internal standard retention time criteria are not achieved corrective action or additional action may be required. This may include re-calibration and re-analysis. Additional action must be completed before sample data is reported.

Internal Standards (ICP Metals). Internal standards are used on ICP instruments to compensate for variations in response caused by differences in sample matrices. This adjustment is performed automatically during sample analysis. The internal standard response of replicated sample analysis is monitored to detect potential analytical problems. If analytical problems are suspected, then the field samples are reanalyzed.

12.4 ***Laboratory Derived Quality Control Criteria.*** Control criteria for in-house methods and client specific modifications that exceed the scope of published methodology are defined and documented prior to the use of the method. The Quality Assurance staff identifies the responsibility for control criteria needs. Control parameters and criteria, based on best technical judgement are established using input provided by the operations staff. These control parameters and criteria are documented and incorporated into the method.

The laboratory derived criteria are evaluated for technical soundness on spiked samples prior to the use of the method on field samples. The technical evaluation is documented and archived by the Quality Assurance staff.

When sufficient data form the laboratory developed control parameter is accumulated, the data is statistically processed and the experimentally derived control limits are incorporated into the method.

12.5 ***Bench Review & Corrective Action***. The bench chemists are responsible for all QC parameters. Before proceeding with sample analysis, they are required to successfully meet all instrumental QC criteria. They have the authority to perform any necessary corrective action before proceeding with sample analysis. Their authority

includes the responsibility for assuring that departures from documented policies and procedures do not occur.

The bench chemists are also responsible for all sample QC parameters. If the sample QC criteria are not achieved, they are authorized and required to perform the method specified corrective action before reporting sample data.

***Data Qualifiers*.** An alpha character coding system is employed for defining use limitations for reported data. These limitations are applied to analytical data by the analyst to clarify the usefulness of the reported data for data user. Accutest Laboratories Southeast qualifies data in accordance with program-specific requirements, such as State of Florida DEP, AFCEE, etc., and these qualifiers are hard-coded in the LIMS on project level. Definitions of common qualifiers could be found at the bottom of the sample report form.

12.6 ***QA Monitoring***. The QA staff prior to client release conducts a spot review of completed data packages. This review includes an examination of QC data for compliance and trends indicative of systematic difficulties. If non-conformances are detected, the QA staff places an immediate stop on the release of the data and initiates corrective action to rectify the situation. The data package is released when the package becomes compliant with all quality requirements.

If the review reveals trends indicative of systematic problems, QA initiates an investigation to determine the cause. If process defects are detected, a corrective action is implemented and monitored for effectiveness.

Performance Limits. The Technical Director is responsible for compilation and maintenance of all precision and accuracy data used for performance limits. Quality control data for all test methods are accumulated and stored in the laboratory information management system (LIMS). Parameter specific QC data is extracted annually and statically processed to eliminate outliers and develop laboratory specific warning limits and confidence limits. The new limits are reviewed and approved by the supervisory staff prior to their use for data assessment. The new limits are used to evaluate QC data for compliance with method requirements for a period of one year. Laboratory generated limits appear on all data reports unless method specifies hard-coded limits (mostly General Chemistry and Metals)

12.7 ***Data Package Review***. Accutest employs multiple levels of data review to assure that reported data has satisfied all quality control criteria and that client specifications and requirements have been met. Production departments have developed data review procedures which must be conducted before data is released to the client.

Analytical Review. The analyst conducts the primary review of all data. This review begins with a check of all instrument and method quality control and progresses through sample quality control concluding with a check to assure that the client's requirements have been executed. Analyst checks focuses on a review of qualitative

determinations and checks of precision and accuracy data to verify that existing laboratory criteria have been achieved. Checks at this level may include comparisons with project specific criteria if applicable. The analyst has the authority and responsibility to perform corrective action for any out-of-control parameter or nonconformance at this stage of review.

Secondary data reviews are performed at the peer level by analysts who have met the qualification criteria for the method in use. Qualification requirements include a valid demonstration of capability and demonstrated understanding of the method SOP. Section supervisors may perform secondary review in-lieu of a peer review Secondary review is performed on 100% of the data produced by their department. It includes a check of all manual calculations; an accuracy check of manually transcribed data from bench sheets to the LIMS, a check of all method and instrument QC criteria, baseline manipulations (if applicable) and a comparison of the data package to client specified requirements. Also included are checks to assure the appropriate methodology was applied and that all anomalous information was properly flagged for communication in the case narrative. Supervisors have the authority to reject data and initiate re-analysis, corrective action, or reprocessing.

All laboratory data requiring manual entry into LIMS system is double-checked by the analysts performing initial data entry and the section supervisor. Verification of supervisory review is indicated on the raw data summary by the supervisor's initials and date.

Electronic data that is manually edited at the bench by the primary analysts is automatically flagged by the instrument data system indicating an override by the analyst. All manual overrides must be verified and approved by a supervisor who initials and dates all manual changes.

Hard copies of manually integrated chromatographic peaks are printed that clearly depict the manually drawn baseline. The hard copy is reviewed and approved by the reviewer (initialed and dated) and included in the data package of all full tier reports or the archived batch records of commercial report packages.

Electronic data that has been committed to the LIMS can only be edited by a manager or supervisor. These edits may be required if needs for corrections are indicated during the final review. An audit record for all electronic changes in the LIMS is automatically appended to the record.

The group manager performs a tertiary review on a spot check basis. This review includes an evaluation of QC data against acceptance criteria and a check of the data package contents to assure that all analytical requirements and specifications were executed.

Report Generation Review. The report generation group reviews all data and supporting information delivered by the laboratory for completeness and compliance

with client specifications. Missing deliverables are identified and obtained from the laboratory. The group also reviews the completed package to verify that the delivered product complies with all client specifications. Non-analytical defects are corrected before the package is sent to the client.

Project Management/Quality Assurance Review. Spot-check data package reviews are performed by the project manager. Project management reviews focus on project specifications. If the project manager identifies defects in the product prior to release, he initiates immediate corrective action to rectify the situation.

The QA Staff reviews approximately 10% of the data produced. The QA review focuses on all elements of the deliverable including the client's specifications and requirements, analytical quality control, sample custody documentation and sample identification. QA reviews at this step in the production process are geared towards systematic process defects, which require procedural changes to effect a corrective action. However, if defects are identified that can be corrected prior to data release, the QA staff returns the package to the laboratory for corrective action. QA data review cannot be used in lieu of a peer level review or a supervisory review.

Data Reporting. Analytical data is released to clients following secondary departmental review. Data release at this stage of the process is limited to electronic information, which is released to clients through a secure, encrypted, password protected, Internet connection.

Hard copy support data is compiled by the report generation group and assembled into the final report. The report is sent to the client following reviews by report generation, and spot-check by QA staff.

All data reports include specified information, which is required to identify the report and its contents. This information includes a title, name and address of the laboratory, a unique report number, total number of pages in the report, clients name and address, analytical method identification, arriving sample condition, sample and analysis dates, test results with units of measurement, authorized signature of data release, statement of applicability, report reproduction restrictions and NELAC requirements certification. Subcontracted data is clearly identified.

In the event of report revision date of the revision, nature of revision and identity of the person revising the report must be clearly stated in the body of the report. Depending on the level of the deliverables it could be either stated in the Case Narrative or Case Narrative generated specifically for this purpose. Case Narrative must state "supercedes all previous reports".

12.8 ***Electronic Data Reduction.*** Raw data from sample analysis is entered into the laboratory information management system (LIMS) using automated processes or manual entry. Final data processing is performed by the LIMS using procedures developed by the Company.

All LIMS programs and internally developed software (including Excel spreadsheets) are tested and validated prior to use to assure that they consistently produce correct results. Validation testing is performed by the Information Technology Staff. The testing procedures are documented in an SOP. Programs are not approved for use until they have demonstrated that they are capable of performing the required calculations.

12.9 ***Representativeness***. Data representativeness is based on the premise that qualitative and quantitative information developed for field samples is characteristic of the sample that was collected by the client and analyzed in the laboratory. The laboratory objective for representativeness defines data as representative if the criteria for all quality parameters associated with the analysis of the sample are achieved.

12.10 ***Comparability***. Analytical data is defined as comparable when data from a sample set analyzed by the laboratory is representatively equivalent to other sample sets analyzed separately regardless of the analytical logistics. The laboratory will achieve 100% comparability for all sample data which meets the criteria for the quality parameters associated with its analysis using the method requested by the client.

13.0 CORRECTIVE ACTION SYSTEM

Requirement. The laboratory must have polices and procedures for correcting defective processes, systematic errors, and quality defects, which enables the staff to systematically improve product quality. The system must include procedures for communicating items requiring corrective action, corrective action tracking procedures, corrective action documentation, monitoring of effectiveness, and reports to management. The system must be documented in a standard operating procedure.

13.1 ***Procedure***. Corrective action is the step that follows the identification of a process defect. The type of defect determines the level of documentation, communication, and training necessary to prevent re-occurrence of the defect or non-conformance.

Routine Corrective Action. Routine corrective action is defined as the procedures used to return out of control analytical systems back to control. This level of corrective action applies to all analytical quality control parameters or analytical system specifications.

Bench analysts have full responsibility and authority for performing routine corrective action. The resolution of defects at this level does not require a procedural change or staff re-training. The analyst is free to continue work once corrective action is complete and the analytical system has been returned to control. Documentation of routine corrective action is limited to bench logbook or maintenance logbook comment.

Process Changes. Corrective actions in this category require procedural modifications. They may be the result of systematic defects identified during audits, the investigation of client inquiries, failed proficiency tests, product defects identified during data review, or method updates. Resolution of defects of this magnitude requires formal identification of the defect, development and documentation of a corrective action plan, and staff training to communicate the procedural change.

Technical Corrective Action. Technical corrective action encompasses routine corrective action performed by bench analysts for out of control systems and corrective actions performed for data produced using out of control systems. Technical corrective action for routine situations is conducted using the procedures detailed above.

Non-routine corrective actions apply to situations where the bench analysts failed to perform routine corrective action before continuing analysis. Supervisors and Department Managers perform corrective action in these situations. Documentation of all non-routine corrective actions is performed using the corrective action system.

Sample re-analysis is conducted if sufficient sample and holding time remain to repeat the analysis using an in-control system. If insufficient sample or holding time remains, the data is processed and qualifiers applied that describe the out of control situation.

The occurrence is further documented in the case narrative and in the corrective action response. The corrective action must include provisions for retraining the analysts who failed to perform routine corrective action.

13.2 ***Documentation & Communication***. Routine corrective actions are documented as part of the analytical record. Notations are made in the comments section of the analytical chronicle or data sheet detailing the nonconformance. Continuation of the analysis indicates that return to control was successful.

Corrective actions for process changes are documented, tracked and monitored for effectiveness. Corrective actions may be initiated by any supervisor or senior staff member by completing the corrective action form in Corrective Action database

The corrective action database is an Access application. The initiator generates the corrective action investigation form, which is documented, tracked, distributed to responsible parties and archived through the application. The application assigns a tracking number initiation data and due date to each corrective action initiated and copies the corrective action form to the corrective action database. The application also distributes an E-mail message containing the form to the responsible parties for resolution.

Corrective Action system employs Deficiency – Root Cause – Immediate Fix – Corrective action approach, further divided into categories of Analytical Error, Omission Error, Random Error, Systemic Error and Training Issue.

The responsible party develops and implements the procedural change. Existing documentation such as SOPs are edited to reflect the change. The affected staff is informed of the procedural change through a formal training session. The training is documented and copies are placed into individual training files. The corrective action form is completed and closed in CA database.

Initial and completed corrective action forms are maintained in the Corrective Action directory. This information is archived daily. Copies of training records describing corrective actions are appended to the involved individuals training files.

Monitoring. The QA Staff monitors the implemented corrective action until it is evident that the corrective action has been effective and the systematic deficiency has been eliminated. The corrective action database is updated by QA to reflect closure of the corrective action. The QA staff also assigns an error code to the corrective action for classification of the type of errors being committed.

If QA determines that the corrective action procedure has not effectively remedied the deficiency, the process continues with a re-initiation of the corrective action. Corrective action continues until the defective process is eliminated. If another procedural change is required, it is treated as a new corrective action, which is documented and monitored using established procedures.

Client Notification. Defective processes, systematic errors, and quality defects, detected during routine audits may have negative impacts on data quality. In some cases, data that has been released to clients may be affected. If defective data has been released for use, Accutest will notify the affected clients of the defect and provide specific details regarding the magnitude of the impact to their data.

14.0 PROCEDURES FOR EXECUTING CLIENT SPECIFICATIONS

***Requirement*.** Systems must be established for evaluating and processing client specifications for routine and non-routine analytical services. The systems must enable the client services staff to identify, evaluate, and document the requested specifications to determine if adequate resources are available to perform the analysis. The system must include procedures for communicating the specifications to the laboratory staff for execution and procedures for verifying the specifications have been executed.

14.1 ***Client Specific Requirements***. The project manager is the primary contact for clients requesting laboratory services. Client specifications are communicated using several mechanisms. The primary source of information is the client's quality assurance project plan (QAPP) which details analytical and quality control specifications for the project. In the absence of a QAPP, projects specifications can also be communicated using contracts, letters of authorization, or letters of agreement, which may be limited to a brief discussion of the analytical requirements and the terms and conditions for the work. These documents may also include pricing information, liabilities, scope of work, in addition to the analytical requirements. QAPPs include detailed analytical requirements and data quality objectives, which supersede those found in the referenced methods. This information is essential to successful project completion.

Laboratory also reviews its Accreditation status to evaluate whether it is possible to accept proposed project. Discrepancies must be resolved before the work commences.

The client services staff provides additional assistance to clients who are unsure of the specifications they need to execute the sampling and analysis requirements of their project. They provide additional support to clients who require assistance in results interpretation as needed, provided they possess the expertise required to render an opinion.

The project manager is responsibility for obtaining project documents, which specify the analytical requirements. Following project management review, copies are distributed to the QA staff and the appropriate departmental managers for review and comment. The original QAPP is numbered with a document control number and filed in a secure location.

14.2 ***Requirements for Non-Standard Analytical Specifications***. Client requirements that specify departures from documented policies, procedures, or standard specifications must be submitted to Accutest in writing. These requirements are reviewed and approved by the technical staff before the project is accepted. Once accepted, the non-standard requirements become analytical specifications, which follow the routine procedure for communicating client specifications. Departures from documented policies, procedures, or standard specifications that do not follow this procedure are not permitted.

Exception Policy: With respect to the quality system, incoming non-conforming product refers to received samples that do not meet requirements of custody documentation, are improperly packaged or stored or are contaminated. An internal non-conformance refers to a problem, caused internally due to improper handling of samples, improper sampling methods, and equipment malfunction or data management errors. The individual who identifies the incoming non-conformance is responsible for notifying the project manager. The project manager resolves the issue with the client. The individual who recognizes an internal non-conformance is responsible for initiating corrective action

Departures from standard practices, policies and specifications are reviewed and approved by Technical Director, QA Officer and by Project Manager of the project affected.

Corrective & Preventative Action: Once a quality problem has been identified, the analytical or review process stops, until the reason is identified. Primary responsibility for identifying the cause of the problem rests with the instrument operator. Other staff may be called on to assist in reaching the root cause. The problem prevention tracking system, using Corrective Action Tracking Records, provides a method to track systemic problems until resolved/removed. The QA Officer is responsible for the record management with respect to the disposition of problems.

Deviations that do not limit themselves to a single department and/or client are cited on Corrective Action Record. This may include but not limited to: sample arrival outside of EPA specified holding time, analysis completion outside of EPA specified holding time (with explanation of the reason), inconsistencies between chain of custody and cooler contents, including labeling errors, improper preservation, etc.

Deviations from analytical methods' SOP's are reported by the Analyst to the Section Leader. Single occurrences warrant completion of Corrective Action Tracking record, repetitive occurrences may indicate that either an additional training session is in order, or the SOP does not reflect proper laboratory practice. Training session is conducted by the Technical Director or by QA Officer. In case where SOP does not reflect current laboratory practice, SOP review and correction process may be initiated.

14.3 ***Evaluation of Resources.*** A resource evaluation is completed prior to accepting projects submitted by clients. The evaluation is initiated by the client services staff receives project requirements (usually in the form of QAPjP) and distributes these requirements to the laboratory departments affected. The specifications are evaluated by the department managers from a scheduling and hardware resources perspective. The project is not accepted unless the department managers have the necessary resources to execute the project according to client specifications.

14.4 ***Documentation***. New projects are initiated using a project set up form, which is completed prior to the start of the project. This form details all of the information needed to correctly enter the specifications for each client sample into the laboratory information management system (LIMS, see example). The form includes data reporting requirements, billing information, data turnaround times, QA level, state of origin, and comments for detailing project specific requirements. The project manager is responsible for obtaining this information from the client and completing the form prior to sample arrival and login.

Sample receipt triggers project creation and the login process. The information on the set-up form is entered into the LIMS immediately prior to logging in the first sample. The set up form may be accompanied by a quotation, which details the analytical product codes and sample matrices. These details are also entered into the LIMS during login.

Special information is distributed to the laboratory supervisors and login department in electronic or hardcopy format upon project setup. All project specific information is retained by the project manager in a secure file. The project manager maintains a personal telephone log, which details conversations with the client regarding the project.

14.5 ***Communication***. A pre-project meeting is held between client services and the operations managers to discuss the specifications described in the QAPjP and/or related documents. Project logistics are discussed and finalized and procedures are developed to assure proper execution of the client's analytical specifications and requirements. Questions, raised in the review meeting, are discussed with the client for resolution. Exceptions to any requirements, if accepted by the client, are documented and incorporated into the QAPjP or project documentation records.

Non-standard specifications for individual clients are documented in the LIMS at the client account level. Once entered into the LIMS, these specifications become memorialized for all projects related to the client account. Upon sample arrival, these specifications are accessed through a terminal or printed as a hard copy and stored in a binder for individuals who require access to the specification. Specifications that are not entered into the LIMS are prohibited unless documented in an interdepartmental memo, which clearly identifies the project, client and effective duration of the specification.

14.6 ***Operational Execution***. A work schedule is prepared for each analytical department on a daily basis. Analytical specifications from recently arrived samples have now been entered into the LIMS database. The database is sorted by analytical due date and holding time, into product specific groups. Samples are scheduled for analysis by due date and holding time. The completed schedule, which is now defined as a work list, is printed. The list contains the client requested product codes and specifications required for the selected sample(s). Special requirements are communicated to the analyst using the comments section or relayed through verbal instructions provided by

the supervisor. The bench analyst assumes full responsibility for performing the analysis according to the specifications printed on the work sheet.

14.7 ***Verification***. Prior to the release of data to the client, laboratory section managers and the report generation staff review the report and compare the completed product to the client specifications documentation to assure that all requirements have been met. Project managers perform a spot check of projects with unique requirements to assure that the work was executed according to specifications.

15.0 CLIENT COMPLAINT RESOLUTION PROCEDURE

Requirement. A system for managing and reconciling client complaints must be implemented in the laboratory. The system must include procedures for documenting client complaints and communicating the complaint to the appropriate department for resolution. The system must also include a quality assurance evaluation to determine if the complaint is related to systematic defects requiring process changes.

15.1 ***Procedure***. Client complaints are communicated to client services representatives, quality assurance staff, or senior management staff for resolution. The individual receiving the complaint retains the responsibility for documentation and communicating the nature of the complaint to the responsible department(s) for resolution. The responsible party addresses the complaint. The resolution is communicated to quality assurance (QA) and the originator for communication to the client. QA reviews the complaint and resolution to determine if systematic defects exist. If systematic defects are present, QA works with the responsible party to develop a corrective action that eliminates the defect.

Documentation. Client's complaints are documented by the client service representative receiving the complaint. A record of the telephone conversation is maintained by client services. Client service staff enters the complaint into Data challenge system, which is also cross-linked with corrective action database – see sec. 13. Complaint is communicated to the production departments concerned via e-mail. The complaint resolution is documented on the e-mail by the responsible party and returned to the originator. QA Officer is copied on the correspondence.

15.2 ***Corrective Action***. Responses to data queries are required from the responsible party. At a minimum, the response addresses the query and provides an explanation to the complaint. Corrective action may focus on the single issue expressed in the complaint. Corrective action may include job case narrative generation, reprocessing of data, editing of the initial report, and re-issue to the client. If the QA review indicates a systematic error, process modification is required. The defective process at the root of the complaint is changed. SOPs are either created or modified to reflect the change. The party responsible for the process implements process changes.

15.3 ***QA Monitoring***. Process changes, implemented to resolve systematic defects, are monitored for effectiveness by QA. If monitoring indicates that the process change has not resolved the defect, QA works with the department management to develop and implement an effective process. If monitoring indicates that the defect has been resolved, monitoring is slowly discontinued. Continued monitoring is incorporated as an element of the annual system audit.

16.0 CONTROL OF NONCONFORMING PRODUCT

Requirement: Policies and procedures have been developed and implemented that describe the procedures employed by the laboratory when any aspect of sample analysis or data reporting do not conform to established procedures or client specifications. These procedures include steps to ensure that process defects are corrected and affected work is evaluated to assess its impact to the client.

Procedure. Nonconforming product is identified through routine internal review and audit practices or through client inquiry. The individuals who identify the nonconformance or receiving a nonconformance inquiry immediately inform the Laboratory Director and the QA Officer. The Laboratory Director initiates an evaluation of the nonconformance through the QA Officer and takes full responsibility for managing the process and identifying the course of action to take, initiating corrective action and mitigating the impact of the nonconformance to the client.

Non-conformances and their significance are explained in case narrative and sample report footnotes. Case narrative comments and sample repot footnotes must state the impact on data quality.

16.1 ***Corrective Action.*** The outcome of the evaluation dictates the course of action. This may include at a minimum client notification, but may also include corrective action. Immediate corrective action is performed using the SOP-specified procedures. However, additional action may be required including cessation of analysis and withholding and/or recalling data reports. If the evaluation indicates that nonconforming data may have been issued to clients, the client is immediately notified and data may be recalled following the procedures specified in respective SOPs. If work has been stopped because of a nonconformance, the Laboratory Director is the only individual authorized to direct a resumption of analysis.

Nonconformances caused by systematic process defects require retraining of the personnel involved as an element of the corrective action solution.

17.0 CONFIDENTIALITY PROTECTION PROCEDURES

Requirements: Policies and procedures are required to protect client data from release to unauthorized parties or accidental release of database information through accidental electronic transmission or illegal intrusion. These policies must be communicated to clients and staff. Electronic systems must be regularly evaluated for effectiveness.

17.1 ***Client Anonymity***. Information related to the Company's clients is granted to employees on a "need to know" basis. An individual's position within the organization defines his "need to know". Individuals with "need to know" status are given password access to systems that contain client identity information and access to documents and document storage areas containing client reports and information. Access to client information by individuals outside of the Company is limited to the client and individuals authorized by the client.

Individuals outside of the Company may obtain client information through subpoena issued by a court of valid jurisdiction. Clients are informed when subpoenas are received ordering the release of their information.

17.2 ***Documents***. Access to client documents is restricted to employees in need to know positions. Copies of all client reports are stored in secure archive with restricted access. Reports and report copies are distributed to individuals who have been authorized by the client to receive them. Documents are not released to third parties without verbally expressed or written permission from the client.

17.3 **Confidential Business Information (CBI).** Operational documents including SOPs, Quality Manuals, personnel information, internal operations statistics, and laboratory audit reports are considered confidential business information. Strict controls are placed on the release of this information to outside parties.

Release of CBI to outside parties or organizations may be authorized upon execution of a confidentiality agreement between Accutest and the receiving organization or individual. CBI information release is authorized for third party auditors and commercial clients in electronic mode as Adobe Acrobat .PDF format only. See also Sec. 6.5.

17.4 ***Electronic Data***.

Database Intrusion. Direct database entry is authorized for employees of Accutest only on a need to know basis. Entry to the database is restricted through a user specific multiple password entry system. Direct access to the database outside of the facility is possible through a VPN connection. A unique password is required for access to the local area network. A second unique password is required to gain access to the database. The staff receives read or write level authorization on a hierarchical privilege basis.

Internet Access. Access to client information is through an HTTP Web application only. It does not contain a mechanism that allows direct access to the database. Clients can gain access to their data only using a series of Accutest assigned, client and user specific passwords. The viewable data, which is encrypted during transmission, consists of an extraction of database information only.

Client Accessibility. Accessibility to client data delivered via electronic means follows strict protocols to insure confidentiality. Clients accessing electronic data are assigned a company account. The account profile, which is established by the MIS staff, grants explicit access to explicit information pertaining to the clients project activity. Passwords are assigned on an individual basis within a client account. These accounts can be activated or deactivated by the MIS staff only.

17.5 ***Information Requests***. Client specific data or information is not released to third parties without verbally expressed or written permission from the client. Written permission is required from third parties, who contact the Company directly for the release of information. Verbal requests will be honored only if they are received directly from the client. These requests must be documented in a record of communication maintained by authorized recipient.

17.6 ***Transfer of Records***. Archived data, which has previously been reported and transmitted to clients, is the exclusive property of Accutest Laboratories. In the event of a cessation of business activities due to business failure or sale, The Company's legal staff will be directed to arrange for the final disposition of archived data.

The final disposition of archived data will be accomplished using the approach detailed in the following sequence:

1. All data will be transferred to the new owners for the duration of the required archive period as a condition of sale.

2. If the new owners will not accept the data or the business has failed, letters will be sent to clients listed on the most recent active account roster offering them the option to obtain specific reports (identified by Accutest Job Number) at their own expense.

3. A letter will be sent to the NELAC accrediting authority with organizational jurisdiction over the company offering them the option to obtain all unclaimed reports at their own expense.

4. All remaining archived data will be recycled using the most expedient means possible.

18.0 QUALITY AUDITS AND SYSTEM REVIEWS

Requirement: The quality assurance group will conduct regularly scheduled audits of the laboratory to assess compliance with quality system requirements, technical requirements of applied methodology, and adherence to documentation procedures. The information gathered during these audits will be used to provide feedback to senior management and perform corrective action where needed for quality improvement purposes.

18.1 ***Quality Systems Review***. Quality system audits are performed annually by the Quality Assurance Director for the Company President. In this audit, the laboratory is evaluated for compliance with the Laboratory Quality Systems Manual (LQSM) and the quality system standards of the National Environmental Laboratory Accreditation Conference. Findings, which indicate non-compliance or deviation from the LQSM, are flagged for corrective action. Corrective actions require either a return to compliance or a plan change to reflect an improved quality process. The QA Officer is responsible for making and documenting changes to the LQSM. These changes are reviewed by the Laboratory Director and Technical Director prior to the approval of the revised system.

18.2 ***Quality System Audits.*** Quality system audits are conducted to evaluate the effectiveness and laboratory compliance with individual quality system elements. These audits are conducted on an established schedule. Audit findings are documented and communicated to the management staff and entered into the corrective action system for resolution. If necessary, retraining is conducted to assure complete understanding of the system requirements.

18.3 ***Technical Compliance Audits***. Technical compliance audits are performed throughout the year following the established schedule. Selected analytical procedures are evaluated for compliance with standard operating procedures (SOPs) and method requirements. If non-conformances exist, the published method serves as the standard for compliance. SOPs are edited for compliance if the document does not reflect method requirements. Analysts are trained to the new requirements and the process is monitored by quality assurance. Analysts are retrained in method procedures if an evaluation of bench practices indicates non-compliance with SOP requirements.

18.4 ***Documentation Audits***. Documentation audits are conducted periodically. This audit includes a check of measurement processes that require manual documentation and non-analytical logbook review. It also includes checks of data archiving systems and a search to find and remove any inactive versions of SOPs that may still be present in the laboratory and being accessed by the analysts. Non-conformances are corrected on the spot. Procedural modifications are implemented if the evaluation indicates a systematic defect.

18.5 ***Corrective Action Monitoring***. Defects or non-conformances that are identified during client or internal audits are shared with management and entered into CA

database for attention by the responsible party. Audit findings are corrected through process modifications and/or retraining. Once a corrective action has been designed and implemented, it is monitored for compliance on a regular basis by the QA staff. Monitoring of the corrective action continues until satisfactory implementation has been verified.

18.6 ***Preventive Action.*** Laboratory systems or processes, which may be faulty and pose the potential for nonconformances, errors, confusing reports or difficulties establishing traceability may be identified during internal audits. These items are highlighted for systematic change using the corrective action system and managed to resolution using appropriate procedures for corrective action.

18.7 ***Client Notification.*** Defective processes, systematic errors, and quality defects detected during routine audits may have negative impact on data quality. In some cases, data that has been released to the client may be affected. If defective data has been released for use, Accutest will immediately notify the affected clients of the defect and provide specific details regarding the magnitude of the impact to their data.

18.8 ***Management Reports***. Formal reports of all audit activities are prepared for the management staff. These reports are prepared annually. The report details the status of the Quality System

The formal report also addresses the following topics:

- Status and results of internal and external audits,
- Status and results of internal and external proficiency testing,
- Identification of quality control problems in the laboratory,
- Discussion of corrective action program issues,
- Status of external certifications and approvals,
- Status of staff training and qualifications,
- Discussion of new quality system initiatives.
- Recommendations for further action on listed items are included in the report.

19.0 HEALTH AND SAFETY

Requirement. The company operates a formal health and safety program that complies with the requirements of the Occupational Health and Safety Administration. The program consists of key policies and practices that are essential to safe laboratory operation. All employees are required to receive training on the program elements. Job specific training is conducted to assure safe practices for specific tasks. All employees are required to participate in the program, receive initial and annual training, and comply with the program requirements. All plan and program requirements are detailed in the Health and Safety Program Manual.

19.1 **Policy.** Accutest Laboratories will provide a safe and healthy working environment for its employees and clients while protecting the public and preserving the Company's assets and property. The company will comply with all applicable government regulations pertaining to safety and health in the laboratory and the workplace.

The objective of the Accutest Health and Safety Program is to promote safe work practices that minimize the occurrence of injuries and illness to the staff through proper health and safety training, correct laboratory technique application and the use of engineering controls.

19.2 **Responsibilities.** The Health and Safety Program assists managers, supervisors and non-supervisory employees in control of hazards and risks to minimize the potential for employee and client injuries, damage to client's property and damage or destruction to Accutest's facility.

The Health and Safety Officer is responsible for implementing the Program's elements and updating its contents as necessary. He also conducts periodic audits to monitor compliance and assess the program's effectiveness and is also responsible for creating and administering safety training for all new and existing employees.

The employee is responsible for following all safety rules established for their protection, the protection of others and the proper use of protective devices provided by the Company. The employee is also expected to comply with the requirements of the program at all times. Department Managers and Supervisors are responsible for ensuring the requirements of the Safety Program are practiced daily. The Company President retains the ultimate responsibility for the program design and implementation.

19.3 **Program Elements.** The Accutest Health and Safety Program consists of key program elements that compliment the company's health and safety objective. These elements form the essence of the health and safety policy and assure that the objectives of the program are achieved.

Safety Education and Training and Communication. Training is conducted to increase the staff's awareness of laboratory hazards and their knowledge of the safety

practices and procedures required to protect them from those hazards. It is also used to communicate general safety procedures required for safe operation in a chemical laboratory.

Initial health and safety training for new employees is conducted during orientation. The training focuses on the Accutest Safety and Health Program and includes specific training for the hazards that may be associated with the employees' duties. Training is also conducted for all program elements focusing on general, acceptable, laboratory safety procedures. Targeted training is conducted to address hazards or safety procedures that are specific to individual employee's work assignments. All training activities are documented and archived in individual training folders. A health and safety training inventory is maintained in the training database.

Accutest Laboratories Southeast maintains personnel trained in HAZWOPER, DOT and HazMat operations, as well as respirator certified.

Safety Committee. The safety committee provides the employee with an opportunity to express their views and concerns on safety issues in a forum where those concerns will be addressed. This committee meets monthly to assure that the interests of the company and the well being of the employee are protected. They also serve as a catalyst for elevating the level of safety awareness among their peers.

***Hazard Identification and Communication*.** The hazard communication program enables employees to readily identify laboratory hazards and the procedures to protect themselves from those hazards. This program complies with OSHA's Hazard Communication Standard, Title 29 Code of Federal Regulations 1910.1200 that requires the company to adopt and adhere to the following key elements:

- Material Safety Data Sheets (MSDS) must be available to any employee wishing to view them,
- The Company must maintain a Hazardous Chemicals Inventory (by location), which is updated on an annual basis,
- Containers are properly labeled,
- All employees must be provided with annual Personal Protection, Hazard Communication and Right to Know training,

Chemical Hygiene Plan. The Chemical Hygiene Plan complies with the requirements of the Occupational Safety and Health Administration's Occupational Exposure to Hazardous Chemicals in the Laboratory Standard, 29 CFR 1910.1450. This plan establishes procedures, identifies safety equipment, personal protective equipment, and work practices that protect employees from the potential health hazards presented by hazardous chemicals in the laboratory if properly used and/or applied.

Emergency Action & Evacuation Plan. The Emergency Action and Evacuation Plan details the procedures used to protect and safeguard Accutest's employees and property during emergencies. Emergencies are defined as fires or explosions, gas leaks, building collapse, hazardous material spills, emergencies that immediately threaten life and health, bomb threats and natural disasters such as floods, hurricanes or tornadoes. The plan identifies and assigns responsibility for executing specific roles in situations requiring emergency action.

Lockout/Tagout Plan. Lockout/tagout procedures have been established to assure that laboratory employees and outside contractors take steps to render equipment inoperable and/or safe before conducting maintenance activities. The plan details the procedures for conducting maintenance on equipment that has the potential to unexpectedly energize, start up, or release energy or can be operated unexpectedly or accidentally resulting in serious injury to employees. The plan ensures that employees performing maintenance render the equipment safe through lock out or tag out procedures.

Personal Protection Policy. Policies have been implemented which detail the personal protection requirements for employees. The policy includes specifications regarding engineering controls, personal protective equipment (PPE), hazardous waste, chemical exposures, working with chemicals and safe work practices. Safety requirements specific to processes or equipment are reviewed with the department supervisor or the Health and Safety Officer before beginning operations.

Emergency Preparedness Plan. This plan identifies the actions to be taken by Accutest Laboratory's staff in the event of terrorism or terrorist actions, to ensure the safety of the employees and the facility. The plan describes the building security actions coinciding with the "Alert Condition", designated by the Department of Homeland Security.

Appendix I

Glossary of Terms

GLOSSARY OF TERMS

Acceptance Criteria: specified limits placed on characteristics of an item, process, or service defined in requirement documents.

Accreditation: the process by which an agency or organization evaluates and recognizes a laboratory as meeting certain predetermined qualifications or standards, thereby accrediting the laboratory. In the context of the National Environmental Laboratory Accreditation Program (NELAP), this process is a voluntary one.

Accuracy: the degree of agreement between an observed value and an accepted reference value. Accuracy includes a combination of random error (precision) and systematic error (bias) components which are due to sampling and analytical operations; a data quality indicator.

Analyst: the designated individual who performs the "hands-on" analytical methods and associated techniques and who is the one responsible for applying required laboratory practices and other pertinent quality controls to meet the required level of quality.

Audit: a systematic evaluation to determine the conformance to quantitative *and qualitative* specifications of some operational function or activity.

Batch: environmental samples that are prepared and/or analyzed together with the same process and personnel, using the same lot(s) of reagents. A **preparation batch** is composed of one to 20 environmental samples of the same NELAC-defined matrix, meeting the above mentioned criteria and with a maximum time between the start of processing of the first and last sample in the batch to be 24 hours. An **analytical batch** is composed of prepared environmental samples (extracts, digestates or concentrates) which are analyzed together as a group. An analytical batch can include prepared samples originating from various environmental matrices and can exceed 20 samples.

Blank: a sample that has not been exposed to the analyzed sample stream in order to monitor contamination during sampling, transport, storage or analysis. The blank is subjected to the usual analytical and measurement process to establish a zero baseline or background value and is sometimes used to adjust or correct routine analytical results.

Blind Sample: a sub-sample for analysis with a composition known to the submitter. The analyst/laboratory may know the identity of the sample but not its composition. It is used to test the analyst's or laboratory's proficiency in the execution of the measurement process.

Case Narrative: a statement of non-conformances associated with particular data report

Calibration: to determine, by measurement or comparison with a standard, the correct value of each scale reading on a meter, instrument, or other device. The levels of the applied calibration standard should bracket the range of planned or expected sample measurements.

Calibration Curve: the graphical relationship between the known values, such as concentrations, of a series of calibration standards and their instrument response.

Calibration Method: a defined technical procedure for performing a calibration.

Calibration Standard: a substance or reference material used to calibrate an instrument.

Certified Reference Material (CRM): a reference material one or more of whose property values are certified by a technically valid procedure, accompanied by or traceable to a certificate or other documentation which is issued by a certifying body.

Chain of Custody: an unbroken trail of accountability that ensures the physical security of samples and includes the signatures of all who handle the samples.

Clean Air Act: the enabling legislation in 42 U.S.C. 7401 *et seq.*, Public Law 91-604, 84 Stat. 1676 Pub. L. 95-95, 91 Stat., 685 and Pub. L. 95-190, 91 Stat., 1399, as amended, empowering EPA to promulgate air quality standards, monitor and to enforce them.

Comprehensive Environmental Response, Compensation and Liability Act (CERCLA/Superfund): the enabling legislation in 42 U.S.C. 9601-9675 *et seq*., as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA), 42 U.S.C. 9601*et seq.*, to eliminate the health and environmental threats posed by hazardous waste sites.

Confirmation: verification of the identity of a component through the use of an approach with a different scientific principle from the original method. These may include, but are not limited to second column confirmation, alternate wavelength, derivatization, mass spectral interpretation, alternative detectors or, additional cleanup procedures.

Conformance: an affirmative indication or judgement that a product or service has met the requirements of the relevant specifications, contract, or regulation; also the state of meeting the requirements.

Corrective Action: the action taken to eliminate the causes of an existing nonconformity, defect or other undesirable situation in order to prevent recurrence.

Data Audit: a qualitative and quantitative evaluation of the documentation and procedures associated with environmental measurements to verify that the resulting data are of acceptable quality (i.e., that they meet specified acceptance criteria).

Data Reduction: the process of transforming raw data by arithmetic or statistical calculations, standard curves, concentration factors, etc., and collation into a more useable form.

Demonstration of Capability: a procedure to establish the ability of the analyst to generate acceptable accuracy.

Document Control: the act of ensuring that documents (and revisions thereto) are proposed, reviewed for accuracy, approved for release by authorized personnel, distributed properly and controlled to ensure use of the correct version at the location where the prescribed activity is performed.

Duplicate Analyses: the analyses or measurements of the variable of interest performed identically on two sub-samples of the same sample. The results from duplicate analyses are used to evaluate analytical or measurement precision but not the precision of sampling, preservation or storage internal to the laboratory.

Federal Water Pollution Control Act (Clean Water Act, CWA): the enabling legislation under 33 U.S.C. 1251 *et seq.*, Public Law 92-50086 Stat. 816, that empowers EPA to set discharge limitations, write discharge permits, monitor, and bring enforcement action for non-compliance.

Field of Testing: NELAC's approach to accrediting laboratories by program, method and analyte. Laboratories requesting accreditation for a program-method-analyte combination or for an up-dated/improved method are required submit to only that portion of the accreditation process not previously addressed (see NELAC, section 1.9ff).

Holding Times (Maximum Allowable Holding Times) the maximum times that samples may be held prior to analysis and still be considered valid or not compromised.

Laboratory Control Sample (however named, such as laboratory fortified blank, spiked blank, or QC check sample): a sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes from a source independent of the calibration standards or a material containing known and verified amounts of analytes. It is generally used to establish intra-laboratory or analyst specific precision and bias or to assess the performance of all or a portion of the measurement system.

Matrix: the component or substrate that contains the analyte of interest. For purposes of batch and QC requirement determinations, the following matrix distinctions shall be used:

Aqueous: any aqueous sample excluded from the definition of Drinking Water matrix or Saline/Estuarine source. Includes surface water, groundwater, effluents, and TCLP or other extracts.

Drinking Water: any aqueous sample that has been designated a potable or potential potable water source. Saline/Estuarine: any aqueous sample from an ocean or estuary, or other salt-water source such as the Great Salt Lake. Non-aqueous Liquid: any organic liquid with <15% settleable solids.

Biological Tissue, Biota: any sample of a biological origin such as fish tissue, shellfish, or plant material. Such samples shall be grouped according to origin.

Solids: includes soils, sediments, sludges and other matrices with >15% settleable solids.

Chemical Waste: a product or by-product of an industrial process that results in a matrix not previously defined.

Air: whole gas or vapor samples including those contained in flexible or rigid wall containers and the extracted concentrated analytes of interest from a gas or vapor that are collected with a sorbent tube, impinger solution, filter, or other device.

Matrix Spike (spiked sample or fortified sample): a sample prepared by adding a known mass of target analyte to a specified amount of matrix sample for which an independent estimate of Target analyte concentration is available. Matrix spikes are used, for example, to determine the effect of the matrix on a method's recovery efficiency.

Matrix Spike Duplicate (spiked sample or fortified sample duplicate): a second replicate matrix spike prepared in the laboratory and analyzed to obtain a measure of the precision of the recovery for each analyte.

Method Blank: a sample of a matrix similar to the batch of associated samples (when available) that is free from the analytes of interest, which is processed simultaneously with and under the same conditions as samples through all steps of the analytical procedures, and in which no target analytes or interferences are present at concentrations that impact the analytical results for sample analyses.

Method Detection Limit: the minimum concentration of a substance (an analyte) that can be measured and reported with 99% confidence that the analyte concentration is greater than zero and is determined from analysis of a sample in a given matrix containing the analyte.

National Institute of Standards and Technology (NIST): an agency of the US Department of Commerce's Technology Administration that is working with EPA, States, NELAC, and other public and commercial entities to establish a system under which private sector companies and interested States can be accredited by NIST to provide NIST-traceable proficiency testing (PT) to those laboratories testing drinking water and wastewater.

National Environmental Laboratory Accreditation Conference (NELAC): a voluntary organization of State and Federal environmental officials and interest groups purposed primarily to establish mutually acceptable standards for accrediting environmental laboratories. A subset of NELAP.

National Environmental Laboratory Accreditation Program (NELAP): the overall National Environmental Laboratory Accreditation Program of which NELAC is a part.

NELAC Standards: the plan of procedures for consistently evaluating and documenting the ability of laboratories performing environmental measurements to meet nationally defined standards established by the National Environmental Laboratory Accreditation Conference.

Performance Audit: the routine comparison of independently obtained *qualitative and quantitative* measurement system data with routinely obtained data in order to evaluate the proficiency of an analyst or laboratory.

Precision: the degree to which a set of observations or measurements of the same property, obtained under similar conditions, conform to themselves; a data quality indicator. Precision is usually expressed as standard deviation, variance or range, in either absolute or relative terms.

Preservation: refrigeration and/or reagents added at the time of sample collection (or later) to maintain the chemical and/or biological integrity of the sample.

PT Fields of Testing: NELAC's approach to offering proficiency testing by regulatory or environmental program, matrix type, and analyte.

Proficiency Testing: a means of evaluating a laboratory's performance under controlled conditions relative to a given set of criteria through analysis of unknown samples provided by an external source.

Proficiency Test Sample (PT): a sample, the composition of which is unknown to the analyst and is provided to test whether the analyst/laboratory can produce analytical results within specified acceptance criteria.

Quality Assurance: an integrated system of activities involving planning, quality control, quality assessment, reporting and quality improvement to ensure that a product or service meets defined standards of quality with a stated level of confidence.

Quality Control: the overall system of technical activities whose purpose is to measure and control the quality of a product or service so that it meets the needs of users.

Quality Manual: a document stating the management policies, objectives, principles, oganizational structure and authority, responsibilities, accountability, and implementation of an agency, organization, or laboratory, to ensure the quality of its product and the utility of its product to its users.

Quality System: a structured and documented management system describing the policies, objectives, principles, organizational authority, responsibilities, accountability, and implementation plan of an organization for ensuring quality in its work processes, products (items), and services. The quality system provides the framework for planning, implementing, and assessing work performed by the organization and for carrying out required QA and QC.

Quantitation Limits: the maximum or minimum levels, concentrations, or quantities of a target variable (e.g., target analyte) that can be quantified with the confidence level required by the data user.

Range: the difference between the minimum and the maximum of a set of values.

Raw Data: any original factual information from a measurement activity or study recorded in a laboratory notebook, worksheets, records, memoranda, notes, or exact copies thereof that are necessary for the reconstruction and evaluation of the report of the activity or study. Raw data may include photography, microfilm or microfiche copies, computer printouts, magnetic media, including dictated observations, and recorded data from automated instruments. If exact copies of raw data have been prepared (e.g., tapes which have been transcribed verbatim, data and verified accurate by signature), the exact copy or exact transcript may be submitted.

Reagent Blank (method reagent blank or method blank): a sample consisting of reagent(s), without the target analyte or sample matrix, introduced into the analytical procedure at the appropriate point and carried through all subsequent steps to determine the contribution of the reagents and of the involved analytical steps.

Reference Material: a material or substance one or more properties of which are sufficiently well established to be used for the calibration of an apparatus, the assessment of a measurement method, or for assigning values to materials.

Reference Method: a method of known and documented accuracy and precision issued by an organization recognized as competent to do so.

Reference Standard: a standard, generally of the highest metrological quality available at a given location, from which measurements made at that location are derived.

Replicate Analyses: the measurements of the variable of interest performed identically on two or more sub-samples of the same sample within a short time interval.

Requirement: denotes a mandatory specification; often designated by the term “shall”.

Resource Conservation and Recovery Act (RCRA): the enabling legislation under 42 USC 321 *et seq.* (1976), that gives EPA the authority to control hazardous waste from the “Cradle-to-grave”, including its generation, transportation, treatment, storage, and disposal.

Safe Drinking Water Act (SDWA): the enabling legislation, 42 USC 300f *et seq.* (1974), (Public Law 93-523), that requires the EPA to protect the quality of drinking water in the U.S. by setting maximum allowable contaminant levels, monitoring, and enforcing violations.

Sample Duplicate: two samples taken from and representative of the same population and carried through all steps of the sampling and analytical procedures in an identical manner. Duplicate samples are used to assess variance of the total method including sampling and analysis.

Spike: a known mass of target analyte added to a blank sample or sub-sample; used to determine recovery efficiency or for other quality control purposes.

Standard: the document describing the elements of laboratory accreditation that has been developed and established within the consensus principles of NELAC and meets the approval requirements of NELAC procedures and policies.

Toxic Substances Control Act (TSCA): the enabling legislation in 15 USC 2601 *et seq.*, (1976), that provides for testing, regulating, and screening all chemicals produced or imported into the United States for possible toxic effects prior to commercial manufacture.

Traceability: the property of a result of a measurement whereby it can be related to appropriate standards, generally international or national standards, through an unbroken chain of comparisons.

United States Environmental Protection Agency (EPA): the federal governmental agency with responsibility for protecting public health and safeguarding and improving the natural environment (i.e., the air, water, and land) upon which human life depends.

Validation: the process of substantiating specified performance criteria.

Verification: confirmation by examination and provision of evidence that specified requirements have been met.
NOTE: In connection with the management of measuring equipment, verification provides a means for checking that the deviations between values indicated by a measuring instrument and corresponding known values of a measured quantity are consistently smaller than the maximum allowable error defined in a standard, regulation or specification peculiar to the management of the measuring equipment. The result of verification leads to a decision either to restore in service, to perform adjustment, to repair, to downgrade, or to declare obsolete. In all cases, it is required that a written trace of the verification performed shall be kept on the measuring instrument's individual record.

Work Cell: A defined group of analysts that together perform the method analysis. Members of the group and their specific functions within the work cell must be fully documented. A "work cell" is considered to be all those individuals who see a sample through the complete process of preparation, extraction, or analysis. The entire process is completed by a group of capable individuals, each member of the work cell demonstrates capability for each individual step in the method sequence.

Appendix II

Analytical Capabilities

NELAC-Accredited Fields of Testing

Method Type	Method Number	Regulatory Program
Organics		
EDB and DBCP	EPA 504.1	Drinking Water
Metals		
ICP: General	EPA 200.7, 1994	Drinking Water
Cold Vapor Mercury	EPA 245.1, 1994	Drinking Water
Inorganic WetChem		
Perchlorate by Ion Chromatography	EPA 314.0	Drinking Water
Organics		
EDB and DBCP	EPA 504, SW846 8011	Non-Potable Water
Volatile Organics	EPA 624, SW846 8260	Non-Potable Water
Semi-Volatile Organics	EPA 625, SW846 8270	Non-Potable Water
Semi-Volatile Organics	SW846 8270 SIM	Non-Potable Water
Purgeable Aromatics	EPA 602, SW846 8021	Non-Potable Water
Chlorinated Pesticides & PCBs	EPA 608, SW846 8081A, 8082	Non-Potable Water
Poly-Aromatic Hydrocarbons	EPA 610, SW846 8310	Non-Potable Water
Nitroaromatics	SW846 8091	Non-Potable Water
Explosives	SW846 8330A, 8332	Non-Potable Water
Chlorinated Herbicides	SW846 8151A	Non-Potable Water
Organophosphorus Pesticides	SW846 8141B	Non-Potable Water
Dissolved Gases	RSK SOP 147-175	Non-Potable Water
Alcohols	SW846 8015B	Non-Potable Water
Gasoline Range Organics	SW846 8015B	Non-Potable Water
Diesel Range Organics	SW846 8015B	Non-Potable Water
Total Petroleum Hydrocarbons	FLPRO	Non-Potable Water
Tennessee EPH	TN-EPH	Non-Potable Water
Tennessee GRO	TN-GRO	Non-Potable Water
Wisconsin DRO	WI-DRO	Non-Potable Water
Petroleum Hydrocarbons	Iowa OA-1	Non-Potable Water
Petroleum Hydrocarbons	Iowa OA-2	Non-Potable Water
Volatile Petro. Hydrocarbons	Massachusetts VPH, 1998	Non-Potable Water
Extractable Petro. Hydrocarbons	Massachusetts EPH, 1998	Non-Potable Water
Metals		

Method Type	Method Number	Regulatory Program
ICP: General – EPA WW	EPA 200.7, 1994; SW-846 6010B	Non-Potable Water
Cold Vapor Mercury – EPA WW	EPA 245.1, 1994; SW-846 7470A	Non-Potable Water
Inorganic WetChem		
Alkalinity	SM2320B	Non-Potable Water
CBOD	SM 5210B	Non-Potable Water
COD	SM5220C	Non-Potable Water
BOD	SM5210B	Non-Potable Water
Color, Apparent	SM2120B	Non-Potable Water
Ion Chromatography (Bromide, Fluoride, Chloride, Sulfate, Nitrite, Nitrate,) – Aqueous	EPA 300.0, SW846 9056	Non-Potable Water
Total Kjeldahl Nitrogen	EPA 351.2	Non-Potable Water
Ammonia	EPA 350.1	Non-Potable Water
Oil & Grease, Gravimetric – AQ	EPA 1664, SW846 9070	Non-Potable Water
Orthophosphate	EPA 365.3	Non-Potable Water
Nitrate	SM 4500NO2-B	Non-Potable Water
pH by electrode (Waters)	SM4500H+B; SW846 9040	Non-Potable Water
Specific Conductance	EPA 120.1	Non-Potable Water
Nitrate-Nitrite	SM 4500 NO3-E	Non-Potable Water
Sulfide	SM4500S=F	Non-Potable Water
Chloride	SM 4500 Cl-B	Non-Potable Water
Total Dissolved Solids	SM2540C	Non-Potable Water
Total Organic Carbon	SM5310B, SW846 9060	Non-Potable Water
Total Phosphorus	EPA 365.3	Non-Potable Water
Total Solids	SM2540B	Non-Potable Water
Total Suspended Solids	SM2540D	Non-Potable Water
Turbidity	EPA 180.1	Non-Potable Water
Total CN	EPA 335.4, SW846 9012	Non-Potable Water
Un-Ionized Ammonia - calculation	FDE SOP10/03/83	Non-Potable Water
Perchlorate	EPA 314	Non-Potable Water
Calcium Hardness by Calculation	SM18 2340B	Non-Potable Water
Hardness, Total by Calculation	SM18 2340B	Non-Potable Water
MBAS (Anionic Surfactants as)	SM5540C	Non-Potable Water
Corrosivity & pH – aqueous	SW846 9040	Non-Potable Water
Hexavalent Chromium	SW846 7196A	Non-Potable Water
Organics		
EDB and DBCP	SW846 8011 Mod	Solid and Chemical Material
Volatile Organics	SW846 8260B	Solid and Chemical Material

Method Type	Method Number	Regulatory Program
Semi-Volatile Organics	SW846 8270C	Solid and Chemical Material
Semi-Volatile Organics	SW846 8270C SIM	Solid and Chemical Material
Gasoline Range Organics	SW846 8015B	Solid and Chemical Material
Diesel Range Organics	SW846 8015B	Solid and Chemical Material
Alcohols	SW846 8015B	Solid and Chemical Material
Polynuclear-Aromatic Hydrocarbons	SW846 8310	Solid and Chemical Material
Explosives	SW846 8330A, 8332	Solid and Chemical Material
Organochlorine Pesticides	SW846 8081A	Solid and Chemical Material
Polychlorinated Biphenyls	SW846 8082	Solid and Chemical Material
Chlorinated Herbicides	SW846 8151A	Solid and Chemical Material
Organophosphorus Pesticides	SW846 8141B	Solid and Chemical Material
Total Petroleum Hydrocarbons	FLPRO	Solid and Chemical Material
Tennessee EPH	TN-EPH	Solid and Chemical Material
Tennessee GRO	TN-GRO	Solid and Chemical Material
Wisconsin DRO	WI-DRO	Solid and Chemical Material
Petroleum Hydrocarbons	Iowa OA-1	Solid and Chemical Material
Petroleum Hydrocarbons	Iowa OA-2	Solid and Chemical Material
Volatile Petro. Hydrocarbons	Massachusetts VPH	Solid and Chemical Material
Extractable Petro. Hydrocarbons	Massachusetts EPH	Solid and Chemical Material
Metals		
ICP: General – EPA WW	SW846 6010B	Solid and Chemical Material
Cold Vapor Mercury – EPA DW	SW846 7471A	Solid and Chemical

Method Type	Method Number	Regulatory Program
		Material
Inorganic WetChem		
Ion Chromatography (Bromide, Fluoride, Chloride, Sulfate, Nitrite, Nitrate,) – Aqueous	SW846 9056	Solid and Chemical Material
Oil & Grease, Gravimetric – Solid	SW846 9071	Solid and Chemical Material
Total CN	SW846 9012	Solid and Chemical Material
Total Organic Carbon	SW846 9060	Solid and Chemical Material
Ammonia	EPA 350.1	Solid and Chemical Material
Total Kjeldahl Nitrogen	EPA 351.2	Solid and Chemical Material
Total Phosphorus	EPA 365.3	Solid and Chemical Material
Waste Ignitability	SW846 1010	Solid and Chemical Material
Hexavalent Chromium/soils	SW846 7196A	Solid and Chemical Material
Corrosivity & pH – aqueous	SW846 9040B	Solid and Chemical Material
Corrosivity & pH – solid	SW846 9045B	Solid and Chemical Material
Organics		
Volatile Organics	TO-3	Air and Emissions
Preparation Methods*		
Liquid/Liquid Extraction, Water	SW846 3510C	
Solid Phase Extraction, Water	SW846 3535A	
Solids Extraction by Sonication	SW846 3550B	
Acid/Base Partitioning	SW846 3650B	
Sulfur Cleanup of Extracts	SW846 3660B	
Sulfuric Acid Cleanup	SW846 3665A	
Purge & Trap - Aqueous	SW846 5030B	

Method Type	Method Number	Regulatory Program
Purge & Trap – Solids	SW846 5035A	
Total Recoverable Metals Digestion	EPA 200.7	
Non-Pot. Water Digest: ICP	SW846 3010A	
Alkaline Digestion of Soils for Hexavalent Chromium	SW846 3060A	
Digestion of Soils for ICP	SW846 3050B	
TCLP	SW846 1311	
SPLP	SW846 1312	

* Preparation methods are not listed on Primary NELAC Accreditation per State of Florida DOH rules. However, for the benefit of other accrediting authorities, these methods are inspected during FDOH visits. Listing of surveyed and approved preparation methods is available from on-site inspection report.

Non-NELAC-Accredited Fields of Testing

Method Type	Method Number	Regulatory Program
Organics		
Thiodiglycol	Accutest in-house method (HPLC)	Solid and Chemical Material
Volatile Petroleum Hydrocarbons	Missouri Gasoline Range Organics	Solid and Chemical Material
Extractable Hydrocarbons	Missouri Diesel Range Organics	Solid and Chemical Material
Extractable Hydrocarbons	Missouri Oil Range Organic	Solid and Chemical Material
Inorganic WetChem		
Oxidation-Reduction Potential	ASTM D1498-76, mod. for solids	Solid and Chemical Material
Percent Ash (dry basis)	ASTM D2974-87, D482-91	Solid and Chemical Material
Grain Size (hydrometer)	ASTM D422-63	Solid and Chemical Material
Sieve Testing	ASTM D422-63	Solid and Chemical Material
Specific Gravity	ASTM D1298-85	Solid and Chemical Material
Acidity	EPA 305.1	Non-Potable Water
Dissolved Oxygen	EPA 360.1	Non-Potable Water
Mineral Suspended Solids	EPA 160.2/160.4	Non-Potable Water
Organophosphonic Acids	Accutest in-house method (IC)	Solid and Chemical Material
Perchlorate	EPA 314MOD	Solid and Chemical Material
Percent Solids	EPA 160.3 MOD	Non-Potable Water
Settleable Solids	EPA 160.5	Non-Potable Water
Total Mineral Solids	EPA 160.4	Non-Potable Water
Total Residual Chlorine	EPA 330.5	Non-Potable Water
Total Volatile Solids	EPA 160.4	Non-Potable Water
Volatile Suspended Solids	EPA 160.2/160.4	Non-Potable Water
CÑ Amenable to Chlorination	EPA 335.4	Solid and Chemical Material
Bicarbonate, Carbonate, CO2	SM18 4500 CO2D	Non-Potable Water
Ferrous Iron	SM18 3500 FE-D	Non-Potable Water
Salinity - calculation	SM18 2520B	Non-Potable Water

Method Type	Method Number	Regulatory Program
Paint Filter Test	SW846 9095	Solid and Chemical Material
Sulfide/Cyanide Reactivity	SW846 Chapter 7	Solid and Chemical Material
Corrosivity & pH – aqueous	SW846 9040B	Solid and Chemical Material

Appendix III

Equipment List

ORGANIC INSTRUMENTATION

Instrument	Model	Location	Serial #	Year
GC/MS	Agilent 5975C MSD/OI 4551/4660	MS-VOA	US83120965	2008
GC/MS	Agilent 5975N MSD/Agilent 7683 AS	SVOC Lab	US71225975	2007
GC/MS	Agilent 5975N MSD/Agilent 7683 AS	SVOC Lab	US62724401	2006
GC/MS	Agilent 5975N MSD/Agilent 7683 AS	SVOC Lab	US53921303	2005
GC/MS	Agilent 5973 MSD/OI 4660/4552 Archon	MS-VOA	US41746628	2004
GC/MS	Agilent 5973 MSD/OI 4660/4552 Archon	MS-VOA	US41746633	2004
GC/MS	Agilent 5973 MSD/OI 4560/4552 Archon	Soil VOA	US21843765	2002
GC/MS	Agilent 5973 MSD/OI 4560/4552 Archon	MS-VOA	US21844034	2002
GC/MS	Agilent 5973 MSD/OI 4660/4552 Archon	MS-VOA	US02440350	2000
GC/MS	Agilent 5973 MSD/OI 4560/4552 Archon	MS-VOA	US94240108	1999
GC/MS	Agilent 5973 MSD/Agilent 7683 AS	SVOC Lab	US82311290	1998
GC/MS	Agilent 5973 MSD/Agilent 7683 AS	SVOC Lab	US81211109	1998
GC/MS	Hewlett-Packard 5970 MSD/OI 4560/4552 Archon	Soil VOA	3034A12782	1989
GC/MS	Hewlett-Packard 5970 MSD/OI 4560/4552 Archon	Soil VOA	2905A11904	1987
GC/MS	Hewlett-Packard 5970 MSD/OI 4560/4552 Archon	Soil VOA	2716A10454	1987
GC	Agilent 7890A/Dual ECD/7683B AS	SVOC Lab	CN10842133	2008
GC	Agilent 6890/Dual FPD/7683B AS	SVOC Lab	US10643024	2006
GC	Agilent 6890/Dual FID/7683B AS	SVOC Lab	CN10641049	2006
GC	Agilent 6890/Dual ECD/7683B AS	SVOC Lab	CN10641081	2006
GC	Agilent 6890/Dual ECD/7683B AS	SVOC Lab	US10613003	2006
GC	Agilent 6890/PID/PID/OI 4560/4552 Archon	GC VOA	CN10421047	2004
GC	Agilent 6890/PID/FID/ENTECH 7032A-LB	GC VOA	US10239007	2002
GC	Agilent 6890N/Dual FID/HP 7683 AS	SVOC Lab	CN10425061	2004

Instrument	Model	Location	Serial #	Year
GC	Agilent 6890N/Dual ECD/HP 7683 AS	SVOC Lab	US10333015	2003
GC	Agilent 6890/Dual ECD/HP 7683 AS	SVOC Lab	US00036916	2000
GC	Agilent 6890/Dual ECD/HP 7683 AS	SVOC Lab	US00028304	1999
GC	Hewlett-Packard 5890/Dual FID/HP 7673 AS	SVOC Lab	3336A61096	1995
GC	Hewlett-Packard 5890/PID/FID/ OI 4560/4552 Archon	GC VOA	3336A60617	1995
GC	Hewlett-Packard 5890/Dual FID/HP 7673 AS	SVOC Lab	3336A59489	1995
GC	Hewlett-Packard 5890/PID/FID/ OI 4560/4552 Archon	GC VOA	3336A51045	1995
GC	Hewlett-Packard 5890/PID/ELCD/OI 4560/4552 Archon	GC VOA	3203A41646	1992
GC	Hewlett-Packard 5890/Dual FID/HP 7673 AS	SVOC Lab	3126A51085	1991
GC	Hewlett-Packard 5890/Dual ECD/HP 7673 AS	SVOC Lab	2921A24618	1990
GC	Hewlett-Packard 5890/PID/FID/ dual MPM 16	Soil VOA	3029A29748	1990
GC	Hewlett-Packard 5890/FID	Soil VOA	2843A20183	1988
GC	Hewlett-Packard 5890/Dual ECD/HP 7673 AS	SVOC Lab	2728A14096	1987
HPLC	Agilent 1100 Automated LC System	HPLC Room	DE91606857	1999
HPLC	Agilent 1100 Automated LC System	HPLC Room	DE23917648	1998
HPLC	Agilent 1100 Automated LC System	HPLC Room	DE01608404	2000
HPLC	Agilent 1100 Automated LC System	HPLC Room	DE40522115	2004
HPLC	Agilent 1100 Automated LC System	HPLC Room	DE03000863	2003
O-Prep	ESSA LM2-P Ring and Puck mill	Explosives Prep Lab	215090-004	2008
O-Prep	TurboVap 4 units	Organic Prep Lab		2001
O-Prep	TurboVap 3 units	Organic Prep Lab		2004
O-Prep	TurboVap 1 unit	Organic Prep Lab		2007
O-Prep	Sonicator 2 units	Organic Prep Lab		2004
O-Prep	Sonicator 3 units	Organic Prep Lab		2007
O-Prep	Midi-Vap 2000 Kontes	Organic Prep Lab	479200-2000	2000

Instrument	Model	Location	Serial #	Year
Data System	Hewlett-Packard/MS ChemStation	Labwide		1999

Inorganic Instrumentation

Instrument	Model	Location	Serial #	Year
ICP	TJA EnviroTrace 61E Simultaneous	Metals Lab	348490	1994
ICP	Thermo ICAP 6000 Series	Metals Lab		2010
Mercury Analyzer	Leeman Hydra AA	Metals Lab	HA-2022	2002
Mercury Analyzer	Leeman Hydra AA	Metals Lab	HA-6007	2005
TOC Analyzer	Shimadzu	WetChem IC room	H51404235007	2004
IC	Dionex DX-500	WetChem IC room	99030664	1999
IC	Dionex	WetChem IC room	04070250	2004
Digestion block	DigiPrep	WetChem main room	3 units	2005
Centrifuge	CentraCL2	WetChem main room	42613052	2003
Spectrophotometer	Milton-Roy Spectronic 200	WetChem main room		2000
MicroDistillation Block	Lachat	WetChem main room	2 units	2005
Auto Analyzer	QuickChem 8500	WetChem main room	050500000130	2005

LIMS		
Instrument	**Model**	**Year**
LIMS	HP True 64	1999

Appendix IV

Certification Summary

Certifying Authority	Certification Program	Registration No.
Alaska	Contaminated Sites	UST-088
Arkansas	Solid/Hazardous Wastes, Non-Potable Water	88-0620
California (NELAP)	Potable Water, Solid/Hazardous Waste	04226CA
Department of Defense (DoD)	Non-Potable Water, Solid and Chemical Materials	L-2229
Florida (NELAP)	Potable, Non-Potable, Solid Waste, UST, Air Toxics	E83510
Georgia	Potable Water	934
Georgia	Solid/Hazardous Wastes	Not Applicable
Iowa	UST, Solid/Hazardous Wastes, Non-Potable Water	IA366
Kansas (NELAP)	Solid/Hazardous Wastes, Non-Potable Water	E-10327
Kentucky	Underground Storage Tank Program	0065
Louisiana (NELAP)	Solid/Hazardous Wastes	38582
Massachusetts	Non-Potable Water	M-FL946
Mississippi	Potable Water	Not Applicable
Nevada	Non-Potable Water, Solid/Hazardous Wastes	FL009462008A
New Jersey (NELAP)	Solid/Hazardous Wastes, Non-Potable Water	FL002
North Carolina	Solid/Hazardous Wastes, Non-Potable Water	573
Oklahoma	Non-Potable Water, Solid/Hazardous Waste	9959
South Carolina	Solid/Hazardous Wastes, Non-Potable Water	96038001
Texas (NELAP)	Non-Potable Water, Solid/Hazardous Waste	T104704040-08-TX
US Dept. of Agriculture	Foreign Soils Permit	S-56027
US Navy NFESC	NFESC Validated Solid/Hazardous Waste	Not Applicable
Utah (NELAP)	Potable, Non-Potable, Solid/Chemical Materials	FL009462008A
Washington	Potable, Non-Potable, Solid/Chemical Materials, Air	C2046
Texas (NELAP)	Non-Potable Water, Solid/Hazardous Waste, Air Toxics	T104704234-08-TX
Wisconsin	Solid/Hazardous Wastes, Non-Potable Water	399043370

Appendix V

SOP List

SOP #	TITLE
	Organic Preparation Department
OP002	SOP for Glassware Cleaning and Storage
OP003	SOP for Reagent Prep
OP006	SOP for the Extraction of Semi-volatile Organics (BNAs) from Aqueous Samples
OP007	SOP for the Extraction of Semi-volatile Organics (BNAs) from Solid Samples
OP008	SOP for the Extraction of Pesticides/PCBs from Aqueous Samples
OP009	SOP for the Extraction of Pesticides/PCBs from Solid Samples
OP010	SOP for the Extraction of Diesel Range Organics (DRO) from Aqueous Samples
OP011	SOP for the Extraction of Diesel Range Organics (DRO) from Solid Samples
OP012	SOP for the Extraction of Petroleum Related Organics (FL-PRO) from Aqueous Samples
OP013	SOP for the Extraction of Petroleum Related Organics (FL-PRO) from Solid Samples
OP014	SOP for the Extraction of PAHs from Aqueous Samples (HPLC)
OP015	SOP for the Extraction of PAHs from Solid Samples (HPLC)
OP016	SOP for the Extraction of EDB/DBCP from Aqueous Samples
OP017	SOP for the Extraction of EDB/DBCP from Solid Samples
OP018	SOP for the Extraction of Explosives from Aqueous Samples
OP019	SOP for the Extraction of Explosives from Solid Samples
OP020	SOP for Sample Introduction via SW846-5035
OP021	SOP for Sample Introduction via SW846-5030B
OP022	SOP For The Extraction Of Nitroglycerine And Pentaerythritoltetranitrate (PETN) From Water Samples (HPLC Analysis)
OP023	SOP For The Extraction Of Nitroglycerine And Pentaerythritoltetranitrate (PETN) From Solid Samples (HPLC Analysis)
OP024	Standard Operating Procedure For The Extraction Of Nitroaromatics From Water Samples
OP025	SOP For Sample Preparation For Dissolved Gases In Aqueous Samples
OP026	SOP For The Extraction Of Extractable Petroleum Products (OA-2) From Water Samples
OP027	SOP For The Extraction Of Extractable Petroleum Products (OA-2) From Solid Samples
OP028	SOP For The Extraction Of Diesel And Oil Range Organics From Water Samples
OP029	SOP For The Extraction Of Diesel And Oil Range Organics From Solid Samples
OP030	SOP For The Extraction Of Extractable Petroleum Hydrocarbons From Water Samples (Tennessee EPH)
OP031	SOP For The Extraction Of Extractable Petroleum Hydrocarbons From Solid

SOP #	TITLE
	Samples (Tennessee EPH)
OP032	SOP For The Extraction Of Volatile Petroleum Hydrocarbons From Soil Samples
OP033	SOP For The Extraction Of PCBs From Wipes
OP034	SOP For The Extraction Of Diesel Range Organics (DRO) From Aqueous Samples WI-DRO
OP035	SOP For The Extraction Of Massachusetts Extractable Petroleum Hydrocarbons From Water Samples
OP036	SOP For The Extraction Of Massachusetts Extractable Petroleum Hydrocarbons From Solid Samples
OP037	SOP For The Extraction Of Chlorinated Herbicides From Water Samples
OP038	SOP For The Extraction Of Chlorinated Herbicides From Soil Samples
OP039	SOP For The Solid Phase Extraction (SPE) Cartridge Cleanup Of Pesticide Extracts
OP040	SOP For SPLP Leaching Of SVOC And Metals
OP041	SOP For TCLP Leaching Of VOC
OP042	SOP For SPLP Leaching Of SVOC And Metals
OP043	SOP For SPLP Leaching Of VOC
OP044	SOP For The Extraction Of Organophosphorus Pesticides From Water Samples
OP045	SOP For The Extraction Of Organophosphorus Pesticides From Soil Samples
	Gas Chromatography/ HPLC SOPs
GC002	Analysis Of 1,2-Dibromoethane (EDB) And 1,2-Dibromo-3-Chloropropane (DBCP) By Gas Chromatography, Electron Capture Detector
GC004	Aromatic Volatiles By Gas Chromatography Using PID Detectors EPA 602
GC005	Analysis Of Organochlorine Pesticides By Gas Chromatography, Electron Capture Detector EPA 608
GC006	Analysis Of Polychlorinated Biphenyls By Gas Chromatography, Electron Capture Detector EPA 608
GC007	Analysis Of Polynuclear Aromatic Hydrocarbons By Gas Chromatography, Flame Ionization Detector EPA 610
GC008	Analysis Of Petroleum Range Organics By Gas Chromatography Using Flame Ionization Detector
GC009	Analysis Of 1,2-Dibromoethane (EDB) And 1,2-Dibromo-3-Chloropropane (DBCP) By Gas Chromatography, Electron Capture Detector SW-846 8011
GC010	Analysis Of Gasoline Range Organics By Gas Chromatography Using Flame Ionization Detector
GC011	Analysis Of Diesel Range Organics By Gas Chromatography Using Flame Ionization Detector
GC014	Analysis Of Polychlorinated Biphenyls By Gas Chromatography, Electron Capture Detector SW-846 8082

SOP #	TITLE
GC015	Analysis Of Organochlorine Pesticides By Gas Chromatography, Electron Capture Detector SW-846 8081
GC016	Analysis Of Nitroaromatics And Nitramines By HPLC
GC017	Aromatic Volatiles By Gas Chromatography Using PID Detectors SW-8021
GC018	Analysis Of Polynuclear Aromatic Hydrocarbons By HPLC SW-846 8310
GC019	Analysis Of Dissolved Gases By Gas Chromatography, Flame Ionization Detector
GC020	Analysis Of Nitroglycerine And PETN By HPLC
GC021	Analysis Of Volatile Petroleum Hydrocarbons By Gas Chromatography
GC022	Analysis Of Extractable Petroleum Products By Gas Chromatography Using Flame Ionization Detector OA-2
GC023	Analysis Of Diesel And Oil Range Organics By Gas Chromatography Using Flame Ionization Detector
GC024	Analysis Of Petroleum Hydrocarbons By Gas Chromatography Using Flame Ionization Detector (Tennessee EPH)
GC025	Analysis Of Nitroaromatics By Gas Chromatography Using Electron Capture Detector
GC026	Method For Determination Of Volatile Petroleum Hydrocarbons By GC-PID/FID
GC027	Analysis Of Non-Halogenated Organics By Gas Chromatography Using Flame Ionization Detector
GC028	Analysis Of Gasoline Range Organics By Gas Chromatography Using Flame Ionization Detector TDEC GRO
GC029	Analysis Of Diesel Range Organics By Gas Chromatography Using Flame Ionization Detector Wi DRO
GC030	Analysis Of Extractable Petroleum Hydrocarbons By Gas Chromatography Using Flame Ionization Detector MA-EPH
GC031	Analysis Of Chlorinated Herbicides Using GC-ECD
GC032	Analysis Of Organophosphorus Pesticides Using GC-NPD Or FPD
GC033	Air Analysis By GC-PID/FID
GC034	Analysis Of Nitroaromatics, Nitramines And Nitrate Esters By HPLC Method 8330b
GC035	Screening Of Volatile Organics By GC-PID/FID

Mass-Spectrometry SOPs

MS003	Analysis of Volatile Organics by EPA Method 624
MS004	Analysis of Semi-volatile Organics by EPA Method 625
MS005	Analysis of Volatile Organics by EPA Method 8260B
MS006	Analysis of Semi-volatile Organics by EPA Method 8270C
MS008	Analysis of Semi-volatile Organics by EPA Method 8270C SIM
MS009	Analysis of Volatile Organics by GC/MS
MS010	Analysis of Volatile Organics by GC/MS SIM

SOP #	TITLE

Quality Assurance SOPs

QA001	Preparation, Approval, Distribution & Archiving Of Standard Operating Procedures (SOPs)
QA002	Calibration Of Thermometers
QA003	Personnel Training And Analyst Proficiency
QA004	Temperature Monitoring
QA005	Calibration Of Analytical Balances
QA006	Eppendorf Pipette Calibration
QA007	Sample Batching Procedure
QA008	Creating New Accounts
QA009	Creating New Projects
QA010	Confidentiality Protection Procedures
QA011	Signature Authority
QA012	Employee Technical Ethics Responsibilities
QA013	Client Complaint Resolution Procedure
QA014	Procedures For The Purchase Of Laboratory Supplies
QA015	Procedures For The Preparation, Distribution, Use And Archiving Of Laboratory Logbooks
QA016	Corrective Action Procedure
QA017	Standards Traceability Documentation Procedure
QA018	Procedure For Login, Management, Handling, And Reporting Of Proficiency Test (Pt) Samples
QA019	Quality System Review
QA020	Procedure For Developing Method Performance Criteria And Experimental Method Detection Limits
QA021	Subcontracting Procedures
QA022	Internal Audit Procedure
QA023	Fume Hood Inspection
QA027	Review Of Inorganics Data
QA028	Review Of Organics Data
QA029	Manual Integration Of Chromatographic Peaks
QA030	Procedure For The Development And Use Of in-house Quality Control Criteria
QA031	Air Quality Monitoring Of Extraction Laboratory
QA032	Routine Maintenance For Major Analytical Instrumentation
QA033	Laboratory Safety
QA034	Sample Homogenizing
QA035	Solvent Testing And Approval
QA036	Data Package Generation
QA037	Deionized Water Quality Control Procedure
QA038	Data Integrity Training Procedure
QA039	Data Integrity Monitoring Procedure
QA040	Procedure For Conducting Data Integrity Investigations

SOP #	TITLE
QA041	Procedure For The Confidential Reporting Of Data Integrity Issues
QA042	Basic Calculations For General Chemistry Methods
QA043	Data Qualifier SOP
QA044	Calibration Of Micro-Distillation Tubes
QA045	Estimation of Uncertainty
QA046	Document Control
QA047	Management of Client Project
QA048	Data Entry for Log-In

General Chemistry SOPs

GNSOP: 101	Acidity (pH 8.2)
GNSOP: 102	Alkalinity, Total (pH 4.5)
GNSOP: 103	Ammonia – Distillation Procedure
GNSOP: 104	Nitrogen, Ammonia
GNSOP: 105	Bicarbonate, Carbonate, Free Carbon Dioxide
GNSOP: 106	Chemical Oxygen Demand
GNSOP: 107	Chloride by Titration
GNSOP: 109	Color, Apparent
GNSOP: 110	Chromium, Hexavalent (Water)
GNSOP: 113	Cyanide Distillation/Aqueous And Solid Samples
GNSOP: 115	Cyanide, Total
GNSOP: 116	Dissolved Oxygen
GNSOP: 121	Ignitability
GNSOP: 122	Anionic Surfactants As MBAS
GNSOP: 123	Nitrogen, Nitrite
GNSOP: 126	Ortho Phosphate
GNSOP: 127	Paint Filter Liquids Test
GNSOP: 128	Phenols Distillation, Soil And Water Samples
GNSOP: 130	Phenols, Total Recoverable
GNSOP: 133	Settleable Solids
GNSOP: 134	Total Suspended Solids (Non Filterable Residue)
GNSOP: 135	Total Dissolved Solids (Total Filterable Residue)
GNSOP: 136	Reactive Sulfide And Reactive Cyanide
GNSOP: 137	pH By Electrode - Water
GNSOP: 140	Sulfide
GNSOP: 144	Total Phosphorus
GNSOP: 145	Turbidity
GNSOP: 147	Winkler Titration For DO Standardization
GNSOP: 161	Percent Solids
GNSOP: 163	Specific Conductance At 25 C.
GNSOP: 166	pH By Electrode – Soil
GNSOP: 167	Biochemical Oxygen Demand (BOD)
GNSOP: 171	Hexachromium In Soils

SOP #	TITLE
GNSOP: 179	Corrosivity (Soil pH By Electrode)
GNSOP: 182	Total Kjeldahl Nitrogen
GNSOP: 189	Corrosivity Toward Steel
GNSOP: 190	Total Nitrogen, Organic Nitrogen
GNSOP: 191	Nitrogen, Nitrate
GNSOP: 192	Carbonaceous Biochemical Oxygen Demand (CBOD)
GNSOP: 193	Oxidation-Reduction Potential
GNSOP: 194	Ferrous Iron
GNSOP: 196	Glassware Cleaning
GNSOP: 197	Anions By Ion Chromatography
GNSOP: 211	Oil & Grease And PHC By 1664
GNSOP: 212	Fractional Organic Carbon
GNSOP: 213	Walkley-Black Total Organic Carbon
GNSOP: 214	Particle Size By Sieve
GNSOP: 215	TOC In Water
GNSOP: 216	Particle Size By Hydrometer
GNSOP: 218	Perchlorate
GNSOP: 219	Bulk Density
GNSOP: 222	Un-Ionized Ammonia Calculation
GNSOP: 224	Hardness By Calculation
GNSOP: 225	Cation Exchange Capacity Of Soils (Sodium Acetate)
GNSOP: 226	TOC In Soil
GNSOP: 227	Oil And Grease – Gravimetric Analysis (Soils)
GNSOP: 228	Anions By Ion Chromatography - IC 2000
GNSOP: 229	Determination Of Nitrocellulose In Water
GNSOP: 230	Determination Of Nitrocellulose In Soil

Metals SOPs

MET 100	Metals By Inductively Coupled Plasma
MET 103	Digestion Of Water Samples For Flame And ICP Analysis
MET 104	Digestion Of Soils For ICP Analysis
MET 105	Cold Vapor Analysis Of Mercury For Soils
MET 106	Cold Vapor Analysis Of Mercury For Water Samples

Sample Management SOPs

SAM101	Sample Receipt And Storage
SAM102	Procedure For Sample Bottle Preparation And Shipment
SAM104	Sample Container Quality Control
SAM108	Sample And Laboratory Waste Disposition

GCAL

GULF COAST ANALYTICAL LABORATORIES, INC

QUALITY ASSURANCE PROGRAM PLAN

FOR

GCAL Inc.
7979 GSRI Avenue
Baton Rouge, Louisiana 70820
225-769-4900

Revision 29
August 20, 2010

Approval Signatures:

08/19/10
Date
Randy Whittington – Chief Executive Officer

8/19/10
Date
Allison Naquin – General Manager/Laboratory Manager

8/19/10
Date
James Turner – QA Director

1 Quality Assurance Policy Statement 4
2 Ethics Policy 6
3 Administrative Organization 8
3.1 Roles, Responsibilities, and Qualifications 8
3.2 Personnel Training 10
3.3 Training Files 11
4 Quality Assurance 12
4.1 Quality Assurance Responsibilities 12
4.2 Performance audits (PT studies) 12
4.3 Accreditation 13
4.4 Quality Control 14
4.5 Statistical Control 16
4.6 Audits 17
4.7 Nonconformance/Corrective Actions 19
4.8 Customer Inquiries/Complaints 20
4.9 Service to Clients 20
5 Data Documentation, Validation, and Reporting 21
5.1 Recording data 21
5.2 Data Reduction 21
5.3 Data Review 22
5.4 Data Validation 23
5.5 Data Reporting 23
5.6 Sub-contracting 25
5.7 Data Storage 25
6 Facility Description and Equipment 27
6.1 Laboratory Facilities 27
6.2 Procurement and Inventory Control 27
6.3 Capital Equipment 27
6.4 Equipment Operation and Calibration 28
6.5 Equipment Maintenance 28
6.6 Reagents 29
6.7 Standards 30
7 Analytical Methodology 32
7.1 Method Validation 32
7.2 Methods Outside of Scope of Accreditation 33
7.3 Review of New Work 34
7.4 Analytical Methods 34
8 Sample Custody and Integrity 42
8.1 Sample Acceptance Policy 43
8.2 Chain of Custody 43
8.3 Internal Chain of Custody 44
8.4 Custody Transfer 44
8.5 Sample Kits 44
8.6 Shipping Requirements 44
9 STANDARD OPERATING PROCEDURES 46

10 Sample Handling Guidelines 47
10.1 Waste Collection and Storage 50
10.2 Pollution Prevention 50
11 Safety Procedures 51
11.1 Basic Safety Rules 51
11.2 Arrangement of Furniture And Equipment 51
11.3 Hoods And Ventilation 51
11.4 Spills 52
11.5 Emergency Equipment 52
11.6 Protective Equipment 52
11.7 Storage of Laboratory Materials 53
11.8 Chemical And Sample Handling 53
12 Confidentiality 54
Appendix A - Organizational Chart
Appendix B - Key Personnel Resumes
Appendix C - Equipment List
Appendix D - Facility Floor Plan
Appendix E - List of Accreditations
Appendix F - List of SOP's

1 Quality Assurance Policy Statement

Quality Assurance consists of a planned system of activities necessary to provide confidence in the results of laboratory analytical determinations. The principal objective of GCAL is the production of high quality analytical data through the use of measurements that are accurate and reliable for the intended purpose. We are dedicated to providing analytical data and services that conform to all of the requirements specified and expected by our clients. This Quality Assurance Program Plan (QAPP) details facilities, personnel and equipment necessary for accomplishing this objective along with general procedures and practices that will be followed to maintain adherence to the objective. All policies and procedures have been structured in accordance with the NELAC standards, the DOD Quality Systems Manual, and in accordance with applicable state, EPA, and other regulatory agency requirements, regulations, methods, and guidance. GCAL's management staff is dedicated to maintaining compliance with both the NELAC Standard and the DOD Quality Systems Manual.

There is a commitment and dedication by all laboratory staff to produce data of known and documented quality. This commitment and dedication to quality is fully supported from the bench level to upper management in order to meet the objectives of our laboratory and best serve our clients.

GCAL's approach to Quality Assurance starts with the General Manager who delineates policy and sets goals in conjunction with senior management personnel. Management staff and laboratory personnel implement policies. All departments are involved in the process by providing assessment of operating procedures along with recommendations for improvements or corrections. The QAPP and the appropriate Standard Operating Procedures are distributed to all laboratory personnel as controlled documents according to SOP QA-001 (Document Control). All personnel are required to read and comply with this program.

The Quality Assurance/Quality Control Director oversees prevention, assessment, and correction procedures for the analytical laboratory and various associated departments within the organization. These three functions; prevention, assessment, and correction, comprise the foundation of the laboratory's approach to Quality Assurance. Through this foundation, GCAL's management staff is committed to continually improve the quality system.

Prevention covers positive actions taken before or during analyses to insure that the analytical systems are functioning properly. Prevention includes such things as instrument calibration and maintenance, frequent standardization, personnel training and quality control planning.

Assessment is a component of quality control that includes monitoring of performance to determine precision and accuracy. Examples include duplicate and spike analyses, check samples, peer review of calculations and validation of methodology.

Correction is action taken to determine the causes of quality defects and to restore proper functioning of the analytical system. This includes trouble shooting to correct instrument malfunctions, or retraining of personnel.

All quality assurance activity requires constant monitoring and documentation to provide evidence of consistent, valid analytical data. GCAL keeps records of such activities in order to have available for its clients documented assurance that the data they receive quantitatively reflect the parameters requested.

The policies and practices of quality assurance/quality control presented in this plan are set forth as minimums. Additional quality assurance/quality control measures are defined by a specific project plan.

In the case of discrepancies between this document and SOPs, the SOP shall take precedence. A list of supporting SOPs including technical procedures are located in Appendix F of this document.

Randy Whittington, CEO

2 Ethics Policy

GCAL utilizes a clearly stated ethics policy in the form of the following Ethics and Data Integrity Statement. This agreement is discussed with all new employees during orientation and is then signed and retained with the employee's training file. Violation of the agreement is basis for termination of employment. Employees receive training in data integrity annually. Each employee signs the ethical policy yearly.

GCAL

ETHICS AND DATA INTEGRITY AGREEMENT

I, _____, state that I understand the high standards of integrity required of me with regard to the duties I perform and the data I report in connection with my employment at GCAL. Our core values are honesty, success, service and integrity. I understand that it is critical for our long-term success that each and every employee aligns with all company core values.

I agree that in the performance of my duties for GCAL and its clients, I shall conform to the following ethics standards and will report immediately to the Quality Assurance Manager and the appropriate supervisor any information concerning misrepresentation of analytical data that includes, but is not limited to:

1) Altering an instrument computer or clock for any inappropriate purpose;

2) Altering the contents of logbooks and/or data sheets to misrepresent data;

3) Misrepresenting an analyst's identity;

4) Changing raw data documents with correction fluid;

5) Preparation and submittal of "fake" data packages;

6) Inappropriate calibration techniques such as peak shaving, setting fraudulent integrator parameters, or use of computer macros that alter QC results.

7) Changing reported results without proper documentation and approval;

8) Altering injection volumes for calibration and misrepresenting the true values;

9) Failure to comply with standard operating procedures or methods without proper documentation and approval;

10) Any attempt to misrepresent data or events as they actually occur in the course of data production, review or reporting;

11) Disposing of or deleting electronic data files or hardcopy of raw data;

12) All QC and PT samples must be analyzed in the same manner as client samples. This includes glassware selection, all prep steps, any clean up steps, reagent addition, and analysis, unless specified to be different by the SOP or reference method;

13) Engaging in any practice that ultimately misrepresents data or narratives in any way.

I will not knowingly participate in any such activity and will not tolerate unethical practices by others. I understand that confidentiality will be strictly enforced by GCAL when dealing with these matters. As a further extension of my commitment to this program, I am responsible for seeking approval to report data resulting from techniques or procedures that deviate from standard operating procedures, methods, or industry standard practices. Any such reporting of data will include a laboratory narrative that must be approved by the appropriate supervisor and the QA Director.

If I am unsure of how to properly handle data generated by me, I am responsible for seeking advice and approval from the Quality Assurance Director and the appropriate supervisor. I agree to inform the Quality Assurance Director and the appropriate supervisor of any accidental reporting of non-authentic data by others or myself within 24 hours of discovery.

I understand that if I knowingly participate in any such prohibited activity, I will be subject to serious disciplinary action that may include termination by GCAL. I also understand that I face individual suspension and debarment from all Federal programs should I be convicted of such practices. I understand that suspension and debarment from all Federal programs affects my ability to work in the environmental field, as well as, any other professions where government funding or loans may be involved. I understand the most serious consequence of unethical conduct can be imprisonment if convicted.

However, it is not the company's intent to punish anyone for an accidental mistake or oversight. Employees will not face disciplinary actions in this case. Repeated careless or neglectful behavior will be subject to corrective action. Covering up a mistake or oversight is not acceptable behavior and will result in termination. Mistakes or oversights are immediately reported to the Quality Assurance Director and the appropriate supervisor.

My signature affirms my understanding of the consequences of violating this "ETHICS AND DATA INTEGRITY AGREEMENT" and my commitment to its intent. My signature further affirms that I have received formal training on this topic.

_____
(Signature)

_____
(Date)

3 Administrative Organization

GCAL is organized along clear lines of authority to provide our clients with service that is efficient and reliable. The organizational structure of the laboratory is shown in Appendix A.

It is the policy of the laboratory that at each management and operational level a designated deputy or deputies will maintain continuity of service and other functions in the event of absence of key staff. The deputies are responsible for the completion of duties during the staff member's absence. Louisiana DEQ, LELAP must be notified in the instance of the Laboratory Manager's absence of more than 65 days.

Position	Deputy
General Manager	Technical Services Manager
Laboratory Manager (Technical Director)	General Manager
QA/QC Director	General Manager
Department Supervisor	Group Leader
IT Manager	Laboratory Manager and CEO

To ensure communication within the laboratory and to communicate project requirements to the analyst, the laboratory supervisors, report generation, and the Laboratory Manager meet daily with project management to discuss key issues for that day.

3.1 Roles, Responsibilities, and Qualifications

The following lists the general roles and responsibilities in each level of the laboratory. Resumes of key personnel are attached in Appendix B.

3.1.1 The CEO directs the functional areas of marketing and finance.

3.1.2 The General Manager bears the primary responsibility for data quality at the laboratory. The General Manager directs laboratory policies.

3.1.3 The Laboratory Manager (Technical Director) is responsible for coordinating the activities of all laboratory personnel. The Laboratory Manager assures the commitment of sufficient resources for the timely generation of data of a known quality. Duties include monitoring standards of performance in quality control and quality assurance and monitoring the validity of the analyses performed and data generated in the laboratory to assure reliable data. The Laboratory Manager must have at least a bachelor's degree in Chemical, Environmental, Biological or Physical sciences, or Engineering, with at least 24 hours of chemistry, and at least 2 year experience in environmental laboratory testing. A master's or doctoral degree may be substituted for

one year of experience. In the event that the Laboratory Manager is absent for a period of time exceeding 15 consecutive calendar days, they will designate another full-time staff member meeting the above qualifications to temporarily perform their duties. If this absence is to exceed 65 consecutive calendar days, all accreditation bodies will be notified in writing.

3.1.4 The Technical Services Manager is responsible for coordinating the activities of the sample administration department, client services, and administrative support personnel.

3.1.5 The Information Technology Director manages the implementation and development of information technology tools. IT Director is also responsible for the automated data collection systems used by the laboratory. IT Director performs strategic planning for IT projects based on projected needs of the Laboratory. Interacts with clients to determine IT requirements such as electronic deliverables.

3.1.6 The Data Validation Manager is responsible for report validation and review. The Data Validation Manager is also responsible for review of Quality Assurance Project Plans on incoming projects and implementation of such plans throughout the laboratory. Assists the lab in method implementation and development. Additional duties include advising the laboratory on reference methods and improving method performance. The Technical Director is also responsible for review of final reports. Any discrepancies found in the data are reported to the appropriate Department Supervisor for review and correction if necessary.

3.1.7 The QA/QC Director is responsible for the preparation and maintenance of the laboratory Quality Assurance Program Plan. The QA/QC Director acts as the official laboratory contact for audits, performance evaluation studies, and project-specific quality control issues. The QA/QC Director approves and confirms the implementation of corrective actions. The QA/QC Director is responsible for the approval and distribution of controlled documents. The QA/QC Director has the authority to intercede in all areas where quality related problems exist. No work will be released until the related quality deficiency has been corrected and approval has been given to proceed forward. The QA/QC Director reports directly to the General Manager, and is not in the chain of command of the departments audited. It is the policy of the GCAL that the QA/QC Director operates independent of the production pressures of the laboratory. The QA/QC Director must have training in QA/QC and a general knowledge of the test under the scope of accreditation. In addition, the QA/QC Director is responsible for implementing, maintaining, and improving the quality system; ensuring that all personnel understand their contributions to the quality system; ensuring communication takes place at all levels within the laboratory regarding the effectiveness of the quality system; evaluating the effectiveness of training; and using available tools, such as audit and surveillance results, control charts, proficiency testing results, data analysis, corrective and preventive actions, customer feedback, and

management reviews in efforts to monitor trends and continually improve the quality system.

3.1.8 Department Supervisors are responsible for the overall flow of work and data through the laboratory. They are responsible for the maintenance of accurate SOP's with the input of the QA/QC Department. Further responsibilities include management of all activities within their department, ensuring that all instrumentation and equipment meet performance criteria and calibration requirements, and training of laboratory staff. The Supervisor is responsible for validating data released from the department. Department Supervisors inform the Laboratory Manager or Technical Services Manager of project status and capacity issues. Department supervisors must have experience in the methods performed in their department and with data validation.

3.1.9 Project Managers act as liaisons between the laboratory and the client. Responsibilities include sample scheduling, communicating project-specific requirements to laboratory personnel, review of log-in summaries, notifying the client of any sample receipt or analytical problems, monitoring the progress of analytical work, and providing data to clients in a timely manner. Project Managers document client complaints.

3.1.10 Analysts/chemists are responsible for the generation of data by analyzing samples according to written SOP's. They are also responsible for ensuring that all documentation related to the analysis is accurate and complete. The analyst/chemist shall inform the Department Supervisor of quality problems immediately. The analysts/chemists have the authority to accept or reject data based on compliance with QC acceptance criteria. Analysts/Chemists are responsible for initial review of all data.

3.1.11 Group Leaders guide the scheduling of sample analysis, ensure there is sufficient staff available, and perform other duties as directed by the Department Supervisor. The group leader shall act as the Department Supervisor in the event of absence.

3.1.12 Safety Compliance Officer is responsible for training lab personnel in proper safety procedures. Safety is responsible for checking and maintaining safety equipment, maintaining documents regarding waste disposal, safety audits, and MSDS files.

3.2 Personnel Training

It is the policy of GCAL to hire employees with an educational background and/or experience in an analytical field. On-the-job training takes place for all new employees based on needs identified by the job description and tasks of the position.

3.2.1 Training Program - The training program begins with an orientation program designed to familiarize the new employee with safety and chemical hygiene issues, the importance of QA/QC in the analytical laboratory, general laboratory procedures, and company policies. All employees undergo training in ethical and legal responsibilities including the

potential penalties for improper, unethical, or illegal actions. Each employee must read and sign an Ethics and Data Integrity Agreement. All technical personnel undergo a training process involving twelve lecture tapes covering basic laboratory functions. A written test follows each lecture tape. Employees who perform or review manual integrations as part of their job functions are also trained in manual integration policy and review and sign a manual integration policy statement.

3.2.2 New employees are under the supervision of experienced analysts and/or the department supervisors who are responsible for showing them the analytical procedures including the applicable QA/QC. This training includes review of the Standard Operating Procedure (SOP), reference methods, and hands-on training with instrumentation or equipment. Manuals for various methods are available to laboratory personnel. Among the manuals are current copies of the EPA Test Methods for Evaluating Solid Waste (SW846), Chemical Analysis for Water and Wastes, Standard Methods, and ASTM methods. The analyst will perform an acceptable initial demonstration of capability before being allowed to analyze and post results without direct supervision. This is accomplished by analyzing four laboratory control samples (LCS) and verifying achievement of acceptable precision and accuracy requirements of the laboratory. This demonstration will be repeated whenever there is a significant change to the instrument or test method and annually. New employees are hired for a probationary period of three months. At the end of three months the employee's records are reviewed and evaluated for performance and productivity and a decision is made whether to continue employment. Additional information on DOC is described in SOP QA-014.

3.2.3 Ongoing training - GCAL also recognizes development training as a means to increase the effectiveness of the employee and the organization. Therefore, GCAL utilizes other training methods along with on-the-job training. Examples of this are seminars, specialized training by instrument manufacturers, internal training courses, and encouraging the employees to take related college courses. On-going proficiency is documented by performance evaluation samples, an annual demonstration of capability, and /or analysis of blind samples.

3.2.4 Additional training - Training is also necessary for an employee whose performance does not meet standard requirements. This deficiency is identified in a performance appraisal or through the occurrence of problems.

3.2.5 Periodic reviews are given to all personnel. The purpose of these reviews is to give recognition for good work and outline personnel and departmental objectives, suggestions for improvement and clarification of responsibilities. Other topics that concern either employee or employer are also discussed at this time.

3.3 Training Files

The QA/QC Department maintains training files for each employee. The records include the demonstration of capability, training course certificates, in-house or external training seminar documentation, and ethics and manual integration agreements.

4 Quality Assurance

4.1 Quality Assurance Responsibilities

The direct and ultimate responsibility for assuring data quality at GCAL rests with the General Manager. The General Manager develops policies and general quality assurance strategies in collaboration with the Management Staff and Department Supervisors.

GCAL has clearly defined staff Quality Assurance (QA) responsibilities. The first level of QA lies with the laboratory analyst, who is responsible for performing the work properly, documenting it, and obtaining peer review to assure that it meets scientific standards. To accomplish this, the analyst must have a clear understanding of the analytical techniques and procedures used and the factors that affect the quality of the results. Analysts' capabilities are verified prior to conducting analyses and reviewed periodically thereafter.

Analysts must have a working knowledge of the QA policies, including data quality objectives for laboratory control standards, duplicates, and spikes; an understanding of detection limits and standard calibration requirements; and knowledge of preventive maintenance techniques. It is a requirement that all staff review and follow all applicable SOPs and this Quality Assurance Program Plan.

The second level of quality assurance lies with the management staff and Department Supervisors. Management is responsible for the proper training of analysts and stresses the importance of accuracy and reliability of results. Management is responsible for the quality of all analytical data produced. This responsibility includes routine review and approval or disapproval of all data and inspection of the QC records associated with the data. If the data are not adequately substantiated, corrective action is taken.

The QA/QC Director supports the entire process of the QA/QC program. This includes administration of the program as outlined in this manual, maintenance of QA records including this QAPP, and preparation of reports to management covering QA activities. The QA/QC Director or designee performs periodic audits of the QA procedures and staff for all departments, establishes and maintains accreditation for regulators, and coordinates all performance audits (e.g. check sample programs). The QA/QC Director also oversees the corrective action program.

4.2 Performance audits (PT studies)

GCAL participates in at least two Water Pollution studies, two UST studies, and two Hazardous Waste studies annually. The QA/QC Department orders the necessary studies at approximately six-month intervals from a NVLAP approved vendor. When samples are received they are logged into the LIMS as a work order. All PT studies are analyzed as client samples with the normal batch QC performed. It is the policy of GCAL that PT studies are handled as client samples throughout the analytical process. It is inappropriate to analyze multiple duplicates or dilutions unless this procedure is described in the approved analytical SOP as the required

analytical method for all samples. Any problems with PT samples shall be immediately communicated to the QA/QC Department.

Samples are reviewed in a different manner than client samples. The QA/QC Department is responsible for the final review and reporting of PT results to the PT provider. PT results and batch QC is reviewed carefully. Also reviewed are sample prep for appropriate dilution, reported concentration, consistency across methods, logical results, and transcription errors. Batch QC failures will necessitate re-analysis of the PT sample, or comments in the case narrative. If, in the QA/QC Director's opinion, GCAL must withdraw from a PT study, the primary accrediting authority shall be informed in writing. Results are reported to the PT provider, generally by fax or electronic submission.

The QA/QC Director shall review scored results for performance and accuracy. Results scored "Not Acceptable" shall be thoroughly reviewed to determine the cause of the failure and corrective action performed. In all cases a corrective action (rapid response) PT sample or blind QC sample shall be analyzed for any failed method/analyte/matrix. Documentation of scored PT results, raw data, and corrective action shall be kept on file. In addition, once root cause analysis, corrective action and additional proficiency testing are complete, this information is submitted to LDEQ, ACLASS, and all other pertinent accrediting bodies that require this information.

It is inappropriate for any personnel to share results or to attempt to obtain results from any other participating laboratory or PT provider.

GCAL utilizes the first WP Study of the year to meet DMR requirements for clients that use GCAL for analysis of samples regulated by a discharge permit. Samples are analyzed, reviewed, and the applicable results are reported to the client. It is the intention of GCAL to submit results to the client at least one-calendar week before results are due to the DMR provider.

It is the responsibility of the QA/QC Director to maintain compliance with NELAC and DOD regulations regarding PT analysis and reporting. Compliance includes passing two of every three studies and performing PT studies for every matrix/method/analyte offered by approved PT providers. Experimental studies shall be performed as required. The QA/QC Department shall suspend any matrix/method/analyte combination that fails two of the three most recent PT study until the laboratory meets the requirements of initial acceptability. See SOP QA-015 for more details.

4.3 Accreditation

GCAL is an accredited NELAC laboratory (Certificate number 01955). The primary accrediting authority is the Louisiana Environmental Laboratory Accreditation Program (LELAP) administered through Louisiana Department of Environmental Quality. A full list of accreditations held is maintained in the QA Department and is listed in Appendix E.

Compliance with and maintenance of laboratory accreditation is the responsibility of the QA/QC Director. Scope of application and certificates shall be kept on file and scanned and stored electronically. All correspondence with accrediting authorities shall be kept on file.

Maintenance of accreditation is based on compliance with NELAC Chapter 5 and associated appendices. It is the responsibility of the QA/QC Director to read and implement changes when each addition is approved for use.

4.4 Quality Control

This section describes the types of quality control samples used in the laboratory and how they are used to assess data precision and accuracy. When the analysis of a sample set is completed, the results will be reviewed and evaluated to assess the validity of the data set. All QC is processed and analyzed using the same conditions as the samples.

4.4.1 A reagent and/or method blank is prepared and analyzed with each set of samples. Field blanks (if provided by the client) are analyzed to determine possible sample contamination during collection and shipment to the laboratory. Trip blanks are applicable to volatile organics analysis (VOA) where volatile contaminants can be introduced from ambient air on site, during shipment, and in the laboratory. Storage blanks are also used in volatile refrigerators and analyzed every other week. The reagent and/or method blank results are evaluated for high readings characteristic of background contamination. If high blank values are observed, laboratory glassware and reagents shall be checked for contamination and the analysis halted until the system can be brought under control before further sample analysis proceeds. The concentration of an analyte in a reagent blank must be less than ½ the reporting limit or less than 5% of the analyte detected in the associated samples. Field blank results are evaluated for high readings similar to the reagent and/or method blanks described above. If high field blank readings are encountered, the procedure for sample collection, shipment, and laboratory analysis will be reviewed. If the reagent and/or method blanks and the field blanks exhibit significant background contamination, the source of contamination is probably within the laboratory. In the case of VOA's, ambient air in the laboratory and reagents shall be checked as possible sources of contamination. If method blanks are not acceptable, the associated samples must be re-prepped and analyzed. For storage blank criteria, please see SOP GEN-010 for details.

4.4.2 A Laboratory Control Standard (LCS) consisting of an interference free matrix spiked with the analytes of interest, or a representative list of the analytes of interest, is prepared and analyzed with each batch of twenty or fewer samples. Some projects, such as DOD, require that all target analytes be spiked. This information is documented by the project manager as a comment in the profile. Analysts are responsible for checking comments in their workstation. Analyte-free reagent water is used for water samples. A purified solid matrix such as Ottawa sand, Teflon beads, or sodium sulfate is used for soil or solid samples. For those tests that it is difficult to obtain a suitable solid matrix for spiking, analyte free reagent water is taken through the preparation and analysis procedure. A

standard reference material is allowable for use as an LCS. The results of check standard analyses are compared with the true values and the percent recovery of the check standard is calculated. If correction is required, the check standard is reanalyzed to demonstrate that the corrective action has been successful. Acceptable accuracy (control limits) is a requirement of the method or determined by the laboratory by the use of control charts.

4.4.3 A matrix spike (a sample to which known concentrations of target analytes have been added before sample manipulation) is performed on one sample in each batch of twenty or fewer samples for those tests that spiking is applicable. The observed recovery of the spike versus the theoretical spike recovery is used to calculate accuracy as defined by the percent recovery. If the accuracy value is outside the control limits for the given parameter, the LCS is reviewed to verify the analytical system is in control. The failure is a result of an error or the matrix. If the accuracy value is outside the control limit, the sample set (parent sample, MS/MSD, or duplicate) is reanalyzed for the parameter in question, unless insufficient sample volume is available or the samples are past holding time. Generally, matrix spike control limits are set as the LCS control limits. Use the same spike list and concentration as required in the LCS.

4.4.4 A duplicate for each matrix type is included in each batch of twenty or fewer samples. Routinely, the laboratory includes a matrix duplicate (a sample the laboratory divides into two aliquots) in inorganic test batches and a matrix spike duplicate (a duplicate of the matrix spike) in organic test batches. The type of duplicate to include in a batch is modified based on specific project requirements. A Laboratory Control Standard Duplicate (LCSD) is included if insufficient sample is available to perform a duplicate on a sample. Duplicate sample analysis for the sample set is used to determine the precision of the analytical method for the sample matrix. The duplicate results are used to calculate the precision as defined by the relative percent difference (RPD). If the RPD is above the control limit, the sample set shall be re-analyzed for the parameter in question or the failure is documented in the case narrative. In inorganic analysis, RPD's are not considered applicable if the concentration in the sample/duplicate is less than 5X the reporting limit.

4.4.5 If required by the method, each sample is spiked with the appropriate surrogate standards prior to extraction and analysis. The results of surrogate standard determinations are compared with the true values spiked into the sample matrix. The percent recoveries of the surrogate standards are calculated and reported with the sample results. If recoveries are outside the control limits, corrective action or comment in the case narrative is required. Surrogates are reported as diluted out, in an analysis requiring extraction, if a dilution greater or equal to 10X is performed on the sample. The specific corrective action required is documented in each SOP. Surrogates are used to monitor instrument performance, extraction performance, and matrix affects in each sample analyzed.

4.4.6 Internal standards are added to GC/MS Volatiles, GC/MS Semi-volatiles, and select GC methods prior to analysis. A continuous flow internal standard is used for ICP analysis. Internal standards are used to correct for minor variations in retention times and/or response. In most cases internal standards are defined in the method. If not defined an internal standard that is similar in response but not present in the sample (such as deuterated or less common isotopes) shall be used. Internal standard performance is monitored as part of the method performance for response and, if applicable, retention time.

4.4.7 An independent calibration verification (ICV) is analyzed following an initial calibration and before any samples are analyzed. The ICV is a standard from a different manufacturer from the initial calibration, if available, or an independent lot if there is only one supplier.

4.5 Statistical Control

As part of the analytical quality control program, the precision and accuracy for each analytical method is established by the use of control charts. The charts are used to assess the method performance over a period of time. A minimum of twenty measurements of precision and accuracy are used to establish a chart. In general, control limits of ± three standard deviations are utilized. Marginal exceedences shall also be charted using ± four standard deviations if marginal failures are allowed by the project.

4.5.1 Control charts are developed to predict trends (positive or negative) in the analytical processes and to determine when an analysis is out of control. Examples of situations that show up in control charts are:

- Shift in mean - this is usually caused by incorrectly prepared standards or reagents, contamination of sample, problems in instrument calibration, or analyst error.
- Trend of mean downward - this is usually caused by deterioration of standards or reagents.
- Trend of mean upward - this is usually caused by concentration of standard due to evaporation of solvent or deterioration of reagents.
- Increase in variability - this is usually caused by poor technique by the analyst or deviation from procedure.

4.5.2 Precision is the measure of how closely multiple analyses of a particular sample agree with each other. To determine the precision of the method and/or laboratory analyst, a routine program of duplicate analyses is performed. The results of the duplicate analyses are used to calculate the relative percent difference (RPD), which is the governing quality control parameter for precision. The relative percent deviation (RPD) for duplicate analyses is defined as 100 times the difference (range) of each replicate set, divided by the average value (mean) of the duplicate set.

4.5.3 Accuracy is the measure of the closeness of an observed value to the "true" value (theoretical or reference value or population mean). The accuracy of an analytical

method and/or the laboratory analyst is based on the analysis of laboratory control standards. The results laboratory control standards are used to calculate the quality control parameter for accuracy evaluation, the Percent Recovery (%R). The %R is defined as 100 times the observed concentration divided by the true concentration of the spike.

4.5.4 Uncertainty can be calculated using the Quality Control based Nested approach as described in SOP QA-013. Uncertainty will only be calculated if requested by the client. The approach uses batch QC over a period of time. This approach can also incorporate sample uncertainty if field QC is available. A minimum of twenty measurements is required.

4.6 Audits

Internal audits are scheduled and documented by the QA Department. A member of the QA Department or designee performs the audits as described below. As part of the scheduling, all technologies and Departments must be reviewed at least annually. Audits are documented with records maintained in the QA Department. The goal of internal audits is to determine if lab activities meet the requirements of the quality system and the NELAC standard.

4.6.1 System audits are performed to determine if all aspects of the QA program are operational. Through use of a checklist (published NELAC checklist), the QA/QC Director reviews all information pertaining to QA system, summarizes the situation and notes any deficiencies. A report is prepared based on the audit and is distributed to management in a timely manner. The report is also discussed with laboratory personnel so that a concerted effort can be made to correct any deficiencies as well as provide positive feedback. The QA/QC Director reviews the following elements of the program:

- Sample handling, including custody and storage procedures
- Sample analysis
- Records
- Preventive maintenance
- Check sample programs (proficiency testing)
- Training
- Project Management
- Report Generation

4.6.2 Method audits are performed throughout the year. These audits focus on a specific method or technology. An analyst is observed performing the method including QC and client samples. The goal of the audit is to determine if the SOP is being followed and traceability of the standards and documentation is maintained. Additionally, the SOP is reviewed for method compliance and is updated as necessary. Part of the system audit is performed at this time including training of analyst performing the tests and performance

in the PT program. After the audit a report is issued to the supervisor. Follow-up audits are necessary to determine if changes are being implemented.

4.6.3 Monthly audits are performed to check support system compliance. A member of QA staff performs these audits and a report is issued to the General Manager and Laboratory Manager. Follow-up and corrective action is performed as necessary. At least the following items are reviewed:

- Calibration of support equipment.
- Temperature checks of ovens, incubators, refrigerators, and freezers are performed daily.
- Logbook documentation and review, and use of strikeout corrections.
- Expiration of standards used.
- Sample chain of custody and tracking of samples.
- Re-Extractions.
- Certificate of analysis.
- Scheduled equipment maintenance is performed.
- Tag-out policy is used.
- Storage blank analysis.
- Safety equipment is being maintained.
- Labeling of Standards and Reagents
- Chain of Custody Procedures

4.6.4 External audits and assessments are scheduled through the QA/QC Director with regulators and clients. It is the policy of GCAL that all information pertaining to that client or scope of accreditation be available for review by the auditor(s). Client confidentiality must be maintained throughout the audit process. The QA/QC Director is responsible for monitoring the audit, reviewing all findings, issuing a corrective action plan in a timely manner, and follow-up to ensure agreed changes are implemented. All documentation pertaining to the audit is kept on file.

4.6.5 Annual Management Review - The management will review the laboratory quality system annually. The review will ensure the suitability and effectiveness of the quality system and introduce any necessary changes and improvements. This is a system wide assessment. After the review, the QA/QC Director shall write a report summarizing the findings and any new policy decisions. The review will include at least the following:

- Matters arising from the previous review
- Suitability of policies and procedures
- Reports from managerial and supervisory personnel
- Outcome of recent internal audits
- Corrective and preventive actions
- Assessments by external bodies
- Results of interlaboratory comparisons or proficiency tests
- Changes in volume and type of work

- Client feedback and complaints
- Staff training needs
- Quality control activities

4.7 Nonconformance/Corrective Actions

A non conformance is any indication or judgment that a product or service has not met the requirements of the relevant specification, contract, or regulation. It is the state of failing to meet the requirements. Corrective action is the action taken to eliminate the causes of an existing non-conformance to prevent recurrence. Nonconformance identification and corrective action are a integral part of GCAL's plan for quality assurance in sample analysis. Every attempt is made by laboratory staff to comply with any requirements set forth in methods, standard operating procedures, GCAL's Quality Assurance Program Plan, and any client or program specific requirements. When non-conformances occur and are not correctable on the spot, the occurrence is documented in the case narrative of the final report and the client is notified on the nonconformance. When errors, deficiencies or out-of-control situations develop, corrective action is initiated. The following nonconformance identification and corrective action programs are used in the laboratory and are described below.

4.7.1 Laboratory non-conformances and corrective actions are documented on a Non-Conformance/Corrective Action Form (NCCAF). NCCAF's are tracked by a controlled logbook and maintained by the QA department. Any GCAL employee that identifies a non-conformance shall initiate corrective action by notifying the QA/QC director or laboratory manager, or they can initiate the process by filling out the non-conformance section of a NCCAF and submitting to the QA/QC director. Once initiated, it is the responsibility of the QA/QC director to see that a root cause analysis is performed, a resolution is identified and any follow up action determined necessary is completed. If corrective action is determined to be unsuccessful, the process is repeated. When identified non-conformances result in a change to reported data, a corrected report is prepared, the client is notified of the change, and the corrected report is submitted to the client. The correct report file copy is then attached to the top of the original report file copy.

4.7.2 Sample integrity problems determined at login are documented in a Login Discrepancy Form. This form is completed at the time the discrepancy is noted at login and forwarded to the assigned project manager. It is the responsibility of the assigned project manager to contact the client for instructions. These instructions are documented on the form. If the client request to proceed with analysis, this is communicated with login personnel and the samples are released for analysis. If re-sampling will occur the samples are sent to disposal. The original Login Discrepancy Form is kept in the report file copy.

4.7.3 On-the-spot or immediate action usually applies to spontaneous, or generally non-recurring problems, such as an instrument malfunction. Any staff member who

detects/suspects nonconformance to previously established criteria or procedure in equipment, instruments, data, methods, etc. shall immediately notify the appropriate department supervisor and/or Laboratory Manager. In many cases, the staff member will be able to correct the problem. Acceptable on-the–sp ot corrective actions are documented in SOPs and in maintenance logbooks. Examples include re-analysis of a failing LCS, re-extraction, etc. Trends in re-extracts are monitored. When a trend is identified a root cause corrective action is triggered.

4.7.4 Prep non-conformances are documented on a Re-extract Form and are logged and tracked by a controlled logbook. Reason for the prep batch re-extraction can include method blank failures, LCS failures, and surrogate failures. Trends in re-extractions are monitored by the QA department. When trends are identified, a corrective action is initiated to determine the root cause using the steps described above in section 4.7.1.

4.7.5 If the result of a corrective action or audit cast doubt on the validity of a sample result, the client must be notified. Client notification and further instructions must be documented.

4.8 Customer Inquiries/Complaints

Customer inquiries and complaints are initially received by project managers. If the inquiry requires follow-up action, the project manager fills out a Client Inquiry Form and logs the inquiry into the Client Inquiry Logbook. The inquiry is then sent to the supervisor of the lab or to a member of management for investigation. Following the investigation, a response is recorded on the Client Inquiry Form and the client is notified of the outcome of the investigation. This investigation can include a complete review of the raw data and reanalysis of the sample if applicable. If the inquiry uncovers a lab error and involves further corrective action, the project manager then completes a Corrective Action Form and logs the corrective action into the Corrective Action Logbook. At this point, the corrective action is turned over to the QA/QC department for follow-up and review. If required, the final report is reissued with the appropriate corrections. The report is marked as resubmitted and the reason for the resubmittal is documented in the case narrative.

4.9 Service to Clients

Periodically, GCAL will seek feedback, both positive and negative, from customers in an effort to identify areas where improvement is needed. This feedback can come from audit reports submitted to us by various clients or through questionnaires which are sent out to customers. This feedback is then used to improve our quality system, testing activities, and service to our clientele. In addition, sometimes immediate communication or feedback is need to clarify certain aspects of upcoming projects or to correct encountered problems with current projects.

5 Data Documentation, Validation, and Reporting

Data validation is performed to check data integrity and to verify that the data is correct and of an acceptable quality. Data integrity involves reviewing all documentation for errors and mistakes. It includes review for correct documentation of sample ID's, verification that holding times were met, transcription errors, correct calculations, complete records, and for acceptable chain of custody documentation. A review of the data is performed to verify the results and to assure that all QC is within acceptable criteria. The data is reviewed according to the criteria that applies to the particular analysis and according to the client specific project requirements. The reviewer will identify unacceptable data and initiate the appropriate corrective actions. The documentation of data shall be performed in a manner that allows for the historical reconstruction of results by internal or third party validators.

5.1 Recording data

All raw data is recorded in bound books and/or by instrument printout. This includes calibration, LCS, matrix spikes, duplicates, reagent blanks, calculations, dilutions and any notations concerning a given analysis. If data is recorded by hand, it must be done in ink. It is inappropriate to have pencils, erasers, or correction fluid at the bench.

Data is kept either as a hardcopy, electronically, or both. All data must be protected by the use of audit trails, passwords, and controlled logbooks. If changes or corrections are necessary, it must be performed in a way that maintains the integrity of the data. Changes must be initialed and dated and corrections made using a single line strikeout. If the record does not allow space to clearly show the change, write it in the comments or at the bottom of the page. If electronic files must be changed, the file must be renamed so original information is not lost. If an entire batch of data must be reprocessed all files must be renamed. Reasons for doing so must be written in the comments and/or fully documented using a correction form. At no time shall data be obliterated for any reasons.

Electronic data is backed up and protected by the IT Department. All schedules and procedures are fully documented in IT SOPs.

5.2 Data Reduction

Data reduction includes all activities that convert instrument/computer responses into reportable results. This involves calculations, compound identification, and QC sample calculations. Final results are obtained by direct reading from the instrument or calculations based on instrument readings, output, or responses. Manual data reduction is performed by calculating results with the appropriate formula. Manually entered information such as the sample ID is reviewed for accuracy on the hard copy. Computer data reduction requires that the analyst verify information used in final calculations is entered accurately. The analyst must also review the raw data for properly identified components, possible interferences, confirmation requirements, and acceptable readings for multiple integrations.

5.3 Data Review

5.3.1 All data undergoes an extensive review process. The analyst performs the first level, often as the analysis is being performed. Data is uploaded or manually entered into the LIMS. This review includes the following:

- The calibration meets SOP/project criteria and frequency, and it supports the required detection limit.
- All reagents and standards used within expiration date.
- The method blank pass criteria.
- All applicable QC is performed and meets criteria.
- Dilutions performed as necessary, and the reason documented.
- Is there anything unusual about the sample that is affecting the data? This includes submitted duplicates that are obviously different, presence of interference, analysis past hold time, etc.
- All documentation is complete.

See SOP QA-002 for more details on analyst review.

It is the analyst's responsibility to document any problems and communicate these to the supervisor. If an immediate solution is not found, such as one re-analysis of QC that passes criteria, the problem(s) must be communicated to the Laboratory Manager, Technical Director, QA/QC Director, and/or Project Manager. An Analyst is not authorized to continue with an analysis if the calibration or QC results violate a requirement of the SOP or project. Notify the supervisor immediately and start the corrective action process. Samples shall be held until further documented instructions are received.

5.3.2 The data is then reviewed and validated by the Department Supervisor or designee. Data is validated in the LIMS. This review includes the following:

- The data meets SOP and/or project requirements, including acceptance criteria, frequency of calibrations and QC, and detection limits.
- A set of analyses is logical. For example nitrite is not greater than nitrate + nitrite.
- All calibration/QC failures are clearly described in the batch exception reports. This includes descriptions of allowed failures such as an allowed number of marginal exceedences in the LCS.
- Dilutions are described in the batch exceptions.
- Times and dates are logical and correct.
- Documentation is complete so that the data can be reconstructed based on the information provided.
- Standards and reagents are used appropriately.
- All storage and preservation requirements were met or violations fully described.

- Data is consistent with historical results when available.
- Result is within permit requirements when known.
- Calculations are correct.
- Manual integrations are appropriate and documented.

See SOP QA-002 for more details on secondary supervisor review.

5.4 Data Validation

After the complete package is assembled, the data validation manager or his designee will review the data. This review will include the following at a minimum:

- The correct package has been prepared.
- The package is complete (includes all requested analysis, forms, reports, chain of custody, and raw data as appropriate).
- Project Specific Data Quality Objectives and/or GCAL requirements have been achieved.
- Exceptions and any information that can impact the data are clearly identified in the case narrative.
- Data is flagged appropriately and the data flags are clearly defined.
- Raw data and data reports are consistent.
- All samples have been analyzed and IDs are correct.
- Reporting limits are supported by the calibration.
- Dilution schemes are justified and correct.
- Calculations are correct.

If problems/questions are identified during review, a corrective action form must be completed. The corrective action identifying the problem and the report is sent back to the supervisor(s) for review and correction. Following review and correction, the report is returned to the validator. All steps are documented using the corrective action form. Once complete the corrective action form is returned to QA/QC Department. If the problem is systemic, the corrective action must be forwarded to the QA/QC Director for review and oversight.

5.5 Data Reporting

Hardcopy and electronic reports are the laboratory's product. It is therefore imperative that the report accurately and completely reports results determined by the lab. Any modifications or departures from SOPs are clearly communicated in the report by the use of data qualifiers and the case narrative.

When all requested analysis have been reviewed and validated by the supervisor(s) a preliminary report is sent via e-mail if requested by the client. This report is subject to change if review of the data by report validation indicates a problem. The client shall be contacted about changes in the preliminary report as soon as they are identified and corrected. The final report is then printed. GCAL has the capabilities to produce several levels of reports. These

include a LIMS report with batch QC, a CLP like forms package, a full CLP like deliverable package, and various other formats. The client specifies the level of reporting when the samples are submitted.

After the reports have been authorized and signed by the Validation Manager or designee they are sent through the project manager for release to the client. The QA Director or designee must review a minimum of 10% of all federal program reports, including DOD/AFCEE packages. The QA review is performed following the release of the final report outside of the day-to-day process. The Project Manager is responsible for checking that the report level is correct and the report is signed. After final approval of the reported data, various electronic deliverable formats can be produced to submit data by electronic means. See SOP's LAD-003 and QA-003 for more details on assembling final reports, reviewing final reports, and QA review.

5.5.1 All test reports include the following:

- A cover page that includes a title, "Analytical Results", name, address, and telephone number of the laboratory, work order number, which uniquely identifies the report, and the name and address of the client, contact, and project name, and NELAP certificate number,
- GCAL contact person for questions,
- Pages are numbered sequentially with a total number of pages written in the Laboratory Endorsement page, or numbered as # of total # (for example 1 of 50),
- Signature of Data Validation Manager or designee,
- Statement that the report relates only to the samples reported,
- Statement that the report shall be reproduced only in full and with the written permission of GCAL,
- Case narrative indicating any anomalies, method or QC failures during sample analysis,
- A report sample summary including the sample ID, lab ID, matrix, and collection and receipt date/time.
- The test results that include prep and analytical methods, prep and analysis date and time, prep and analysis batch, weight or volume of sample prepped/analyzed, units, indication of dry weight correction where applicable, results, reporting limits, and data qualifiers,
- QC summary with qualifiers as appropriate, and
- Chain of custody, log-in check sheets, and log-in discrepancy form where applicable.

5.5.2 Additional information shall be provided to clients when requested through reports. This information includes:

- Copies of raw data and logbook entries for submitted analysis,
- Instrument calibration summary and raw data,
- Method detection limits,

- Summaries for surrogate recoveries, internal standards, instrument tune, and method blank summary,
- Manual Integration Summary
- Additional information as requested.
- Identification of sub-contracted work.

5.6 Sub-contracting

Sub-contracting laboratories will be reviewed with an emphasis on their overall quality control practices and compliance to GCAL quality assurance requirements. GCAL bears the responsibility of all sub-contracted work performed by a sub-contractor selected by GCAL. Any laboratory used for subcontracting must be certified or accredited if required for the project and documentation of such must be kept on file. The QA/QC Department or project manager will submit a request to the lab to provide verification of certification or will notify the appropriate accrediting authority to verify certification. Project requirements must be communicated to the sub-contract lab in a timely manner. When data is received it is reviewed by report validation. GCAL will facilitate any client comments or complaints regarding sub-contracted data. The sub-contract laboratory must have successfully completed an assessment by the applicable DOD component (AFCEE, DOD QSM, Army Corp, etc.) for use in all DOD work. The sales representative and project manager verifies compliance with the DOD QSM or other project criteria before the start of the project. Records of compliance must be supplied by the sub-contract lab and kept on file. If testing is subcontracted to another laboratory, the client will be notified in writing.

5.7 Data Storage

The laboratory will retain all records related to sample analysis including raw test data, calculations, derived data, calibrations and copies of test reports. These records are archived in accordance with regulatory requirements for a minimum of ten years or as required by specific client contracts. If the laboratory is going out of business, clients will be notified at least 60 days (if time permits) prior to closure of the laboratory and will receive a final report for all submitted samples. The client notification will request instructions on the retention or distribution of laboratory records and will provide contact information for after the closure. Software/hardware permitting the access of electronic data must be maintained.

The copy of client reports is stored in a room requiring key-card access. All reports must be signed out using the archived reports logbook. Client reports and chain of custodies are also scanned for electronic storage. All archived logbooks, corrective actions, PT results, training records, and other QA/QC reports are stored in a locked storage closet. Only members of the QA/QC Department have access to these records. Written and printed data records (bench sheets, logbooks, electronic printouts, etc.) are scanned before being boxed and placed in storage. Electronic data is stored on a dedicated server. This server is backed-up daily. Approximately 1 year of electronic data is accessible at workstations. Data removed from the servers and stored on tapes can be reloaded by submitting a request to IT. The safety officer

keeps safety and disposal information. The Comptroller in locked files keeps personnel information.

Archived data is stored on-site until capacity is met. The oldest archived data is then moved to a secure storage facility. The storage and on-site facility are monitored and protected from fire and theft. Electronic data storage is free from magnetic sources. It is the goal of GCAL to have redundant copies (hard and electronic) to prevent loss of records due to being misplaced or environmental deterioration or catastrophe.

6 Facility Description and Equipment

6.1 Laboratory Facilities

GCAL is a full service environmental laboratory. The laboratory was established in 1979 with a staff of two and has grown to its present size of over 50 employees operating in a modern laboratory space of 20,000 square feet.

The laboratory's working areas are subdivided into areas for instrumental analysis, wet chemistry and sample preparation. These areas are designed to allow for a safe and comfortable working environment with special attention having been given to ventilation, airflow patterns and environmental controls. Administrative and Marketing areas are located for optimization of supervision and to allow for efficient handling of paperwork and results. The laboratory is protected by an electronic security and fire monitoring system. A floor plan of the facility is included in Appendix D.

6.2 Procurement and Inventory Control

Chemical reagents, solvents, gases, glassware and general chromatographic supplies are ordered as needed to maintain sufficient quantities on hand for use. Purchase orders are maintained as an inventory control of materials ordered by the laboratory. All orders are processed through central receiving and routed to the appropriate departments. Routine supplies are maintained on site in an inventory control stock room.

The purchase of analytical instrumentation is based on anticipated sample volume and the need to maintain superior quality data. Specifications are carefully examined to be sure new instrumentation meets current and anticipated needs. Warranty and service contract information is gathered at the time bids are reviewed and this information is considered in making the final selection. An extensive performance check-out before the instrument is accepted is mandatory. New equipment must undergo a rigorous method validation before being put into production. Operators of new instruments are sent to training courses if necessary.

Inventory records are maintained for all major capital equipment. Major suppliers of consumable items are:

Allometrics	Templet & Templet	Dionex
Fisher Scientific Company	Supelco	CPI
Environmental Express	Perkin-Elmer	Shimadzu

6.3 Capital Equipment

Laboratory equipment and instrumentation are maintained in compliance with instrumentation manuals. All equipment is kept in working condition to allow for conformity to each approved method. The key instrumentation such as Gas Chromatography, Gas Chromatographs/Mass Spectrometers, ICP and Atomic Absorption Spectrometers has maintenance contracts with their

respective suppliers. A list of instrumentation and equipment is maintained by the QA/QC Department and is included in Appendix C.

6.4 Equipment Operation and Calibration

Equipment is defined as any non-disposable mechanical and/or electronic device used in the generation or measurement of data.

6.4.1 The calibration of instruments and support equipment is required to ensure that the analytical system is operating correctly and functioning within acceptable precision, accuracy and sensitivity limits. Calibration is defined as the systematic determination of the relationship of the response of the measurement system to a known standard. The calibrations or calibration checks are performed with reference standards traceable to primary standards (e.g. NIST or other certified standards). If traceable chemical standards are not available, standards are prepared according to the laboratory quality control procedures or the project's requirements. The calibration requirements for each type of equipment or instrument are defined in the standard operating procedures. Additionally, specific requirements are defined in a project plan. Table 6-1 summarizes the calibration requirements of the lab.

6.4.2 It is the responsibility of the analyst to verify that the instrument configuration and operating conditions used satisfy the analytical requirements and to maintain quality control data confirming instrument performance and analytical results. The inability to achieve calibration is an indication that the equipment needs maintenance. It is not acceptable for an analyst to repeat analysis of calibration or QC standards beyond what is allowed by the SOP until "acceptable" results are achieved.

6.4.3 If equipment outside the permanent control of the laboratory is used, it must meet the same criteria. The laboratory shall ensure that the function and calibration status of the equipment is checked and shown to be satisfactory before it is put into service. The equipment must meet all requirements of LADEQ regulations/NELAC standards.

6.5 Equipment Maintenance

Maintenance is defined as cleaning and/or replacing equipment components to assure that the equipment has been properly and periodically serviced and is in satisfactory condition. The equipment manual is a good guideline to determine preventive and routine maintenance schedules. These manuals also assist in identification of commonly needed replacement parts so that an inventory of these parts can be properly maintained.

6.5.1 A maintenance log is issued for each piece of equipment. It shall be maintained by the analyst to describe problems, the maintenance performed on the instrument and outcome. This includes routine service checks by laboratory personnel (unless described in the SOP) as well as factory service calls. This log also provides a written source for future use in preventive maintenance. The logs are periodically reviewed by QA.

6.5.2 In order to prevent system down time, minimize corrective maintenance cost and to help insure data validity, GCAL uses a system of preventive maintenance. All routine maintenance is performed as recommended by the manufacturer. Maintenance contracts are purchased for most instruments. This insures periodic preventive maintenance visits by factory authorized service representatives and immediate service for corrective actions if required.

6.5.3 When a piece of equipment is deemed defective, it is taken out of service and identified with an "OUT OF SERVICE" label. For support equipment such as balances, ovens, coolers, and pipettes, the QA/QC Department is notified so that proper servicing and repair can be scheduled. The analysts perform routine and preventive maintenance for major instrumentation. If outside service is necessary, the Department Supervisor schedules it, with approval from the Laboratory Manager. Satisfactory instrument performance must be verified prior to returning to service any repaired equipment.

6.5.4 Table 6-1 is a list of support equipment calibration frequencies. In addition to the stated frequencies, calibrations are performed prior to first use and upon evidence of deterioration. Class "A" glassware is only verified upon evidence of deterioration. Calibration acceptance is based on 10 replicate measurements. See SOP GEN-010 for more details.

Table 6-1 Equipment Calibration

Equipment	Calibration*	Frequency
Analytical Instrument	Traceable standard	Each day of use or as required by instrument manual
Oven and Refrigerator	Calibrated thermometer	Each day of use
Thermometers	NIST Thermometer	Annually (Mercury), Quarterly (Digital)
NIST Thermometer	Certified off-site	As required by certificate
Balance	Certified weights	Each day of use, certified semi-annually
Weights	Certified off-site	As required by certificate
Adjustable pipettes	Weight	Each day of use
Non standard lab ware	Weight	By lot
Non-class A volumetric	Weight	Quarterly
Agitators (TCLP, SPLP)	Stop watch	Monthly

* Acceptance criteria are included in logbook used to document check, or in certificate.

6.6 Reagents

6.6.1 All solvents used for preparation of standards must be of acceptable purity to not interfere or invalidate the test. Purity of reagents must meet the reference method requirements and must not invalidate the test as shown by the acceptability of method blanks.

6.6.2 Reagents must be stored as specified by the manufacturer, and must be disposed of after the expiration date. If no expiration date is supplied, label acids and bases for five years from receipt, and other reagents as one year from receipt.

6.6.3 Neat chemicals must be stored as specified by the manufacturer, and must be disposed of after the expiration date. If no expiration date is supplied, label the neat chemicals for 10 years from receipt.

6.6.4 All reagents must be in labeled bottles with the date of receipt and date opened marked in permanent marker.

6.6.5 Reagent water is available throughout the lab. GCAL uses de-ionized water supplied by US Filter. The water conductivity is monitored daily and is serviced when necessary.

6.7 Standards

Preparation of standards for calibration or QC must be made from materials of known purity, (98% or better preferred) or from purchased concentrates certified by NIST, EPA, or other acceptable agencies.

6.7.1 Stock standards can be kept up to one year if the manufacturer indicates no expiration date. Upon preparation of the standard, the following items must be recorded on the bottle containing the standard: laboratory assigned ID, standard name, concentration, initials of the analyst preparing the standard, date prepared, and expiration date. All other information regarding the standard including solvent used, lot number(s) of solvent used, the analyte source, purity and lot number, expiration date, concentration, dilution procedure, analyst's initials, and date prepared must be entered in the log book.

6.7.2 Preparation of intermediate standard solutions is necessary for many tests. These working standards include calibration standards, spiking solutions, surrogate solutions, internal standard solutions, etc., and must be stored as suggested by the manufacturer when not in use. Working standards for the analysis of volatile organic constituents must be prepared at least once in two weeks or more often if required by the method or if performance is compromised. Working standards for the analysis of semi-volatile organic constituents and pesticides are prepared as needed or every six months. Working standards for trace metal analysis is prepared at least once a month for concentrations of 1 mg/L and less. Calibration standards for mercury are digested as needed and calibration standards for graphite furnace are prepared daily. Working standards expiration cannot be longer than the expiration of the parent standard or reagents used. Standard expiration is extended by approval of the QA Director. Acceptable performance must be demonstrated and documentation kept on file. Prepared working standards are verified by comparison to response from the previous calibration as described in SOP GEN-006.

6.7.3 The identification of each standard prepared must be unique and all documents related to sample analysis in which the standard was used must contain this unique identification. The documentation shall be such that all of the standard information could be traced from the raw data for the sample.

6.7.4 Freezers and refrigerators are designated for storage of standards. Samples are not stored with standards. Refrigerators or freezers used for storage of standards or samples are monitored for temperature compliance seven days a week. Refrigerators are maintained at <6°C and >0°C. Freezers are maintained between -10°C and -20°C.

7 Analytical Methodology

GCAL utilizes methods of analysis that provide evidence of analyte identification, separation from interfering substances, limits of measurement appropriate to that of analyte concentration and reasonable measures of precision and accuracy of the data obtained. Depending upon the analysis requested and the sample matrix, the methods used are official, standard or reference, screening, or modified. Analyses will be performed in accordance with the methods cited herein unless specific project requirements or needs dictate adoption of an alternate method or modification of the cited methods. Modification of a method due to sample matrix shall be discussed with and authorized by the client.

If analysis is performed in an alternate manner, the method shall be documented. Documentation is dependent upon the specific instrumentation and data collection and reduction methods used within the lab. Methods used directly from official or standard procedures are referenced as such. Routinely used procedures are available in each department and are also available electronically. Official protocols are used when required or requested.

7.1 Method Validation

Before the performance of methods for reporting to client, each method must be validated. This shall include achieving acceptable calibration and a demonstration of capability. Any work that is performed for government or regulatory purposes shall also have an acceptable limit of detection (LOD) or method detection limit (MDL) study before samples are reported.

7.1.1 Every instrument used to determine results for client samples or QC shall be appropriately calibrated daily before each use. Calibration shall include an initial calibration and continuing calibration as defined in the reference method and described in the SOP. Acceptable performance as defined in the reference method/SOP shall be shown before proceeding with sample analysis. Initial calibrations are verified using an independent standard. Additionally the following shall apply to all calibrations performed:

- Raw data shall be retained to allow reconstruction of the calibration and process to reduce instrument response to concentration. Records shall also include the analyst, date performed, and instrument.
- Samples and QC shall be quantitated using the initial calibration unless the cited method uses alternative procedures.
- The calibration range shall define the working range of the instrument with the exception of metals analysis. For all other analysis the low level standard defines the lowest reporting limit (PQL or LOQ) that is reported to a client. For metals a zero and one point calibration is used. High and low-level checks shall also be included as required by the project or method.
- Sample results exceeding the concentration range (or linear range for metals analysis) shall be diluted.

- The analyst is allowed to drop points out of a calibration curve at the high and/or low ends of the calibration curve if the minimum number of points and the project required detection limits are maintained. Points shall not be removed from the middle of a calibration unless there is a documented reason. The analyst is allowed to re-analyze and replace the suspect point within the same analytical batch or remove the point for all analytes with approval from the QA Director or Laboratory Manager.

7.1.2 Before the implementation of a test method or analyte to a test method, a satisfactory demonstration of method capability is required. This shall include the analysis of four LCS samples with acceptable accuracy and precision. Accuracy and precision is generally defined in the test method. Thereafter, each analyst shall perform a demonstration of capability as part of their initial training and annually. This demonstration shall include acceptable performance in one of the following:

- Acceptable performance of a blind sample;
- A demonstration of method capability; or
- Performance of four consecutive LCS samples with acceptable precision and accuracy.
- If the first three cannot be performed, analysis of samples with results statistically indistinguishable from a trained analyst.

All demonstrations shall be documented on a certification statement and maintained in the analyst's training filed by the QA/QC Department.

7.1.3 A low-level check standard shall be performed at 1-2X the reporting limits. The recovery of this check standard must meet method defined LCS criteria, or lab derived limits if not defined by the method. Alternatively an LOD check shall be performed meeting the criteria of SOP QA-009.

7.1.4 Method detection limit studies shall be performed using 40CFR Part 136 Appendix B. All MDL/LOD are verified using NELAC limit of detection requirements. See SOP QA-009 for a full description of MDL/LOD requirements.

7.1.5 Precision and accuracy of measurement shall be monitored as an ongoing method validation measure. Control charts shall be generated at least annually and control limits updated and compared to method or laboratory historical limits. A copy of the control chart shall be kept on file in the QA/QC Department.

7.2 Methods Outside of Scope of Accreditation

Occasionally a client will request analysis for informational or non-regulatory purposes. Work outside of the scope of NELAC accreditation does not require validation in the same manner as other analysis. Method development will be discussed with the client to meet the client's needs. A letter stating the intent of the work shall be obtained from the client and kept on file.

Reports issued outside of the scope of accreditation shall be identified. This identification shall include either the removal of the LELAP certification number, or, in the case of a mixed report, those methods outside of the scope of accreditation shall be clearly stated in the case narrative.

7.3 Review of New Work

For the laboratory to perform additional work within its scope or to expand its scope of testing a thorough review must be undertaken. Laboratory management considers available resources and current and pending workload prior to accepting new work.

It is the responsibility of the Laboratory Manager, with input from the department supervisors and General Manager, to assess the ability of the laboratory to accept new work.

Before new work is accepted the QA/QC Director must assess the accreditation needs and obtain all necessary certifications.

7.4 Analytical Methods

The analysis performed at GCAL is listed in the following Tables.

Table Organic Tests Performed

Parameter	Method	Reference
Analysis		
Aromatic Volatile Organics	8021B 602	2 6
Explosives	8330A	2
Organochlorine Pesticides	608 8081B	6 2
PCBs	8082A	2
TPHG	8015C	2
TPHD	8015C	2
GRO	8015C	2
DRO	8015C	2
ORO	8015C	2
Petroleum Range Organics	Fl-Pro	10
Total Petroleum Hydrocarbons	TX1005/TX1006	13,14
EPH	Massachusetts	15
VPH	Massachusetts	16
Organophosphorus Pesticides	8141A	2
Chlorinated Herbicides	8151A	2
Dissolved Gases	RSK175	9
GC/MS Semivolatile Organics	625 8270C, 8270D	6 2

Parameter	Method	Reference
GC/MS Volatile Organics	624 8260B	6 2
GC/MS SIM Semivolatile	625 8270C, 8270D	6 2
HPLC PAH's	8310	2
Solvents	8015C	2
Alcohols	8015C	2
Methanol	94.03/99.01,HAPS	11
Volatile Organics in Ambient Air	TO-15	17
Extractions and Preparations		
TCLP	1311	2
SPLP	1312	2
Separatory Funnel	3510C	2
Liquid/Liquid	3520C	2
Ultrasonic	3550C	2
Waste Dilution	3580A	2
Soxhlet	3540C	2
Purge and Trap	5030B, 5030C	2
Closed System Purge and Trap	5035A	2

Table Inorganic Test Performed

Parameter	Method	Reference
Metals Analysis		
Aluminum -ICP	200.7 6010B, 6010C	7 2
Antimony -ICP	200.7 6010B, 6010C	7 2
Arsenic GFAA ICP	206.2 7010 200.7 6010B, 6010C	1 2 7 2
Barium -ICP	200.7 6010B, 6010C	7 2
Beryllium -ICP	200.7 6010B, 6010C	7 2
Boron	200.7	7

Parameter	Method	Reference
-ICP	6010B, 6010C	2
Cadmium -ICP	200.7 6010B, 6010C	7 2
Calcium -ICP	200.7 6010B, 6010C	7 2
Chromium -ICP	200.7 6010B, 6010C	7 2
Chromium VI -Colorimetric	7196A 3500Cr D	2 3
Cobalt -ICP	200.7 6010B, 6010C	7 2
Copper -ICP	200.7 6010B, 6010C	7 2
Iron -ICP	200.7 6010B, 6010C	7 2
Lead -ICP	200.7 6010B, 6010C	7 2
Magnesium -ICP	200.7 6010B, 6010C	7 2
Manganese -ICP	200.7 6010B, 6010C	7 2
Mercury CVAA	245.1/245.2 7471B 7470A	1 2 2
Molybdenum -ICP	200.7 6010B, 6010C	7 2
Nickel -ICP	200.7 6010B, 6010C	7 2
Potassium -ICP	200.7 6010B, 6010C	7 2
Selenium -GFAA -ICP	 270.2 7010 200.7 6010B, 6010C	 1 2 7 2
Silver -ICP	200.7 6010B, 6010C	7 2
Sodium -ICP	200.7 6010B, 6010C	7 2
Strontium -ICP	200.7 6010B, 6010C	7 2

Parameter	Method	Reference
Thallium -GFAA -ICP	 279.2 7010 200.7 6010B, 6010C	 1 2 7 2
Tin -ICP	200.7 6010B, 6010C	7 2
Titanium -ICP	200.7 6010B, 6010C	7 2
Vanadium -ICP	200.7 6010B, 6010C	7 2
Zinc -ICP	200.7 6010B, 6010C	7 2
Zirconium -ICP	200.7 6010B, 6010C	7 2
Metal Preparation Methods		
Acid Digestion Aqueous and ICP	200.7 3010A	7 2
Acid Digestion Aqueous GFAA	200.9 3020A	1 2
Acid Digestion Solids	3050B	2
Microwave Assisted Acid Digestion Solid and Organic	3051 3052	2
TCLP	1311	2
SPLP	1312	2
Acidity	2310B	3
Alkalinity	2320B	3
Ash	D482	4
BOD/BODC	5210B	3
Bromide	300.0 9056A	1 2
BTU-Heat of Combustion	D240-92	4
Cation Exchange Capacity	9080	2
COD	HACH 8000/8328	5
Corrosivity	1110A 9040B/4500 H B 9045C	2 2 2
Chloride	SM 4500Cl E 300.0 9056A 9251	3 2 2

Parameter	Method	Reference
Residual Chlorine	4500-Cl G	3
Fecal Coliform	9222D	3
Color	2120 C	3
Conductivity	2510B 9050 A	3 2
Corrosivity Toward Steel	1110A	2
Cyanide -Free -Total -Amenable to Chlorination	 335.4 335.4/ 9012A 335.4/ 9012A	 1 1 2 1 2
Density	2520C	3
Fluoride	4500F-D/300.0 9056A	31 2
Hardness Calculation	2340B	3
Ignitibility	1010A 1030	2 2
% Moisture	SW846 Dry Weight/2540B	2
Nitrogen -Ammonia -Kjeldahl -Nitrate -Nitrite -Total Nitrate Nitrite	 4500NH_3BE 4500NH_3BF 4500NH_3BE 4500NH_3BF 300.0 9056A 353.2 300.0 9056A 353.2	 3 3 3 3 1 2 1 1 2 1
Oil and Grease	1664A 9071B	8 2
Oxygen, Dissolved	4500 O G 4500O-C	3 3
Paint Filters Liquid Test	9095A	2
Phenolics	420.1/420.4 9066	1 2
pH	4500-H^+B 9040B 9045C	3 2 2

Parameter	Method	Reference
Phosphorus -Orthophosphate -Total Phosphorus	 4500PBE 365.1	 3 1
Reactivity -Cyanide -Sulfide	 7.3.3.2 7.3.4.2	 2 2
Silica, Dissolved	4500Si-D	3
Solids -Total Dissolved -Total Suspended -Total Solids -Total Volatile Solids -Volatile Suspended Solids -Setteable	 2540C 2540D 2540B 2540E 2540E 2540F	 3 3 3 3 3 3
Specific Gravity	2710F	3
Sulfate	300.0 9038 9056	1 2 2
Sulfide	$4500S^2D$ 9034	3 2
Sulfite	4500 $SO_3^{2-}B$	3
Surfactants -Ionic (MBAS) -Non-Ionic (CTAS)	 5540C 5540D	 3 3
Total Organic Carbon (TOC)	5310B 9060	3 2
Total Organic Halides (TOX)	9020B	2
Turbidity	180.1 2130B	1 3
Viscosity	D445	4
Perchlorate	314.0	12
Sample Preparation Procedures		
Alkaline Digestion Cr^{6+}	3060A	2
Bomb Prep Method for Solid Wastes	5050	2
Distillation Sulfides	9030B	2
SPLP	1312	2

METHOD REFERENCES

1) EPA 600 4-79-020, Methods For Chemical Analysis of Water and Wastes, 1983, second printing. Methods for the Determination of Inorganic Substances in Environmental Samples (EPA/600/R-93/100)

2) EPA SW-846, Test Methods for Evaluation Solid Waste, 3rd Edition, Update I dated 7/92, Update II dated 9/94, Update IIA dated 8/93, Update IIB dated 1/95, Update III dated 12/96, Update IV dated 1/08.

3) APHA/AWWA/WPCF, Standard Methods for the Examination of Water and Wastewater, 18th Edition, 1992, Online Edition.

4) ASTM, American Society for Testing & Materials.

5) Hach Company, EPA Approved Procedures for Water and Wastewater, 1986.

6) 40 CFR Part 136 Appendix A, Test Procedures for Analysis of Organic Pollutants

7) Method 200.7, Determination of Metals and Trace Elements in Water and Wastes By Inductively Coupled Plasma-Atomic Emission Spectrometry, Revision 4.4, EMMC Version, May 1994.

8) EPA-821-R-98-002, USEPA Office of Water Analytical Methods; Method 1664, Revision A: N-Hexane Extractable Material (HEM; Oil and Grease) and Silica Gel Treated N-Hexane Extractable Material (SGT-HEM; Non-polar Material) by Extraction and Gravimetry, February 1999.

9) EPA Standard Operating Procedure

10) Florida Department of Environmental Protection, Method For Determination of Petroleum Range Organics, FL-PRO, Revision 1, November 1995.

11) NCASI Method DI/MEOH-94.03, Methanol in Process Liquids by GC/FID, May 2000 and NCASI Method DI/HAPS-99.01, Selected Haps in Condensates by GC/FID, February 2000.

12) NERL, Office of Research and Development, EPA; Method 314.0, Determination of Perchlorate in Drinking Water Using Ion Chromatography, Revision 1.0, November 1999.

13) TNRCC; Method 1005, Total Petroleum Hydrocarbons, Revision 03, June1, 2001.

14) TNRCC, Method 1006, Characterization of Nc_6 to Nc_{35} Petroleum Hydrocarbons in Environmental Samples, Draft

15) Massachusetts Department of Environmental Protection, Method for the Determination of Extractable Hydrocarbons (EPH), Revision1

16) Massachusetts Department of Environmental Protection, Method for the Determination of Volatile Hydrocarbons (VPH)

17) EPA/625/R-96/010b, Compendium of Methods for the Determination of Toxic Organic Compounds in Ambient Air

8 Sample Custody and Integrity

GCAL utilizes a Laboratory Information Management System (LIMS) that was specifically developed for the needs of environmental laboratories. Horizon©, was developed by Chemware, Inc., tracks samples and data throughout the laboratory. Results are available from the LIMS in a variety of hard copy formats. Furthermore, web access can be provided to clients who wish to view their data via the World Wide Web. A password security system prevents clients from viewing any data other than their own.

The following is an example of some of the information that is entered into the system:

1. Sample number (unique to this sample)
2. Job number (unique to this job or set of samples)
3. Date received
4. Time received
5. Date analytical results due
6. Sample description
7. Customer's name
8. Customer's address
9. Group number
10. Storage location
11. Notation of any special handling instructions or priority assignments
12. Billing information - purchase orders
13. Analyses requested

GCAL understands that sample integrity is a vital part of Quality Assurance. Samples submitted to the laboratory shall be logged in immediately, or other action taken to preserve integrity of the sample until it can be logged into the system. Any sample that is suspected of being contaminated, improperly stored or preserved, or improperly prepared, shall be reported

to the client immediately. Storage blanks located in the volatiles refrigerators are analyzed every two weeks. Records of these analyses are maintained in the GC and GC/MS Volatiles laboratories. No sample is analyzed if there is a question concerning its integrity.

After the sample analyses are complete and the final report is issued to the client, samples are held for 60 days from receipt before disposal. Samples are held longer per the customer request. GCAL does not accept evidentiary samples.

8.1 Sample Acceptance Policy

Delivery of samples to GCAL shall constitute acceptance by Client of these Terms and Conditions. Until GCAL accepts delivery of samples by notation on a chain of custody document or otherwise in writing, GCAL is not responsible for loss of or damage to samples. GCAL, at its sole discretion, reserves the right to refuse or revoke Acknowledgment of Receipt for any sample due to insufficient sample volume, improper sample container, or risk of handling for any health, safety, environmental, or other reason. GCAL does not accept samples that contain asbestos, biohazards, or radiological materials. Regardless of prior acceptance, GCAL may return samples at its sole discretion if it is determined that the samples may pose a risk in handling, transport or processing, for any health, safety, environmental or other reason. GCAL also reserves the right to return excessive sample volume to the Client, at the Client's expense.

Samples not consumed in testing will normally be retained for a maximum of sixty (60) days before disposal. Samples will be returned to the Client when requested in writing or when they would pose a disposal problem as a hazardous waste as determined by GCAL, at its sole discretion. The cost of returning samples will be invoiced to the Client. GCAL, in its sole discretion, may also agree in writing to retain samples at a monthly storage charge, agreed upon and payable in advance.

If the Client is ordering the work on behalf of another, the Client represents and warrants that the Client is the duly authorized agent for the purpose of ordering and directing said work unless otherwise stated in writing, and accepted by GCAL.

Sample acceptance policy is sent out with bottle orders in an effort to make sample collection personnel aware of GCAL's policy prior to sampling. Sample acceptance policy is also available electronically upon request.

8.2 Chain of Custody

A complete chain of custody is maintained by GCAL. Each sample when submitted to our laboratory is accompanied by a Chain of Custody form. These forms contain pertinent information about the sample including specific analytical requests, sampling notes, sample condition, customer name and address.

Additionally, information concerning the site name, field identification marks, date and time of collection, sampler signature, and preservation data is recorded.

Samples are tagged, preserved if necessary and stored appropriately (i.e. refrigerator, freezer or shelf). Samples to be analyzed for volatile organic compounds are stored in refrigerators located in the volatiles analytical laboratories.

8.3 Internal Chain of Custody

Samples labels include a bar code. All samples must be scanned each time custody of the container is changed. This information is stored in the LIMS, and includes a complete record of the sample custody from receipt to disposal. Information includes the location of the sample, the date and time of each custody transfer, unique initials of each person assuming custody, and a reason for the transfer.

8.4 Custody Transfer

If a sample requires additional work to be performed by a qualified outside laboratory, a chain of custody form is completed and submitted with a representative portion of the sample. A copy of this form is maintained on file along with similar information located in a logbook. The chosen laboratory must sign and date the form upon receipt and return it, along with any unused sample, upon completion of analysis.

8.5 Sample Kits

Occasionally, a customer will request a sampling kit (bottles, vials, etc.) with which to collect samples. Chain of Custody forms are always sent along with the kit to insure proper sample custody. This form is completed at the time of sample collection and is returned with the samples.

8.6 Shipping Requirements

The Department of Transportation (DOT) regulations shall be used for packaging and quantities of shipment. Shipping containers shall be secured using impact strapping material. Copies of the signed Chain of Custody (COC) forms must be delivered with the containers. Any samples being split with another party must be properly labeled, contain a COC, and be packed and shipped according to DOT regulations.

A laboratory file is maintained listing sample kits prepared for clients. It contains the client name, address, form of delivery, preservative (if requested), sample bottle distribution, and analyses to be performed. Additionally, the date the kit is requested, sent and expected arrival date is included, along with any pertinent miscellaneous information.

9 STANDARD OPERATING PROCEDURES

GCAL employs standard procedures for all work performed. These standard procedures insure that work is completed in a professional and timely manner and that all contractual obligations are met.

Standard safety procedures are also part of GCAL Standard Operating Procedures. Confidentiality and security agreements on all work performed are strictly enforced.

Analytical SOPs must incorporate or reference the following topics:

- Identification of test method
- Applicable matrix or matrices
- Detection limit
- Scope of application
- Summary of test method
- Definitions
- Interferences
- Safety
- Equipment and supplies
- Reagents and standards
- Sample collection, preservation, storage, and handling
- Quality control
- Calibration
- Procedure
- Calculations
- Method performance
- Pollution prevention
- Data assessment and acceptance criteria
- Corrective action for out-of-control data
- Handling out-of-control data
- Waste management and
- References
- Tables, Diagrams, Flowcharts, and Validation Data

SOPs are reviewed annually and are the basis for internal method audits. If no changes are made to an SOP during review, an SOP review form is completed and appended to the last page of the original SOP kept on file. See SOP QA-001 for document control procedures.

10 Sample Handling Guidelines

Inorganic and Conventional Parameters

Parameters	Container	Recommended Quantity (mL)	Preservative	Holding Time
Acidity	P,G	100	<6^{0}C	14 days
Alkalinity	P,G	100	<6^{0}C	14 days
Ammonia-N	P,G	500	<6^{0}C, H_2SO_4 to pH <2	28 days
Biochemical Oxygen Demand (BOD)	P,G	1000	<6^{0}C	48 hours
Bromide	P,G	200	None	28 days
Chemical Oxygen Demand (COD)	P,G	100	<6^{0}C H_2SO_4 to pH <2	28 days
Chloride	P,G	200	None	28 days
Chlorine, Residual	P,G	200	None	Immediately
Coliform, Fecal	P,G (sterile)	100	<6^{0}C, $Na_2S_2O_3$	6 hours
Color	P,G	100	<6^{0}C	48 hours
Cyanide	P,G	1000	<6^{0}C, ascorbic acid, NaOH to pH > 12	14 days
Ferrous Iron	P,G	100	2mHCl/100mL	Immediately
Flashpoint	P,G	100	None	Not specified
Fluoride	P	500	None	28 days
Hardness	P,G	100	HNO_3 to pH < 2	6 months
Nitrogen, Kjeldahl (TKN)	P,G	500	<6^{0}C, H_2SO_4 to pH < 2	28 days
Nitrate-N	P,G	100	<6^{0}C	48 hours
Nitrite-N	P,G	100	<6^{0}C	48 hours
Nitrate-Nitrite as N	P,G	200	<6^{0}C, H_2SO_4 to pH < 2	28 days
Oil and Grease	G	1000	<6^{0}C, H_2SO_4 or HCI to pH < 2	28 days
Phenols	P,G	1000	<6^{0}C, H_2SO_4 to pH < 2	28 days
Phosphorus, Total	P,G	200	<6^{0}C H_2SO_4 to pH < 2	28 days
Phosphorus, Ortho	P,G	200	<6^{0}C	48 hours
pH	P,G	100	None	Immediately
Radiochemistry				
Alpha, Beta, Radium	P,G	2000	HNO_3 to pH < 2	6 months
Tritium	P,G	100	None	6 months
Radon, I-131	P,G	1000	HNO_3 to pH < 2	14 days
Reactivity	G	100g	<6^{0}C	Not Specified
Silica	P, PFTE, Quartz	100	<6^{0}C	28 days
Solids, Dissolved (TDS)	P,G	100	<6^{0}C	7 days
Solids, Suspended (TSS)	P,G	500	<6^{0}C	7 days
Solids, Volatile (TVS)	P,G	100	<6^{0}C	7 days
Solids, Total (TS)	P,G	100	<6^{0}C	7 days

Inorganic and Conventional Parameters

Parameters	Container	Recommended Quantity (mL)#	Preservative#	Holding Time**
Specific Conductance	P,G	100	<6^{0}C	28 days
Specific Gravity	P,G	100	<6^{0}C	28 days
Sulfate	P,G	200	<6^{0}C	28 days
Sulfide	P,G	500	<6^{0}C, Zn acetate, NaOH to pH > 9	7 days
Sulfite	P,G	200	None	Immediately
Surfactants (MBAS)	P,G	250	<6^{0}C	48 hours
Total Organic Carbon (TOC)	P,G	100	<6^{0}C, HCl to pH < 2	28 days
Total Organic Halogens (TOX)	G-TLC (amber)	100	<6^{0}C, H_2SO_4 to pH <2	28 days
Total Petroleum Hydrocarbon (TPH)	G-TLC	1000	<6^{0}C, H_2SO_4 or HCl to pH < 2	28 days
Turbidity	P,G	100	<6^{0}C	48 hours
Viscosity	P,G	500	None	Not Specified

#Solid and waste samples: Quantity 1-100g, preservative <6^{0}C.
**Holding time for solids and samples is not defined
Organic Nitrogen = TKN – Ammonia-N

Metals

Parameters	Container	Recommended Quantity (mL)	Preservative	Holding Time
Total	P,G	500	HNO_3 to pH < 2	6 months
Dissolved	P,G	500	Filter on site HNO_3 to pH < 2	6 months
Solid Total	P,G	100g	<6^{0}C	6 months
Hexavalent Chromium: **Aqueous**	P,G	500	<6^{0}C	24 hours
Solid	P,G	100g	<6^{0}C	30/7 days
Mercury: **Aqueous** Total	P,G	500	HNO_3 to pH < 2	28 days
Dissolved	P,G	500	Filter on site HNO_3 to pH < 2	28 days
Solid Total	P,G	100g	<6^{0}C	28 days

CrIII=Total Cr-Hexavalent Cr

Organic Parameters
Volatile Organics

Sample Matrix	Container	Minimum Quantity	Preservative	Holding Time
Concentrated Waste Samples	G-TLC or G-TLS	2 x 40mL vials or 2-oz wide mouth	<6^{0}C	14 days
Aqueous Samples	G-TLS	2 x 40mL vials	<6^{0}C, HCl to pH < 2,	14 days, 7 days if not

			$Na_2S_2O_3$ if residual chlorine present	acid preserved
Solid Samples	G-TLS or G-TLC	2-oz wide mouth and/or 3 Encores	<6°C	14 days **

**Solid samples collected in EnCore™ samplers must be transferred to a soil sample vial within 48 hours.

Semivolatile Organics, Pesticides/PCBs, Herbicides, PAH's, Petroleum Hydrocarbons

Sample Matrix	Container	Minimum Quantity	Preservative	Holding Time
Concentrated Waste Sample	G-TLC (Amber)	1 Liter	None	14 days until extraction, 40 days after extraction
Aqueous Samples	G-TLC (Amber)	2 x 1 Liter	<6°C	7 days until extraction, 40 days after extraction
Solid Samples	G-TLC	8 oz.	<6°C	14 days until extraction, 40 days after extraction

Parameter	Container	Recommended Quantity	Preservative	Holding Time
Dioxins and Furans**	G-TLC(Amber)	2 x 1 Liter	<6°C	30 days until extraction, 45 days after extraction

**Concentrated wastes and soil samples are collected in 2 oz. to 1 Liter amber glass jars with TLC.
***1005/1006, Petroleum Hydrocarbons –14 days after extraction

TCLP/SPLP Parameters

Parameters	Holding Time from Collection to TCLP Extraction (days)	Holding Time from TCLP Extraction to Preparative Extraction (days)	Holding Time from TCLP/Preparative Extraction to Analysis (days)	Total Time
Volatiles	14	NA	14	28
Semivolatiles	14	7	40	61
Mercury	28	NA	28	56
Metals	180	NA	180	360

Reference: 40CFR Part 136 Tables IA, IB, IC, ID & IE and Table II., SW846 Table 4-1 and Table 3-1, SW846 Method 1311 8.5,

Acronym Definitions: (Teflon is a registered trademark of E.I. DuPont)
CLP: EPA Contract Laboratory Program
G-TLC: Glass with Teflon®-lined cap
NA: Not Applicable
G: Glass
G-TLS: Glass with Teflon®-lined septum
P: Polyethylene

10.1 Waste Collection and Storage

Samples are stored in the appropriate cooler for 60 days after receipt. After 60 days, samples are moved to a waste area. The samples are scanned out for disposal on the LIMS. The samples are then stored in the waste staging area until disposal into appropriate drums. Hazardous samples are returned to the client whenever possible to be disposed of with larger quantities of the sample material. Laboratory waste is segregated by laboratory personnel into waste streams, which have been established by the Regulatory Compliance Officer. The waste streams are determined by analysis of the waste and through process knowledge. All laboratory wastes are disposed of in the proper container. No waste is placed in regular trash containers or poured down the drain. Waste is stored in drums in satellite accumulation areas and then in the central accumulation facility. Waste disposal service is provided by approved vendors who will incinerate, landfill, treat, or reclaim the waste based on the characteristics.

10.2 Pollution Prevention

Environmental concerns, risks to employees and the public, and high disposal costs have increased the need and effort of the laboratory to minimize or prevent waste generation. The quantity of chemicals and standards purchased is based on expected usage during its shelf life and the disposal cost of the unused material. The volume of standards and reagents prepared in the laboratory reflect stability and anticipated usage. If possible, methods requiring the use of hazardous chemicals or that produce hazardous waste are replaced with an alternative method. Sample containers are selected based on the minimum volume that is necessary to perform a test, therefore reducing sample waste. Sample sizes are reduced in some cases, therefore reducing the quantities of extraction solvents and reagents.

11 Safety Procedures

GCAL has a comprehensive safety program outlined for all employees. A safety manual is distributed to each employee followed by a training seminar to familiarize the employee with the safety procedures at GCAL.

11.1 Basic Safety Rules

1. All injuries are promptly reported to a supervisor.
2. All hazards are promptly reported to a supervisor.
3. Running and horseplay are not permitted in the laboratory.
4. Smoking is not permitted in the laboratory.
5. Laboratory glassware is not to be used for eating or drinking.
6. Laboratory reagents such as sucrose or sodium chloride shall not be used for food.
7. Eating on the premises is confined to designated areas.

11.2 Arrangement of Furniture And Equipment

Furniture is arranged for maximum use of available space while providing working conditions that are efficient and safe.

Aisles are kept at least 4 feet wide to provide for safe passage of personnel and equipment, and are kept free of obstructions.

Stepladders or footstools are supplied for reaching high objects and are kept out of the way when not in use.

Eyewash stations, safety showers and fire extinguishers are located centrally and care is taken to avoid blocking access to them.

11.3 Hoods And Ventilation

Adequate hood facilities are installed and used where toxic or flammable materials are used. Hood windows provide physical protection and greater control of fumes.

11.4 Spills

Spilled materials are cleaned up promptly. All spills shall be handled as if corrosive or dangerous unless definitely known to be harmless. Spill Kits are located in the laboratory.

Corrosive or toxic materials are not placed in waste cans in the laboratory. When in doubt a supervisor is consulted.

Broken glass is swept up immediately and discarded so as to avoid any injury or cuts.

11.5 Emergency Equipment

Fire extinguishers are located in each room of the laboratory. The paths to these are kept free and clear at all times.

An extinguisher that has been used shall not be returned to its holder until it has been recharged and checked.

Any fire that appears to be too large to extinguish immediately is reported to the fire department at once. All fires, regardless of size are to be reported to a supervisor. Causes shall be determined and necessary steps to prevent a similar accident shall be taken.

Eyewashes are located in the laboratories for irrigation of the eyes if corrosive liquids shall be splashed into them. Tubing attached to faucets in the sink shall also be used to wash the eyes if necessary.

Safety showers are centrally located throughout the laboratory and are used whenever corrosive materials are spilled on an analysts' skin or clothing.

All safety equipment is periodically checked to be sure everything is in working order and is easily accessible.

General first aid kits are located throughout the laboratory. These kits contain first aid products for the treatment of minor cuts and bruises, burns or abrasions, and personal discomfort.

11.6 Protective Equipment

Lab coats and aprons are supplied for all employees of GCAL. Protective clothing is always available to prevent damage to clothing and persons.

Shoes must be worn at all times and must be closed-toe; high heels or sandals are not acceptable.

Eye Protection is mandatory for all personnel working in the laboratory. Safety glasses or goggles shall be worn by analysts to protect the full eye area in designated areas.

Various types of gloves are provided for employees: Insulated gloves are provided for use when handling hot or cold items; Heavy rubber gloves are to be used when handling corrosive liquids or unknown substances; Lightweight disposable gloves are provided for use with toxic or irritating substances.

Air purifying respirators are available for use when working with organic vapors and/or acid fumes for qualified trained analysts. These respirators shall be worn whenever contact with irritating concentrations of these fumes is encountered.

11.7 Storage of Laboratory Materials

All chemicals, reagents and glassware are stored in such a manner that they are easily located and do not present a danger. Heavy items are kept near the floor.

Flammable solvents are stored in special cabinets or in solvent bunker. Only quantities required for immediate use are stored in analytical areas.

Reagents are grouped to prevent danger from hazardous combinations. Acids and bases are stored separately.

Compressed gases are stored away from heat and open flames. Chains or belts to prevent rolling or toppling always contain them. A special cart is used to transport replacement cylinders and empties.

11.8 Chemical And Sample Handling

If there are questions about proper chemical handling the MSDS (Material Safety Data Sheet) is used as reference.

Samples are always treated as if they were hazardous chemicals.
Rubber pipette bulbs are used.
Procedures that produce flames or toxic vapors are performed under a hood.
Chemicals are returned to their proper storage area after use.
All prepared solutions are properly labeled.
Acids are always poured into water when diluting.
Large amounts of alkali are never added to water at one time.
Glass-stopper containers are not used for storing alkaline solutions.
Labels for Acid and Caustic solutions will note the concentrations.

12 Confidentiality

GCAL understands that it must retain in confidence all information obtained through the analysis of samples or the information disclosed to GCAL in order to adequately perform and interpret analyses.

GCAL will maintain the secrecy and confidentiality of any proprietary information it receives or generates.

Only the party who requested the analytical work or consultation, and who will receive the final report (and invoice) will be informed of any findings.

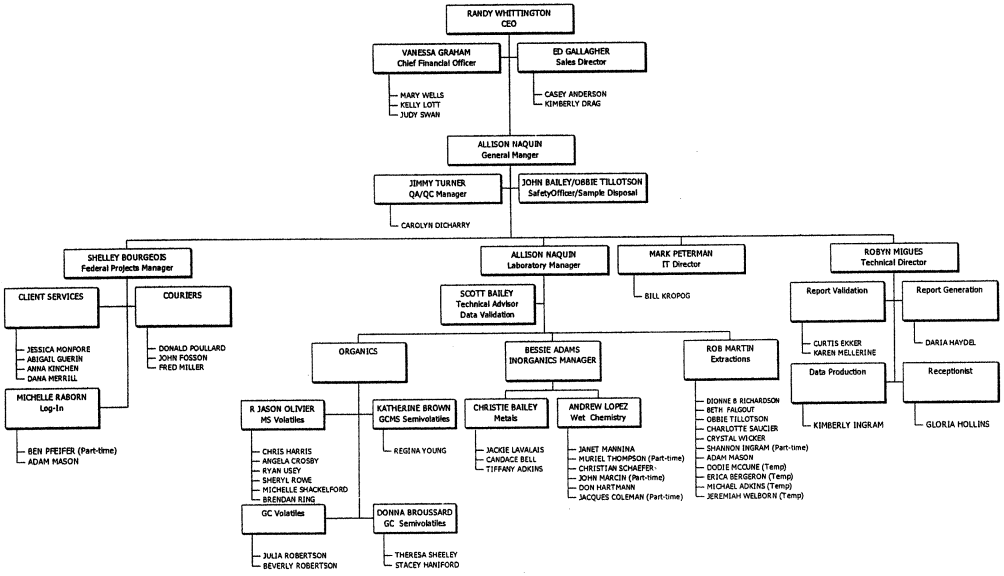
The contracting party will not disclose results of analyses to anyone other than the contracting party without unequivocal authorization.

Appendix A

GCAL

GULF COAST ANALYTICAL LABORATORIES, INC

ORGANIZATIONAL CHART



8/16/2010

Appendix B

RANDY K. WHITTINGTON

Current Position:

CEO, Gulf Coast Analytical Laboratories, Baton Rouge, LA, October 2009 - present

Responsible for financial and marketing functions. Responsible for long range planning and structuring of future business operations..

Previous Experience:

Technical Services Manager, Gulf Coast Analytical Laboratories, Baton Rouge, LA, January 1997 – April 2007

Responsible for the management and supervision of Sample Management, Project Management, and Report Generation. Duties include implementing systems for increased productivity in all three sections. Also coordinates communication among these departments and other areas of the laboratory and marketing.

Technical Services Manager, ITS-Environmental Laboratories, Baton Rouge, LA, October 1996 - January 1997

Responsible for the management and supervision of Sample Management, Client Services, and Report Generation. Duties include implementing systems for increased productivity in all three sections. Also coordinates communication among these departments and other areas of the laboratory and marketing.

Project Manager and Data Validation Manager, Terra Consulting Group, Baton Rouge, LA, 1993 - 1996

Performed organic data validation for CLP and RCRA data packages for pesticides, PCBs, volatile and semi-volatile analytical fractions. Responsible for the design and implementation of the analytical aspects needed to generate legally defensible data for a Remedial Feasibility Investigation (RFI) at various large chemical plants. Ensured data validation issues were addressed in the day-to-day operations of the investigation.

Gas Chromatography Supervisor, West-Paine Laboratories, Baton Rouge, LA, 1991-1993

Directly responsible for the supervision of the organics laboratory in Randy

environmental and hazardous waste matrices following current SW-846, 500 and 600 series methodologies. Responsibilities include coordinating and managing of QA/QC for all Gas Chromatography data from sample log-in, extraction, analysis, review and preparation of computerized reports.

Gas Chromatography Laboratory Manager, ETC/Toxicon, Baton Rouge, LA, 1987-1991

Supervised the Gas Chromatography laboratory in the analysis of Organochlorine and Organophosphorus Pesticides, PCBs, Herbicides, PNAs, VOA and Semi-VOAs; supervised all aspects of the GC laboratory including analysis, data interpretation, report preparation, instrument maintenance, method development, and problem solving. In 1990 temporarily relocated to Edison, New Jersey to restructure the Gas Chromatography division while also implementing USEPA CLP and Finnigan QA Formaster; maintained efficiency of twenty-two various Gas Chromatographs.

Education:

BS, Environmental Engineering , Columbia Southern University

Inchcape Managerial Training Skills Workshop - 1993

Finnigan QA Formaster Training

Restek Chromatography Class

Bank One Managing and Financing Independent Business - 16 Hours - October 1998

ALLISON M. NAQUIN, Ph.D.

Current Position:

Laboratory Manager, GCAL Inc, Baton Rouge, LA, Jan 2010 - Present
Responsible for coordinating the overall activities of the analytical laboratories on a daily basis and providing long-term direction. Responsibilities include monitoring the scheduling of analytical testing and releasing testing data and results. Continue General Manager duties as described below.

General Manager, QA/QC Manager, GCAL, Inc., Baton Rouge, LA, August 2007 - Present
Responsible for all operations within the facility including laboratory and administrative policies and procedures.

Previous Experience

QA/QC Manager, GCAL Inc., Baton Rouge, LA, April 2005 – August 2007

Responsible for implementing and monitoring the laboratory Quality Assurance Program Plan, conducting internal audits, investigating problem areas, control-chart generation, establishing data-quality criteria, verifying corrective actions are being taken when necessary, directing participation in accreditation programs, and monitoring performance evaluation studies. Additional duties include administering the ethics training/data integrity program and providing reports concerning QA matters to management.

Laboratory Auditor, GCAL Inc., Baton Rouge, LA, February 2005 – April 2005

Support QA/QC functions and perform internal audits. Responsibilities include performing internal audits of lab and writing audit reports. Assist in writing standard operating procedures.

Environmental Scientist Supervisor, Louisiana DEQ, Baton Rouge, LA, December 2004 – February 2005

Served as the Technical Advisor for the laboratory to the Assistant Secretary of the Office of Environmental Assessment. Responsibilities include draft/review and approval of Quality System documents; advise laboratory on technical and quality issues to obtain NELAP accreditation, and audit laboratory activities to NELAC standards. Continue assistance to Lab Accreditation Program.

Environmental Scientist III, Louisiana DEQ, Lab Accreditation Program, Baton Rouge, LA, April 2002 – December 2004

Assess commercial environmental and industrial laboratories to NELAC/ISO standards, and assess quality documents. Responsibilities also include serving as organic specialist to accreditation group, review data packages, assist in training seminars to environmental community, and assists Executive Staff with technical issues.

Environmental Scientist I-II, Louisiana DEQ, Laboratory Services Division, Baton Rouge, LA, February 2001 – April 2002

Responsibilities include analysis of volatile samples by GC/MS, interpretation and reporting data, preparation of data packages, and draft standard operating procedures. Cross-trained on semi-volatile analysis by GC/MS.

Research Assistant, Louisiana State University, Chemistry Department Baton Rouge, LA, August 1998 – December 2000

Responsibilities include directing daily activities of research lab, conduct environmental research, maintain and repair laboratory equipment, and mentor undergraduate students. Also, prepared and delivered seminars on personnel research and related literature, and was liaison between LSU and Southern University for research project.

Teaching Assistant, Louisiana State University, Chemistry Department Baton Rouge, LA, January 1995 – August 1998

Responsibilities include instructor for general chemistry laboratory, tutor undergraduate students, and provides class reviews and exam proctoring for professors.

Independent Contractor, Baton Rouge, LA, September 1998 – November 1998

Performed metals digestion and ICP/MS analysis of environmental samples from an EPA clean-up site. Issued reports to Dr. James Wharton of LSU Chemistry Department.

Adjunct Chemistry Instructor, Louisiana State University, Chemistry Department, Baton Rouge, LA, August 1994 – December 1994

Responsibilities include instructor for general chemistry laboratory, provides instruction in class materials, and administers and grades class-work and exams.

Education

Doctor of Philosophy, Chemistry, Louisiana State University, Baton Rouge, LA, May 2001

BS Chemistry, Louisiana State University, Baton Rouge, LA August 1994

Accreditation Process, Laboratory Ethics, How to Write Quality Documents Training Course, Analytical Excellence, April 2004

Assessments for ISO/IEC 17025 & NELAC (ASI Course 300), Advanced Systems, Inc., July 2003

Data Assessment Training, Analytical Excellence, Inc., May 2003

QA/QC Workshop, Advanced Systems, Inc., May 2003

Calibration and Manual Integration, Analytical Excellence, Inc., May 2003

HAZWOPER 40-hour Training Course, July 2002 and yearly refreshers August 2003 and August 2004

Data Integrity Seminar – Ethics Training, Analytical Excellence, Inc., March 2002 and yearly refresher

Environmental GC/MS Instrument and ChemStation Operation, Agilent Technologies, October 2001

Comprehensive Public Training Program

SHELLEY BOURGEOIS

Current Position:

Client Services Manager, Gulf Coast Analytical Laboratories, Baton Rouge, LA, April 2007 – present

Responsible for the management and supervision of Sample Management and Project Management. Duties include implementing systems for increased productivity and coordinating communication among these departments and other areas of the laboratory.

Previous Experience:

Project Chemist, Conestoga-Rovers & Associates, Baton Rouge, LA, May 2004 – April 2007

Responsible for contracting analytical laboratory services and for QA/QC verification of data. Performed data validations and ensured data validation issues were addressed in the day-to-day operations of the investigation.

Inorganics Manager, Gulf Coast Analytical Laboratories, Baton Rouge, LA, May 1998 – May 2004

Responsible for the management and supervision of the Metals Laboratory. Duties include the management and training of personnel, scheduling of sample workloads, supervision of metals sample preparation, analysis of samples by various analytical instrumentation, coordination of laboratory QA/QC projects, and maintenance of procedures to QA/QC guidelines. In addition, responsibilities include comprehensive data review and validation for the laboratory as well as the coordination of higher level QA data packages.

Metals Analyst, Gulf Coast Analytical Laboratories, Baton Rouge, LA, December 1997 – May 1998

Responsible for analysis of samples by various instruments including GFAA, Flame AA, ICP and the mercury analyzer. Additional responsibilities included data reduction and posting in the LIMS.

Head Technician, American Radiation Services, Baton Rouge, LA, November 1996 - December 1997

Responsible for coordinating sample analysis and field services. Supervised sample receipt, preparation, analysis, and report generation.

Analyst, ITS Environmental Laboratories, Baton Rouge, LA, July 1996 - November 1996

Education:

BS/Microbiology - Louisiana State University, Baton Rouge, LA, December 1995

Perkin Elmer Atomic Spectroscopy Workshop, Baton Rouge, LA, April 1998

Perkin Elmer Optima Instrument Series ICP training, Atlanta, GA, June 1998

ROBYN B. MIGUES

Current Position:

Technical Director, Gulf Coast Analytical Laboratories Baton Rouge, LA, April 2005 – Present

Responsible for report validation and review. Responsible for review of Quality Assurance Project Plans on incoming projects and implementation of such plans throughout the laboratory. Assists the lab in method implementation and development. Additional duties include advising the laboratory on reference methods and improving method performance.

Previous Experience:

QA/QC Manager, Gulf Coast Analytical Laboratories Baton Rouge, LA, January 1997 – April 2005

Responsible for implementing and monitoring the laboratory Quality Assurance Program Plan, conducting internal audits, reviewing reports, investigating problem areas, control-chart generation, establishing data-quality criteria, verifying corrective actions are being taken when necessary, and monitoring performance evaluation studies. Additional duties include providing reports concerning QA matters to management.

QA/QC Manager, ITS- Environmental Laboratories, Baton Rouge, LA October 1994 - January 1997

Responsible for implementing and monitoring the laboratory Quality Assurance Program Plan, conducting internal audits, reviewing reports, investigating problem areas, control-chart generation, establishing data-quality criteria, verifying corrective actions are being taken when necessary, and monitoring performance evaluation studies. Additional duties include providing reports concerning QA matters to management.

General Chemistry Supervisor, ITS- Environmental Laboratories, Baton Rouge, LA, June 1994 - October 1994

Responsibility includes the management and training of personnel conducting inorganic analysis using EPA methodologies. Duties include data validation, QC review, instrument maintenance and method set up.

Metals Supervisor, ITS –Environmental Laboratories, Baton Rouge, LA, October 1993 - June 1994

Responsible for the management and supervision of the Metals section which includes supervision of metals sample preparation, supervision and training of analysts, scheduling sample workload, analysis of samples by various analytical instrumentation and reviewing and validating all data.

Research Associate, Louisiana State University, Agronomy Department, Baton Rouge, LA, September 1990 - March 1993

Prepared and analyzed samples by ICP, maintained ICP and other laboratory equipment, assisted associate Professor of soil and environmental chemistry with laboratory courses and research projects and supervised student workers. Computer experience includes Quattro Pro and Wordperfect.

Previous Experience:

Spectroscopy and Water Departments Supervisor, James Laboratories, Lafayette, LA, February 1987 - September 1990
Laboratory Technician

Prepared and analyzed samples by ICP, Flame Atomic Absorption & Emission, Mercury Hydride System and Graphite Furnace. Performed quality control coordination, trained laboratory technicians, maintained equipment . Prepared and analyzed various sample types.

Education:

BS Geology, University of Southwestern Louisiana, Lafayette, LA, May 1985.

Member - American Society for Quality Control

Perkin Elmer Spectroscopy training course - 1987

Basic Statistics - Pittsburgh Conference Continuing Education Program - March 1995

Quality Management/Quality Assurance in Industry and in the Laboratory - ACS Short Course - March 1995

Inchcape Managerial Training Skills Workshop - 1994

Inchcape Testing Services - Environmental Laboratories, Baton Rouge, Manager and Supervisor Training Retreat - June 1996

Executrain Microsoft Excel 5.0 Beginning For Windows - July, 1996

ERTCO - Thermometer Calibration per ISO - October 1997

Assuring Ethical Practices in The Environmental Laboratory, A Training Short Course – Analytical Excellence – October 27, 2000

Member - LADEQ Laboratory Accreditation Task Force

JAMES D. TURNER

Current Position:

QA/QC Manager, GCAL Inc., Baton Rouge, LA, May 2008 - Present

Responsible for implementing and monitoring the laboratory Quality Assurance Program Plan, conducting internal audits, investigating problem areas, control-chart generation, establishing data-quality criteria, verifying corrective actions are being taken when necessary, directing participation in accreditation programs, and monitoring performance evaluation studies. Additional duties include administering the ethics training/data integrity program and providing reports concerning QA matters to management.

Previous Experience:

Project Manager, Gulf Coast Analytical Laboratories, Baton Rouge, LA, October, 2004 – May 2008

Responsible for management of client projects and project management activities within the laboratory. Served as the interface between client and laboratory management to achieve client satisfaction with delivery of analytical results on schedule and to the requested level of quality.

QC Lab Manager, The Wright Group, Inc., Crowley, LA
March 2004 – October 2004

Responsible for the management of a neutraceutical laboratory for a food fortification company.

Organics Manager, Gulf Coast Analytical Laboratories, Baton Rouge, LA, June 2001- February 2004

Responsible for the management of the GC, GCMS, and the extraction departments of the laboratory.

Training Officer, Gulf Coast Analytical Laboratories, Baton Rouge, LA , January 2000 - 2001

Responsibilities include development of a company training program that will efficiently train employees to ensure compliance with the internal SOP's and the analytical methods. The officer will be responsible for initial training of new employees as well as ongoing training for all employees.
The officer will also maintain the training records and the analyst certification program.

General Chemistry Supervisor, Gulf Coast Analytical Laboratories, Baton Rouge, LA, January 1997 - Present

Responsible for the supervision and training of personnel, conducting inorganic analysis using EPA methodologies, correlation and validation of data, maintenance of Standard Operating Procedures (SOPs) and instrumentation, method set up and day-to-day management of the general chemistry laboratory.

General Chemistry Department Group Leader, ITS -Environmental Laboratories, Baton Rouge, LA, August 1996 - January 1997

Responsible for analyst training, instrument maintenance, and scheduling daily work loads.

General Chemistry Laboratory Technician, ITS -Environmental Laboratories, Baton Rouge, LA, November 1992 - August 1996

Responsible for preparation and analysis of standards and samples for most wet chemistry tests. Experience on instrumentation includes Lachat Quick Chem Analyzer, TOC, TOX, HACH Spectrophotometer, IC, HPLC, GCMS, and GPC. Additional responsibilities included initial review of data and associated QC and entry into the LIMS.

Chemist, La-Mar-Ka Chemical, Baton Rouge, LA, November 1991 - November 1992

Responsible for preparation and standardization of chemical solutions. Instrumentation experience included D.L. 40 Auto Titrator and Moisture Analyzer.

General Chemistry Laboratory Technician, Enviromed Laboratories, Baton Rouge, LA, June 1988 - November 1991

Experience includes preparation and analysis of samples by wet chemistry methods and preparation of samples by organic extraction procedures. Introduced to GC/MS. Assisted with sample collection and waste disposal.

Education:

BS, Microbiology, Louisiana State University, Baton Rouge, LA, May 1999
Minor-Chemistry

OSHA 40 hour Hazardous Waste Training Course - August 1991

ITS - Environmental Laboratories, Laboratory Skills Training Program - August 1995

ITS - Environmental Laboratories, Basic Gas Chromatography Theory - May 1996

Appendix C

GCAL Equipment List

ORGANICS	Location	Date Received	Date in Service	Condition	MAKE/MODEL	SERIAL NUMBER
GCMSSV 4	MSSV Lab	September-05	September-08	new	AGILENT 5975	US52430653
	MSSV Lab	September-05	September-08	new	AGILENT 6890N	CN10532052
GCMSSV 5	MSSV Lab	November-05	November-05	new	AGILENT 5975	US53931245
	MSSV Lab	November-05	November-05	new	AGILENT 6890N	CN10539069
GCMSSV 6	MSSV Lab	July-07	July-07	new	Agilent 7890	CN10717068
	MSSV Lab	July-07	July-07	new	Agilent 5975C	US71235850
GCMSV 0	MSV lab	September-01	September-01	new	HP 5890 SERIES II	3336A58851
	MSV lab	September-01	September-01	new	HP 5972	3501A02325
	MSV lab	September-01	September-01	new	Teledyne/Tekmar-XPT	US05279001
	MSV lab	September-01	September-01	new	T/D Solatek 72	USO2294002 (GCAL# 0337)
GCMSV5	MSV lab	October-03	October-03	new	HP 5890 SERIES II	3310A48460
	MSV lab	October-03	October-03	new	HP 5971	3307A00395
	MSV lab	October-03	October-03	new	Tekmar LCS 2000	90211015/93154002/9115009
GCMSV 8	MSV Lab	October-01	October-01	new	AGILENT 5973	US10441235
	MSV Lab	October-01	October-01	new	AGILENT 6890N	US10134037
	MSV Lab	October-01	October-01	new	Tekmar LCS 2000	90163023
	MSV Lab	October-01	October-01	new	Tekmar ALS 2032/2016	92268005/95084019/93130001
GCMSV 9	MSV lab	April-07	April-07	new	AGILENT 5979B	US63234781
	MSV lab	April-07	April-07	new	AGILENT 6890N	CN10647134
	MSV lab	April-07	April-07	new	Teledyne/Tekmar-XPT	US06296004
	MSV lab	April-07	April-07	new	T/D Solatek 72	US07022004
GCMSV 11	MSV Lab	April-04	April-08	new	AGILENT 5973	US33220204
	MSV Lab	April-04	April-08	new	AGILENT 6890N	CN10407013
	MSV Lab	July-07	July-07	new	Teledyne/Tekmar-XPT	US03140007
	MSV Lab	July-07	July-07	new	T/D Solatek 72	US02098018
GCMSV 12	MSV Lab	June-10	June-10	new	AGILENT 5973	US10441235
	MSV Lab	June-10	June-10	new	AGILENT 7890A	CN10211053
	MSV Lab	June-10	June-10	new	Teledyne/Tekmar-XPT	US10160001
	MSV Lab	June-10	June-10	new	T/D Solatek 72	US05283001
FUME HOOD	MSV Lab	January-97	January-97	new	LABCONCO (#20) GCMSV	N/A
FUME HOOD	MSSV Lab	January-97	January-97	new	LABCONCO (#19)	N/A
COOLER	MSV lab	January-97	January-97	new	TRUE (#22)	1330620
COOLER	MSV lab	January-97	January-97	new	TRUE/GDM-45 (#30)	1-3681854
REFRIG/FREEZER	MSV lab	January-97	January-97	new	KENMORE/2538684012	0983108619
REFRIG/FREEZER	MSV lab	January-97	January-97	new	SEARS (V0A 2)	983108619
FREEZER#12	MSV lab	January-97	January-97	new	FRIGIDAIRE, MODEL #MFU17F3GW6 (#12) C	WB02927861
REFRIGERATOR	MSV lab	January-97	January-97	new	GE (#27)	HR112092
BALANCE	MSV lab	January-97	January-97	new	METTLER AE200	L65273
GCSV 12	GCSV Lab	November-03	November-03	new	AGILENT TECH 6980N	US10338067
GCSV 14	GCSV Lab	January-04	January-04	new	AGILENT TECH 6980N	US10342128
GCSV 15	GCSV Lab	April-04	April-04	new	AGILENT TECH 6980N	CN10413018
GCSV 16	GCSV Lab	August-05	August-05	new	AGILENT TECH 6980N	CN10525006
GCSV 17	GCSV Lab	September-05	September-05	new	AGILENT TECH 6980N	CN10529074

GCSV 18	GCSV Lab	September-05	September-05	new	AGILENT TECH 6980N	CN10528084
GCSV 19	GCSV Lab	September-05	September-05	new	AGILENT TECH 6980N	CN10534099
GCSV 20	GCSV Lab	October-05	October-05	new	AGILENT TECH 6980N	CN10534109
GCSV 21	GCSV Lab	December-05	December-05	new	AGILENT TECH 6980N	CN10538039
FUME HOOD	GCSV Lab	January-97	January-97	new	LABCONCO(#33)	301116
GCV 5	GCV Lab	February-08	February-08	new	AGILENT 6890 SERIES	US00026701
GCV 6	GCV Lab	November-05	November-05	new	AGILENT 6890N SERIES	CN10538061
GCV 7	GCV Lab	April-07	April-07	new	AGILENT 6890N SERIES	CN10545063
GCV 8	GCV Lab	April-08	April-08	new	AGILENT 6890N SERIES	CN10636089
GCV9	GCV Lab	March-05	June-10	new	AGILENT 6890N	CN10452003
PURGE/TRAP INSTRUMENT 5	GCV Lab	February-08	February-08	new	TELEDYNE TEKMAR / 14-8900-00T	US05257002
PURGE/TRAP INSTRUMENT 6	GCV Lab	November-05	November-05	new	TEKMAR	BETA 005
PURGE/TRAP INSTRUMENT 7	GCV Lab	April-07	April-07	new	TELEDYNE TEKMAR XPT / 14-8900O0T	US0527002
PURGE/TRAP INSTRUMENT 9	GCV Lab	March-05	June-10	new	TELEDYNE TEKMAR XPT	US0507010
AUTOSAMPLER INSTRUMENT 5	GCV Lab	February-08	February-08	new	TELEDYNE TEKMAR SOLATEK 72	US02277005
AUTOSAMPLER INSTRUMENT 6	GCV Lab	November-05	November-05	new	TELEDYNE TEKMAR AQUATek 70	US05355004
AUTOSAMPLER INSTRUMENT 7	GCV Lab	April-07	April-07	new	TELEDYNE TEKMAR AQUATek 70	US05347003
AUTOSAMPLER INSTRUMENT 9	GCV Lab	March-05	June-10	new	TELEDYNE TEKMAR SOLATEK 72	US0324004
Digital Vortex Meter	GCV Lab	November-08	November-08	new	N/A	080801081
BALANCE	GCSV Lab	January-97	January-97	new	SARTORIUS AC211P	50305162
REFRIGERATOR	GCSV Lab	January-97	January-97	new	DANBY #21	N/A
REFRIGERATOR	GCSV Lab	January-97	January-97	new	MASTERBILT (#18)	254034
FREEZER	GCSV Lab	January-97	January-97	new	Frigidaire (#34)	WB44328710
REFRIG/FREEZER	GCSV Lab	January-97	January-97	new	SEARS (#11)	BA01000875
REFRIG/FREEZER	GCSV Lab	January-97	January-97	new	KENMORE (#14)	BA04391055
REFRIG/FREEZER	GCSV Lab	January-97	January-97	new	KENMORE (#15)	BA04391057
REFRIG/FREEZER	GCSV Lab	January-97	January-97	new	KENMORE (#17)	BA03100524
FREEZER	GCSV Lab	January-97	January-97	new	Whirlpool (#37)	EWW3489616
FREEZER	GCSV Lab	January-97	January-97	new	Frigidaire (#26)	WB83724994
HPLC	**Location**	**Date Received**	**Date in Service**	**Condition**	**MAKE/MODEL**	**SERIAL NUMBER**
COLUMN HEATER	MSSV Lab	December-06	December-06	new	EPPENDORF TC-45	N/A
HPLC - 2	MSSV Lab	December-06	December-06	new	AGILENT 1200 SERIES - MWD	DE60555127
	MSSV Lab	December-06	December-06	new	AGILENT 1200 SERIES - FLD	DE60555722
	MSSV Lab	December-06	December-06	new	AGILENT 1200 SERIES - TCC	DE63060177
	MSSV Lab	December-06	December-06	new	AGILENT 1200 SERIES - QUANT PUMP	DE60556714
	MSSV Lab	December-06	December-06	new	AGILENT 1200 SERIES - ALS	DE60557762
	MSSV Lab	December-06	December-06	new	AGILENT 1200 SERIES - DEGASSER	JP62354304
METALS	**Location**	**Date Received**	**Date in Service**	**Condition**	**MAKE/MODEL**	**SERIAL NUMBER**
ICP	Metals Lab	September-05	September-05	new	PERKIN-ELMER OPTIMA 4300DV	077N0050202
AUTOSAMPLER	Metals Lab	September-05	September-05	new	PERKIN-ELMER AS93 Plus	N/A
ICP	Metals Lab	May-00	May-00	new	PERKIN-ELMER 5300DV	077N5090602
GFAA 2	Metals Lab	January-09	January-09	used	PERKIN-ELMER 800	8411
GFAA Autosampler	Metals Lab	January-09	January-09	used	PERKIN-ELMER AS800	1852
GFAA Chiller	Metals Lab	January-09	January-09	used	N/A	N/A

GCAL Equipment List

HG ANALYZER	Metals Lab	January-97	January-97	new	PERKIN ELMER/FIMS 400	4515
CHILLER	Metals Lab	January-97	January-97	new	Polyscience	G51284
FUME HOOD--FLOW SCIENCES	Metals Lab	January-97	January-97	new	FS3100BKFVA	11-j-07-04
FUME HOOD	Metals Lab	January-97	January-97	new	FS3100BKFVA	11-j-07-15
METALS PREP	**Location**	**Date Received**	**Date in Service**	**Condition**	**MAKE/MODEL**	**SERIAL NUMBER**
MICROWAVE	Metals Prep Lab	January-97	January-97	new	CEM MARS5	DS-6208
DIGESTION BLOCKS (4)	Metals Prep Lab	January-97	January-97	new	CPI MOD BLOCK	N/A
FUME HOOD -FLOW SCIENCES (2)	Metals Prep Lab	January-97	January-97	new	FS3100BKDVA / FS3100BKGVA	05-N-03-02 / 08-M-13-02
BALANCE	Metals Prep Lab	July-07	July-07	new	Mettler Toledo XS 104	1128260845
EXTRACTIONS	**Location**	**Date Received**	**Date in Service**	**Condition**	**MAKE/MODEL**	**SERIAL NUMBER**
FUME HOODS (18)	EXT Area	January-97	January-97	new	N/A	N/A
GLASS WASHER	EXT Area	January-97	January-97	new	AMSCO 400	36911195001
SHAKER (4)	EXT Area	January-97	January-97	new	GLAS-COL 099A	N/A
MILLIPORE(2)	EXT Area	January-97	January-97	new	N/A	N/A
VACUUM PUMP	EXT Area	May-08	May-08	new	Edwards	76434563
GPC (1)	EXT Area	January-97	January-97	new	ABC AP-100	9161SI/AS007-9114-9114
CENTRIFUGE	EXT Area	January-97	January-97	new	IEC HN-SII	N/A
OVEN	EXT Area	January-97	January-97	new	FISHER ISOTEMP 655G	11000184
TCLP/ZHE ROTATOR	EXT Area	January-97	January-97	new	ASSOCIATED DESIGN	NA 05101808
ZHE EXTRACTORS	EXT Area	January-97	January-97	new	ENVIRONMENTAL EXPRESS	NA 05081684
SONICATOR (6)	EXT Area	January-97	January-97	new	FISHER SCIENTIFIC	BBW052140/BBW05101848/BBW025101849/BBW05101850
INCUBATOR SHAKER	EXT Area	January-97	January-97	new	NEW BRUNSWICK SCIENTIFIC/CLASSIC SEF	100524881
BALANCE	EXT Area	January-97	January-97	new	METTLER PM 3000	M33557
BALANCE	EXT Area	January-97	January-97	new	METTLER PG 3001 S	1117331005
BALANCE	EXT Area	January-97	January-97	new	AND FX-300	5015502
BALANCE	EXT Area	January-97	January-97	new	OHAUS SCOUT PRO SP2001	7124330243
BALANCE	EXT Area	January-97	January-97	new	OHAUS SCOUT PRO SP402	7124280031
BALANCE	EXT Area	January-97	January-97	new	OHAUS SCOUT PRO SPE4001	7123450167
BALANCE	EXT Area	January-97	January-97	new	OHAUS SCOUT PRO SP2001	7124371673
PH METER	EXT Area	January-97	January-97	new	ORION SA520	QT20A
PH METER	EXT Area	January-97	January-97	new	THERMO ORION 720A	074216
PH METER	EXT Area	January-97	January-97	new	ORION 720A+	085153
PH METER	EXT Area	January-97	January-97	new	ORION 720A+	089622
PH PROBE 01/ATC PROBE	EXT Area	January-97	January-97	new	ORION SURE-FLOW ROSS 8172BNWP	LYI-16730
PH PROBE 03/ATC PROBE	EXT Area	January-97	January-97	new	ORION SURE-FLOW ROSS 8172BNWP	MX3-10451
PH ELECTRODE (03)	EXT Area	January-97		new	ORION SURE FLOW	MP3-10011
COOLER	EXT Area	January-97	January-97	new	TRUE (#5)	1334961
REFRIG/FREEZER	EXT Area	January-97	January-97	new	WHITE WESTINGHOUSE (#8)	LA10903763
REFRIG/FREEZER	EXT Area	January-97	January-97	new	WHITE WESTINGHOUSE (#9)	BA04391056
REFRIG/FREEZER	EXT Area	January-97	January-97	new	Frigadaire (R#34)	BA61019273
FREEZER	EXT Area	January-97	January-97	new	WHITE WESTINGHOUSE (#23)	WB40802629
ULTRASONIC CLEANER	EXT Area	January-97	January-97	new	FISHER SCIENTIFIC/FS30	RTB040265340
MUFFLE FURNACE	EXT Area	January-97	January-97	new	FISHER SCIENTIFIC/ISOTEMP 550 SERIES M	410N0074
STANDARD TEST SIEVE	EXT Area	January-97	January-97	new	WS TYLER/MODEL #RX-812	24372

GCAL Equipment List

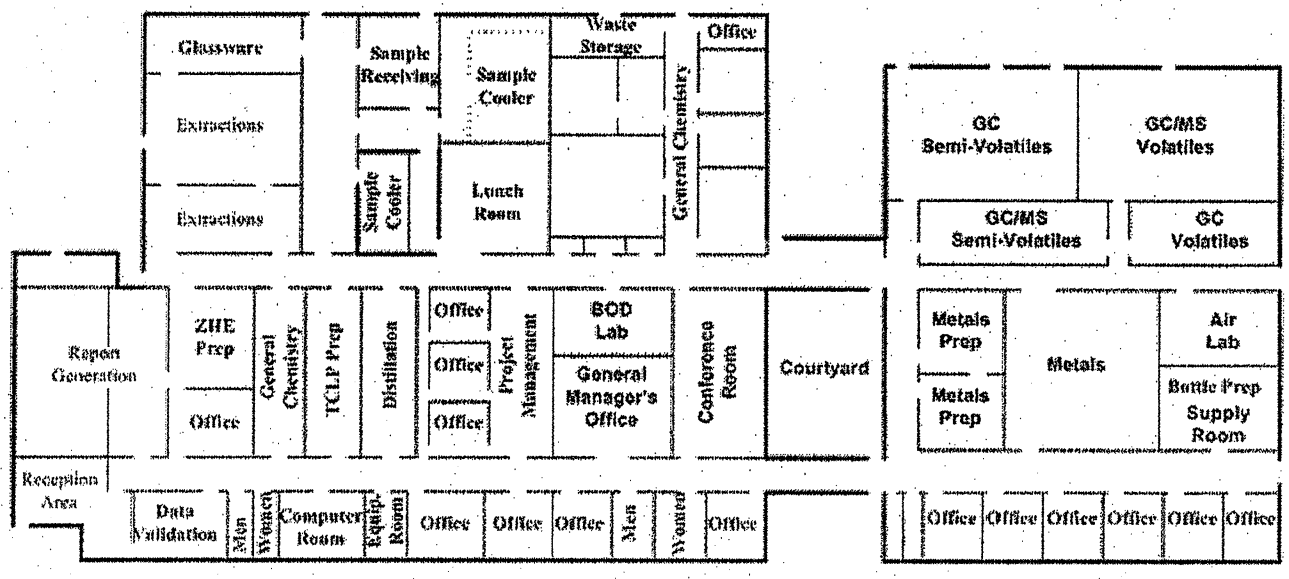
PYROMETER	EXT Area	January-09	January-09	new	PM20700	SN 8502832
SAMPLE CONCENTRATOR	EXT Area	January-05	January-05	new	OA-SYS	SN 20018
SAMPLE CONCENTRATOR	EXT Area	January-05	January-05	new	OA-SYS	SN 20019
WET CHEMISTRY	**Location**	**Date Received**	**Date in Service**	**Condition**	**MAKE/MODEL**	**SERIAL NUMBER**
TOX	Wet Chemistry	January-97	January-97	new	MITSUBISHI TOX-10E	N/A
TOC (1)	Wet Chemistry	June-08	June-08	new	Shimadzu TOC-V CSH	H51104535288CS
	Wet Chemistry	January-97	January-97	new	Shimadzu Solid Module	H52504500370
	Wet Chemistry	January-97	January-97	new	Shimadzu Autosampler	H52104502483
AUTOANALYZER	Wet Chemistry	June-08	June-08	new	LACHET QUICK CHEM AE	200-474
IC	Wet Chemistry	October-00	October-00	new	DIONEX LC20/ED40/AD20/AS40	900915
COD REACTOR	Wet Chemistry	January-97	January-97	new	HACH COD REACTOR	910404575/920800007697
TURBIDIMETER	Wet Chemistry	January-97	January-97	new	HACH 2100P	960700011424
SPECTROPHOTOMETER	Wet Chemistry	January-97	January-97	new	HACH #3 DR 2800	1209697
SPECTROPHOTOMETER	Wet Chemistry	January-97	January-97	new	HACH #4 DR 2800	11996-79
TITRATOR	Wet Chemistry	January-97	January-97	new	METTLER TOLEDO DL53	S119484414
VISCOMETER	Wet Chemistry	January-97	January-97	new	BROOKFIELD DVII	32587
WATER BATH	Wet Chemistry	January-97	January-97	new	BROOKFIELD TC-200	GCAL# 0311
CLOSED CUP FLASH PT	Wet Chemistry	January-97	January-97	new	PRECISION SCIENTIFIC	10BR-12
FLASHPOINT (FP3)	Wet Chemistry	December-08	December-08	new	Herzog HFP 339	083390442
AMMONIA PROBE	Wet Chemistry	January-97	January-97	new	ORION 95-12	N/A
OXYGEN BOMB CAL	Wet Chemistry	January-97	January-97	new	PARR	6616
CONDUCTIVITY METER	Wet Chemistry	September-02	September-02	new	OAKTON pH/CON 510 SERIES	79134
COLIFORM BATH 1	Wet Chemistry	January-92	January-92	new	PRECISION SCIENTIFIC INCUBATOR	10AZ-1
COLIFORM BATH 2	Wet Chemistry	May-08	May-08	new	THERMOSCIENTIFIC INCUBATOR	204785
COLIFORM BATH 3	Wet Chemistry	May-09	May-09	new	THERMOSCIENTIFIC INCUBATOR	207063
PH METER	Wet Chemistry	January-97	January-97	new	ORION 720A+	092891
PH PROBE 04/ATC PROBE	Wet Chemistry	January-97	January-97	new	ORION SURE-FLOW ROSS 8102BNUWP	LUI-18038
PH METER	Wet Chemistry	January-97	January-97	new	ORION 420A	7881
PH PROBE	Wet Chemistry	January-97	January-97	new	*ORION TRIODE*	*N/A*
PH PROBE/ATC PROBE	Wet Chemistry	January-97	January-97	new	*ORION COMB 915600/917006*	*N/A*
PH METER (PH-05)	Wet Chemistry	October-08	October-08	new	ORION 2STAR	B11765
PH PROBE	Wet Chemistry	January-97	January-97	new	ORION 9107APMD	RMR21
AUTOCLAVE	Wet Chemistry	January-97	January-97	new	AMSCO EAGLE TEN /E105P	429095113
DO METER	Wet Chemistry	January-97	January-97	new	YSI MODEL 59/5905 PROBE	93A01946
DO METER	Wet Chemistry	March-10	March-10	new	YSI MODEL 5100	10A 101264
OVENS (2)	Wet Chemistry	January-97	January-97	new	BLUE M SW17TA-1	SW-5478/SW-5408
OVEN	Wet Chemistry	January-97	January-97	new	FISHER SCIENTIFIC 3510-ISF	1879070606147
OVEN	Wet Chemistry	January-97	January-97	new	GRIEVE PL-326	444341
OVEN	Wet Chemistry	January-97	January-97	new	FISHER SCIENTIFIC ISOTEMP/MODEL 516G	506NO196
OVEN	Wet Chemistry	January-97	January-97	new	FISHER SCIENTIFIC ISOTEMP/MODEL 650G	508N0138
OVEN	Wet Chemistry	January-97	January-97	new	FISHER SCIENTIFIC ISOTEMP/MODEL 650G	508N0137
FURNACE	EXT area	January-97	January-97	new	THERMOLYNE 1500	N/A
DESSICATORS (7)	Wet Chemistry	January-97	January-97	new	DRY KEEPER	N/A
INCUBATOR	Wet Chemistry	January-97	January-97	new	FISHER SCIENTIFIC(#3)	WB93928030

GCAL Equipment List

BALANCE	Wet Chemistry	January-97	January-97	new	METTLER AE160	C05693
BALANCE	Wet Chemistry	January-97	January-97	new	METTLER AX504	1122043050
BALANCE	Wet Chemistry	January-97	January-97	new	SARTORIUS / PT6-000V2	60802675
BALANCE	Wet Chemistry	January-97	January-97	new	FISHER SCIENTIFIC / ACCU-224	F224075004
FUME HOODS (5)	Wet Chemistry	January-97	January-97	new	N/A	N/A
INCUBATOR (BOD#6)	Wet Chemistry	January-97	January-97	new	REVCO	T28C-142152-TC
INCUBATOR (BOD#2)	Wet Chemistry	January-97	January-97	new	PRECISION SCIENTIFIC	10AZ-12
INCUBATOR (BOD#7)	Wet Chemistry	January-97	January-97	new	FISHER SCIENTIFIC	407N0211
INCUBATOR (BOD#5)	Wet Chemistry	January-97	January-97	new	FISHER SCIENTIFIC	WB93928030
INCUBATOR (BOD#8)	Wet Chemistry	January-97	January-97	new	FISHER SCIENTIFIC	WB53337398
INCUBATOR (BOD#9)	Wet Chemistry	January-97	January-97	new	FISHER SCIENTIFIC	2018080398339
INCUBATOR (BOD#10)	Wet Chemistry	January-97	January-97	new	FISHER SCIENTIFIC	2018080607337
REFRIG/FREEZER	Wet Chemistry	January-97	January-97	new	SEARS (#19)	LA91905856
REFRIG/FREEZER	Wet Chemistry	January-97	January-97	new	WHITE WESTINGHOUSE (#1)	WB10507478
VACUUM PUMP	EXT Area	May-08	May-08	new	Edwards	7643558
GRINDING MILL	Wet Chemistry	January-97	January-97	new	THE STRAUB CO./MODEL 4E	N/A
LOG-IN	**Location**	**Date Received**	**Date in Service**	**Condition**	**MAKE/MODEL**	**SERIAL NUMBER**
FUME HOOD (1)	LOGIN Area	January-97	January-97	new	FUME HOOD #9	N/A
COOLER	LOGIN Area	January-97	January-97	new	TRUE (#2)	708391
COOLER	LOGIN Area	January-97	January-97	new	TRUE (#3)/GDM-72	1-3792963
WALK-IN COOLER (2)	LOGIN Area	January-97	January-97	new	N/A	N/A
REFRIG/FREEZER	LOGIN Area	January-97	January-97	new	KENMORE (#4)	BA01902878
IR THERMOMETER	LOGIN Area	May-08	May-08	new	FISHER SCIENTIFIC	72704761
REFRIG/FREEZER	LOGIN Area	January-97	January-97	new	FRIDGIDAIRE (#33)	BA454622395
FREEZER	LOGIN Area	January-97	January-97	new	FRIGIDAIRE(#27) MFU17F3GW6	WB03102969
SCANNER	LOGIN Area	January-97	January-97	new	HEWLETT PACKARD SCANJET 5470C/C9850	CN1B41HOTZ
FREEZER	LOGIN Area	January-97	January-97	new	FRIGIDAIRE (#28) FFU20FC4CWO	WB34937210
FREEZER	LOGIN Area	January-97	January-97	new	FRIGIDAIRE (#29) FFC15C4CWO	WB40427812

Appendix D

Facility Floor Plan



Approximate Square Footage: 19,600 Sq. Ft.

Scale: 1 in. = 25 ft.

Sample Receiving/Cooler:	1320	GCMS Volatiles:	906
Extractions/Prep:	2913	GCMS Semi-Volatiles:	394
General Chemistry:	2025	GC Volatiles:	323
Metals:	840	GC Semi-Volatiles:	906
Metals Preparation:	450	Report Generation:	713
Supply Room:	616	Offices/Storage:	8200

Appendix E

GULF COAST ANALYTICAL LABORATORIES
CERTIFICATIONS

Scopes of Accreditation are maintained by the QA/QC department and are available for review upon request.

< State of Illinois Environmental Protection Agency, NELAP Accreditation #200048, Certification No. 001202 (Expiration: February 2011)

< State of California Environmental Laboratory Accreditation Program, (Expiration: May 2011)

< State of Florida, Department of Health, Bureau of Laboratories, NELAP, Lab ID: E87854 (Expiration: June 2011)

< South Carolina Department of Health and Environmental Control, Environmental Laboratory Certification Program, Certificate Number: 73006001 (Expiration: June 2011)

< Louisiana Department of Environmental Quality, Environmental Laboratory Accreditation Program, NELAP, Certificate Number 01955 (Expiration: June 2011)

< Texas Commission on Environmental Quality, Certificate Number: T104704178-05-TX (Expiration: August 2011)

< State of Arkansas, Department of Pollution Control and Ecology, Laboratory Certification Program (Expiration: August 2011)

< Oklahoma Department of Environmental Quality, Laboratory Certification Program, ID # 9403 (Expiration: August 2011)

< State of Kansas, Department of Health and Environment, NELAP, Certificate No. E-10354 (Expiration: October 2010)

< Arizona Department of Health Services, License AZ0718 (Expiration November 2010)

< State of Washington, Department of Ecology, Certificate No. C2061 (Expiration: November 2010)

< State of North Carolina, Division of Water Quality Laboratory Certification Program, Certificate 618 (December 2010)

< State of Connecticut, Department of Public Health, Certificate PH-0334 (December 2010)

< Department of the Navy (NFESC) Approval

< State of Georgia Environmental Protection Division accreditation based on LA NELAP

Appendix F

GULF COAST ANALYTICAL LABORATORIES, INC
STANDARD OPERATING PROCEDURES

SOP	METHOD	REVISION #	DATE	LAST REVIEW
Extractions				
EXT-001	BNA Solid/Low/3550	16	06/14/2010	
EXT-002	Pest/PCB Low/3550	16	12/23/2009	
EXT-003	BNA Prep SEP Funnel/3510	19	07/08/2010	
EXT-004	BNA Prep Continuous/3520	8	01/04/2010	
EXT-010	Pest/PCB Prep SEP Fun/3510	14	04/07/2010	
EXT-011	Pest/PCB Prep Cont/3520	8	01/04/2010	
EXT-017	Herbicide Preparation	20	12/21/2009	
EXT-019	ZHE Cleanup	6	01/06/2010	
EXT-026	TCLP/1311	8	01/06/2010	
EXT-027	TPHD Solid/Low Level Ext	12	08/06/2010	
EXT-029	TPHD Prep SEP Funnel	10	12/18/2009	
EXT-031	Herbicide Prep Soils	16	08/16/2010	
EXT-032	pH-Solids & Wastes	9	12/18/2009	
EXT-033	pH-Waters	8	12/18/2009	
EXT-034	Orgphos Pest Soil Prep/8141	10	01/04/2010	
EXT-035	Orgphos Pest/SEP Fun/8141	9	12/21/2009	
EXT-036	TCLP-Volatiles/1311	7	01/06/2010	
EXT-037	Pest-Organic Prep	8	12/22/2009	
EXT-038	BNA-Organic Prep	7	12/22/2009	
EXT-039	Phenol/SEP Funnel	5	01/21/2005	
EXT-050	BNA Sep OLC0.2	6	01/05/2010	
EXT-051	Pest/PCB OLC0.2	5	01/05/2010	
EXT-052	Oil & Grease-1664	13	03/16/2010	
EXT-056	PAH/Soil/3550	7	12/23/2009	
EXT-057	PAH/Water/3510	7	12/18/2009	
EXT-058	Sulfuric Acid/Permanganate Clean-up	4	01/05/2010	
EXT-059	Florisil Clean-up	4	01/05/2010	
EXT-060	IDA/Soil Samples	2	10/30/2001	7/21/2008
EXT-061	IDA/Water Samples	2	10/30/2001	7/21/2008
EXT-063	Particle Size	2	10/30/2001	7/21/2008
EXT-064	Oil & Grease/Soxhlet-29B	6	01/05/2010	
EXT-065	Explosives Prep/Soil Samples	8	01/04/2010	
EXT-066	Explosives Prep/Water Samples	7	04/22/2010	
EXT-067	% Lipid in Crawfish	4	09/26/2007	
EXT-068	Formaldehyde Derivatization/Soil	4	01/04/2010	
EXT-069	Formaldehyde Derivatization/Water	5	12/22/2009	
EXT-070	SPLP/1312 Water & Solids	3	02/01/2010	
EXT-071	SPLP-Volatiles/1312 Water & Solids	1	10/09/2003	
EXT-072	Olefin Polymers	1	03/01/2004	
EXT-073	Extraction of Tissue Samples	3	07/14/2009	
EXT-074	% Lipids in Tissue	3	01/20/2010	
EXT-076	625 SIM/Water	4	12/21/2009	
EXT-077	Method 619 Extraction	4	08/16/2010	
EXT-078	Formaldehyde Extraction	1	12/22/2009	

GULF COAST ANALYTICAL LABORATORIES, INC
STANDARD OPERATING PROCEDURES

SOP	METHOD	REVISION #	DATE	LAST REVIEW
GC				
GC-001	XAD Tubes	1	06/26/2002	
GC-002	Volatiles/602	8	11/18/2009	
GC-004	DRO/ORO	15	05/24/2010	
GC-006	Gasoline Range Organics	15	05/21/2010	
GC-007	TPH by Texas 1005/1006	7	05/24/2010	
GC-008	Organophosphorous Pest/8141	7	05/24/2010	
GC-011	Chlorinated Herbicides/8151	9	05/21/2010	
GC-012	Pesticides/PCB 608	7	06/23/2009	
GC-013	Pesticides/8081B	13	05/24/2010	
GC-022	BTEX/8021	7	05/21/2010	
GC-023	PCB/8082	11	05/24/2010	
GC-024	Dissolved Gas/RSK-175	6	05/21/2010	
GC-025	EPH-Extractable Pet. Hydrocarbons	5	09/10/2009	
GC-028	Methanol/NCASI Method	2	09/17/2009	
GC-029	Methanol/Method 8015B	6	07/27/2010	
GC-030	NCASI Method DI/HAPS-99.01	2	09/17/2009	
GC-031	Florida PRO	6	05/24/2010	
GC-032	Volatile Petroleum Hydrocarbons	2	07/10/2009	
GC-033	Triazine Pesticides – Method 619	2	12/01/2009	
GC-034	Method 8011	6	05/24/2010	
GC-035	Flexol	0	09/15/2006	
GCMSSV				
GCMSSV-001	Semivolatiles/8270C	16	05/21/2010	
GCMSSV-002	Semivolatiles/625	10	05/21/2010	
GCMSSV-003	Semivolatiles/625 SIM	3	05/21/2010	
GCMSSV-004	Semivolatiles/8270D	3	05/21/2010	
GCMSV				
GCMSV-002	Volatiles/624	9	05/21/2010	
GCMSV-003	Volatiles/8260	20	07/09/2010	
GCMSV-004	Oxygenates/8260	0	10/07/2008	
General Laboratory				
GEN-001	Laboratory Glassware Prep.	5	10/02/2006	1/28/2010
GEN-002	Balance Calibration	8	05/05/2010	
GEN-003	Temperature Monitoring	10	04/30/2010	
GEN-005	Mechanical Pipette Calibration	5	09/29/2006	1/28/2010
GEN-006	Standard Preparation	7	06/17/2010	
GEN-007	GCAL Training	5	08/07/2009	
GEN-008	Documentation of Data (Logbooks)	6	06/26/2002	1/28/2010
GEN-009	Waste Handling	7	07/13/2010	
GEN-010	General Lab Monitoring	7	05/11/2010	

GULF COAST ANALYTICAL LABORATORIES, INC
STANDARD OPERATING PROCEDURES

SOP	METHOD	REVISION #	DATE	LAST REVIEW
GEN-012	Preventive Maintenance	4	02/02/2010	
GEN-013	Spill Clean Up	1	07/23/1998	1/28/2010
GEN-015	Laboratory Contingencies	1	08/31/2000	1/27/2010
GEN-016	Definitions	2	05/09/2005	
GEN-018	Non-conformances/Corrective Actions	5	05/14/2010	
GEN-019	Project Specific Requirements	2	03/10/2010	
GEN-020	Standard Tracking	1	05/06/2010	
GEN-021	Calibration Modules for Target	0	05/26/2009	
GEN-022	Linear Least Square Regression	0	05/26/2009	
HPLC				
HPLC-001	PAH'S/8310	10	05/21/2010	
HPLC-003	Explosives/8330	7	05/25/2010	
HPLC-004	Carbonyls by HPLC (8315A)	4	04/01/2009	
HPLC-006	Hydrazine by HPLC	2	06/01/2006	
HPLC-007	Formaldehyde by HPLC (EPA 1667)	0	01/13/2009	
Lab Administration/General				
LAD-001	Master Signature List	3	07/14/1998	1/26/2010
LAD-002	Visitor Procedure	4	02/26/2003	11/09/2009
LAD-003	Report Generation	8	07/19/2010	
LAD-005	Vehicle Inspection	3	07/14/1998	11/16/2009
LAD-008	Postage Machine	7	11/10/2009	
LAD-009	Mail	7	11/10/2009	
LAD-011	Answering the Telephone	7	11/09/2009	
LAD-012	Sending a Fax	6	09/15/2006	11/09/2009
LAD-013	Receptionist/Arriving and Departing	9	11/10/2009	
LAD-014	Project Management	9	06/08/2010	
LAD-018	Confidentially	4	03/15/2007	11/13/2009
LAD-019	Data Assembly	0	09/13/2006	
Metals				
MET-001	Glassware Prep-Metals	8	11/09/2009	
MET-002	Digestion for GFAAS	10	10/19/2009	
MET-003	Digestion for As & Se-GFAAS	6	10/19/2009	
MET-004	Digestion Solids/3050	13	11/09/2009	
MET-005	Digestion for ICP-water	13	11/09/2009	
MET-006	Digestion for Mercury	19	05/19/2010	
MET-008	Mercury Analysis/PS200	16	05/19/2010	
MET-010	ICP Analysis/PE 3000XL/4300DV	18	05/19/2010	
MET-013	Hardness/Calc. Method	5	11/02/2009	
MET-015	GFAAS Analysis/PE 4100ZL	6	05/19/2010	
MET-018	Microwave Digestion/Organics	4	11/09/2009	

SOP	METHOD	REVISION #	DATE	LAST REVIEW
MET-019	Total Recoverable Metals	2	11/09/2009	
MET-020	ICP Water Preparation for 200.7	2	11/02/2009	
Quality Assurance				
QA-001	Document Control	9	08/10/2010	
QA-002	Data Reduction Validation	7	07/08/2010	
QA-003	Report Validation	5	7/19/2010	
QA-004	Laboratory Audits	3	05/09/2005	1/29/2010
QA-007	Data Archive	5	06/14/2010	
QA-008	Generation of SOP's	4	01/31/2007	1/27/2010
QA-009	Determination of MDL's	9	01/30/2007	1/26/2010
QA-010	Proper Handling of Raw Data	4	11/02/2006	1/26/2010
QA-011	Data Integrity and Ethical Practices	3	08/28/2004	1/25/2010
QA-012	Control Charts	3	07/12/2010	
QA-013	Estimation of Uncertainty	2	06/14/2010	
QA-014	Demonstration of Capability	2	06/10/2010	
QA-015	Performance Evaluation Studies	1	06/17/2010	
Sample Administration				
SAD-001	Sample Log-In	15	08/02/2010	
SAD-002	Sample Custodian	9	08/12/2008	11/16/2009
SAD-003	Sample Kit Preparation	8	08/14/2008	11/16/2009
SAD-004	LIMS Log-In Procedure	8	05/31/2006	11/16/2009
Wet Lab (General Chemistry)				
WL-002	Total Solids	9	11/09/2009	
WL-003	Total Dissolved Solids	9	11/05/2009	
WL-004	Total Suspended Solids	11	11/05/2009	
WL-005	Vol. Suspended Solids	7	11/05/2009	
WL-006	Sulfate/Turbidimetric	9	05/18/2010	
WL-007	Sulfite	6	10/29/2009	
WL-008	Color	7	05/18/2010	
WL-009	Paint Filter Test	9	11/09/2009	
WL-012	Hexavalent Chromium	8	05/18/2010	
WL-014	Phenols	9	05/18/2010	
WL-015	Cyanide	9	05/18/2010	
WL-016	Chlorine	7	05/18/2010	
WL-017	Fluoride	7	05/18/2010	
WL-018	BOD	20	05/19/2010	
WL-019	Specific Gravity	8	10/29/2009	
WL-021	COD/HACH	10	05/18/2010	
WL-022	Ash/D482-80	9	11/09/2009	
WL-025	Surfactant	7	05/18/2010	
WL-026	Fecal Coliform	11	07/20/2009	
WL-028	Silica	7	05/18/2009	

SOP	METHOD	REVISION #	DATE	LAST REVIEW
WL-029	Specific Conductance	7	02/17/2010	
WL-032	Turbidity	8	06/04/2010	
WL-033	Sulfide/MB	9	06/07/2010	
WL-034	Total Phosphorus	8	05/18/2010	
WL-035	Total Settable Solids	4	10/29/2009	
WL-037	TOX	4	11/03/2009	
WL-038	Chlorides	8	05/18/2010	
WL-041	Nitrate/Nitrite/N+N	9	05/18/2010	
WL-042	Anions by Ion Chromatography	15	05/19/2010	
WL-043	TOC Waters	9	05/19/2010	
WL-044	Heat of Combustion	7	11/02/2009	
WL-045	TKN/Titration	7	11/09/2009	
WL-046	NH3 by ISE	10	11/09/2009	
WL-047	Ferrous Iron	5	05/18/2010	
WL-048	Orthophosphate	9	05/18/2010	
WL-051	Sulfide Titration	7	11/17/2009	
WL-052	Viscosity	3	06/15/2009	
WL-054	Reactive Cyanide & Sulfide	9	05/18/2010	
WL-056	Corrosivity Toward Steel	6	12/17/2009	
WL-057	TOC Solid	2	06/25/2009	
WL-060	Flashpoint-Automated	5	10/28/2009	
WL-061	Water by Karl Fisher	2	10/29/2009	
WL-062	Automated Ammonia Titration	5	11/09/2009	
WL-063	Automated Alkalinity	6	11/09/2009	
WL-064	Automated Low Alkalinities	5	11/10/2009	
WL-066	Ignitability of Solids	3	02/18/2009	11/05/2009
WL-068	Perchlorate	2	01/11/2010	
WL-069	Total Acidity	2	10/29/2009	
WL-070	Volatile Fatty Acids	1	11/04/2009	
WL-071	Sediment Concentration	0	04/22/2008	11/05/2009
WL-073	Desiccator Monitoring	1	11/09/2009	

QUALITY ASSURANCE MANUAL

for

DHL Analytical, Inc.

2300 Double Creek Drive
Round Rock, TX 78664

Responsible Parties

Name	Function (Unit)	Phone	Signatures	Date
Derhsing Luu, Ph.D	President Laboratory Director Technical Director	(512) 388-8222		4/18/11
John DuPont	General Manager	(512) 388-8222		4/18/11
Scott Schroeder	Lab Manager Technical Director	(512) 388-8222		4/18/11
Sherri Herschmann	Quality Manager	(512) 388-8222		4/18/11

Revision Number:	10.0	Effective Date:	04/15/11

RECORD OF REVIEW/REVISION

REVIEW CODES

0 – REVIEW - No Change Required
1 – REVIEW – With Revisions
2 – Modification of QAM – With Approvals

REVISION SECTION	REVIEW/REVISION APPROVED BY:	CODE	DATE	DESCRIPTION OF REVISION
ALL, Appendix A, E	Sherri Herschmann	1,2	10/25/10	Update references to DoD QSM 4.2. Update Lab Scope and Support Equipment.
Sec 19	Sherri Herschmann	1,2	10/25/10	Add definitions from LOD/LOQ DoD Fact Sheet
Sec 20, 23	Sherri Herschmann	1,2	04/15/11	Add DoD requirements for CCVs and PT samples.
Sec 3, 4	Sherri Herschmann	1,2	04/15/11	Add 2009 TNI Standard implementation date.

SECTION 2 - TABLE OF CONTENTS

SECTION 3 – INTRODUCTION AND SCOPE 5

3.1 Scope of Testing ... 5
3.1.1 Laboratory Directives ... 5
3.1.2 Quality System ... 5
3.2 Table of Contents, References and Appendices ... 6
3.3 Glossary and Acronyms Used ... 6

SECTION 4 – ORGANIZATIONAL ROLES AND RESPONSIBILITIES 9

4.1 Laboratory Organizational Structure ... 9
4.1.1 Key Personnel ... 9
4.2 Responsibility and Authority ... 10

SECTION 5 – QUALITY SYSTEMS 11

5.1 Quality Policy ... 11
5.2 Quality Assurance Manual (QAM) ... 11

SECTION 6 – DOCUMENT MANAGEMENT 12

6.1 Controlled Documents ... 12
6.1.1 Quality Assurance Manual (QAM) ... 13
6.1.2 Standard Operating Procedures (SOPs) ... 13
6.1.3 Health and Safety Manual ... 13
6.1.4 Forms ... 13
6.1.5 Quality Assurance Project Plan (QAPP) ... 13
6.2 Document Changes to Controlled Documents ... 14
6.2.1 Paper Document Changes ... 14
6.2.2 Electronic Document Changes ... 14
6.3 Obsolete Documents ... 14
6.4 Standard Operating Procedures ... 14
6.4.1 Test Method SOPs ... 15

SECTION 7 – REVIEW OF REQUESTS, TENDERS AND CONTRACTS 17

7.1 Procedure for the Review of Work Requests ... 17
7.2 Documentation of Review ... 18

SECTION 8 – SUBCONTRACTING OF TESTS 19

SECTION 9 – PURCHASING SERVICES AND SUPPLIES 21

SECTION 10 – SERVICE TO THE CLIENT 22

10.1 Client Confidentiality ... 22
10.2 Storage and Distribution of Client Reports ... 23

SECTION 11 – COMPLAINTS 24

SECTION 12 – CONTROL OF NON-CONFORMING WORK 25

SECTION 13 – CORRECTIVE ACTION(S) 26

13.1 Selection and Implementation of Corrective Actions ... 27
13.2 Monitoring of Corrective Action(s) ... 27
13.3 Technical Corrective Action ... 28
13.4 Policy for Exceptionally Permitting Departures from Documented Policies and Procedures ... 28

SECTION 14 – PREVENTIVE ACTION 29

14.1 Selection and Implementation of Preventive Actions ... 29
14.2 Monitoring of Preventive Action(s) ... 30
14.3 Preventive Action Taken ... 30

SECTION 15 – CONTROL OF RECORDS 31

15.1 Records Management and Storage ... 31
15.1.1 Identification ... 31
15.1.2 Collection ... 32
15.1.3 Access ... 32
15.1.4 Filing ... 32
15.1.5 Storage ... 32
15.1.6 Disposal of Records ... 33
15.2 Chain of Custody (COC) Records ... 33
15.2.1 Sample Receipt ... 34

SECTION 16 – AUDITS AND MANAGEMENT REVIEW 35

16.1 Internal Audits ... 35
16.2 External Audits ... 35
16.3 Performance Audits ... 36
16.4 System Audits and Management Reviews ... 36
16.4.1 Management Review of Quality System ... 36

SECTION 17 – PERSONNEL, TRAINING, AND DATA INTEGRITY 38

17.1 Job Descriptions ... 38
17.1.1 President/Laboratory Director ... 38
17.1.2 General Manager ... 38
17.1.3 Laboratory Manager ... 38
17.1.4 Technical Director(s) ... 39
17.1.5 Quality Assurance (QA) Manager ... 39
17.1.6 Laboratory Staff: Analysts & Technicians ... 40
17.1.7 Health and Safety Officer ... 40
17.2 Data Integrity and Ethics ... 40
17.3 Data Integrity and Ethics Training ... 41
17.4 General Training ... 42

SECTION 18 – ACCOMMODATIONS & ENVIRONMENTAL CONDITIONS 44

SECTION 19 – TEST METHODS AND METHOD VALIDATION 45

19.1 Demonstration of Capability (DOC) ... 45
19.2 On-Going (or Continued) Proficiency ... 45
19.3 Initial Test Method Evaluation ... 45
19.3.1 Detection Limit (DL) ... 45
19.3.2 Limit of Detection (LOD) ... 46
19.3.3 Limit of Quantitation (LOQ) ... 46
19.3.4 Precision and Accuracy ... 47
19.3.5 Selectivity ... 49
19.4 Estimation of Uncertainty ... 49
19.5 Laboratory-Developed or Non-Standard Method Validation ... 49
19.6 Control of Data ... 50

SECTION 20 – EQUIPMENT 52

20.1 General Equipment Requirements ... 52
20.2 Support Equipment ... 53
20.2.1 Balances ... 54
20.2.2 Refrigerators & Walk-in ... 54
20.2.3 Oven Temperature ... 55
20.2.4 TCLP Tumbler ... 55
20.2.5 Support Equipment Maintenance ... 55
20.2.6 Support Equipment Calibration ... 55
20.3 Analytical Equipment ... 55
20.3.1 Maintenance ... 55
20.3.2 Initial Instrument Calibration ... 56
20.3.2 Continuing Instrument Calibration ... 58
20.3.4 Noncompliant Continuing Instrument Calibration Verifications ... 59

SECTION 21 – MEASUREMENT TRACEABILITY 61

21.1 Reference Standards ... 61
21.2 Reference Materials ... 61
21.3 Transport and Storage of Reference Standards and Materials ... 62
21.4 Labeling of Reference Standards, Reagents, and Materials ... 62

SECTION 22 – SAMPLE MANAGEMENT 64

22.1 Sample Receipt ... 64
22.2 Sample Acceptance ... 64
22.2.1 Sample Receipt and Verification Protocol ... 64
22.2.2 Preservation Checks ... 64
22.3 Sample Identification ... 65
22.4 Sample Storage ... 67
22.5 Sample Disposal ... 67
22.6 Sample Transport ... 67
22.6.1 Sample Distribution and Tracking ... 67
22.6.2 Sample Transfer ... 68
22.7 Sampling Records ... 68

SECTION 23 – QUALITY OF TEST RESULTS 69

23.1 Essential Quality Control Procedures ... 69
23.2 Internal Quality Control Practices ... 70
23.2.1 Positive and Negative Controls ... 70
23.2.2 Selectivity ... 70
23.2.3 Consistency, Variability, Repeatability, and Accuracy ... 70
23.2.4 Test Method Capability ... 71
23.2.5 Data reduction ... 71
23.3 Method Blanks ... 71
23.4 Laboratory Control Samples ... 72
23.5 Matrix Spikes and Matrix Spike Duplicates ... 73
23.6 Matrix Duplicates ... 74
23.7 Surrogate Spikes ... 74
23.8 Proficiency Test Samples or Interlaboratory Comparisons ... 75
23.9 Data Review ... 76

SECTION 24 – REPORTING OF RESULTS 78

24.1 Test Reports ... 78
24.2 Supplemental Test Report Information ... 78
24.3 Environmental Testing Obtained from Subcontractors ... 79
24.4 Electronic Transmission of Results ... 79
24.5 Amendments and Revisions to Test Reports ... 79

SECTION 25 – APPENDIX 80

APPENDIX A - Laboratory Scope of Analytical Testing Services for DHL Analytical ... 80
APPENDIX B - Job Descriptions for all Laboratory Positions ... 82
APPENDIX C - DHL Analytical Ethics and Data Integrity Agreement ... 84
APPENDIX D - DHL Analytical Floor Plan ... 85
APPENDIX E - Minimum Performance Checks and Acceptance Criteria for Support Equipment ... 86
APPENDIX F – Scope of Accreditation for DoD-ELAP (DoD QSM 4.2) ... 87

SECTION 3 – INTRODUCTION AND SCOPE

The purpose of this *Quality Assurance Manual (QAM)* is to outline the quality system for the laboratory. The QAM defines the policies, procedures, and documentation that assure analytical services continually meet a defined standard of quality that is designed to provide clients with data of known and documented quality and, where applicable, demonstrate regulatory compliance.

POLICY

The DHL Analytical QAM sets the standard under which all laboratory operations are performed including the laboratory's organization, objectives, and operating philosophy.

3.1 Scope of Testing

DHL Analytical's QAM establishes a consistent quality foundation for the diversified engineering and technical operations of DHL Analytical. Copies of this manual, when issued to individuals or organizations outside of DHL Analytical, are uncontrolled, proprietary documents. Current copies of all referenced controlled distribution DHL Analytical Quality Documents are available for review during normal working hours. In the instance of critical need, outside organizations may request in writing to be issued a controlled copy of this Quality Assurance Manual. All requests for controlled copies of this document shall be addressed to the Quality Assurance (QA) Manager. Only the QA Manager has the authority to issue a controlled copy of documents.

3.1.1 Laboratory Directives

This manual is to be used as a guide to meet and exceed the objectives and directives of DHL Analytical. The following objective and directives have been established as means of providing continuous improvement for the company, our industry, and its customers:

- Create a better service atmosphere for our customers
- Fully comply with the technical requirements of our customers
- Improve and sustain the team approach to problem solving
- Improve communication with our employees, customers and industries
- Continuously improve testing procedures and practices
- Improve employee training and comprehension
- Increase efficiency and reduce costs
- Meet the requirements of 2003 NELAC standards
- Meet the requirements of DoD Quality Systems Manual Version 4.2

3.1.2 Quality System

This QAM, together with Standard Operating Procedures (SOPs) and other applicable documents comprise the Quality System of DHL Analytical. The QAM provides general requirements for the quality system while the SOPs provide specific requirements. For the laboratory, the QAM and SOPs document DHL Analytical's policies and procedures established to meet the requirements of 2003 NELAC standards and DoD Quality Systems Manual Version 4.2. A brief description of the quality system documents are listed below.

The Standards adopted by the National Environmental Laboratory Accreditation Conference (NELAC) in 2003 are the current standards that are

used by TNI accreditation bodies for the accreditation of environmental laboratories, and will continue to be the applicable standards until the new TNI standards have been implemented. Implementation of the 2009 TNI Standard is scheduled to occur on July 1, 2011.

3.1.2.1 Quality Assurance Manual (QAM)

This manual defines DHL Analytical's Quality System. This system is defined by executive management and is controlled by the Quality Assurance (QA) Manager with regards to its issuance, revision, and distribution. The QAM will be reviewed at least annually for accuracy and adequacy, and updated as appropriate.

3.1.2.2 Standard Operating Procedures (SOPs)

Instruction-level documents generated, used and controlled by each individual department within DHL Analytical. Each analyst is responsible for generation of new SOPs and for an annual review of existing SOPs for his/her department, and updated as appropriate with the Laboratory Manager or designee acting as editor.

3.1.2.2 Other Documents

Includes other documents and manuals referenced in the above items; may include Forms and the Health and Safety Manual. The laboratory scope of analytical testing services includes those listed in Appendix A in Section 25 of this QAM.

3.2 Table of Contents, References and Appendices

The Table of Contents is located in Section 2 of this Manual. The QAM uses references from the 2003 NELAC Standards, Chapter 5, Appendix A and the DoD Quality Systems Manual Version 4.2. For more detail, click on the following links:

2003 NELAC Standard: http://www.nelac-institute.org/docs/2003nelacstandard.pdf

2009 TNI Standard: ..\..\..\TNI\EL V1 ISO 2009.pdf

DoD QSM 4.2: http://www.navylabs.navy.mil/QSM%20V4.2%20-%20Final%20102510.pdf

Note: Make sure to include Appendices (SOPs, forms, further policies) if you have them. Otherwise change the section heading above to "Table of Contents and Reference". The added appendices can be added to the Table of Contents by applying "Header 1" style to the title page "Appendices", and "Header 2" style to each individual appendix title.

3.3 Glossary and Acronyms Used

Quality control terms are generally defined within the section that describes the activity.

Glossary

Appendix A, Chapter 1, 2003 NELAC Standards

DoD Quality Systems Manual Version 4.2

Acronyms

A list of acronyms used in this document and their definitions are:

AA	–	Accrediting Authority
ANSI	–	American National Standards Institute
ASQC	–	American Society for Quality Control
ASTM	–	American Society for Testing and Materials
°C	–	degrees Celsius
CAL	–	Calibration
CAS	–	Chemical Abstract Service
CCB	–	Continuing Calibration Blank
CCV	–	Continuing Calibration Verification
CDOC	–	Continuing Demonstration of Capability
COC	–	Chain of Custody
COD	–	Coefficient of Determination
DCS	–	Detectability Check Standard
DL	–	Detection Limit
DOC	–	Demonstration of Capability
DoD QSM	–	Department of Defense Quality Systems Manual
DQO	–	Data Quality Objective
DUP	–	Matrix Duplicate
DUS	–	Data Usability Summary
EPA	–	Environmental Protection Agency
ER	–	Exception Report
FoPT	–	Field of Proficiency Testing
g/L	–	grams per liter
GC/MS	–	Gas chromatography/mass spectrometry
ICAL	–	Initial Calibration
ICP-MS	–	Inductively coupled plasma-mass spectrometry
ICS	–	Interference Check Sample
ICV	–	Initial Calibration Verification
IDOC	–	Initial Demonstration of Capability
IS	–	Internal Standards
ISO/IEC	–	International Organization for Standardization/ International Electrochemical Commission
LCS	–	Laboratory Control Sample
LCSD	–	Laboratory Control Sample Duplicate
LFB	–	Laboratory Fortified Blank
LIMS	–	Laboratory Information Management System
LOD	–	Limit of Detection
LOQ	–	Limit of Quantitation (formerly reporting limit)
LRC	–	Laboratory Review Checklist
MB	–	Method Blank
MDL	–	Method Detection Limit
mg/Kg	–	milligrams per kilogram
mg/L	–	milligrams per liter
MQL	–	Method Quantitation Limit
MS	–	Matrix Spike
MSD	–	Matrix Spike Duplicate
MSDS	–	Material Safety Data Sheets
NELAC	–	National Environmental Laboratory Accreditation Conference
NELAP	–	National Environmental Laboratory Accreditation Program
NIST	–	National Institute of Standards and Technology
PDS	–	Post Digestion Spike
PE	–	Proficiency Evaluation (sample)
PQL	–	Practical Quantitation Limit
PT	–	Proficiency Test(ing)
PTOB	–	Proficiency Testing Oversight Body
PTPA	–	Proficiency Testing Provider Accreditor
QA	–	Quality Assurance
QAM	–	Quality Assurance Manual
QAPP	–	Quality Assurance Project Plan
QC	–	Quality Control
%R	–	Percent Recovery
RCRA	–	Resource Conservation Recovery Act
RL	–	Reporting limit

RPD	–	Relative percent difference
RPM	–	Revolutions per minute
RSD	–	Relative standard deviation
SD	–	Serial Dilution
SDL	–	Sample Detection Limit
SOPs	–	Standard operating procedures
SPK	–	Spike
SPLP	–	Synthetic Precipitation Leaching Procedure
SQL	–	Sample Quantitation Limit
SSCV	–	Second Source Calibration Verification
STD	–	Standard
SVOC	–	Semivolatile Organic Compound
TICs	–	Tentatively Identified Compounds
TCEQ	–	Texas Commission on Environmental Quality
TCLP	–	Toxicity Characteristic Leaching Procedure
TRRP	–	Texas Risk Reduction Program
µg/L	–	micrograms per liter
UV	–	Ultraviolet
VOC	–	Volatile Organic Compound
WET	–	Whole Effluent Toxicity

SECTION 4 – ORGANIZATIONAL ROLES AND RESPONSIBILITIES

POLICY

DHL Analytical Laboratory is a legally identifiable organization. Through application of the policies and procedures outlined in this chapter, the laboratory assures that it is impartial and that its' personnel are free from undue commercial, financial, or other undue pressures that might influence their technical judgment. The laboratory is responsible for carrying out testing activities that meet the requirements of the 2003 NELAC Standards, the DoD Quality Systems Manual Version 4.2, and that meet the needs of the client. Implementation of the 2009 TNI Standard is scheduled to occur on July 1, 2011.

4.1 Laboratory Organizational Structure

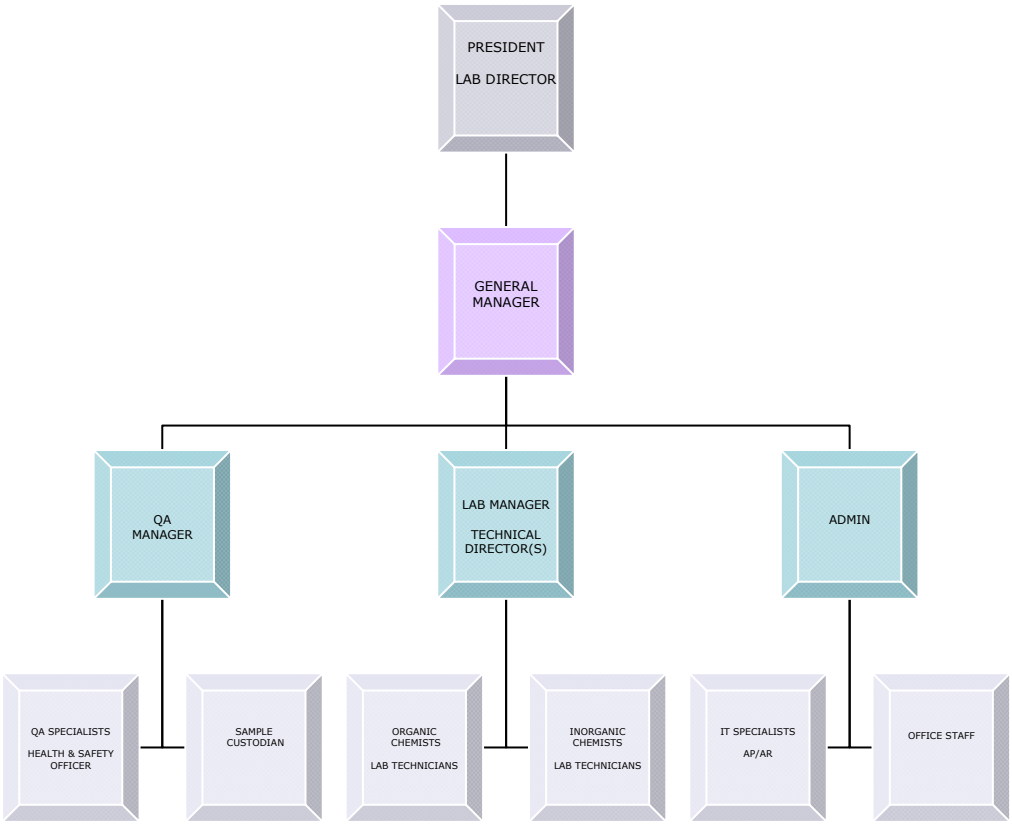
Policy

The organizational structure indicated minimizes the potential for conflicting or undue interests that might influence the technical judgment of analytical personnel.

DHL Analytical is a minority-owned corporation located in Round Rock, Texas. DHL Analytical is a full service fixed laboratory offering chemical environmental analyses of soil, water, sediment, wastes, and air. The tax ID number is available on request.

4.1.1 Key Personnel

An organizational chart for DHL Analytical is presented below. The key personnel are the President/Laboratory Director, General Manager, Lab Manager, and Quality (QA) Manager. They are responsible for all aspects of laboratory operations, analytical methods, technical development and supervision of analyses.



4.2 Responsibility and Authority

The term **MANAGEMENT** includes the titles, President/Laboratory Director, General Manager, Lab Manager, QA Manager, and Technical Director(s).

Policy

DHL Analytical is supervised by the General Manager with the assistance of trained and experienced chemists. It is the responsibility of the QA Manager to maintain the QA/QC protocols set forth in this document for the laboratory. In order to review adherence to these procedures, periodic meetings are established to review project data and related QA concerns. Approved signatories for final reports shall be the President/Laboratory Director, General Manager, QA Manager, and Technical Director(s). This may also include other personnel authorized by the Laboratory Director with written approval placed in their personnel file. Additional discussion of responsibilities regarding each position is documented in Section 17.1.

All management has overall responsibility for the technical operations and authority needed to generate the required quality of laboratory operations.

Management's commitment to quality and to the Quality System is stated in the Quality Policy, which is upheld through the application of related policies and procedures.

All management ensures technical competence of personnel operating equipment, performing tests, evaluating results, or signing reports, and limits authority to perform laboratory functions to those appropriately trained and/or supervised.

Procedure

The assignment of responsibilities, authorities, and interrelationships of the personnel who manage, perform, or verify work affecting the quality of environmental tests is described in detail in Section 17.1.

The General Manager and QA Manager bear specific responsibility for maintenance of the Quality System. This includes defining roles and responsibilities to personnel, approving documents, providing required training, providing a procedure for confidential reporting of data integrity issues, and periodically reviewing data, procedures, and documentation. The QA Manager ensures that audit findings and corrective actions are completed within required time frames.

The Technical Director(s) who is absent for a period of time exceeding 15 consecutive calendar days shall designate another full-time staff member meeting the qualifications of the Technical Director(s) to temporarily perform this function. If this absence exceeds 65 consecutive calendar days, the primary accrediting authority shall be notified in writing. The President/Laboratory Director and/or Technical Director(s) are the designated alternates during the absence of the Laboratory Manager, Technical Director(s), or the QA Manager.

The President/Laboratory Director and the General Manager are responsible for defining the minimal level of education, qualifications, experience, and skills necessary for all positions in the laboratory and assuring that technical staff have demonstrated capabilities in their tasks. Training is kept up to date as described in Section 17.4 by periodic review of training records and through employee performance review.

SECTION 5 – QUALITY SYSTEMS

The laboratory's Quality System is documented in this QAM and associated quality system documents. Together they describe the policies, objectives, principles, organizational authority, responsibilities, accountability, and implementation plan of the organization for ensuring quality in its' work processes, products, and services.

5.1 Quality Policy

The quality policy is signed and dated, and is issued under the authority of the highest level of laboratory management, which demonstrates management's commitment to integrity, ethics, the quality system and associated standards. The copy of the Quality Policy is posted in key areas throughout the laboratory.

Quality Policy Statement

The objectives of the quality system and the commitment of management are to consistently provide our customers with on time, scientifically valid, legally defensible data that meets their project requirements. Our policy is to use good professional practices, to maintain quality, to uphold the highest quality of service, and to comply with the 2003 NELAC Standards and the DoD Quality Systems Manual Version 4.2. Implementation of the 2009 TNI Standard is scheduled to occur on July 1, 2011. The laboratory ensures that personnel are free from any commercial, financial, and other undue pressures, which might adversely affect the quality of work. This policy is implemented and enforced through the unequivocal commitment of management, at all levels, to the Quality Assurance (QA) principles and practices outlined in this manual. However, the primary responsibility for quality rests with each individual within the laboratory organization. Every laboratory employee must ensure that the generation and reporting of quality analytical data is a fundamental priority. Every laboratory employee is required to familiarize themselves with the quality documentation and to implement the policies and procedures in their work. All employees are trained annually on ethical principles and procedures surrounding the data that is generated. The laboratory maintains a strict policy of client confidentiality.

5.2 Quality Assurance Manual (QAM)

Policy

The QA Manager ensures that the laboratory's policies and objectives for quality are documented by reference or by inclusion in the QAM, and that the QAM is communicated to, understood by, and implemented by all personnel concerned.

All laboratory requirements not included in the QAM will be documented in the DHL Analytical SOPs as described in Section 6.4.

Procedure

All employees sign a form which is kept with their training records in their personnel file that states that they have read and understood the QAM, including the quality policy. The QAM is maintained current and up-to-date by the QA Manager.

SECTION 6 – DOCUMENT MANAGEMENT

This Section describes procedures for document management, which includes controlling, distributing, reviewing, and accepting modifications. The purpose of document management is to preclude the use of invalid and/or obsolete documents.

It is DHL Analytical's policy to maintain a document control system to ensure that new, revised, and obsolete documents are properly reviewed and approved prior to distribution or disposition. These documents include this Quality Assurance Manual, Standard Operating Procedures, Health and Safety Manual, Forms, and any Quality Assurance Project Plans. These documents are identified, listed, and stored with controlled access. The Quality Assurance Manager or his designated representative shall be responsible for document control. All quality documents are available to laboratory personnel via PDF or DOC files located on the DHL network server.

The laboratory manages three types of documents: 1) controlled, 2) approved, and 3) obsolete.

- A **CONTROLLED DOCUMENT** is one that is uniquely identified, issued, tracked, and kept current as part of the quality system. Controlled documents may be internal documents or external documents.

- **APPROVED** means reviewed, and either signed and dated, or acknowledged in writing or secure electronic means by the issuing authorities.

- **OBSOLETE DOCUMENTS** are documents that have been superseded by more recent versions.

POLICY

All documents that affect the quality of laboratory data are managed appropriate to the scope and depth required.

6.1 Controlled Documents

Policy

Documents will be reviewed and approved for use by the General Manager, Lab Manager, and QA Manager prior to issue.

Procedure

Documents are reviewed at least annually and revised as necessary as specified in the DHL SOP: ADM-QA/QC-01 to ensure their contents are suitable and in compliance with the current quality systems requirements, and accurately describe current operations.

Approved revisions of all documents are available at all locations where operations are essential to the effective functions of the laboratory in electronic form located on the DHL network server.

Controlled internal documents are uniquely identified with:

- effective date of issue
- revision identification (revision number)

- page number
- total number of pages or a mark to indicate the end of the document
- the signatures of the issuing authorities (i.e. management)

A master list of controlled internal documents is maintained that includes distribution, location, and revision dates. A master list of controlled external documents is also maintained that includes title, author, copyright date, and date of publication, and location. The controlled document list is maintained by QA Manager. The controlled document list is updated as required.

6.1.1 Quality Assurance Manual (QAM)

The QA Manager shall be responsible for controlling the content, revision, issuance, and recall of the QAM. The QAM shall be reviewed by the QA Manager annually and revised as necessary to reflect contractual, procedural, or organizational changes. This process shall involve reviewing all new codes, specifications, etc. and incorporating any required changes into the manual. The President/Lab Director, General Manager, Lab Director, and QA Manager must approve any such changes.

6.1.2 Standard Operating Procedures (SOPs)

Each analyst is responsible for generation of new SOPs and for an annual review of existing SOPs for his/her department, and updated as appropriate with the Laboratory Manager or designee acting as editor.

6.1.3 Health and Safety Manual

DHL Analytical's Health and Safety Manual contains policies related to Health and Safety. Responsibilities for development of individual policies rest with the Health and Safety Officer. The H&S manual shall be reviewed by the H&S Officer annually and revised as necessary to reflect any procedural changes.

6.1.4 Forms

Forms related to the proper implementation of the Quality Program shall be identified with a Title, Effective Date, and Signature. These forms include:

- DHL Analytical Signature Sheet
- Ethics and Data Integrity Agreement
- Health & Safety / HAZCOM / Hazardous Waste Disposal Practices
- Quality Assurance Manual (QAM) Training
- DHL Analytical In-House Training

6.1.5 Quality Assurance Project Plan (QAPP)

A Quality Assurance Project Plan is a document submitted by the client that outlines the procedures a monitoring project will use to ensure that samples, data, and subsequent reports meet a particular client's project requirements. The client shall be responsible for controlling the content, revision, issuance, and recall of a QAPP. A QAPP shall be reviewed by the QA Manager annually and revised as necessary to reflect contractual, procedural, or organizational changes. This process shall involve reviewing all new codes, specifications, etc. and incorporating any required changes into the QAPP. The General Manager, Lab Director, and QA Manager must approve any such changes.

6.2 Document Changes to Controlled Documents

Policy

Changes to documents shall be reviewed and approved by the same function that performed the original review unless specifically designated otherwise. The designated personnel shall have access to pertinent background information upon which to base their review and approval.

Document changes are approved by the General Manager, Lab Manager, and QA Manager. The document management process allows for handwritten modifications to documents only during the revision or review process.

6.2.1 Paper Document Changes

The laboratory's documentation control system allows for the amendment of documents by hand, pending the re-issue of the documents. Amendments shall be clearly marked, initialed and dated. The amended page(s) are scanned into a PDF and are inserted into the original electronic document. A revised document shall be formally re-issued as soon as practicable.

Document changes are approved with signature and dated by management. The modified document is then copied and distributed, and obsolete documents are removed.

6.2.2 Electronic Document Changes

Suggested revisions to electronic documents are presented to management for review and approval. Changes to electronic documents are approved either on an accompanying form or through electronic means (such as email, change tracking functions, or memoranda).

Where practicable, the altered text or new text in the draft is identified during the revision or review process to provide for easy identification of the modifications. The document will be designated as "DRAFT" with marked changes viewed as "Final Showing Markup". The draft will be saved as a PDF showing all marked changes.

6.3 Obsolete Documents

Policy

All invalid or obsolete documents are removed and archived, or otherwise prevented from unintended use.

Procedure

Obsolete documents retained for legal use or historical knowledge preservation are appropriately marked and retained.

Obsolete documents are identified as being obsolete by management. All copies of the obsolete document are collected from employees according to the distribution log and each obsolete document is destroyed. At least one copy of any obsolete document is kept in the QA office as required by the regulations.

6.4 Standard Operating Procedures

STANDARD OPERATING PROCEDURES (SOPs) are used to ensure consistency of application of common procedures, are written procedures that describe in detail how

to accurately reproduce laboratory processes, and are of two types: 1) test method SOPs, which have specifically required details, and 2) general use SOPs which document the more general organizational procedures.

DHL SOPs are formal documents with predefined section headings and contents that are compliant with 2003 NELAC Standards and DoD QSM 4.2 requirements. Implementation of the 2009 TNI Standard is scheduled to occur on July 1, 2011.

Policy

Copies of all SOPs are accessible to all personnel via PDF files located on the DHL network server.

Procedure

Each SOP indicates the effective date, the revision number, and the signature(s) of either the General Manager or QA Manager, and the Technical Director(s).

6.4.1 Test Method SOPs

Policy

The laboratory has SOPs for all test methods within its scope and for procedures that are part of the Quality System that accurately reflect how the analytical process is performed.

Any deviation from a test method is documented within the appropriate SOP, including both a description of the change made and a technical justification. Any deviation from a SOP must be documented by use of a Variance Report that is approved by the QA Manager or Technical Director(s) and reported to the client.

Procedure

Each Test Method SOP includes or references (as applicable) the following as required by the requirements of 2003 NELAC standards and DoD Quality Systems Manual Version 4.2:

SCOPE, APPLICATION AND DEFINITIONS

- identification of the test method
- applicable matrix or matrices
- components to be analyzed
- definitions

SUMMARY AND REFERENCES

- summary of the test method
- instrumentation used for analysis

INTERFERENCES

- target or non-target analyte(s) that can bias data
- lab artifacts
- cross-contamination of high level samples
- use of method blanks

APPARATUS AND MATERIALS

- instrument descriptions

- equipment and supplies
- reagents and standards
- gases

SAMPLE HANDLING AND PRESERVATION

- proper sample container
- adequate sample volume required to perform analysis
- sample preservation
- correct temperature storage of samples

INSTRUMENT PARAMETERS

- recommended operating conditions for instrument

PREPARATION OF STANDARDS

- calibration levels and concentrations

SAMPLE PREPARATION

- detailed description of sample preparation
- some analysis will refer to a prep SOP

CALIBRATION

- detection limits
- calibration and standardization

SAMPLE ANALYSIS

- data analysis and calculations
- method performance

DATA INTERPRETATION AND METHOD PERFORMANCE

- data assessment and acceptance criteria for quality control measures

QA/QC AND CORRECTIVE ACTIONS

- quality control, including acceptance criteria
- contingencies for handling out-of-control or unacceptable data
- corrective actions for out-of-control data

INSTRUMENT MAINTENANCE

- routine maintenance schedule
- troubleshooting

HEALTH, SAFETY, AND WASTE DISPOSAL

- health and safety policies
- waste management
- pollution prevention

APPENDIX

- tables, diagrams, flowcharts and validation data
- references

SECTION 7 – REVIEW OF REQUESTS, TENDERS AND CONTRACTS

POLICY

The review of all new work assures that oversight is provided so that requirements are clearly defined, the laboratory has adequate resources and capability, and the test method is applicable to the customer's needs. This process assures that all work will be given adequate attention without shortcuts that may compromise data quality.

Contracts for new work may be formal bids, signed documents, verbal, or electronic.

PROCEDURE

7.1 Procedure for the Review of Work Requests

The laboratory determines if it has the necessary accreditations, resources, including schedule, equipment, deliverables, and personnel to meet the work request.

All incoming new projects shall be reviewed by DHL Analytical management (President/Laboratory Director, General Manager, QA Manager and/or Technical Director(s)). This consists of preparing for all new projects by having all in-house resources available.

All projects of significant size or turnaround time requirements are evaluated in a manner to determine the laboratory's capability of performing the required tests for the amount of sample throughput in the turnaround time necessary. Generally, a maximum number of samples per test are estimated to insure proper quality and service for our clients. Factors that affect this number are:

- personnel
- instrumentation
- concurrent projects
- hold times
- data reporting requirements

If, after careful estimation, this number is below the project requirements, DHL Analytical shall not participate in the project and the client will be informed in writing via a "No Bid" letter. Other options are increasing capacity of the laboratory by purchase of additional instruments and obtaining back-up laboratory support, if the client approves and if warranted by the project requirements. Additionally, we shall work closely with our clients to insure all project objectives shall be met. Project objectives include detection limits, QA/QC requirements, data reporting, and electronic deliverables.

The laboratory will inform the client in writing the results of the review if it indicates any potential conflict, deficiency, lack of accreditation or inability of the lab to the complete the work satisfactorily.

The client is informed of any deviation from the contract including the test method or sample handling processes. All differences between the request and the final contract are resolved and recorded before any work begins. It is necessary that the contract be acceptable to both the laboratory and the client.

The review process is repeated when there are amendments to the original contract by the client. The participating personnel are given copies of the amendments.

7.2 Documentation of Review

Records are maintained for every contract or work request, when appropriate. This includes pertinent discussions with a client relating to the client's requirements or the results of the work during the period of execution of the contract.

SECTION 8 – SUBCONTRACTING OF TESTS

A **SUBCONTRACT LABORATORY** is defined as a laboratory external to this laboratory, or at a different location than the address indicated on the front cover of this manual, that performs analyses for this laboratory because of unforeseen reasons (workload, need for further expertise, or temporary incapacity) or on a continuing basis through permanent subcontracting, agency or franchising arrangements.

POLICY

When applicable, DHL Analytical shall subcontract to only NELAP and DoD-ELAP (if applicable) accredited laboratories for analyses not done in-house. The Subcontract laboratory shall meet applicable statutory and regulatory requirements for performing the tests and submitting the results of tests performed. If NELAC work is being performed, only laboratories that are NELAP accredited for that test shall be used. DHL Analytical shall obtain customer approval before subcontracting, and this shall be documented in the quote to the customer.

DHL Analytical must ensure that subcontracted laboratories meet the requirements of the DoD QSM 4.2 and provide documentation of DoD-ELAP accreditation. Subcontracted laboratories must be accredited by DoD or its designated representatives. Subcontracted laboratories must receive project-specific approval from the DoD client before any samples are analyzed.

If it is determined that the subject analyses will be conducted by an outside laboratory, management must consider the applicable factors presented below.

- Does the laboratory perform all required analysis in house? How experienced is the laboratory in conducting the requested analysis? Do they perform the analysis frequently enough to be competent?
- If subcontractor laboratories are used, are they NELAP and DoD-ELAP (if applicable) accredited for the requested analysis?
- Can the subcontractor laboratory meet required turnaround times?
- Can the laboratory meet required method detection limits and is this documented?
- Does the laboratory use state-of-the-art methods and equipment?
- Does the standard laboratory reporting format meet required needs, or will they customize the report?
- Can the subcontractor laboratory satisfy all necessary procedures/protocols of regulatory agencies with jurisdiction?

PROCEDURE

No parameters under the DoD-ELAP Scope of Accreditation shall be subcontracted to any laboratory that does not have the DoD-ELAP accreditation. Refer to Appendix F for the DoD-ELAP accreditation. If the subcontractor laboratory has a tentative completion date for the DoD-ELAP accreditation, the subcontractor must provide documentation stating that their accreditation is pending.

The laboratory shall maintain a register of all subcontractors that it uses for environmental tests and a record of the evidence of compliance with DoD QSM 4.2. A list of approved subcontractors and suppliers is maintained; see Section 9 of the QAM for purchasing services and supplies.

The laboratory notifies the client of the intent to subcontract the work in writing. When possible, the laboratory gains the approval of the client to subcontract their work prior to

implementation, preferably in writing. If a subcontractor laboratory does not have DoD-ELAP accreditation, the client must provide approval prior to analysis.

The laboratory performing the subcontracted work and all non-NELAP accredited work is clearly identified in the final report. The laboratory assumes responsibility to the client for the subcontractor's work, except in the case where a client or a regulating authority specified which subcontractor is to be used.

SECTION 9 – PURCHASING SERVICES AND SUPPLIES

POLICY

The laboratory ensures that purchased supplies and services that affect the quality of environmental tests are of the required or specified quality by using pre-approved suppliers and products; exceptions must be approved prior to placing an order.

The laboratory has procedures for purchasing, receiving, and storage of supplies that affect the quality of environmental tests that are documented in the DHL SOP: OTHER-Purchasing-01.

Quality Critical Supplies (Q-Crit) are defined as any chemical, solvent, standard, glassware, plastic ware, container, consumable supply or apparatus that is required to meet specifications and if not meeting those specifications, would adversely affect the operations.

PROCEDURE

The General Manager, QA Manager and/or the Technical Director(s) reviews and approves the supplier of services and supplies and approves technical content of purchasing documents prior to ordering.

Evaluation of suppliers is accomplished by ensuring the supplier ships the product or material ordered by the requested delivery time and that the material is of the appropriate quality. The purchasing documents contain the data that adequately describe the services and supplies ordered.

The laboratory keeps a list of approved suppliers that meet the Q-Crit criteria in the Laboratory Information Management System (LIMS). All vendors that are listed in DHL Analytical LIMS have met specified quality, critical parameters required to maintain on-going quality system. An employee that orders supplies must first select the vendor(s) from this established list. All commonly used Q-Crit goods also have their catalog numbers or part numbers established. The user can select the needed items from the list. Any vendor or item outside the list must go through the quality check system as described in the Purchasing SOP first and seek approval from the General Manager, QA Manager, or Technical Director(s) prior to placing the order.

The laboratory shall ensure that purchased supplies and reagents and consumable materials that affect the quality of environmental tests are not used until they have been inspected or otherwise verified as complying with standard specifications or requirements defined in the methods for the environmental tests concerned. These services and supplies used shall comply with specified requirements. Records of actions taken to check compliance shall be maintained.

Purchasing documents for items affecting the quality of laboratory output shall contain data describing the services and supplies ordered. These purchasing documents shall be reviewed and approved for technical content prior to release.

The laboratory shall evaluate suppliers of critical consumables, supplies and services which affect the quality of environmental testing, and shall maintain records of these evaluations and list those approved

SECTION 10 – SERVICE TO THE CLIENT

Customer requests or potential projects are carefully evaluated ensuring the customer's needs are clearly understood and to determine whether a department has the capability of performing the service(s). Routine requests (limited numbers of samples for tests routinely performed in-house) are approved without formal review. Only extra-ordinary requests are given formal review.

If not a routinely provided service or if a number of samples approaching the capacity of the laboratory are requested, the customer's needs are carefully evaluated to determine whether the laboratory has the necessary facilities to perform the work. Even if all necessary equipment and facilities are not available, the consideration of a project may continue, with the General Manager or designee in dialogue with the customer. In some cases alternative test methods, if applicable, may be recommended and discussed with the client as well as leasing additional equipment or sub-contracting other laboratories.

More complex orders/projects are also carefully scrutinized to be sure requirements are adequately defined and any questionable issues are resolved with the customer. Such reviews include, but are not limited to personnel qualifications, equipment, procedures, reporting criteria, project specific QAPP requirements, and any viable alternative methods where in-house capability does not exist. If it is not possible for DHL Analytical to provide the requested services, the General Manager or designee shall make an effort to help the customer find a qualified subcontract laboratory to perform the service.

A written description of services (proposal or bid or quote) and an associated schedule is submitted for the customer's approval. In some cases, the project scope may be discussed verbally and personally documented by the General Manager or designee (e.g. phone notes). If the requested support is not within DHL Analytical's present capability, a response is provided to the client indicating this. All correspondence relating to the customer order is maintained in the customer's project files or in the computer network files.

The laboratory shall maintain and document timely communication with the client for the purposes of seeking feedback, both positive and negative, and clarifying customer requests. Feedback shall be used and analyzed to improve the quality system, testing activities, and service to the client. Clients are strongly encouraged to document requests via email, but phone communications can be recorded by hand or sent to the client in written form for their approval. All email communications between the laboratory and the client are printed and filed in their project file.

10.1 Client Confidentiality

Policy

The laboratory confidentiality policy is to not divulge or release any information to a third party without proper authorization.

All electronic data (storage or transmissions) are kept confidential, based on technology and laboratory limits, as required by client or regulation.

Procedure

Samples received come into the building which has an electronic control access with outside doors either locked or with controlled access through the reception area.

Sample information is recorded in the LIMS. The LIMS assigns every project a unique laboratory project number. Sample documents (Chain of Custody, Work Order Summary Sheet, Sample Checklist and any shipping container documentation) are put in a project file and labeled with the DHL Analytical project number to ensure client confidentiality.

After completion of the required analyses, a final report is released exclusively to the client or to others if requested on the COC.

The final report may be sent to the client in the following formats:

- mailing the report in a sealed envelope
- emailing the report as a PDF file
- emailing database or spreadsheet files of the analytical data in the client's prescribed format as an electronic disk deliverable (EDD) report

10.2 Storage and Distribution of Client Reports

Procedure

The Sample Custodian or employee performing sample log-in is responsible for initiating a project file for each batch of samples on delivery to the laboratory. The following procedures are implemented as part of the document control process for the laboratory:

A project file is labeled with the DHL Analytical project number and client name/project number.

The Chain of Custody, Work Order Summary Sheet, Sample Checklist and any shipping container documentation is placed in the file.

On completion of the quality assurance review of the log-in, all corrected paperwork and forms generated for the project are transferred to this file.

All log entries and paperwork are completed in waterproof ink, with any corrections marked out with a single line, initialed, and dated.

On completion of the analytical tests and second level review, the QA Specialist shall close the file by generating the data report, verifying all contents are present in the file, and sending the file and report on for review and signatures by approved signatories as defined in Section 4.2 of the QAM.

After the report is signed and electronically transmitted to the client and other designated recipients, a copy of the file is made and inserted into the project folder. This folder is stored in a sequentially numbered filing system. Access to these files is restricted to the administrative staff, QA staff, and management.

Confidentiality is assured through the transmittal of the reports exclusively to the client named on the COC and other designated individuals.

SECTION 11 – COMPLAINTS

The purpose of this section is to assure that customer complaints are addressed and corrected. This method is designed to provide consistency and quality control in the procedures for tracking and resolution of customer concerns. This includes requests to verify results or analytical data. Records shall be maintained of all complaints and of the investigations and corrective actions taken by the laboratory.

POLICY

Customer satisfaction strategy starts with a careful evaluation of the customer requests for assistance to make certain support is proposed and furnished which fully meets the customer's needs. Our goal is to keep customers informed, to prevent "surprises" and to maintain staff accessibility for the timely handling of questions and concerns.

Customer feedback concerning performance is collected both by the laboratory operation as well as through programs instituted by DHL Analytical's management. Regardless of the source of the feedback, the information provided by our customers is documented, evaluated for potential improvement opportunities, and timely follow-up action is taken.

When a customer identifies an issue with the services provided, the department proactively seeks to understand the customer's concerns and takes action to resolve the question or problem. Corrective actions will include issuing a revised report if the results are found to be significantly affected.

PROCEDURE

The objective is to provide a means of tracking concerns or complaints raised by clients, staff or other persons. Any staff member who is aware of a concern being raised will complete the form and deliver it to the manager for signature and filing.

All customer complaints are documented by the person receiving the complaint and addressed by appropriate personnel. Each concern shall be tracked on the Concerns Form found in DHL SOP: ADM-Complaint-01 or the Corrective Action Report (CAR) located in the LIMS. All the concerns and corrective action forms will be reviewed and signed by the Lab Manager and QA Manager. These will be filed in a Concerns/Corrective file. If further investigation into a complaint is needed, a laboratory panel shall be formed to resolve the problem. If a problem is found that indicates previous results are incorrectly reported, the laboratory shall notify clients whose reports are affected. As soon as feasible, a revised report will be issued to the client with the corrected results. These procedures for handling customer concerns are found in the DHL SOP: ADM-Complaint-01. See Section 13 of the QAM for corrective action procedures.

Audits of the Concerns records will be performed during the internal laboratory audits by the QA manager and during the management review of the laboratory. In addition, the Lab Manager and the QA Manager must investigate any areas that may be affected by or related to specific complaints.

SECTION 12 – CONTROL OF NON-CONFORMING WORK

NON-CONFORMING WORK is work that does not meet acceptance criteria or agreed requirements of the client. Nonconformances or Variances can include unacceptable quality control results or departures from standard operating procedures or test methods. The information that is included in the final report is found in Section 24.2 of the QAM under supplemental test report information. Requests for departures from laboratory procedures are approved by either the General Manager or QA Manager and documented in the Variance Report.

POLICY

It is DHL Analytical's policy to promptly respond to correct any actions, conditions of tests, test equipment or DHL Analytical furnished materials which have resulted or could result in the submission of test results, services or supplies which do not conform to the requirements of this manual, related procedures and policies. This includes all contractually imposed government, industry or customer requirements. The administration and maintenance of the system shall be the responsibility of the QA Manager. All employees have the authority to stop work on samples when any aspect of the process does not conform to laboratory requirements.

PROCEDURE

The responsibilities and authorities for the management of non-conforming work are designated in the QAM. The procedure for investigating and taking associated corrective actions of non-conforming work are documented in the DHL SOP: ADM-QA/QC-01 and described in Section 13 of the QAM.

The laboratory evaluates the significance of the nonconforming work, and takes corrective action immediately. A Variance Report is generated, the client is notified if their data has been impacted, and corrective action is placed in the Case Narrative of the Analytical Report. Resumption of work after nonconformance is authorized by the General Manager, QA Manager, and/or the client.

Whenever the quality control goals set for precision or accuracy of data are not achieved, a program of corrective action shall be initiated. QC criteria shall be specified in each individual Standard Operating Procedure (SOP). Corrective action can also be initiated by other items such as control limits, customer concerns, or by method specific criteria.

The first step in corrective action is identification of the source of the problem. Initial identification responsibility is with the analyst, who shall spot most problems during sample analysis. The General Manager or QA Manager is responsible for identification of problems, which the analyst may have overlooked. The QA Manager must also initiate the corrective action and review the effectiveness of the action. The President/Laboratory Director is responsible for review of the General Manager or QA Manager's reports.

SECTION 13 – CORRECTIVE ACTION(S)

CORRECTIVE ACTION(S) is the action taken to eliminate the causes of an existing nonconformity, defect, or other undesirable situation in order to prevent recurrence (NELAC, 2003).

MAJOR DISCREPANCIES are those where an error in the report reverses the acceptance or rejection of the tested material or sample. A corrective action report shall be initiated in these instances.

MINOR DISCREPANCIES are discrepancies such as typographical errors and conditions that do not affect the conclusion of the report. A corrective action report need not be initiated in these instances. However, a corrective action report shall be initiated if a trend has been established over a period of time or if deemed appropriate by the QA Manager or any other member of DHL management.

POLICY

It is DHL Analytical's policy to maintain a corrective action system to prevent, minimize, or eliminate the causes of nonconformance and its repetition. Formal corrective actions shall be initiated in response to major nonconformances described herein, when trends in nonconformance are established, upon nonconforming supplier actions, customer requests/complaints, findings made during internal audits, data reviews or when deemed appropriate by the General Manager, Lab Manager, and/or QA Manager. Whenever a major discrepancy is discovered, any reported results affected by the discrepancy shall be determined and the customer notified within 48 hours of the finding. A review shall be made to verify that the discrepancy has not affected work performed prior to discovery. Corrective actions taken are appropriate for the magnitude of the problem and the degree of risk. The administration and maintenance of the system shall be the responsibility of the QA Manager. Corrective actions taken are appropriate for the magnitude of the problem and the degree of risk.

PROCEDURE

The QA Manager is responsible for initiating, monitoring, and documenting corrective actions on routine data reviews.

All deficiencies are investigated and a corrective action plan is developed and implemented if determined necessary. The implementation is monitored for effectiveness.

Corrective action reports for routine, non-recurring exceedances can be records in logbooks, email, or other informal documents. More serious corrective actions will require a more formal corrective action report.

Specific corrective action protocols specified in test methods may over-ride general corrective action procedures specified in this manual.

Corrective actions shall be initiated as recommended by external parties, such as state and federal certification agencies, client review, or other regulatory agencies. These corrective actions may result from systems or performance audits, split samples, or data validation review. Any situations requiring corrective actions shall be documented in a Corrective Action Report located in the LIMS.

13.1 Selection and Implementation of Corrective Actions

ROOT CAUSE is the condition or event that, if corrected or eliminated, would prevent the recurrence of a deficiency.

Once a nonconformance is noted, the first action is an investigation to determine the root cause. Records are maintained of nonconformances requiring corrective action to show that the root cause(s) was investigated, and includes the results of the investigation.

Where uncertainty arises regarding the best approach for analysis of the cause of exceedances that require corrective action, the General Manager/QA Manager will recommend corrective actions to be initiated by the analyst.

The QA Manager ensures that corrective actions are discharged within the agreed upon time frame.

When a quality control problem is noted, the following steps are taken to identify and correct the problem:

- The hard copies of the data are re-examined.
- The analyst re-analyzes the sample(s), as appropriate.
- If the problem is not resolved by re-analysis, the QA Manager or the laboratory director is consulted to provide additional information about rectifying the problem.
- If the problem cannot be solved in-house, equipment repair contractors manufacturer's representatives, or outside consultants are contacted as necessary to correct the problem.
- All information is documented on a specific analytical Variance Report, which is reviewed and signed by the QA manager and then placed in the associated project folders.
- Clients may authorize the analysis of samples that may not meet QC criteria (i.e. samples out of hold time, samples received above temperature limit). All data resulting from such situations shall be appropriately flagged in the report.
- All information shall be documented in the final report and summarized in the case narrative. This shall include data flags, if applicable.
- Information on the incident and corrective actions shall be noted in the instrument maintenance logbook (if applicable).

13.2 Monitoring of Corrective Action(s)

Policy

The QA Manager will monitor implementation and documentation of the corrective action(s) to assure that the corrective actions were effective.

Procedure

The analyst and QA Manager shall initially discuss the identification of problems and implementation of corrective actions.

If the problem is of a severe nature, the situation shall be discussed immediately with the President/Laboratory Director so that he may be involved in the decision-making process regarding corrective action. If a revised report is issued, the procedures in Section 24.5 shall be followed.

13.3 Technical Corrective Action

CAUSE ANALYSIS in corrective action investigates the root cause of the problem.

Policy

Sample data associated with a failed quality control is evaluated for the need to be reanalyzed or qualified.

Procedure

Unacceptable quality control results are documented, and if the evaluation requires cause analysis, the cause and solution are recorded.

The analyst is responsible for initiating or recommending corrective actions and ensuring that exceedances of quality control acceptance criteria are documented in a Variance Report. Analysts routinely implement corrective actions for data with unacceptable QC measures. First level correction may include re-analysis without further assessment. If the test method SOPs addresses the specific actions to take, they are followed. Otherwise, corrective actions start with assessment of the cause of the problem.

The QA Manager reviews corrective action reports and suggest improvements, alternative approaches, and procedures where needed. If the data reported are affected adversely by the nonconformance, the client is notified in the case narrative in the final report.

The discovery of a nonconformance for results that have already been reported to the client must be immediately evaluated for significance of the nonconformance, its acceptability to the client, and determination of the appropriate corrective action.

13.4 Policy for Exceptionally Permitting Departures from Documented Policies and Procedures

Policy

Exceptionally permitting departures are those variations in standard operating procedures where it is not feasible to follow the standard procedure or it is technically justifiable to alter the procedure. The alteration to the procedure shall be noted on a specific analytical variance form and proper approval for the variance shall be obtained before procedure.

The laboratory allows the release of non-conforming data only with approval on a case-by-case basis by the appropriate manager or their designee. Planned departures from procedures or policies do not require audits or investigations.

Procedure

Permitted departures for nonconformances, such as QC failures, are fully documented and include the reason for the departure and the impact of the departure on the data. This information is transmitted to the client in the case narrative of the report.

SECTION 14 – PREVENTIVE ACTION

PREVENTIVE ACTION is a pro-active process to identify opportunities for improvement rather than a reaction to the identification of problems or complaints.

POLICY

Preventive action, rather than corrective action, aims at minimizing or eliminating inferior data quality or other nonconformance through scheduled maintenance and review, before the nonconformance occurs.

Preventive action includes, but is not limited to, review of QC data to identify quality trends, annual budget reviews, annual managerial reviews, regular instrument maintenance, and other actions taken to prevent problems.

Needed improvements and potential sources of nonconformances, either technical or concerning the quality system, shall be identified. If preventive action is required, action plans shall be developed, implemented and monitored to reduce the likelihood of the occurrence of such nonconformances and to take advantage of the opportunities for improvement.

PROCEDURE

Procedures for preventive actions shall include the initiation of such actions and application of controls to ensure that they are effective.

All employees have the authority to develop preventive action procedures; however management is responsible for implementing preventive action. The QA Manager or designee is responsible for monitoring preventive actions on routine data reviews to ensure their effectiveness. All preventive actions plans are developed and implemented if determined necessary. All preventive actions shall be documented in a Preventive Action Report located in the LIMS and/or in the applicable instrument maintenance logbook.

14.1 Selection and Implementation of Preventive Actions

Policy

The initial step is to identify the potential problem in order to prevent the occurrence of a nonconformance.

ROOT CAUSE is the condition or event that, if corrected or eliminated, would prevent the occurrence of a potential problem.

Procedure

Once the potential problem is identified, the first action is an investigation to determine the root cause and recorded in the preventive action report.

Where uncertainty arises regarding the best approach for analysis of the potential problem that requires preventive action, the General Manager/QA Manager will recommend preventive actions to be initiated by the analyst.

The QA Manager ensures that preventive actions are discharged within the agreed upon time frame.

This preventive action is a process for detecting potential problems or nonconformance's and eliminating them. When a potential problem is noted, the following steps are taken to identify and correct the problem:

- Identify the potential problem or nonconformance
- Find the root cause of the potential problem
- Develop a plan to prevent the occurrence
- Implement the plan
- Review actions taken and effectiveness in preventing the problem
- Information on the preventive actions shall be noted in the instrument maintenance logbook (if applicable).

14.2 Monitoring of Preventive Action(s)

Policy

The QA Manager will monitor implementation and documentation of the preventive action(s) to assure that the preventive actions were effective.

Procedure

The analyst and QA Manager shall initially discuss the identification of problems and implementation of preventive actions. The preventive actions may also be discussed with the Technical Director or General Manager if needed.

14.3 Preventive Action Taken

Policy

After the root cause of the potential problem is identified, a plan to prevent the occurrence of the problem is developed and implemented.

Procedure

The analyst is responsible for initiating or recommending preventive actions and ensuring that the action taken is documented in a Preventive Action Report. Analysts routinely implement preventive actions.

The QA Manager reviews preventive action reports and suggest improvements, alternative approaches, and procedures where needed.

The QA Manager must provide an evaluation that the preventive action is effective and monitor the results for verification.

SECTION 15 – CONTROL OF RECORDS

RECORDS are a subset of documents, usually data recordings that include annotations, such as daily refrigerator temperatures posted to a laboratory form, lists, spreadsheets, or analyst notes on a chromatogram. Records may be on any form of media, including electronic and hard copy. Records allow for the historical reconstruction of laboratory activities related to sample-handling and analysis.

POLICY

The laboratory maintains a record system appropriate to its needs, records all laboratory activities, and complies with applicable standards or regulations as required.

PROCEDURE

The laboratory retains all original observations, calculations and derived data, calibration records, and a copy of the test report for a minimum of ten years.

Records of all procedures to which a sample is subjected while in the possession of the laboratory are kept.

15.1 Records Management and Storage

Policy

Records, including electronic records, are easy to retrieve, legible, and protected from deterioration or damage; held secure and in confidence; and are available to accrediting authorities for a minimum of ten years.

The laboratory maintains a record management system for control of laboratory notebooks, instrument logbooks, standards logbooks, and records for data reduction, validation, storage and reporting.

Archived information and access logs are protected against fire, theft, loss, environmental deterioration, vermin, and in the case of electronic records, electronic or magnetic sources.

In the event that the laboratory transfers ownership or goes out of business, records are maintained or transferred according to the clients' instructions.

Procedure

A secondary backup copy of all electronic records is kept on hand in the event of a data loss event. Deleted or corrupted data files can be restored from this backup by the IT Specialist. Access to protected records is limited to laboratory management or their designees to prevent unauthorized access or amendment.

Procedures for identification, collection, access, filing, storage, and disposal of records are found below:

15.1.1 Identification

Records are uniquely identified.

15.1.2 Collection

Observations, data, and calculations are recorded at the time they are made. When mistakes are made in technical records, each mistake is crossed out with a single line (not erased, made illegible, or deleted) and the correct value entered alongside. Corrections are signed or initialed by the person making the corrections. For electronic systems, all changes are tracked by the audit trail or by added notes. When changes are made to technical records for reasons other than for correction of transcription errors, the reason for the change is recorded on the document.

15.1.3 Access

Access to archived information is documented with an access log.

15.1.4 Filing

Records are filed promptly and in organized fashion.

15.1.5 Storage

DHL Analytical uses computers for data storage and reporting purposes. All computers containing analytical data are housed in controlled access areas of the laboratory to ensure data integrity. Initial chromatographic data gathering is performed by instrument specific software that is documented in the test method SOPs which prints a chromatogram and integration report. Parameters of integration are established for each analysis. It is the responsibility of the chemist to evaluate each chromatogram with regard to correct integration, peak identification, and calibration.

Verified numeric data from the instruments are then electronically transferred a template in the LIMS. The data is named and saved onto the laboratory network system with an identifier corresponding to the DHL instrument, date, project number, and the analyses run. The data then goes to the QA Department for final review. Access to the laboratory network files is controlled through use of password log-in procedures, data back up and storage.

<u>Data back up and storage</u>:

All electronic data on instrument computers is to be backed up a weekly basis by each individual instrument. The data is stored on the LIMS administrator local hard drive and is mirrored every Friday night to a data server for additional data redundancy. No more than two weeks of data shall remain on the instrument computer at any given time to prevent data loss.

When enough data is collected from each instrument a series of DVD or CD media is used to permanently write data for safe keeping. All removable media storage is duplicated and kept both on-site in a fire-proof safe and off site in the off-site storage trailer for redundancy and emergency purposes. Once data has been verified and written properly onto removable media the data residing on the LIMS administrator computer hard drive and the server can be removed. The DVD or CD will be dated and the data storage period will also be labeled.

The LIMS data is backed up automatically on a daily basis. Transaction log backups hourly are also taken so in the event of data loss, data can be restored to a prepoint of failure state. Backup media is rotated weekly through five tapes to keep up to a month of database recovery media. The LIMS tapes are stored in the fire-proof safe in house and are controlled by the IT Manager. The LIMS server also contains a Redundant Array of Independent Disks (RAID) for additional data redundancy. Backups are routinely tested for usability and integrity.

Data records storage:

DHL Analytical shall maintain project data files for a minimum of ten years. The files shall contain all related prep logs, analysis logs, chromatograms, Chain of Custody records, computer printouts, copies of the final report and any other related information to the project. These files shall be stored in chronological order by DHL Analytical project number for ease of retrieval. DHL Analytical shall maintain magnetic media on tape or disk for the same time period as the project data files. All records shall be stored in a secured, limited access storage area. In the event that DHL Analytical, Inc. goes out of business, the records shall be maintained for the 10 year holding period by our attorneys before being destroyed.

15.1.6 Disposal of Records

Records are disposed of according to applicable regulation, client request, or after ten years.

15.2 Chain of Custody (COC) Records

Policy

Chain of Custody (COC) is used in sampling situations to maintain the integrity of the sample by providing documentation of the control, transfer, and analysis of samples. The Chain of Custody procedure incorporates a number of controls to assure the integrity of a sample. These procedures, along with the required written documentation, provide the laboratory with the necessary backing to defend the integrity of the sample in any litigation.

The COC procedure starts with sample collection and follows through to the destruction of the sample. The purpose of the procedure is to ensure that the sample has been in possession of, or secured by, a responsible person at all times. It shall remove any doubt about sample identification or that the sample has been tampered with.

Procedure

Procedures for sample receipt and verification protocol are documented in the DHL SOP: OTHER-Log-In-01.

The DHL Analytical Chain of Custody (COC) is a three-color, triplicate form. Whenever sample containers or samples are transferred between parties, the COC is signed by both the relinquishing and accepting representative and the date and time are recorded by both parties. The sampler retains the bottom copy (pink). The original (white) form and one copy (yellow) are delivered to the laboratory with the samples. The completed original is returned to the client with the final analytical report. The yellow copy of the completed COC is maintained in the project file by the laboratory.

15.2.1 Sample Receipt

Samples are received by laboratory personnel trained to handle samples. The sample handling procedures are intended to maintain the integrity of both the samples and the documentation necessary to support the analytical data. DHL Analytical receives samples by courier services or hand delivery/walk-ins. The Sample Receipt Checklist in the LIMS is used to document the condition of the cooler when delivered to the laboratory.

SECTION 16 – AUDITS AND MANAGEMENT REVIEW

AUDITS measure laboratory performance and verify compliance with accreditation, certification, and project requirements. Audits specifically provide management with an on-going assessment of the quality system. They are also instrumental in identifying areas where improvement in the quality system will increase the reliability of data. Audits are of four main types: internal, external, performance, and system.

Performance and system audits are administered by both external agencies and internal personnel. These audits are conducted at a regular frequency to review and evaluate the individual components of the laboratory and the overall measurement system. The following sections include descriptions and frequency of both internal and external audits.

Notification of clients for events that cast doubt on the validity of the results is completed within 48 hours.

16.1 Internal Audits

Policy

The laboratory conducts internal audits of its quality systems activities, including data integrity, using trained and qualified personnel in all area of the laboratory at least on an annual basis. Personnel may not audit their own activities except when it can be demonstrated that an effective audit will be carried out.

Procedure

Annually, the laboratory prepares a schedule of internal audits of all areas of the laboratory to be performed during the year. These audits verify compliance with the requirements of the quality system, including analytical methods, SOPs, ethics policies, other laboratory policies, and the 2003 NELAC Standards and the DoD Quality Systems Manual Version 4.2. Implementation of the 2009 TNI Standard is scheduled to occur on July 1, 2011.

Internal system audits are designed to be conducted over the course of one year as determined by the QA Manager. The audits shall be conducted by the QA Manager or designee. At the completion of the audit, a formal list of findings and recommended corrective actions shall be generated by the QA Manager and presented to the President/Laboratory Director. For each finding, a Corrective Action Form shall be issued by the QA Manager. The Corrective Action Form contains a description of the findings, a description of the corrective action, and the documentation of implementation of the correct action. This form helps to "close the loop" on audit findings.

Clients must be notified promptly, in writing, when audit findings cast doubt on the validity of the data.

Audits are reviewed after completion to assure that corrective actions were implemented and effective. Procedures on performing audit are documented in the DHL SOP: ADM-Audit-01.

16.2 External Audits

Policy

DHL Analytical welcomes external system audits from regulatory agencies, clients, and peer groups. The external system audit provides an opportunity to improve the

DHL Analytical system operation in ways that may differ from internal audits, and evaluates the laboratory with respect to other laboratory operations.

All external audits are fully documented and tracked to closure.

Procedure

Management ensures that all areas of the laboratory are accessible to auditors as applicable and that appropriate personnel are available to assist in conducting the audit.

Any findings related to an external audit follow corrective action procedures.

Management ensures that corrective actions are carried out within the timeframe specified by the auditor(s)

All documentation related to each external audit is filed in the QA office and stored electronically in PDF format on the DHL network server. This documentation includes all correspondences such as the final assessment reports with findings issued by the accreditation agency, DHL Analytical's audit responses with all corrective action plans (CAP), and the implementation of CAP report.

16.3 Performance Audits

Performance audits may be Proficiency Test Samples, internal single blind samples, double blind samples through a provider or client, or anything that tests the performance of the analyst and method.

Internal performance audits are conducted as needed periodically by the DHL Analytical QA Manager or designee. QC check samples and blind samples are prepared by the QA Manager or designee. Commercial check samples may also be obtained. The report of analysis for these samples is prepared in the same manner as a normal project report. The QA Manager or designee reviews this report in comparison with known values. The QA Manager or designee then makes a formal report of the audit.

The policy and procedures for Proficiency Test Samples are discussed in Section 23.7.

16.4 System Audits and Management Reviews

Policy

Top level management reviews the quality system and maintains records of review findings and actions.

Procedure

The quality system is reviewed annually, and findings are recorded. Managers assure that actions are performed within agreed time frames.

16.4.1 Management Review of Quality System

This review shall be conducted at a minimum of once per year. Additional review may be conducted as needed such as when there is a major deficiency found in any audits or WP performance evaluations. Every year, the President/Lab Director, General Manager, Lab Manager, and QA

Manager shall hold the meeting to review all quality issues affecting the laboratory including but not limited to the following:

- suitability of laboratory policies and procedures
- reports from managerial and supervisory personnel
- outcome of recent internal audit results
- corrective and preventive actions
- assessment by external bodies (external audit results)
- results of analyst proficiency tests
- changes in the volume and type of the work
- client feedback
- complaints
- quality control activities, resources and staff training
- review the new State and Federal rules
- new laboratory procedures and implementations

The Review Criteria

- New State and Federal rules – their impact on current system and their implementation
- New laboratory procedures – why such new procedures are needed and how will they affect the quality?
- Internal audits – the audit frequencies, which department, which analyst, deficiencies found and corrective actions made
- External audits – which agencies performed the audit and for which project
- Staff training – who did the training? What were the training subjects, record of training and documentation, when such training occurred?
- Analyst performance evaluation – knowledge of his or her field, the efficiency and deficiency of an analyst, DOCs and (PT) analysis performed
- Clients' feedback – efficiency and quality are the only issues needed to be reviewed
- Deficiencies and Corrective measures made – Have all the causes for the corrective measures found? Have all the corrective measures being implemented and reviewed?

At the conclusion of the meeting, if any new corrective actions are proposed, they shall be documented in the meeting minutes for future review and reference. This documentation shall be kept at the Quality Assurance Office as the permanent record. The decisions made after the review shall be implemented within a reasonable time frame. Future management review will also examine the effectiveness of such implementations.

Findings from management reviews shall be recorded. The management shall ensure that those actions are carried out within an appropriate and agreed timescale.

SECTION 17 – PERSONNEL, TRAINING, AND DATA INTEGRITY

17.1 Job Descriptions

Policy

Job descriptions are available for all positions that manage, perform, or verify work affecting data quality, and are located in Appendix B in Section 25 of this QAM.

Procedure

Job descriptions include the specific tasks, minimum education and qualifications, skills, and experience required for each position.

17.1.1 President/Laboratory Director

The President/Laboratory Director is the person ultimately responsible for all operations. He performs both technical and business development activities for the laboratory. Specifically the president is responsible for:

- assuring the General Manager, Laboratory Manager, Technical Director(s), and QA manager perform their duties
- improving business development and providing approval of all major projects and contracts
- keeping the laboratory technologically current with the latest analytical methods
- providing technical expertise in method development
- providing backup to the General Manager

17.1.2 General Manager

It is the responsibility of the General Manager to oversee the general functions of the laboratory. The General Manager must meet regularly with the QA Manager to discuss general adherence to the program as well as specific QA problems or projects that require additional review and corrective action. Additional responsibilities of the General Manager include:

- preparation and/or review of Standard Operating Procedures (SOPs)
- implementation, updating and distribution of SOPs
- supervision of laboratory personnel training
- maintaining document control, security and confidentiality
- provide technical application and development
- resolution of QA and technical problems
- directs the development and implementation of the Laboratory Information Management System (LIMS)

17.1.3 Laboratory Manager

It is the responsibility of the Laboratory Manager to oversee the day to day planning, coordination, and overall supervision of all laboratory operations including the following:

- provide laboratory personnel training and support

- provide technical application and development of the test method SOPs
- assist in the resolution of QA and instrument problems

17.1.4 Technical Director(s)

The Technical Director(s) is a full-time member of the staff of an environmental laboratory who exercises actual day-to-day supervision of laboratory operations. The title of such person may include but is not limited to Laboratory Director, General Manager, or Laboratory Manager. A laboratory may appoint one or more technical directors for the appropriate fields of accreditation. His/her name must appear in the national database. This person's duties shall include, but not be limited to, monitoring standards of performance in QA/QC including demonstrations of capabilities, monitoring the validity of the analyses performed and data generated in the laboratory to assure reliable data.

The Technical Director(s) certify that personnel with appropriate educational and/or technical background perform all tests for which the laboratory is accredited. Technical Director(s) qualification requirements are found in NELAC 2003 Section 4.1.1.1.

17.1.5 Quality Assurance (QA) Manager

The Quality Assurance Manager (QA) Manager is responsible for the development and implementation of the DHL Analytical QA/QC program. The QA Manager will be responsible for the oversight and/or review of quality control data and have functions independent from laboratory operations for which they have QA oversight. He/she must able to evaluate data objectively and perform assessments without outside (managerial) influence. Specifically, the QA Manager is responsible for:

- technical training of personnel with respect to the DHL Analytical QA/QC program as defined under NELAC and the DoD Quality Systems Manual Version 4.2
- knowledge of the analytical test methods for which data review is performed
- reviewing SOPs for compliance with Quality Assurance Program
- compiling, revising and submitting the DHL Analytical Quality Assurance Plan
- initiating, conducting and supervising internal audits
- notifying laboratory management of deficiencies in the quality system and monitor corrective action
- preparing QA reports for the directors, clients and regulatory agencies
- data assembly and final review of project reports, including:

    1) verification of data completeness
    2) verification of QA/QC compliance
    3) verification of client requirements
    4) review of preliminary reports
    5) preparation of case narrative to include technical difficulties, corrective actions and conclusions

17.1.6 Laboratory Staff: Analysts & Technicians

The personnel performing analyses at the laboratory consist of chemists, scientists, technicians, and analytical personnel qualified in accordance with the requirements of DHL Analytical's QAM. The staff reports to the Laboratory Manager and are responsible for performing their assigned tasks in accordance with the laboratory Standard Operating Procedures. They are also responsible for adherence to the QAM in the performance of their tasks.

17.1.7 Health and Safety Officer

The Health and Safety (H&S) Officer at DHL Analytical is responsible for the following:

- coordination of training programs in first aid, CPR, hazardous materials handling, emergency contingency planning and right-to-know compliance
- labeling and storage of hazardous materials
- maintenance of Material Safety Data Sheet (MSDS) sheets
- Resource Conservation Recovery Act (RCRA) small quantity generator record keeping
- H&S equipment ordering, maintenance and record keeping

17.2 Data Integrity and Ethics

DATA INTEGRITY is the result of the processes that together assure valid data of known and documented quality.

Data integrity and ethics procedures in the laboratory include training, signed, and dated integrity documentation for all laboratory employees, periodic monitoring of data integrity, and documented data integrity procedures.

Policy

Technical managers uphold the spirit and intent by supporting integrity procedures, by enforcing data integrity procedures, and by signing and dating the data integrity procedure training forms.

Data integrity procedures and evidence of inappropriate actions are reviewed annually or through regularly scheduled internal audits, and are updated by management.

The mechanism for confidential reporting of ethics and data integrity issues is (1) unrestricted access to senior management, (2) an assurance that personnel will not be treated unfairly for reporting instances of ethics and data integrity breaches, and (3) anonymous reporting.

Employees are required to understand, through training and review of quality systems documents, that any infractions of the laboratory data integrity procedures will result in a detailed investigation that could lead to very serious consequences such as immediate termination, or civil/criminal prosecution.

Any potential data integrity issue is handled confidentially until a follow-up evaluation, full investigation, or other appropriate actions have been completed and

the issues clarified. Inappropriate activities are documented, including disciplinary actions, corrective actions, and notifications of clients, if applicable. These documents are maintained for a minimum of ten years.

Procedure

Any determination for detailed investigation of data integrity issues must be communicated to senior management. Allegations are investigated and remain confidential to the extent necessary.

Documentation for all investigations that result in findings of inappropriate activity include any disciplinary actions involved, corrective actions taken, and all appropriate notifications of clients.

Data integrity procedures are reviewed and documented at the time of initial hiring and annually for all laboratory personnel. These procedures are periodically monitored through in-depth data review, records review, or other thorough check processes.

Refer to DoD Quality Systems Manual 4.2 Section 5.2.7 Box-18 for: Detecting and Deterring Improper, Unethical, or Illegal Actions.

Refer to Appendix C in Section 25 of this QAM for a copy of the DHL Analytical Ethics and Data Integrity Agreement.

17.3 Data Integrity and Ethics Training

Policy

Data integrity training is provided for all employees initially upon hire and annually thereafter.

Procedure

Attendance at an initial data integrity training (part of new employee orientation) and the annual refresher training is recorded with a signature attendance sheet or other form of documentation that demonstrates all staff have participated and understand their obligations related to data integrity.

Initial training of employees shall include the Ethics and Data Integrity Agreement. This review shall document employees' requirements to record accurately all information, including dates and times of analysis, and to report to their supervisor if they find any information accidentally or intentionally misrepresented.

Any employee that witnesses any information accidentally or intentionally misrepresented that violates DHL Analytical Ethics and Data Integrity Agreement can choose to report to their supervisor without any reservation. This meeting will take place in private and in confidentiality and the source employee shall never be disclosed to the other party in question.

This is clearly stated in the DHL Analytical Ethics and Data Integrity Agreement that each employee shall sign and date upon hire at DHL Analytical, Inc. This review shall also include the potential punishment and penalties for improper or unethical actions. The Ethics and Data Integrity Training will be conducted on an annual basis and/or for periodic revisions or updates as necessary. All DHL employees are required to attend this training. Training will include review of the Ethics and Training Agreement

along with the penalties and punishments for improper or unethical actions. DHL Analytical personnel are free from commercial, financial or other undue pressures which might adversely affect the quality of their work.

Training records regarding data integrity and ethics are signed and dated by senior management.

When contracted technical or support personnel are used, management is responsible for ensuring that they are trained to the laboratory's quality system and data integrity procedures, competent to perform the assigned tasks, and appropriately supervised.

Topics covered are provided in writing and provided to all trainees.

17.4 General Training

Policy

All personnel are appropriately trained and competent in their assigned tasks before they contribute to functions that can affect data quality. It is management's responsibility to assure personnel are trained.

Only trained personnel are authorized to perform specific tasks.

Training records are kept on individual training forms.

Procedure

New staff members are given introductory training and orientation upon arrival. Training is documented by signature sheets of all who attended. Attendance at training sessions is documented on signature sheets.

The initial training for a new task will contain the following steps:

- All documentation involved with a new and unfamiliar task will be read and understood by the trainee.
- Training will be under the direct supervision of a qualified senior analyst. During the time the analyst is training, the trainee may sign laboratory notebooks or logbooks, but laboratory notebooks must be cosigned by the senior analyst, who is responsible for the data generated.
- The trainee will demonstrate competency in the new task before they can operate independently. The competency for a test method is accomplished by a demonstration of capability as indicated in Section 19. Approval of competency is noted by the initials or signature of the qualified senior analyst on the training form.
- Each step of the training process is documented.

Ongoing training will consist of the following:

- The analyst attests, through signature, that they have read, understood and agreed to perform the latest version of the QAM and any test method SOPs that the analyst performs.
- Annually, the analyst will show continued proficiency in each method they perform.

- Other training as determined by management.
- Proof of acceptable on-going training is documented by the annual demonstrations of capability for each analyst and each method.

Quality data is dependent upon properly trained and conscientious personnel. New personnel receive on-the-job training to ensure that all proper procedures are followed consistently throughout the laboratory. Experienced personnel shall train all new hires, and the General Manager shall oversee all training. Experienced personnel shall supervise all of the trainee's initial activities until the trainee performs their duties with competence and understanding of the Standard Operating Procedures (SOPs) involved. Besides laboratory duties, new personnel shall be instructed in proper health & safety, documentation, and quality assurance activities. This training process also applies to current DHL Analytical personnel who are undergoing cross training for new responsibilities.

Records of all internal training and external courses attended by DHL Analytical employees shall be kept in the DHL Training Files, which are maintained by the QA Department. Upon completion of training in a particular SOP, the trainee's record is updated with the procedure/activity learned, date of final training, and supervisors and/or trainer's name. The trainee and trainer shall then sign the entry. DHL Analytical has the approach to assess Demonstration of Capability (DOC) for methods which cannot comply with the procedure of analyzing 4 replicates such as EPA 1311 and 1312 (TCLP and SPLP extractions). These are assessed by an oversite of the analyst by the Technical Director(s), QA Manager or their appointees during the evaluation process. This is documented on the DOC form. Employees shall be educated for revisions of SOPs through meetings with all pertinent staff. The employee shall sign and date the training log upon completion of the meeting. This signifies that the employee has read and understood the revisions to the SOPs.

After the initial training period is completed, the General Manager, QA Manager, Technical Director(s), and qualified senior analysts shall continue to carefully review all work performed by the trainee. After a period of six months from the date of hire, the new employee undergoes a Performance Review with the General Manager and QA Manager to correct any deficiencies and determine if further training is necessary.

SECTION 18 – ACCOMMODATIONS & ENVIRONMENTAL CONDITIONS

POLICY

Laboratory facilities are designed and organized to facilitate testing of environmental samples. Environmental conditions are monitored to ensure that conditions do not invalidate results or adversely affect the required quality of any measurement.

Environmental tests are stopped when the environmental conditions jeopardize the results.

Access to, and use of areas affecting the quality of the environmental tests is controlled by restriction of areas to authorized personnel only.

The laboratory work spaces are adequate, and appropriately clean to support environmental testing and ensure an unencumbered work area.

PROCEDURE

Laboratory space is arranged to minimize cross-contamination between incompatible areas of the laboratory. Refer to Appendix D in Section 25 of this QAM for DHL Analytical's Floor Plan.

Laboratory areas are temperature controlled and have ventilation appropriate for the testing activities performed therein. Certain areas, as required, are also humidity controlled to comply with standards requiring "Standard Laboratory Conditions". These areas have a means for monitoring the temperature and humidity conditions. Fume hoods are also in place for flammability testing and working with chemicals.

When cross-contamination is a possibility, samples suspected of containing high concentrations of target analytes shall be isolated from other samples. Samples or extracts designated for volatile organics analysis must be segregated from other samples and extracts. Samples suspected of containing high concentrations of volatile organics shall be further isolated from other volatile organics samples.

Storage blanks shall be analyzed quarterly to determine if cross-contamination may have occurred.

Adequate lighting is maintained in the laboratories and good housekeeping practices are maintained and monitored by department management.

Access to the laboratories is limited to laboratory staff and accompanied registered guests. Building doors are locked after business hours. Guest access is limited to the main entrance. Staff escorts unauthorized persons within the building to the main entrance. Exits and contingency evacuation routes are provided in applicable areas.

Computer equipment is used to manipulate and store test data. This equipment shall be operated in clean areas, free of electromagnetic interference, to maintain the integrity of the data.

If the laboratory environment is required to be controlled by method or regulation, the adherence is recorded.

SECTION 19 – TEST METHODS AND METHOD VALIDATION

A method is validated before it is put into use. All methods are published or documented.

19.1 Demonstration of Capability (DOC)

A **DEMONSTRATION OF CAPABILITY** is a procedure to establish the ability of the analyst to generate data of acceptable accuracy and precision. The DOC shall include verification of sensitivity, precision, and bias in each quality system matrix of concern.

Policy

The laboratory confirms that it is capable of generating data of acceptable accuracy and precision on all methods before employing them.

Procedure

The DOC is documented on the form in Appendix C of the 2003 NELAC Standard, and these completed forms are kept in the training files for each analyst. Implementation of the DOC requirements in the 2009 TNI Standard is scheduled to occur on July 1, 2011.

A DOC is performed for each analyte whenever the method, analysts, analytes, or instrument type is changed.

The General Manager or Technical Director, and the QA Manager certifies that technical staff members in their area of expertise are trained and authorized to perform all tests for which we are accredited by signing the DOC form.

The process for DOC is documented in the DHL SOP: OTHER-Demonstration of Capabilities-01.

19.2 On-Going (or Continued) Proficiency

After the demonstration of capability is completed, on-going proficiency is maintained and demonstrated at least annually through the analysis of either PT samples, single-blind samples, performing another DOC, or the use of four consecutive laboratory control samples compared to pre-determined acceptance limits for precision and accuracy. This is documented in the training file of each analyst.

19.3 Initial Test Method Evaluation

For chemical analyses, the **INITIAL TEST METHOD EVALUATION** involves the determination and confirmation of the Detection Limit (DL), Limit of Detection (LOD), and Limit of Quantitation (LOQ), an evaluation of precision and bias, and an evaluation of the selectivity of the method. The following terms are used to describe the routine sensitivity of analytical procedures:

- DL – Detection Limit
- LOD – Limit of Detection
- LOQ – Limit of Quantitation

19.3.1 Detection Limit (DL)

The Detection Limit (DL) is the smallest analyte concentration that can be demonstrated to be different from zero or a blank concentration at the

99% level of confidence. Although a result at or above the DL indicates that the analyte is present, the absence of a result at or above the DL is inconclusive (i.e., one cannot confidently state whether the analyte is present or absent), because the false negative rate at the DL is 50%. The DL is also referred to as the MDL (Minimum Detection Limit). The detection limit shall be used to determine the LOD for each analyte and matrix as well as for all preparatory and cleanup methods routinely used on samples.

19.3.2 Limit of Detection (LOD)

The **LIMIT OF DETECTION** (LOD) is an estimate of the minimum amount of a substance that an analytical process can reliably detect. An LOD is analyte- and matrix specific and may be laboratory-dependent. (Refer to NELAC Glossary 2003 and DoD QSM 4.2).

DoD Environmental Quality Workgroup specifies that the LOD is defined at the smallest amount or concentration of a substance that must be present in a sample in order to be detected at a 99% confidence level. If a sample has a true concentration at the LOD, there is a minimum probability of 99% of reporting a measured value ≥ DL) and a 1% chance of reporting a non-detect (a false negative).

19.3.3 Limit of Quantitation (LOQ)

The **LIMIT OF QUANTITATION** (LOQ) is an estimate of the minimum levels, concentrations, or quantities of a target variable (target analyte) that can be reported with a specified degree of confidence. (Refer to NELAC Glossary 2003 and DoD QSM 4.2). The LOQ is also referred to as the MQL (Method Quantitation Limit) or RL (Reporting Limit) or PQL (Practical Quantitation Limit). For DoD projects, the LOQ must be set within the calibration range prior to sample analysis.

Policy

The laboratory shall determine the LOD for the method for each target analyte of concern in the quality system matrices. All sample-processing steps of the analytical method shall be included in the determination of the LOD.

An LOD study is not required for any component for which spiking solutions or quality control samples are not available such as temperature, or, when test results are not to be reported to the LOD (versus the Limit of Quantitation or working range of instrument calibration), according to Appendices D.1.2, D.4.5, D.5.4, and D.6.6.

If an LOD study is not performed, concentrations less than the Limit of Quantitation are not reported. If results are not reported outside of the calibration range (low), the LOD determination is not required. The lowest calibration standard is equal to or slightly less than the LOQ. The LOQ is greater than the LOD unless specified in the test method SOPs.

Procedure

LODs are determined from a quality system matrix using all sample processing steps, and are verified quarterly or when there is a change in the test method or instruments affects sensitivity. Refer to DoD QSM 4.2 Box D-13 for the determination and verification of the LOD.

After each detection limit determination, the laboratory must immediately establish the LOD by spiking a quality system matrix at approximately two to three times the detection limit (for a single-analyte standard) or one to four times the detection limit (for a multi-analyte standard). This spike concentration establishes the LOD. It is specific to each combination of analyte, matrix, method (including sample preparation), and instrument configuration.

Minimum Detection Limits (MDLs) shall be derived from in-house data according to the guidelines found in the USEPA document: *Definition and Procedure for the Determination of the Method Detection Limit – Revision 1.11, 40 CFR Part 136, Appendix B.* This determination shall involve analyzing seven replicate samples or standards, with the method detection limit based on 3.143 times the standard deviation of the analyses. MDLs shall be re-evaluated by in-house analyses every 12 months or each time a major modification is made to an analytical procedure. Actual detection limits may vary due to the sample matrix. DHL Analytical will perform DCS standards throughout the year on a quarterly basis to verify the LOD and LOQ.

According to DoD QSM 4.2 guidelines, the Limit of Quantitation (LOQ) shall be defined as greater than the LOD. The LOQ must be set within the calibration range prior to sample analysis. The lowest standard of the calibration establishes the LOQ. At a minimum, the LOD and LOQ must be verified quarterly with the analysis of the DCS and LCS.

The reporting limit (RL) shall be defined as the lowest calibration standard multiplied by the dilution factor and prep factor.

The **LOQ** is verified using a quality systems matrix sample spiked at 1-2 times the determined LOQ that returns a concentration within the acceptance criteria for accuracy, according to the requirements of the method or client data quality objectives.

The laboratory must employ quarterly Limit of Detection (LOD) verification (see Box D-13 of DoD QSM 4.2) to verify method sensitivity and quarterly Limit of Quantitation (LOQ) verification (see Box D-14 of DoD QSM 4.2) to verify precision and bias at the LOQ. A laboratory may use laboratory QC samples (such as LCS) to verify precision and bias of the quantitation range.

19.3.4 Precision and Accuracy

PRECISION is determined through evaluation of the relative percent difference (RPD) or percent Relative Standard Deviation (%RSD) between duplicate analyses of samples or matrix spike/matrix duplicate samples.

Policy

Precision and accuracy are determined for standard and non-standard methods.

Procedure

Precision and accuracy are determined for standard methods through the performance of a DOC.

Precision and accuracy using non-standard, modified standard or laboratory-developed methods are compared to the criteria established by the client (when requested), the method, or the laboratory.

Sample replicates or replicate spikes in a quality system matrix are analyzed according the procedures outlined in the 2003 NELAC Standard, Appendix C.3.3.b. where applicable.

Precision (as RPD) of duplicate analyses is calculated as:

$$RPD = \frac{|(A - B)|}{\frac{(A + B)}{2}} * 100$$

where: A = the concentration in Sample A
B = the concentration in Sample B

Precision (as %RSD) is calculated as:

$$\%RSD = \frac{S}{X_{avg}} * 100$$

where: S = standard deviation of sample results
X_{avg} = average of sample results

For duplicate pairs, this equation becomes:

$$\%RSD = \frac{|A - B| * 2}{(A + B) * \sqrt{2}} * 100$$

where: A = the concentration in Sample A
B = the concentration in Sample B

ACCURACY is determined through the evaluation of the percent recovery (%R) of compounds in fortified samples. These samples may be fortified with either known concentrations of target analyte(s) (spiked samples) and/or with known concentrations of a surrogate compound. Surrogate spiking compounds differ for each analysis and are usually not naturally occurring compounds. Surrogates are chosen such that they are chemically similar to the analytes of concern, with similar detector response, but do not interfere with determination of the target analytes.

Accuracy of spiked sample analyses is calculated in percent recovery (%R) as follows:

$$\%R = \frac{(C_S - C_U)}{S} * 100$$

where: C_S = concentration of spiking compound detected in spiked sample
C_U = concentration of spiking compound detected in unspiked sample
S = expected concentration of spike in sample

Accuracy of surrogate compound analyses and performance evaluation samples is calculated in percent recovery (%R) as follows:

$$\%R = \frac{C}{S} * 100$$

where: C = concentration detected in sample
S = expected concentration in the sample "Reported True Value"

19.3.5 Selectivity

SELECTIVITY is the capability of a test method or instrument to respond to a target substance or constituent in the presence of non-target substances. The laboratory evaluates selectivity through procedures defined in the test method SOPs.

19.4 Estimation of Uncertainty

ESTIMATION OF UNCERTAINTY consists of the sum (combining the components) of the uncertainties of the numerous steps of the analytical process, including, but not limited to, sample plan variability, spatial and temporal sample variation, sample heterogeneity, calibration/calibration check variability, extraction variability, and weighing variability.

Procedure

The laboratory estimates uncertainty using the standard deviation calculated from routine quality control samples.

DHL Analytical's procedure for estimation of uncertainty is found in the DHL SOP: Other-Uncertainty-01.

19.5 Laboratory-Developed or Non-Standard Method Validation

Laboratory developed, modified standard methods, and non-standard methods require method validation.

Procedure

METHOD VALIDATION is the confirmation by examination and the provision of objective evidence that the particular requirements for a specific intended use are fulfilled as specified in NELAC 2003 and DoD QSM 4.2.

Policy

Where applicable, the laboratory validates non-standard methods, laboratory-designed/developed methods, standard methods used outside their published scope, and amplifications and modifications of standard methods to confirm that the methods are fit for the intended use.

The range and accuracy of the values obtainable from validated methods (e.g. the uncertainty of the results, detection limit, selectivity of the method, linearity, limit of repeatability and/or reproducibility, robustness against external influences and/or

cross-sensitivity against interference from the matrix of the sample/test object), is assessed for the intended use and whether it is relevant to the clients' needs.

Procedure

The laboratory's method validation procedures include, at a minimum, the steps described in Appendix C.3 to Chapter 5 (NELAC 2003) and DoD QSM 4.2. The laboratory records method validation results, the procedure used for the validation, and a statement as to whether the method is fit for the intended use.

19.6 Control of Data

Policy

All calculations and all relevant data are subject to appropriate checks in a systematic manner.

a) The laboratory shall establish SOPs to ensure that the reported data are free from transcription and calculation errors.

b) The laboratory shall establish SOPs to ensure that all quality control measures are reviewed, and evaluated before data are reported.

c) The laboratory shall establish SOPs addressing manual calculations including manual integrations.

Commercial off-the-shelf software (e. g. word processing, database and statistical programs) used within the designed application range is considered sufficiently validated when in-house programming is not used.

Procedure

The laboratory assures that computers and software are protected, maintained, and secure through measures such as documentation, locked access, and control of the laboratory environment. DHL Analytical's procedure for computer and software control is found in the DHL SOP: ADM-Software-01.

The laboratory has procedures to insure that reported data are free from transcription and calculation errors and that all quality control measures are reviewed and evaluated before data are reported.

The laboratory has procedures to address manual calculations, including manual integrations in the DHL SOP: Other-Manual Integrations-01.

Manual integration sometimes is necessary due to interference, poor chromatographic peak shape, and resolution. These are the cases where automated integration fails to produce representative results. A manual integration may involve redrawing an adequate baseline and/or to reset the peak detecting parameters such as peak width and peak threshold. When manual integrations are performed, raw data records shall include a complete audit trail for those manipulations.

Any manual changes must be:

- initialed and dated by the analyst on the hardcopy
- notation of rationale for the manual integration
- noted on the run log
- subjected to additional QA/QC approval

If manual adjustments are made, the file must contain the original data/chromatograms or Quantitation Reports and the data after adjustments. DoD QSM 4.2 requirements state that each manual integration must be documented in the case narrative of the client report and include the rationale for the manual integration. This requirement applies to all analytical runs including calibration standards and QC samples.

The laboratory assures that computers, user-developed computer software, automated equipment, or microprocessors used for the acquisition, processing, recording, reporting, storage, or retrieval of environmental test data are:

- documented in sufficient detail and validated as being adequate for use
- protected for integrity and confidentiality of data entry or collection, data storage, data transmission and data processing
- maintained to ensure proper functioning and are provided with the environmental and operating conditions necessary to maintain the integrity of environmental test data
- held secure including the prevention of unauthorized access to, and the unauthorized amendment of, computer records

SECTION 20 – EQUIPMENT

20.1 General Equipment Requirements

Policy

The laboratory provides all the necessary equipment required for the correct performance of the scope of environmental testing presented in this QAM.

All equipment and software used for testing and sampling is capable of achieving the accuracy required and complies with the specifications of the environmental test method as specified in the laboratory SOPs.

The laboratory has procedures for safe handling, transport, storage, use and planned maintenance of measuring equipment to ensure proper functioning and in order to prevent contamination or deterioration.

The preventive maintenance program combines both in-house procedures and maintenance provided by the manufacturers and vendors of the equipment. Major equipment and components are periodically inspected and tested by manufacturers' representatives, as appropriate. Routine parts replacement and system modifications are performed by qualified personnel.

DHL Analytical performs routine maintenance, cleaning, and adjustments to the instruments to ensure accurate analytical results. Each trained analyst is competent with these procedures and a supply of common repair parts is maintained in the laboratory. Back up instrumentation is available in house for most analytical equipment in the event serious problems are encountered.

In the event of catastrophic failure of any instrument in the laboratory, the following contingency plans shall be implemented as appropriate:

- Analyze on another identical instrument by the same method, if available
- A new instrument or the necessary repair parts shall be ordered and the instrument brought back on-line
- Samples shall be analyzed by a different instrument, utilizing a comparable methodology (only done with client and/or regulatory approval)
- Instrumentation may be replaced with leased/rented equipment
- Samples may be transferred to a subcontracted laboratory. This plan shall only be implemented with client and/or regulatory approval.

Procedure

Equipment is operated only by authorized personnel.

Up-to-date instructions on the use and maintenance of equipment (including any relevant manuals provided by the manufacturer of the equipment) are readily available for use by laboratory personnel.

All equipment is calibrated or checked before being placed into use to ensure that it meets laboratory specifications and the relevant standard specifications.

Test equipment, including hardware and software, are safeguarded from adjustments which would invalidate the test results measures by limiting access to the equipment and using password protection where possible.

Equipment that has been subject to overloading, mishandling, given suspect results, or been shown to be defective or outside specifications is taken out of service, isolated to prevent its use, or clearly labeled as being out of service until it has been shown to function properly. If it is shown that previous tests are affected, then procedures for non-conforming work are followed.

When equipment is needed for a test that is outside of permanent control of the laboratory, the lab ensures the equipment meets the requirements of this manual prior to its use by inspecting or otherwise testing it.

Each item of equipment and the software used for testing and significant to the results is uniquely identified and records of equipment and software are maintained. A list of DHL Analytical's primary instrumentation can be found in the LIMS that includes the following:

- DHL Instrument Name and Number
- Manufacturer's name, type identification
- Model and serial number or other unique identifier
- date received and date placed into service (if available)
- condition when received, if available (new, used, reconditioned)
- current laboratory location
- manufacturer's instructions, if available, or a reference to their location
- Service agreement contract - maintenance plan where appropriate, and maintenance carried out to date; documentation on all routine and non-routine maintenance activities and reference material verifications
- any damage, malfunction, modification, or repair to the equipment

An instrument Maintenance/Run Logbook is maintained for each instrument. All maintenance activities are documented in the logbook by the analyst. The logbooks are used by the analyst to detect any changes in the performance of the instrument. Routine and preventive maintenance is performed on a schedule to minimize downtime and to record requirements.

Logbooks are also maintained for support equipment such as refrigerator, balances, and drying ovens to monitor the appropriate parameter. The logbooks are used to monitor performances of the equipment and to document any repairs or adjustments.

20.2 Support Equipment

SUPPORT EQUIPMENT includes, but is not limited to: balances, ovens, refrigerators, freezers, incubators, water baths, temperature measuring devices, volumetric dispensing devices, and thermal/pressure sample preparation devices.

Policy

All support equipment is maintained in proper working order and records are kept of all repair and maintenance activities, including service calls.

Procedure

All raw data records are retained to document equipment performance. These records include logbooks, data sheets, or equipment computer files.

All support equipment is calibrated or verified annually over the entire range of use using NIST traceable references where available as required by the 2003 NELAC standards. The results the calibration of support equipment must be within specifications or (1) the equipment is removed from service until repaired, or (2) records are maintained of correction factors to correct all measurements.

Support equipment such as balances, ovens, refrigerators, freezers, and water baths are checked with a NIST traceable reference if available, each day prior to use, to ensure they are operating within the expected range for the application for which the equipment is to be used.

Mechanical volumetric dispensing equipment, including burettes (except Class A glassware) is checked for accuracy quarterly. Records of calibration and verification of all mechanical volumetric dispensing devices are documented in the Syringe and Pipetter Calibration Logbook.

Glass micro-liter syringes (considered to be Class A glassware) do not have to be verified quarterly, but must have a certificate attesting to the established accuracy.

20.2.1 Balances

All laboratory balances shall be calibrated annually using NIST-Traceable weights. This calibration is performed by Allometrics Inc. according to NIST Calibration Lab Certificate Number 482902-1. Laboratory balance calibration shall be monitored daily according to the following protocol:

- check level of balance
- zero the balance
- weigh standard weight (NIST-certified S-class weight)
- record true weight, measured weight, and error in Balance
- Calibration Log and sign log

20.2.2 Refrigerators & Walk-in

The purpose of monitoring refrigerator temperatures daily is to maintain a record of temperature variation which may affect sample integrity. Each working day, the refrigerator temperature shall be monitored from the thermometer mounted in the unit and entered on the Refrigerator Temperature Log. The Laboratory Director, General Manager, or QA Manager shall be notified immediately if the temperature is outside the acceptable temperature range of 4 ± 2°C. In the event of a refrigerator malfunction, the samples will be packed in a cooler and put on ice to maintain 4 ± 2°C until they are analyzed.

For weekend and holiday temperature monitoring, the minimum/maximum (min/max) thermometers will be used to record the temperature. The min/max thermometers shall be reset at the end of the day on Friday or prior to any holiday closure. The Log-In Manager is automatically notified if any Refrigerator exceeds the acceptable temperature range over the weekend or holiday closure and corrective action measures are immediately employed. On Monday or the following workday, the min/max

temperature will be recorded in the Refrigerator Temperature Logbook. The Laboratory Director, General Manager, or QA Manager shall be notified immediately if the temperature is outside of the acceptable temperature range of 4 ± 2°C.

20.2.3 Oven Temperature

The purpose of monitoring laboratory oven temperature is to maintain a record of temperature variation which may affect sample integrity or glassware drying procedures. Each working day, the oven temperature shall be monitored from the thermometer mounted in the unit and entered on the Oven Temperature Log. If the temperature is unacceptable, the temperature dial shall be adjusted accordingly until the oven temperature is within the acceptable range. The oven is then monitored to prevent any further fluctuations. The General Manager or QA Manager shall be notified immediately should the oven temperature fluctuate while samples are being processed.

20.2.4 TCLP Tumbler

The apparatus used to tumble TCLP extracts shall be monitored before each use to verify that the revolutions per minute (RPMs) meet method requirements. The tumbler turned on and the number of RPMs is counted and recorded on the TCLP Extraction Log. If the tumbler is outside of the 30 ± 2 RPMs allowed by the TCLP method, the General Manager, Laboratory Manager or designee is contacted and the tumbler shall be adjusted to the correct revolution rate. The correct rate shall be verified after adjustment and before any samples are extracted.

20.2.5 Support Equipment Maintenance

Regular maintenance of support equipment, such as balances and fume hoods is conducted at least annually.

Maintenance on other support equipment, such as ovens, refrigerators, and thermometers is conducted on an as needed basis.

Records of maintenance to support equipment are documented in Instrument Maintenance Logs. Each piece of support equipment does not necessarily have its own logbook. Maintenance logbooks may be shared with equipment that is housed in the same laboratory area. These procedures are found in the DHL SOP: Other-Monitor Lab-01.

20.2.6 Support Equipment Calibration

Calibration requirements for analytical support equipment are found in the DHL SOP: Other-Monitor Lab-01. For analytical instrumentation, the calibration requirements are found in the test method SOPs. Refer to APPENDIX E - Minimum Performance Checks and Acceptance Criteria for Support Equipment for DoD QSM 4.2 Guidelines.

20.3 Analytical Equipment

20.3.1 Maintenance

Policy

All equipment is properly maintained, inspected, and cleaned.

Procedure

Maintenance of analytical instruments and other equipment may include regularly scheduled preventive maintenance or maintenance on an as-needed basis due to instrument malfunction and is documented in Instrument Maintenance Logs, which become part of the laboratory's permanent records. The procedure for maintenance logs is found in Section 13 of the DHL SOP: ADM-QA/QC-01.

20.3.2 Initial Instrument Calibration

Initial instrument calibration and continuing instrument calibration verification are an important part of ensuring data of known and documented quality. If more stringent calibration requirements are included in a mandated method or by regulation, those calibration requirements override any requirements outlined here or in laboratory SOPs. Generally, instrument calibrations are provided in the test methods.

Instruments shall be calibrated at the frequency required by the specific method being performed. All calibration procedures and results shall be documented and the files maintained. For methods requiring daily calibration curves, the results are kept with each day's results. For methods allowing continuing calibration, the curve is maintained in the calibration files.

Policy

All initial instrument calibrations are verified prior to analyzing any samples with a standard obtained from a second source traceable to a national standard when commercially available. A second source must come from a different manufacturer (producer) unless only one manufacturer of the standard exists. If a second source is not available, a standard prepared from a separate lot may be used.

The minimum number of calibration standards used for each analysis will comply with the reference or mandated method and be outlined in the test method SOPs. If the reference or mandated method does not specify the number of calibration standards to use, the QA manager and/or Technical Director(s) will determine an acceptable minimum number that will be noted in the test method SOPs. DoD QSM 4.2 requirements state that the Initial Calibration range shall consist of a minimum of 5 contiguous levels for organics and 3 contiguous levels for inorganics unless specified by the method. All reported target analytes and surrogates (if applicable) shall be included in the initial calibration.

Any samples that are analyzed after an unacceptable initial calibration are re-analyzed or the data are reported with qualifiers, appropriate to the scope of the unacceptable condition.

Quantitation is determined from the initial calibration unless the test method or applicable regulations require quantitation from the continuing calibration.

The lowest calibration standard is the lowest concentration for which quantitative results can be reported without qualification. The lowest

calibration standard is equal to or slightly less than the Limit of Quantitation (LOQ) and is greater than the Limit of Detection. Any data reported below the lower Limit of Quantitation should be considered to have an increased quantitative uncertainty and shall be reported using defined qualifiers or flags or explained in the case narrative.

The highest calibration standard is the highest concentration for which quantitative results can be reported. The LOQ and the highest calibration standard of a multi-level calibration curve establish the quantitation range.

DoD QSM 4.2 requires that all sample results that exceed the highest calibration standard shall be diluted and reanalyzed to bring results within the quantitation range. Data reported that are greater than the highest calibration standard without dilution are considered to have an increased quantitative uncertainty (estimate) and are reported with a qualifier code and explained in the case narrative.

Results outside the quantitation range shall be reported as estimated values, qualified using appropriate data qualifiers (see Box 47) and explained in the case narrative.

Calibration standards shall be prepared for three to six concentration levels (depending upon the method) for use in determining the linearity of the system. The linearity of the response to concentration shall be assessed over the working range of the standards which are prepared for each analyte. A low level standard shall be prepared equal to or slightly less than the LOQ. The medium and high level standards shall be prepared to correspond with the range of concentrations anticipated in the samples and within the working range of the detector. A solvent blank shall be run prior to the initial calibration in order to provide information regarding system cleanliness.

If the relative standard deviation (RSD) of the calibration or response factors is less than 20% (more or less - depending on method specifics) for each analyte, linearity shall be assumed and the average response factor, as defined by the slope of the response curve, is used in calculating concentration of unknown samples. If the RSD is outside the range for a particular compound, then a linear or quadratic curve is used. The coefficient of determination (COD) must meet method requirements (typically $R^2 \geq 0.990$ or $R > 0.995$ for DoD methods). If the minimum numbers of calibration points are available, a high or low point may be excluded from the curve. Midpoints of the curve may not be excluded unless the cause is determine and documented.

On completion of the initial calibration, a standard from a different manufacturer (producer) than the calibration standard shall be run. The second source calibration verification standard (SSCV) is an independent check standard to validate the initial calibration. The concentration of the second source standard shall be at or near the midpoint of the calibration range. The recovery of this standard shall meet method specifications (typically 5-10% for metals, 15% for inorganics, and 20-30% for organics). Acceptance criteria for the SSCV must be at least as stringent as those for the continuing calibration verification.

For DoD projects, refer to DoD QSM 4.2 Appendix F – SW846 Quality Control Requirements for Acceptance Criteria and Corrective Actions for each specific method.

Procedure

Initial instrument calibration includes calculations, integrations, acceptance criteria, and associated statistics referenced in the test method SOP.

Sufficient raw data records are collected to allow reconstruction of the initial instrument calibration. These include, at a minimum, calibration date, test method, instrument, analysis date, analyte names, analysts signature or initials, concentration and response, calibration curve or response factor, or unique equation or coefficient of determination used to reduce instrument responses to concentration.

Acceptance criteria are listed in individual method SOPs.

Corrective actions are performed when the initial calibration results are outside acceptance criteria. Calibration points are not dropped from the middle of the curve unless the cause is determined and documented. If the cause cannot be determined, the calibration curve is re-prepared. If the low or high calibration point is dropped from the curve, the working curve is adjusted and sample results outside the curve are qualified.

Results that are less than the lower calibration standard are considered to have increased uncertainty, and are either reported with a qualifier code or explained in the case narrative.

Results that are greater than the highest calibration standard are either diluted to within the calibration range, or considered to be an estimate; and are reported with a qualifier code and explained in the case narrative.

20.3.2 Continuing Instrument Calibration

Policy

The validity of the initial calibration is verified prior to sample analysis by use of continuing instrument calibration verification (CCV) standards.

Corrective action is initiated for continuing instrument calibration verification results that are outside of acceptance criteria.

Procedure

A continuing calibration verification check standard (CCV) at the mid-level concentration of the initial calibration shall be run using a standard prepared similarly to the curve standards. Following a solvent blank, an initial calibration verification standard (ICV) shall be run before starting each sample batch and a CCV shall be run at a frequency determined by the method to validate response factors and retention times. When the method specifies that CCVs shall be run at specific sample intervals, the count of these samples shall be of field samples only.

The percent difference of the continuing calibration check response factor to the initial calibration response shall be within method criteria. Some

methods have different criteria established that are documented in the SOPs for each analytical test method.

For chromatographic analyses, retention time of continuing calibration checks must fall within the daily retention time windows. If outside the window, corrective actions include instrument maintenance to determine the cause of the shift.

The concentration of the calibration checks are varied over the established working range of the initial calibration curve. For methods requiring multiple calibration checks in a one day period, the ICV is at a different concentration than the CCV. For GC/MS analyses, the SSCV is at a different concentration than the ICV.

Continuing instrument calibration verification (CCV) is performed at the beginning (ICV) and end of each analytical batch, except for instances when an internal standard is used. For methods employing internal standards, only one verification (ICV) is performed at the beginning of the analytical batch.

Continuing instrument calibration verification is performed for all analytical systems that have a calibration verification requirement. Calibration is verified for each target analyte that is defined as a compound, element, or other discrete chemical species.

The calculations and associated statistics for continuing instrument calibration are included or referenced in the test method SOP.

Sufficient raw data records are retained to allow reconstruction of the continuing instrument calibration verification. Continuing instrument calibration verification records connect the continuing verification date to the initial instrument calibration.

20.3.4 Noncompliant Continuing Instrument Calibration Verifications

If the continuing calibration verification results obtained are outside established acceptance criteria, corrective actions must be performed. If routine corrective action procedures fail to produce a second consecutive (immediate) calibration verification within acceptance criteria, then either the laboratory has to demonstrate acceptable performance after corrective action with two consecutive calibration verifications, or a new initial instrument calibration must be performed.

For DoD projects, all samples analyzed since the last successful calibration verification shall be reanalyzed. If reanalysis is not possible, the client must be notified prior to reporting data associated with a noncompliant CCV. If these data are reported, the data must be qualified and explained in the case narrative.

If the laboratory routinely analyzes two CCVs, then both CCVs must be evaluated. If either CCV fails, perform corrective actions as required by NELAC Section 5.5.10 and reanalyze all samples since last acceptable calibration verification.

For any samples analyzed on a system with an unacceptable calibration, some results may be useable if qualified and under the following conditions:

a) If the acceptance criteria are exceeded high (high bias) and the associated samples are below detection, then those sample results that are non-detects may be reported as non-detects.

b) If the acceptance criteria are exceeded low (low bias) and there are samples that exceed the maximum regulatory limit, then those exceeding the regulatory limit may be reported.

SECTION 21 – MEASUREMENT TRACEABILITY

Measurement quality assurance comes in part from traceability of standards to certified materials.

POLICY

All equipment used that affects the quality of test results are calibrated prior being put into service and on a continuing basis. These calibrations are traceable to national standards of measurement where available.

Measurements from laboratory equipment provide the uncertainty required by test method or client.

If traceability of measurements to SI units is not possible or not relevant, evidence for correlation of results through interlaboratory comparisons, proficiency testing, or independent analysis is provided.

PROCEDURE

All equipment that affects the quality of test results are calibrated according to the minimum frequency suggested by the manufacturer, by regulation, by method, or as needed.

Clients can verify that required uncertainty is achieved by reviewing the internal quality control data, if requested.

21.1 Reference Standards

REFERENCE STANDARDS are standards of the highest quality available at a given location, from which measurements are derived.

Policy

Reference Standards, such as ASTM Class 1 weights, are used for calibration only and for no other purpose unless it is shown that their performance as reference standards will not be invalidated.

Procedure

Reference standards, such as ASTM Class 1 weights, are calibrated by Allometrics Inc. or by an entity that can provide traceability to national or international standards. The following reference standards are calibrated on-site during the annual balance calibration or sent out to be calibrated to a national standard:

- Class 1 weights are sent out for calibration every 5 years
- Reference thermometers are sent out for calibration every 5 years

Records of calibration of weights and thermometers shall be kept in QA office and the electronic copies are stored on the DHL LIMS.

21.2 Reference Materials

REFERENCE MATERIALS are substances that have concentrations that are sufficiently well established to use for calibration or as a frame of reference. Records of standards, reagents, and reference materials shall include lot numbers.

Policy

Reference materials, where commercially available, are traceable to national standards of measurement, or to Certified Reference Materials, usually by a Certificate of Analysis.

Internal reference materials, such as working standards or intermediate stock solutions, are checked as far as technically and economically possible.

It is DHL Analytical's policy that we utilize only those vendors and subcontractors who meet the minimum requirements of the customer for whom the product or services are to be supplied.

Procedure

Purchased Reference Materials require a Certificate of Analysis where available. Otherwise, purchased reference materials are verified by application to a certified reference material, inter-laboratory comparison, and/or demonstration of capability.

Internal Reference Materials, such as working standards and intermediate stock solutions, are checked with independent analysis.

- Electronic thermometers are checked at least quarterly against the NIST certified reference thermometer.
- Pipettes are verified gravimetrically for accuracy at least on a quarterly basis.

Records of calibration and verification of all thermometers are documented in the Thermometer Calibration Logbook located in the QA office.

Records of calibration and verification of all mechanical volumetric dispensing devices are documented in the Syringe and Pipetter Calibration Logbook located in the QA office.

21.3 Transport and Storage of Reference Standards and Materials

Policy

The laboratory handles and transports reference standards and materials in a way that protects their integrity.

Procedure

Reference standard and material integrity is protected by separation from incompatible materials and/or minimizing exposure to degrading environments or materials.

Reference standards and materials are stored according to manufacturer's recommendations and separately from working standards or samples.

21.4 Labeling of Reference Standards, Reagents, and Materials

Policy

Reference standards and materials are tracked from purchase, receipt, and storage through disposal.

Expiration dates can be extended if the reference standard or material's integrity is verified. Original containers (such as provided by the manufacturer or vendor) shall be labeled with an expiration date. Expiration dates and storage conditions for standards are stated in the relevant SOPs.

Reagent quality is verified by "blank" testing for impurities prior to usage and periodically before each sub-stock or working standard is prepared.

Procedure

Standard and solvents used in the preparation of substocks and in analyses are recorded on receipt in the LIMS. DHL Analytical assigns its' own unique identification number and expiration date for all standards and subsequent standard solutions. All manufacturers' documentation (Certificate of Analysis and NIST Traceability Statements) are linked by PDF to the standard record and retained in the laboratory file.

The following information is recorded in the LIMS for each standard:

- DHL ID number
- Standard Name
- Prepared by (Analyst Name)
- Date of Receipt
- Date Opened
- Date of Preparation
- Expiration date
- Department
- Manufacturer/Vendor Name
- Lot Number (Lot #)
- Purity (if supplied)
- Volume
- Recommended storage conditions

Preparation of standards and substocks is recorded in the LIMS specific to each method. Standards are prepared according to procedures specified in the analytical methods. Standard preparation is performed as outlined in each test method SOP. For purchased standards, the date of receipt is recorded as part of the identification of the standard.

In methods where the purity of reagents is not specified, analytical reagent grade is used. If the purity is specified, that is the minimum acceptable grade. Purity is verified and documented according to Section 9, Purchasing, Services, and Supplies.

All containers of standards, reagents, or materials, whether original or prepared, are labeled with an expiration date. All containers of prepared standards and reference materials have a preparation date and unique identifier. This laboratory uses method prefix, year, month, date and sequential letter if applicable.

Standard preparation records are kept in the LIMS and indicate traceability to purchased stocks or neat compounds, reference to the method of preparation, date of preparation, expiration date, and preparer's initials.

Prepared reagents are verified to meet the requirements of the test method through blank analysis.

SECTION 22 – SAMPLE MANAGEMENT

22.1 Sample Receipt

Procedure

When samples are received at the laboratory, their condition is documented, they are given unique identifiers, and they are logged into the sample tracking system.

22.2 Sample Acceptance

Policy

The laboratory has a sample acceptance policy in the DHL SOP: Other-Log-In-01 that specifies the minimum conditions a sample must meet on receipt. If these conditions are not met, the client is contacted prior to any further processing.

Procedure

The laboratory checks samples for the following qualities, where appropriate, to evaluate sample acceptance: temperature, pH, preservative type, bottle type, sample integrity, and full required documentation (sample ID, location, date and time of collection, collector's name, preservation type, sample type and comments.)

Samples are received by laboratory personnel trained to handle samples of evidentiary nature. The sample handling procedures are intended to maintain the integrity of both the samples and the documentation necessary to support the analytical data. DHL Analytical receives samples by courier services or hand delivery/walk-ins. The Sample Receipt Checklist in the LIMS is used to document the condition of the cooler when delivered to the laboratory.

22.2.1 Sample Receipt and Verification Protocol

- note presence, absence, and condition of the shipping container (cooler) tape and custody seals
- open cooler and remove COC, record signature, date and time of receipt
- take the temperature of the samples and record
- record condition of shipping container and identity of common carrier (if applicable)
- remove samples from shipping container and organize samples by client ID numbers
- fill out the cooler receipt checklist

22.2.2 Preservation Checks

The following preservation checks are performed and documented upon receipt:

Thermal preservation

- For temperature preservation, the temperature must be within 4°C ± 2°C unless otherwise stated.
- For samples that require preservation at 4°C, the acceptable range is from just above freezing to 6°C.

- Samples that are delivered to the lab the same day as they are collected are likely not to have reached a fully chilled temperature. This is acceptable if there is evidence that chilling has begun.
- Record on the receipt form that ice is present (if it is) and the temperature.

pH Checks

- The pH of samples requiring acid/base preservation is checked upon sample receipt or upon initiation of analysis, if applicable

The sample acceptance policy is available to the sample collection personnel, and emphasizes the need for use of water resistant ink, use of appropriate containers, adherence to holding times, sample volume requirements, and what to do with compromised samples.

Chain of Custody Forms are maintained and filed in the work order.

If the checks performed upon sample receipt indicate the criteria are not met, then:

- the sample is rejected as agreed with the client
- the decision to proceed is documented and agreed upon with the client
- the condition is noted on the Chain of Custody form and/or lab receipt documents
- the data are qualified in the report

22.3 Sample Identification

Policy

Samples, including subsamples, extracts, and digestates, are uniquely identified in a permanent chronological record (such as a sample receipt log book or database) to prevent mix-up and to document receipt of all sample containers.

Procedure

Samples are assigned sequential numbers that reference more detailed information kept in the LIMS.

Sample information is recorded in the LIMS. The LIMS assigns every project a laboratory project number, which identifies a batch of samples to be analyzed for a particular test(s), listed on the COC. The project number individually identifies samples as follows: 11-04-001-01-A

11=year

09=month

001= work order number which identifies a batch of samples to be analyzed by a particular test listed on the COC.

01=sequential number (01-99) identifying each client sample in the batch

A= a sequential letter code (A,B,C…) which identifies each replicate sample container for each client sample

The following protocol is used for sample log-in:

- Each batch of samples is assigned a unique DHL Analytical project number.
- Client sample identifiers and number of samples is confirmed with the COC.
- Matrix of samples is verified with information of COC and any samples of an unusual matrix are marked with a yellow sticker for return to client for disposal.
- Analyses requested are verified with the COC.
- Completeness of COC is noted.
- Each sample ID is assigned a unique internal laboratory identification number followed by sequential numbers (01-99).
- Notes regarding condition received, integrity, seals, preservation, and any peculiarities are noted on the chain of custody.
- Discrepancies and any reasons for sample rejection noted.
- Sample information is entered into the LIMS.
- Labels containing the DHL Analytical project number and internal sample identification number are placed on the sample bottles.
- The samples are then stored in controlled access refrigerators. Samples received for volatile organic analyses are stored separate from all other samples. Based on information from client or previous history of the project volatile samples are separated from high and low concentrations.
- A project data file is stared as described in the Document Control section below.

The Log-In Manager, Sample Custodian or designee is responsible for noting any irregularities in the samples during log-in and informing the General Manager or QA Manager who then accepts or rejects samples. In the event of sample irregularities or rejections, it shall be noted on the sample receipt checklist, maintained in the data file, and included in the final report with the appropriate data flags, if applicable. It shall also be included in the case narrative portion of the report. The client shall be notified of any irregularities or rejections found in the samples or sample documentation and all correspondence and/or records of conversations concerning the final disposition of rejected samples is placed in the project file. The final decision for analyzing the sample is up to the client and shall be noted on the final report.

Criteria for sample rejection may include:

- elevated temperature, if cooling is necessary
- breakage or leakage
- evidence of seal tampering
- missing or duplicate samples
- incomplete chain of custody record
- discrepancies in sample documentation
- missing labels
- lack of preservation
- insufficient sample for specified analyses
- improper sample containers
- headspace in VOA vials
- hold time expired

The following information is collected on the Chain of Custody and sample receipt checklist:

- Client or project name
- Date and time of sampling
- Date and time of receipt at lab
- Unique laboratory identification number
- Unique field identification number (may be same as lab #)
- Initials of recorder
- Analyses requested
- Comments regarding rejection (if any)

22.4 Sample Storage

Procedure

Storage conditions are monitored for any required criteria, verified, and the verification recorded in logbooks. This includes temperature monitoring and holding times.

Samples are held secure, as required. Samples are stored apart from standards, reagents, food or potentially contaminating sources, and such that cross-contamination is minimized. All portions of samples, including extracts, digestates, leachates, or any product of the sample is maintained according to the required conditions.

22.5 Sample Disposal

Samples are disposed of according to Federal, State and local regulations. Procedures are available for the disposal of samples, digestates, leachates, and extracts. Documentation and records are maintained by the Health & Safety Officer and filed in the QA Office.

The sample disposal procedure is found in the DHL SOP: Other-Waste Disposal-01.

22.6 Sample Transport

Samples that are transported under the responsibility of the laboratory, where necessary, are done so safely and according to storage conditions. This includes moving bottles within the laboratory. Specific safety operations are addressed outside of this document.

22.6.1 Sample Distribution and Tracking

DHL maintains sample information records in a laboratory information management computer system. This chronological record contains all samples received or generated by subsampling in order to allow a single sample to be analyzed by different analyses. All identifying information and cross-referencing data described above are maintained in the computer for tracking purposes. Samples are signed out from storage by the chemist or analyst.

Extraction Logs (Prep Batch Reports) and Analytical Run Logs are maintained by the analyst as applicable for the requested sample analyses. Extraction logs must contain a minimum: sample id number, duration times for processes, volumes or weights of sub-samples, dilution factors,

final volume, analyst name and initials, pH checks, etc. Extraction logs are generated through the LIMS. On completion of analysis or taking an aliquot from the sample, the remaining sample and any excess extract or digest is returned to a secured storage area.

The time, date, and initials/signature of persons performing the work are required on each form used in tracking and handling samples. All tracking of samples is performed in the LIMS through a password and location identification system. It is the responsibility of the QA Manager and General Manager to ensure that holding time constraints in the extraction and analysis of samples are met. Laboratory analytical reports include dates of sampling, extraction, and analyses; and are compared with extraction and analysis logs by the General Manager or QA Manager during final data review to assure that holding time criteria have been met.

22.6.2 Sample Transfer

Samples transferred to other laboratories are labeled with the client field ID and the DHL Analytical sample ID number. A COC generated in the LIMS is filled out with the DHL Analytical project number, sampling date and time, requested analyses, and appropriate sample preservatives. The samples are packaged at appropriate temperatures and shipped to the external laboratory. The same information required in the above-listed protocol for sample custody applies to samples extracts shipped to other laboratories.

22.7 Sampling Records

The clients of DHL Analytical are responsible for sampling and the information regarding the sampling process.

Policy

Sampling plans are based, whenever it is reasonable or requested by the client, on appropriate statistical sampling methods.

Subsampling within the laboratory is performed according to the DHL SOP: Other-Sub-Samp-01.

SECTION 23 – QUALITY OF TEST RESULTS

23.1 Essential Quality Control Procedures

Policy

All essential quality control elements are collected and assessed on a continuing basis. The qualities of test results are recorded in such a way that trends are detectable, and where practicable, are statistically evaluated.

For test methods that do not provide acceptance criteria for an essential quality control element or where no regulatory criteria exist, acceptance criteria are developed. Control limits are developed using the mean, plus or minus 3 standard deviations; or static limits such as ± 15% which can be found in the test methods SOPs.

The quality control procedures specified in test methods are followed by laboratory personnel. The most stringent of control procedures is used in cases where multiple controls are offered. If it is not clear which is the most stringent, that mandated by test method or regulation is followed.

Procedure

To monitor the validity of environmental tests performed, review includes any one or combination of the techniques below:

- use of certified reference materials or cultures and/or internal quality control using secondary reference materials
- participation in proficiency testing programs
- replicate testing using the same or different methods
- retesting of retained samples
- correlation of results for different characteristics of a sample

Written procedures to monitor quality controls including acceptance criteria are located in the test method SOPs, except where noted, and include such procedures as:

- use of laboratory control samples and blanks to serve as positive and negative controls for chemistry methods
- use of laboratory control samples to monitor test variability of laboratory results
- use of calibrations, continuing calibrations, certified reference materials and/or PT samples to monitor accuracy of the test method
- measures to monitor test method capability, such as limit of detection, limit of quantitation, and/or range of test applicability, such as linearity
- use of regression analysis, internal/external standards, or statistical analysis to reduce raw data to final results
- use of reagents and standards of appropriate quality
- procedures to ensure the selectivity of the test method
- measures to assure constant and consistent test conditions, such as temperature, humidity, rotation speed, etc., when required by test method

23.2 Internal Quality Control Practices

Analytical data generated with QC samples that fall within prescribed acceptance limits indicate the test method is **IN CONTROL**.

QC samples that fall outside QC limits indicate the test method is **OUT OF CONTROL** (non-conforming) and that corrective action is required or that the data are qualified.

Policy

All QC measures are assessed and evaluated on an on-going basis, so that trends are detected. Detailed QC procedures and QC limits are included in the LIMS and documented in the test method SOPs.

Procedure

The following general controls are used:

23.2.1 Positive and Negative Controls

- Blanks (negative)
- Laboratory control sample (positive)
- Matrix Spike/Matrix Spike Duplicate (positive)
- Post Digestion Spike (positive)

23.2.2 Selectivity

Selectivity is assured through:

- absolute and relative retention times in chromatographic analyses
- two-column confirmation when using non-specific detectors
- use of acceptance criteria for mass-spectral tuning (found in test method SOPs)
- use of the correct method according to its scope assessed during method validation

23.2.3 Consistency, Variability, Repeatability, and Accuracy

Consistency, Variability, Repeatability, and Accuracy are assured through:

- proper installation and operation of instruments according to manufacturer's recommendations or according to the processes used during method validation
- monitoring and controlling environmental conditions (temperature, access, proximity to potential contaminants)
- selection and use of reagents and standards of appropriate quality
- cleaning glassware appropriate to the level required by the analysis. Cleaning procedures not provided in test method SOPs are provided in the DHL SOP: Other-Glassware-01
- following SOPs and documenting any deviation, assessing for impact, and treating data appropriately
- testing to define the variability and/or repeatability of the laboratory results, such as replicates

- use of measures to assure the accuracy of the test method, including calibration and/or continuing calibrations, use of certified reference materials, proficiency test samples, or other measures

Acceptance or rejection criteria are created according to laboratory policy where no method or regulatory criteria exist. Acceptance criteria define the boundary for the appropriate response from laboratory personnel, such as corrective action, reporting with qualifiers, reanalysis, review, and others.

23.2.4 Test Method Capability

Test Method Capability is assured through:

- establishment of the limit of detection where appropriate
- establishment of the limit of quantitation or reporting level
- establishment of the range of applicability such as linearity

23.2.5 Data reduction

Data reduction is assured to be accurate by:

- selection of appropriate formulae to reduce raw data to final results such as regression
- periodic review of data reduction processes to assure applicability

23.3 Method Blanks

Policy

Contaminated blanks are identified according to the acceptance limits in the test method SOPs or laboratory documentation.

Samples associated with a contaminated blank are evaluated as to the appropriate corrective action for the samples (e.g. reprocessing or data qualifying codes).

Procedure

DHL Analytical identifies a blank as contaminated when analyte results are greater than the LOQ AND greater than 1/10 of that found in any sample, or where the contamination affects the sample results according to test method requirements or client objectives. For DoD samples, the method blank will be considered to be contaminated if:

- The concentration of any target analyte in the blank exceeds 1/2 the reporting limit and is greater than 1/10 the amount measured in any sample or 1/10 the regulatory limit (whichever is greater);
- The concentration of any common laboratory contaminant in the blank exceeds the reporting limit and is greater than 1/10 the amount measured in any sample or 1/10 the regulatory limit (whichever is greater); or
- The blank result otherwise affects the samples results as per the test method requirements or the project-specific objectives.

If the method blank is contaminated as described above, then the laboratory shall reprocess affected samples in a subsequent preparation batch, except when sample

results are below the LOD. If insufficient sample volume remains for reprocessing, the results shall be reported with appropriate data qualifiers.

When a blank is determined to be contaminated, the cause must be investigated and measures taken to minimize or eliminate the problem.

Data that are unaffected by the blank contamination (non-detects or other analytes) are reported unqualified.

Sample data that are suspect due to the presence of a contaminated blank are reanalyzed or qualified.

23.4 Laboratory Control Samples

LABORATORY CONTROL SAMPLES (LCS) are prepared from analyte free water or other analyte free matrices, and spiked with verified and known amounts of analytes for the purpose of establishing precision or bias measurements.

Policy

Laboratory control samples are analyzed at a frequency mandated by method, regulation, or client request, whichever is more stringent. Each target analyte must be spiked and monitored in the LCS.

Procedure

The results of laboratory control samples (LCS) are calculated in percent recovery or other appropriate statistical technique that allows comparison to established acceptance criteria. The laboratory documents the calculation in the Test Method SOPs.

The individual batch LCS is calculated in percent recovery that allows comparison to established acceptance criteria as published in the mandated test method. Where there are no established criteria, the laboratory shall determine internal criteria or utilize client specified assessment criteria. The laboratory shall document the calculation. An LCS that is determined to be within the criteria effectively establishes that the analytical system is in control and validates system performance for the samples in the associated batch.

Samples analyzed along with an LCS determined to be "out of control" shall be considered suspect and the samples reprocessed and re-analyzed or the data reported with appropriate data qualifying codes. This includes any allowable marginal exceedance as described below.

- when the acceptance criteria for the positive control are exceeded high (i.e., high bias) and there are associated samples that are non-detects, then those non-detects may be reported with data qualifying codes; or
- when the acceptance criteria for the positive control are exceeded low (i.e., low bias), those sample results may be reported if they exceed a maximum regulatory limit/decision level with data qualifying codes.

If a large number of analytes are in the LCS, it becomes statistically likely that a few will be outside control limits. This may not indicate that the system is out of control; therefore corrective action may not be necessary. Upper and lower marginal exceedance (ME) limits can be established to determine when corrective action is

necessary. A ME is defined as being beyond the LCS control limit (3 standard deviations), but within the ME limits. ME limits are between 3 and 4 standard deviations around the mean.

The number of allowable marginal exceedances is based on the number of analytes in the LCS. If more analytes exceed the LCS control limits than is allowed, or if any one analyte exceeds the ME limits, the LCS fails and corrective action is necessary. This marginal exceedance approach is relevant for methods with long lists of analytes. It will not apply to target analyte lists with fewer than 11 analytes.

DoD QSM 4.2 does not allow any target analyte to exceed its LCS control limits, even marginally as identified by a project without project-specific approval. It is inappropriate to control batch acceptance on poor-performing analytes.

The number of allowable marginal exceedances is as follows:

1) >90 analytes in LCS, 5 analytes allowed in ME of the LCS control limit;
2) 71–90 analytes in LCS, 4 analytes allowed in ME of the LCS control limit;
3) 51–70 analytes in LCS, 3 analytes allowed in ME of the LCS control limit;
4) 31–50 analytes in LCS, 2 analytes allowed in ME of the LCS control limit;
5) 11–30 analytes in LCS, 1 analytes allowed in ME of the LCS control limit;
6) <11 analytes in LCS, no analytes allowed in ME of the LCS control limit.

Marginal exceedances must be random. If the same analyte exceeds the LCS control limit repeatedly, it is an indication of a systemic problem. The source of the error must be located and corrective action taken. Laboratories must have a written procedure to monitor the application of marginal exceedance allowance to the LCS to ensure random behavior.

DoD QSM 4.2 considers the same analyte exceeding the LCS control limit two (2) out of three (3) consecutive LCS to be indicative of non-random behavior.

23.5 Matrix Spikes and Matrix Spike Duplicates

MATRIX SPIKES (MS/MSD) are environmental samples fortified with a known amount of analyte to help assess the affect of the matrix on method performance.
The results from matrix spike/matrix spike duplicate (MS/MSD) pairs are used to assess the effect of sample matrix on precision and accuracy of analytical results.

Policy

MS/MSD samples are analyzed at a frequency mandated by method, regulation, or client request, whichever is more stringent. For DoD projects, all target analytes must be spiked and monitored in the MS/MSD.

Procedure

The laboratory procedure for MS/MSD includes spiking appropriate analytes at appropriate concentrations, calculating percent recoveries and relative percent difference (RPD), and evaluating and reporting the results.

Where there are no established criteria, the laboratory uses the mean plus or minus three standard deviations as the control limits for MS/MSD. For DoD projects, the results of all MS/MSDs must be evaluated using the same acceptance criteria used for the LCS.

For MS/MSD results outside established criteria, corrective action is documented or the data reported with appropriate data qualifying codes.

23.6 Matrix Duplicates

MATRIX DUPLICATES (DUP) are replicate aliquots of the same sample taken through the entire analytical procedure. The results from this analysis indicate the precision of the results for the specific sample using the selected method. The matrix duplicate provides a usable measure of precision only when target analytes are found in the sample chosen for duplication.

The frequency of the analysis of matrix duplicates may be determined as part of a systematic planning process (e.g., Data Quality Objectives-DQO) or as specified by the mandated test method.

For DoD projects, if the known concentration of concern is greater than five times the LOQ, a sample duplicate may be analyzed in place of the MSD. A matrix spike is still required. Duplicate analysis should be performed at a minimum frequency of once per preparatory batch per matrix type.

Matrix duplicates are performed on replicate aliquots of actual samples. The composition is usually not known.

The results from matrix duplicates are primarily designed to assess the precision of analytical results in a given matrix and are expressed as relative percent difference (RPD) or another statistical treatment (e.g., absolute differences). The laboratory shall document the calculation for relative percent difference or other statistical treatments.

Results are compared to the acceptance criteria as published in the mandated test method. Where there are no established criteria, the laboratory shall determine internal criteria and document the method used to establish the limits. For matrix duplicates results outside established criteria, corrective action shall be documented or the data reported with appropriate data qualifying codes

23.7 Surrogate Spikes

SURROGATES are substances with chemical properties and behaviors similar to the analytes of interest used to assess method performance in individual samples.

Policy

Surrogates are added to all samples (in test methods where surrogate use is appropriate) prior to sample preparation or extraction.

Procedure

Surrogate recovery results are compared to the acceptance criteria as published in the mandated test method.

Where there are no established criteria, the laboratory uses the mean plus or minus three standard deviations as surrogate control limits.

For surrogate results outside established criteria, data are evaluated to determine the impact. Corrective actions include rerun of data or qualifying the data.

23.8 Proficiency Test Samples or Interlaboratory Comparisons

Proficiency Testing (PT): A means to evaluate a laboratory's performance under controlled conditions relative to a given set of criteria, through analysis of unknown samples provided by an external source.

Proficiency Testing Sample (PT Sample): A sample, the composition of which is unknown to the laboratory and is provided to test whether the laboratory can produce analytical results within the specified acceptance criteria.

Field of Proficiency Testing (FoPT): Analytes for which a laboratory is required to successfully analyze a PT sample in order to obtain or maintain accreditation, collectively defined as: matrix, technology/method, analyte.

Policy

DHL Analytical participates in proficiency test samples (PT) as required and institutes corrective action procedures for failed PT samples.

DHL Analytical does not share PT samples with other laboratories, does not communicate with other laboratories regarding current PT sample results, and does not attempt to obtain the assigned value of any PT sample from the PT provider.

Procedure

Proficiency Testing (PT) samples are treated as typical samples in the normal production process where possible, including the same preparation, calibration, quality control and acceptance criteria, sequence of analytical steps, number of replicates, and sample log-in. PT samples are not analyzed multiple times unless routine environmental samples are analyzed multiple times.

PT samples are analyzed every six months for each analytical test and matrix and follows corrective action procedures for unacceptable PT results. The analysis dates of successive PT samples for the same accreditation Field of Proficiency Testing (FoPT) shall be at least five (5) months apart and no longer than seven (7) months apart unless the PT sample is being used for corrective action to reestablish successful history in order to maintain continued accreditation, or is being used to reinstate accreditation after suspension, in which case the analysis dates of successive PT samples for the same accreditation FoPT shall be at least fifteen (15) days apart.

DoD QSM 4.2 Requirements for Proficiency Testing (PT) Program:

Initial or Continuing PT Studies:

Two initial or continuing PT studies shall be successfully completed for each requested field of proficiency testing within the most recent three rounds attempted. For initial acceptance, the laboratory must successfully analyze two sets of PT studies, the analyses to be performed at least 15 calendar days apart from the closing date of one study to the shipment date of another study for the same field of proficiency testing. For continuing acceptance, completion dates of successive proficiency rounds for a given field of proficiency testing shall be approximately six months apart. Failure to meet the semiannual schedule is regarded as a failed study.

Failed Studies and Corrective Action:

If the laboratory fails a PT study, it shall determine the cause for the failure and take any necessary corrective action. The laboratory shall provide documentation

describing both the cause for the failure and the corrective action taken to the pertinent accreditation authorities. In addition, if a laboratory fails two out of the three most recent environmental PT studies for a given field of proficiency testing or is rated as non-proficient by AIHA, its performance is considered unacceptable and the laboratory shall then meet the requirements of initial acceptability for the fields of testing before analyzing any further DoD samples.

Pass/Fail Criteria for Environmental Analyte Group PT Samples (excerpted from NELAC 2003 Standard - Appendix C.5.3):

Proficiency testing pass/fail evaluations for Analyte Group PT studies shall be determined as follows: To receive a score of "Pass", a laboratory must produce acceptable results as defined in Section C.1 for 80% of the analytes in an Analyte Group PT Study. Greater than 20% "Not Acceptable" results shall result in the laboratory receiving a score of "Fail" for that group of analytes. A "Not acceptable" result for the same analyte in two out of three consecutive PT studies shall also result in the laboratory receiving a score of "Fail" for that analyte. The PCB analyte group is exempt from the 80% pass/fail criteria.

Note: In some cases it is necessary for blind or double blind QC samples to be submitted to the laboratory to show a return to control.

23.9 Data Review

Policy

The laboratory reviews all data generated in the laboratory for compliance with method, laboratory and, where appropriate, client requirements. Internal data review shall consist of a tiered or sequential system of verification, consisting of at least three tiers, with each check performed by a different person. The three tiers must include at a minimum, 100% review by the analyst, 100% verification review by a technically qualified supervisor or data review specialist, and a final administrative review.

Procedure

Initially, the analyst reviews data for acceptability of quality control measures and accuracy of the final result(s).

DoD QSM 4.2 Requirements for Internal Data Review:

The analyst and verification review must include at least the following procedures:

1. Determination of whether the results meet the laboratory-specific quality control criteria;

2. Checks to determine consistency with project-specific measurement quality objectives (MQOs);

3. Checks to ensure that the appropriate sample preparatory and analytical SOPs and methods were followed, and that chain-of-custody and holding time requirements were met;

4. Checks to ensure that all calibration and quality control requirements were met; and

5. Checks for complete and accurate explanations of anomalous results, corrective action, and the use of data qualifiers in the case narrative.

The final administrative review shall verify that previous reviews were documented properly and that the data package is complete.

In addition, the Quality Manager or designee shall review a minimum of 10% of all data packages for technical completeness and accuracy. This review is part of the QA program and does not need to be completed before the data package is issued to the client.

If electronic audit trail functions are available, they must be in use at all times, and associated data must be accessible. If the instrument does not have an audit trail, the laboratory must have procedures to document the integrity of the data.

After the initial review, a second reviewer considers all manual transfers and calculations of data in detail and spot checks all electronic transfers of data.

Final reports are compared to raw data either directly or through several reviewed steps.

All data review is documented. Refer to the DHL SOP: ADM-QA/QC-01 for data review procedure.

SECTION 24 – REPORTING OF RESULTS

POLICY

The result of each test carried out is reported accurately, clearly, unambiguously, and objectively and complies with all specific instructions contained in the test method.

Data are reported without qualification if they are greater than the lowest calibration standard, lower than the highest calibration standard, and without compromised sample or method integrity.

24.1 Test Reports

Policy

The report format has been designed to accommodate each type of test performed and to minimize the potential for misunderstanding or misuse.

Procedure

Each test report generated contains the following information (unless not required by the client):

- the name and address of the laboratory, the phone number, and name of a contact person
- unique identification of the test report, such as the work order number, on each page and a pagination system that ensures that each page is recognized as part of the test report and a clear identification of the end of the report, such as 3 of 10
- the name and address of the client and project name if applicable
- the identification of the test method used
- an unambiguous identification of the sample(s), including the client identification code
- the date of sample receipt, date(s)/time of sample collection, date(s)/time the tests were performed, the date(s)/time of sample preparation and/or analysis (essential regardless of required holding time)
- reference to the sampling plan and procedures used by the laboratory where these are relevant to the validity or application of the results
- the test results with appropriate data flags, units of measurement, and an indication of whether results are calculated on a dry weight or wet weight basis
- the name, function, and signature or an equivalent electronic identification of the person authorizing the test report, and the date of issue
- a statement to the effect that the results relate only to the samples
- at the laboratory's discretion, a statement that the report shall not be reproduced except in full without written approval of the laboratory
- certification that the results are in compliance with the NELAC Standards and the DoD Quality Systems Manual Version 4.1 if accredited to be in compliance or provide reasons and/or justification if they do not comply

24.2 Supplemental Test Report Information

When necessary for interpretation of the results or when requested by the client, test reports include the following additional information:

- deviations from, additions to, or exclusions from the test method, information on specific test conditions, such as environmental conditions, and any non-standard conditions that may have affected the quality of the results, and any information on the use and definitions of data qualifiers
- a statement of compliance/non-compliance when requirements of the quality systems are not met, including identification of test results that did not meet NELAC or DoD QSM 4.2 sample acceptance requirements, such as holding time, preservation, etc.
- where applicable and when requested by the client, a statement on the estimated uncertainty of the measurement
- where appropriate and needed, opinions and interpretations are included, documented, and clearly marked as such in the test report
- additional information which may be required by specific methods or client
- qualification of results with values outside the working range

24.3 Environmental Testing Obtained from Subcontractors

Test results obtained from test performed by subcontractors are clearly identified on the test report by subcontractor name and/or accreditation number. The test results from subcontractors are reported in writing or electronically. A copy of the subcontractors report is be made available to the client if requested.

24.4 Electronic Transmission of Results

All test results that are transmitted by fax, e-mail, or other electronic means must comply with the requirements of this QAM and associated procedures to protect the confidentiality and proprietary rights of the client.

24.5 Amendments and Revisions to Test Reports

Policy

Material amendments to a test report after it has been issued are made only in the form of another document or data transfer. All supplemental reports must meet all the requirements for the initial report and the requirements of this QAM.

Procedure

When minor changes are made to a limited number of pages in a report, an amended test report is uniquely titled to assure they can be differentiated from the original test report. The cover letter shall state "Amendment No. 1" on it and state the reason the report was modified.

As per NELAC and DoD QSM 4.2 protocol, any report that requires major changes or additions, the entire report is to be re-issued. (eg. data, QC, etc.) When changes or additions are made to a report which has been issued, the report shall be clearly marked as being revised with the specific changes identified as well as the reason for the data being changed. The cover letter shall state "Revision No. 1" on it and state the reason the report was modified. All revisions shall be kept with the project folder. Amended and revised reports receive the same level of review and approval as the original report.

SECTION 25 – APPENDIX

APPENDIX A – Laboratory Scope of Analytical Testing Services for DHL Analytical
APPENDIX B – Job Descriptions for all Laboratory Positions
APPENDIX C – DHL Analytical Ethics and Data Integrity Agreement
APPENDIX D – DHL Analytical Floor Plan
APPENDIX E – Minimum Performance Checks and Acceptance Criteria for Support Equipment
APPENDIX F – Scope of Accreditation for DoD-ELAP (DoD QSM 4.2)

APPENDIX A - Laboratory Scope of Analytical Testing Services for DHL Analytical

UST Related Tests

BTEX/MTBE – Method 8021B/602
BTEX in Air
TPH – Method TX 1005
TPH – Method TX 1006 (TPH Fractionation)
TPH – Diesel Range Organics (DRO) – Method 8015B
TPH – Diesel Range Organics – OK-DRO
TPH – Gasoline Range Organics (GRO) – Method 8015B
TPH – Gasoline Range Organics – OK-GRO
TPH in Air
TPH – CWG
TRPH – Method 418.1

Volatiles and Semivolatiles Tests

Volatile Organics – Method 8260B
Volatile Organics – Method 624
TCLP/SPLP/ZHE Volatiles – Method 1311/1312
Semivolatile Organics - Method 8270C/D
PAH - Method 8270C/D
Semivolatile Organics – Method 625
TCLP/SPLP Semivolatiles – Method 1311/1312
Organochlorine Pesticides – Method 8270C/D
Organochlorine Pesticides – Method 625
Organophosphorus Compounds – 8270C/D, 625
PCBs – Method 8082A, 8270C/D
PCBs in Oil – Method 8082A
EDB – Method 8011
Explosives HPLC Analysis – Method 8330
Herbicides HPLC Analysis – Method 8321
Glycol (Ethylene and Propylene Glycol) – Method 8015
Dissolved Gases (Methane, CO2, Ethane, & Ethylene)
Low-Level Volatile and Semi-Volatile Organic Compounds by GC/MS-SIM

Metals Tests

ICP-MS Metals – Method 6020/6020A/200.8
RCRA 8 Metals – Methods 6020/6020A/7470/7471
Hexavalent Chromium (Cr_6) – Method 7196/SM4500 Cr-D
Mercury – Method 7470/7471/245.1
Ferrous Iron – Method SM4500Fe-D
TCLP/SPLP Metals – Method 1311/1312

Wet Chemistry Tests

Acidity – Method SM2310B/305.1
Alkalinity – Method SM2320B/310.1
Ammonia – Method SM 4500-NH_3 F
Anions by IC – Method 300/SW9056
Anions by IC – TxDOT Method 620J
COD – Method SM 5220D, 410.4
Conductivity – Method SM2510B
Cyanide – Method SM4500-CN-E/9010
Hardness – Method 130.2
Ignitability – Method SW1010
Moisture Content in Soil & Sludge – ASTM D2216
Hexane Extractable Materials (Oil and Grease) – Method SW1664
Perchlorate IC-MS Analysis – Method 332 / 6860
pH/Corrosivity – Method SM4500 H^+B/9045C
Phosphate (total or ortho-) – Method SM4500-P-E Phosphate, Total – Method 365.2
RCI - Reactivity, Corrosivity, Ignitability
Reactivity – Method SW846
Silica (Dissolved silica) – SM4500-Si-D
Sulfide – Method SM4500-S^{2-}D
TDS – Method SM2540C
TOC (Water samples) - Method 5310C
TSS – Method SM2540D
Turbidity – Method 180.1

Subcontracted Testing

Biogenic Gases – Method EPA 3C
BOD – Method SM 5210B
Color Analysis – Method SM 2120B
Extractable Organic Halogens (EOX) – Method SW9023
Fecal Coliform – Method SM 9222D
Fraction Organic Carbon (FOC) – Method SW9060
Loss on Ignition – Method D7348
Organo-Phosphate Pesticides – Method SW8141
Plant Available Minerals/Nutrients – Method SW6010
TOC/FOC (soil) - Method SW9060
Total Kjeldahl Nitrogen (Soil) – Method SW351.2
Total Kjeldahl Nitrogen – Method SM 4500-N B/E
TOX – Method SW9056/9076/SW9020B

Reporting

Standard Reporting Formats – Default, MDL, and Outfall
NELAC Report
TRRP Report
TRRP Extended Report
DoD – NELAC Report
DoD – TRRP Report

APPENDIX B - Job Descriptions for all Laboratory Positions

TITLE	MINIMUM QUALIFICATIONS	DESCRIPTION
President Lab Director	College Graduate	He is Laboratory President and Technical Methods Development Specialist. Performs the initial development of all instrument method of analyses at DHL Analytical, Inc. Responsible for maintaining DHL's capability to perform analytical methods as they are approved by NELAC, TCEQ and DoD QSM 4.2. Heavily involved in projects, which require a significant allocation of Human Resources. Experience in the laboratory is utilized to determine laboratory analytical capacity and assures that project deadlines are met.
General Manager	College Graduate	Responsible for coordinating all technical activities within the laboratory meeting project turnaround times and allocating Human and Physical resources to meet the customer requirements.
Laboratory Manager	College Graduate	Oversees the day to day planning, coordination, and overall supervision of all laboratory technical operations. Qualified to perform the testing of water and soil for virtually all environmental testing. Provides laboratory personnel training and support. Assists in the QA and instrument problems.
QA Manager	College Graduate	Provides direct client support for a wide range of private business customers and government agencies. As the laboratory quality assurance manager, performs internal laboratory audits and quality reviews of data summaries, including expert witness testimony. Conducts internal technical training for laboratory analysts and for customers covering analytical and sampling procedures. Is a primary customer contact for problem solving in analytical methods. Provides direct support to customers in the development of sampling and analysis plans, which are designed to meet the project requirements in the most cost-effective means available.
QA Specialist	College Graduate	Acts as the primary backup in the absence of the QA Manager. Provides client support, including answering analytical questions, interpreting analysis results and compiling quotes. Performs reviews of all daily instrument analyses. Responsible for insuring field reports are accurate and that results are delivered within project turnaround times. Reviews analytical data for all QA/QC parameters. This includes checking all analytes and data is correctly imported. Compiles data packages which comply with TCEQ and DoD 4.1regulations. Submits final report to clients. Responsible for maintaining (i.e. writing and reviewing) SOPs on an annual basis. Renews annually DHL Analytical's laboratory certifications with various state agencies. Assists in responding to internal and external Quality Control audits.
Health & Safety Officer	College Graduate	Performs monthly laboratory safety checks and monitors DHL Analytical's adherence of OSHA guidelines. Provides initial safety training to new employees and other safety training to current employees.
Log-In Manager Sample Custodian	High School Graduate	Responsible for sample intake and project entry into the LIMS database. Reviews each Chain of Custody form to verify that pertinent data is entered into the database. Supplies appropriate materials to clients for matrix sampling. Maintains sample storage to ensure safe and expedient disposal of samples. Acts as customer liaison providing information on sample containers, preservatives and chain-of- custody.

TITLE	MINIMUM QUALIFICATIONS	DESCRIPTION
Analyst	College Graduate	Performs some sample preparation (including TCLP, SPLP & ZHE extractions) and performs all in-house analyses. Performs Florisil®, sulfuric acid and GPC clean-ups when necessary. Performs quality control analysis with each sample batch including surrogate spiking method, blanks, control standards, matrix spikes and duplicates. Performs initial review of analytical results to assure that quality control parameters are within control limits.
Laboratory Technician	High School Graduate	Performs preparation of water and soil samples to be analyzed for all in-house analyses. This includes sample preparation for TCLP and SPLP extractions. Maintaining glassware and chemical supplies. Proper handling and disposal of chemicals and chemical wastes.
IT/IS Specialist	High School Graduate with computer training	Directs IT/IS operations including computer operations, technical support, systems analysis, and programming. Responsible for developing and maintaining the laboratory information management system (LIMS). Directs telecommunications, establishes technical priorities, standards, and procedures. Ensures sufficient systems capacity for organizational needs. Installs, configures, and maintains the laboratory's LAN server and workstations. Manages performance and maintains security of LANS. Works with multiple hardware and software platforms.
Administrative Assistant	High School Graduate	Prepares Insurance, Federal Acquisition Form and other required paperwork involving laboratory analysis contract for each corporate client giving detailed attention to special requirements or provisions as well as assisting the General Manager in preparing Bids and Proposals. Identifies office procedures that need improvement and implement forms and/or improved practices to help operating procedures. Responsible for updating job bids, monthly pay estimates and contract documents. Responsible for invoicing clients/customers per job and project.
Receptionist	High School Graduate	Responsible for answering all incoming calls and routing them to the appropriate destination. Responsible for faxing analytical results and any other documents. Responsible for copying reports, contracts, requests for proposals and any other documents. Responsible for pulling and filing reports and assists in keeping the contracts filing system organized. Responsible for checking the post office for all incoming mail and sends out all outgoing mail. Orders FedEx and courier for pickup and delivery of all pertinent items. Assists in invoicing reports.
Bookkeeper	High School Graduate	In charge of all financial aspects of DHL Analytical including payroll, accounts payable/accounts receivable, and Human Resources.

DHL ANALYTICAL

ETHICS AND DATA INTEGRITY AGREEMENT

I. I, _____, state that I understand the high standards of integrity required of me with regard to the duties I perform and the data I report in connection with my employment at DHL ANALYTICAL.

2. I agree that in the performance of my duties at DHL ANALYTICAL:
   a. I shall not intentionally report data values that are not the actual value obtained;
   b. I shall not intentionally report the dates and times of data analyses that are not the actual dates and times of data analyses;
   c. I shall not intentionally represent another individual's work as my own.

3. I agree to inform DHL ANALYTICAL of any accidental reporting of non-authentic data by myself in a timely manner.

4. I agree to inform DHL ANALYTICAL of any accidental or intentional reporting of non-authentic data by other employees.

5. Penalties/punishments for improper, unethical or illegal actions are as follows:
   a. Verbal Reprimand
   b. Verbal/written reprimand and re-training
   c. Dismissal

6. DHL Analytical has a mechanism to assure confidentiality and a receptive environment in which all employees may privately discuss ethical issues or report items of ethical concern. The president or general manager may be contacted with ethical concerns by any employee without fear of repercussions.

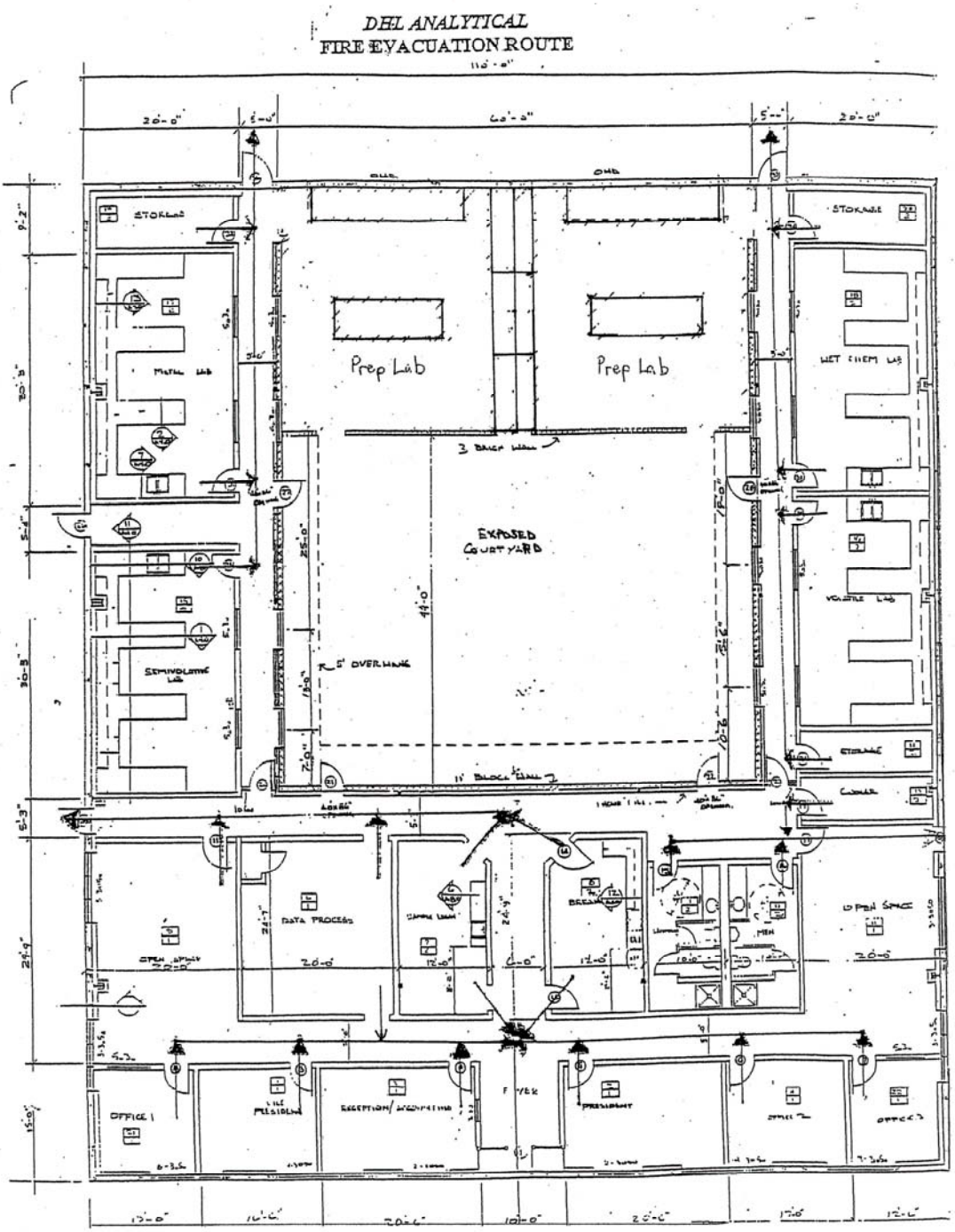
7. Employees are required to understand that any infractions of the laboratory data integrity procedures will result in a detailed investigation that could lead to very serious consequences including immediate termination, debarment or civil/criminal prosecution.

_____
PRINTED NAME

_____
SIGNATURE

_____
DATE

APPENDIX D - DHL Analytical Floor Plan



APPENDIX E - Minimum Performance Checks and Acceptance Criteria for Support Equipment

Performance Check	Frequency	Acceptance Criteria
Balance calibration check using two traceable standard weights that bracket the expected weight	Daily or before use	Top-loading balance: ± 2% or ± 0.02 g, whichever is greater Analytical balance: ± 0.1% or ± 0.5 mg, whichever is greater
Verification of standard weight, using weights traceable to the International System of Units (SI) through a National Metrology Institute (NMI) such as NIST	Every 5 years	Certificate of Calibration from accredited calibration laboratory or NMI
Monitoring of refrigerator/ freezer temperature	Daily (i.e., 7 days per week) (MIN/MAX thermometers allowed)	Refrigerators: 0°C to 6°C Freezers: ≤ -10°C
Thermometer calibration check, using a thermometer traceable to the SI through an NMI such as NIST, at two temperatures that bracket the target temperature(s)	Liquid in glass: Before first use and annually Electronic: Before first use and quarterly; if only a single temperature is used, at the temperature of use	Apply correction factors or replace thermometer
Volumetric labware	Class B: By lot before first use; Class A and B: Upon evidence of deterioration	Bias: Mean within ± 2% of nominal volume Precision: RSD ≤ 1% of nominal volume (based on 10 replicate measurements)
Non-volumetric labware (Applicable only when used for measuring initial sample volume or final extract/digestate volume)	By lot before first use or upon evidence of deterioration	Bias: Mean within ± 3% of nominal volume Precision: RSD ≤ 3% of stated value (based on 10 replicate measurements)
Mechanical volumetric pipettes	By lot before first use and quarterly or upon evidence of deterioration	Bias: Mean within ± 2% of nominal volume Precision: RSD ≤ 1% of nominal volume (based on 10 replicate measurements) [**Note**: for variable volume pipettes, the nominal volume is the largest user-selectable volume setting]
Drying oven temperature check	Before and after use	Within ± 5% of set temperature **DoD QSM 4.2 Box-31**

APPENDIX F – Scope of Accreditation for DoD-ELAP (DoD QSM 4.2)

MATRIX	SPECIFIC TEST	SPECIFICATION OR STANDARD METHOD (all SW846 unless specified)	* KEY EQUIPMENT OR TECHNOLOGY USED
Waste / Water / Soil	Volatile Organics	8260B / 8260C / EPA 624 / Prep 5030B / 5035	GC-MS
Waste / Water / Soil	Semivolatile Organics	8270C / 8270D / EPA 625 Prep 3510C / 3550C / 3535A	GC-MS
Waste / Water / Soil	Polychlorinated Biphenyls (PCBs)	8082 / Prep 3510C / 3535A / 3550C	GC
Waste / Water / Soil	Polychlorinated Biphenyls (PCBs)	8270C/8270D EPA625 Prep 3510C / 3550C / 3535A	GC-MS
Waste / Water / Soil	Organochlorine Pesticides	8081A/8081B / Prep 3510C / 3535A / 3550C	GC
Waste / Water / Soil	Organochlorine Pesticides	8270C/8270D EPA625 Prep 3510C / 3550C / 3535A	GC-MS
Waste / Water / Soil	Explosives	8330A / Prep 3535A / 8330A	HPLC
Waste / Water / Soil	Perchlorate	332 / 6860	Ion Chromatograph-MS
Waste / Water / Soil	Anions	300 / 9056	Ion Chromatograph
Waste / Water / Soil	Metals	6020 / Prep 3005A / 3050B	ICP-MS
Waste / Water / Soil	Mercury	7470A / 7471A	Cold vapor AA
Waste / Water / Soil	Herbicides	8321	LC-MS

MATRIX	SPECIFIC TEST	SPECIFICATION OR STANDARD METHOD (all SW846 unless specified)	* KEY EQUIPMENT OR TECHNOLOGY USED
Water	Total Organic Carbon	9060 SM 5310C	TOC Analyzer
Water	Dissolved Gases MEE+CO2	RSK 175	GC
Waste / Water / Soil	BTEX / MTBE	8021B / Prep 5030B / 5035	GC
Waste / Water / Soil	TPH – 1005 TPH - 1006	TX 1005 TX 1006	GC
Waste / Water / Soil	TPH Gasoline	8015B-GRO / Prep 5030B / 5035	GC
Waste / Water / Soil	TPH Diesel	8015B-DRO / Prep 3510C / 3550C	GC
Water	EDB	8011	GC / GC-MS
Waste / Water / Soil	Ethylene and Propylene Glycol	8015B / Prep 3510C / 3550C	GC
Waste / Water / Soil	Hexavalent Chromium	7196A SM 3500-Cr-D / Prep 3060A	Spectrophotometer
Water	Ferrous Iron	SM 3500-Fe-D	Spectrophotometer
Waste / Water / Soil	pH Corrosivity	9045C 9040B SM 4500-H-B	pH Meter / ISE
Water	Total Dissolved Solids (TDS)	SM 2540C	Gravimetry
Water	Total Suspended Solids (TSS)	SM 2540D	Gravimetry

APPENDIX B

FORMS

This page intentionally left blank.

GENERAL. Complete a separate report for each person who was *injured, caused,* or *contributed* to the accident (excluding uninjured personnel and witnesses). Use of this form for reporting USACE employee first-aid type injuries not submitted to the Office of Workers' Compensation Programs (OWCP) shall be at the descretion of the FOA commander. Please type or print legibly. Appropriate items shall be marked with an "X" in box(es). If additional space is needed, provide the information on a separate sheet and attach to the completed form. Ensure that these instructions are forwarded with the completed report to the designated management reviewers indicated in sections 16. and 17.

INSTRUCTIONS FOR SECTION 1 — ACCIDENT CLASSIFICATION. *(Mark All Boxes That Are Applicable.)*

a. GOVERNMENT. Mark "CIVILIAN" box if accident involved government civilian employee; mark "MILITARY" box if accident involved U.S. military personnel.

(1) INJURY/ILLNESS/FATALITY — Mark if accident resulted in any government civilian employee injury, illness, or fatality that requires the submission of OWCP Forms CA-1 (injury), CA-2 (illness), or CA-6 (fatality) to OWCP; mark if accident resulted in military personnel lost-time or fatal injury or illness.

(2) PROPERTY DAMAGE — Mark the appropriate box if accident resulted in any damage of $1000 or more to government property (including motor vehicles).

(3) VEHICLE INVOLVED — Mark if accident involved a motor vehicle, *regardless* of whether "INJURY/ILLNESS/FATALITY" or "PROPERTY DAMAGE" are marked.

(4) DIVING ACTIVITY — Mark if the accident involved an in-house USACE diving activity.

b. CONTRACTOR.

(1) INJURY/ILLNESS/FATALITY — Mark if accident resulted in any contractor lost-time injury/illness or fatality.

(2) PROPERTY DAMAGE — Mark the appropriate box if accident resulted in any damage of $1000 or more to contractor property (including motor vehicles).

(3) VEHICLE INVOLVED — Mark if accident involved a motor vehicle, *regardless* of whether "INJURY/ILLNESS/FATALITY" or "PROPERTY DAMAGE" are marked.

(4) DIVING ACTIVITY — Mark if the accident involved a USACE Contractor diving activity.

c. PUBLIC.

(1) INJURY/ILLNESS/FATALITY — Mark if accident resulted in public fatality or permanent total disability. (The "OTHER" box will be marked when requested by the FOA to report an unusual non-fatal public accident that could result in claims against the government or as otherwise directed by the FOA Commander).

(2) VOID SPACE — Make no entry.

(3) VEHICLE INVOLVED — Mark if accident resulted in a fatality to a member of the public and involved a motor vehicle, *regardless* of whether "INJURY/ILLNESS/FATALITY" is marked.

(4) VOID SPACE — Make no entry.

INSTRUCTIONS FOR SECTION 2 — PERSONAL DATA

a. NAME — (MANDATORY FOR GOVERNMENT ACCIDENTS. OPTIONAL AT THE DISCRETION OF THE FOA COMMANDER FOR CONTRACTOR AND PUBLIC ACCIDENTS). Enter last name, first name, middle initial of person involved.

b. AGE — Enter age.

c. SEX — Mark appropriate box.

d. SOCIAL SECURITY NUMBER — (FOR GOVERNMENT PERSONNEL ONLY) Enter the social security number (or other personal identification number if no social security number issued).

e. GRADE — (FOR GOVERNMENT PERSONNEL ONLY) Enter pay grade. Example: O-6; E-7; WG-8; WS-12; GS-11; etc.

f. JOB SERIES/TITLE — For *government civilian employees* enter the pay plan, full series number, and job title, e.g. GS-0810/Civil Engineer. For *military personnel* enter the primary military occupational specialty (PMOS), e.g., 15A30 or 11G50. For *contractor employees* enter the job title assigned to the injured person, e.g. carpenter, laborer, surveyor, etc.,

g. DUTY STATUS — Mark the appropriate box.

(1) ON DUTY — Person was at duty station during duty hours or person was away from duty station during duty hours but on official business at time of the accident.

(2) TDY - Person was on official business, away from the duty station and with travel orders at time of accident. Line-of-duty investigation required.

(3) OFF DUTY - Person was not on official business at time of accident

h. EMPLOYMENT STATUS — (FOR GOVERNMENT PERSONNEL ONLY) Mark the most appropriate box. If "OTHER" is marked, specify the employment status of the person.

INSTRUCTION FOR SECTION 3 — GENERAL INFORMATION

a. DATE OF ACCIDENT — Enter the month, day, and year of accident.

b. TIME OF ACCIDENT — Enter the local time of accident in military time. Example: 1430 hrs (not 2:30 p.m.).

c. EXACT LOCATION OF ACCIDENT — Enter facts needed to locate the accident scene. (installation/project name, building number, street, direction and distance from closest landmark, etc.,).

d. CONTRACTOR NAME

(1) PRIME — Enter the exact name (title of firm) of the prime contractor.

(2) SUBCONTRACTOR — Enter the name of any subcontractor involved in the accident.

e. CONTRACT NUMBER — Mark the appropriate box to identify if contract is civil works, military, or other: if "OTHER" is marked, specify contract appropriation on line provided. Enter complete contract number of prime contract, e.g., DACW 09-85-C-0100.

f. TYPE OF CONTRACT — Mark appropriate box. A/E means architect/engineer. If "OTHER" is marked, specify type of contract on line provided.

g. HAZARDOUS/TOXIC WASTE ACTIVITY (HTW) — Mark the box to identify the HTW activity being performed at the time of the accident. For Superfund, DERP, and Installation Restoration Program (IRP) HTW activities include accidents that occurred during inventory, predesign, design, and construction. For the purpose of accident reporting, DERP Formerly Used DoD Site (FUDS) activities and IRP activities will be treated separately. For Civil Works O&M HTW activities mark the "OTHER" box.

INSTRUCTIONS FOR SECTION 4 — CONSTRUCTION ACTIVITIES

a. CONSTRUCTION ACTIVITY — Select the *most appropriate* construction activity being performed at time of accident from the list below. Enter the activity name and place the corresponding code number identified in the box.

CONSTRUCTION ACTIVITY LIST

1. MOBILIZATION
2. SITE PREPARATION
3. EXCAVATION/TRENCHING
4. GRADING (EARTHWORK)
5. PIPING/UTILITIES
6. FOUNDATION
7. FORMING
8. CONCRETE PLACEMENT
9. STEEL ERECTION
10. ROOFING
11. FRAMING
12. MASONRY
13. CARPENTRY
14. ELECTRICAL
15. SCAFFOLDING/ACCESS
16. MECHANICAL
17. PAINTING
18. EQUIPMENT/MAINTENANCE
19. TUNNELING
20. WAREHOUSING/STORAGE
21. PAVING
22. FENCING
23. SIGNING
24. LANDSCAPING/IRRIGATION
25. INSULATION
26. DEMOLITION

b. TYPE OF CONSTRUCTION EQUIPMENT—Select the equipment involved in the accident from the list below. Enter the name and place the corresponding code number identified in the box. If equipment is not included below, use code 24, "OTHER", and write in specific type of equipment.

CONSTRUCTION EQUIPMENT

1. GRADER
2. DRAGLINE
3. CRANE (ON VESSEL/BARGE)
4. CRANE (TRACKED)
5. CRANE (RUBBER TIRE)
6. CRANE (VEHICLE MOUNTED)
7. CRANE (TOWER)
8. SHOVEL
9. SCRAPER
10. PUMP TRUCK (CONCRETE)
11. TRUCK (CONCRETE/TRANSIT MIXER)
12. DUMP TRUCK (HIGHWAY)
13. DUMP TRUCK (OFF HIGHWAY)
14. TRUCK (OTHER)
15. FORKLIFT
16. BACKHOE
17. FRONT-END LOADER
18. PILE DRIVER
19. TRACTOR (UTILITY)
20. MANLIFT
21. DOZER
22. DRILL RIG
23. COMPACTOR/VIBRATORY ROLLER
24. OTHER

INSTRUCTIONS FOR SECTION 5—INJURY/ILLNESS INFORMATION

a. SEVERITY OF INJURY / ILLNESS - Reference para 2-10 of USACE Suppl 1 to AR 385-40 and enter code and description from list below.

NOI NO INJURY
FAT FATALITY
PTL PERMANENT TOTAL DISABILITY
PPR PERMANENT PARTIAL DISABILITY
LWD LOST WORKDAY CASE INVOLVING DAYS AWAY FROM WORK
NLW RECORDABLE CASE WITHOUT LOST WORKDAYS
RFA RECORDABLE FIRST AID CASE
NRI NON-RECORDABLE INJURY

b. ESTIMATED DAYS LOST—Enter the estimated number of workdays the person will lose from work.

c. ESTIMATED DAYS HOSPITALIZED—Enter the estimated number of workdays the person will be hospitalized.

d. ESTIMATED DAYS RESTRICTED DUTY—Enter the estimated number of workdays the person, as a result of the accident, will not be able to perform all of their regular duties.

e. BODY PART AFFECTED—Select the most appropriate primary and when applicable, secondary body part affected from the list below. Enter body part name on line and place the corresponding code letters identifying that body part in the box.

GENERAL BODY AREA	CODE	BODY PART NAME
ARM/WRIST	AB	ARM AND WRIST
	AS	ARM OR WRIST
TRUNK, EXTERNAL MUSCULATURE	B1	SINGLE BREAST
	B2	BOTH BREASTS
	B3	SINGLE TESTICLE
	B4	BOTH TESTICLES
	BA	ABDOMEN
	BC	CHEST
	BL	LOWER BACK
	BP	PENIS
	BS	SIDE
	BU	UPPER BACK
	BW	WAIST
	BZ	TRUNK OTHER
HEAD, INTERNAL	C1	SINGLE EAR INTERNAL
	C2	BOTH EARS INTERNAL
	C3	SINGLE EYE INTERNAL
	C4	BOTH EYES INTERNAL
	CB	BRAIN
	CC	CRANIAL BONES
	CD	TEETH
	CJ	JAW
	CL	THROAT, LARYNX
	CM	MOUTH
	CN	NOSE
	CR	THROAT, OTHER
	CT	TONGUE
	CZ	HEAD OTHER INTERNAL
ELBOW	EB	BOTH ELBOWS
	ES	SINGLE ELBOW
FINGER	F1	FIRST FINGER
	F2	BOTH FIRST FINGERS
	F3	SECOND FINGER
	F4	BOTH SECOND FINGERS
	F5	THIRD FINGER
	F6	BOTH THIRD FINGERS
	F7	FOURTH FINGER
	F8	BOTH FOURTH FINGERS
TOE	G1	GREAT TOE
	G2	BOTH GREAT TOES
	G3	TOE OTHER
	G4	TOES OTHER
HEAD, EXTERNAL	H1	EYE EXTERNAL
	H2	BOTH EYES EXTERNAL
	H3	EAR EXTERNAL
	H4	BOTH EARS EXTERNAL
	HC	CHIN
	HF	FACE
	HK	NECK/THROAT
	HM	MOUTH/LIPS
	HN	NOSE
	HS	SCALP
KNEE	KB	BOTH KNEES
	KS	KNEE
LEG, HIP, ANKLE, BUTTOCK	LB	BOTH LEGS/HIPS/ ANKLES/BUTTOCKS
	LS	SINGLE LEG/HIP ANKLE/BUTTOCK
HAND	MB	BOTH HANDS
	MS	SINGLE HAND
FOOT	PB	BOTH FEET
	PS	SINGLE FOOT
TRUNK, BONES	R1	SINGLE COLLAR BONE
	R2	BOTH COLLAR BONES
	R3	SHOULDER BLADE
	R4	BOTH SHOULDER BLADES
	RB	RIB
	RS	STERNUM (BREAST BONE)
	RV	VERTEBRAE (SPINE; DISC)
	RZ	TRUNK BONES OTHER
SHOULDER	SB	BOTH SHOULDERS
	SS	SINGLE SHOULDER
THUMB	TB	BOTH THUMBS
	TS	SINGLE THUMB
TRUNK, INTERNAL ORGANS	V1	LUNG, SINGLE
	V2	LUNGS, BOTH
	V3	KIDNEY, SINGLE
	V4	KIDNEYS, BOTH
	VH	HEART
	VL	LIVER
	VR	REPRODUCTIVE ORGANS
	VS	STOMACH
	VV	INTESTINES
	VZ	TRUNK, INTERNAL; OTHER

f. NATURE OF INJURY/ILLNESS - Select the most appropriate nature of injury / illness from the list below. This nature of injury / illness shall correspond to the primary body part selected in 5e, above. Enter the nature of injury / illness name on the line and place the corresponding CODE letters in the box provided.

* The injury or condition selected below must be caused by a specific incident or event which occurred during a single work day or shift.

GENERAL NATURE CATEGORY	CODE	NATURE OF INJURY NAME
*TRAUMATIC INJURY OR DISABILITY	TA	AMPUTATION
	TB	BACK STRAIN.
	TC	CONTUSION; BRUISE; ABRASION
	TD	DISLOCATION
	TF	FRACTURE
	TH	HERNIA
	TK	CONCUSSION
	TL	LACERATION, CUT
	TP	PUNCTURE
	TS	STRAIN, MULTIPLE
	TU	BURN, SCALD, SUNBURN
	TI	TRAUMATIC SKIN DISEASES/ CONDITIONS INCLUDING DERMATITIS
	TR	TRAUMATIC RESPIRATORY DISEASE
	TQ	TRAUMATIC FOOD POISONING
	TW	TRAUMATIC TUBERCULOSIS
	TX	TRAUMATIC VIROLOGICAL/ INFECTIVE/PARASITIC DISEASE
	T1	TRAUMATIC CEREBRAL VASCULAR CONDITION/STROKE
	T2	TRAUMATIC HEARING LOSS
	T3	TRAUMATIC HEART CONDITION
	T4	TRAUMATIC MENTAL DISORDER; STRESS; NERVOUS CONDITION
	T8	TRAUMATIC INJURY — OTHER (EXCEPT DISEASE, ILLNESS)

**A nontraumatic physiological harm or loss of capacity produced by systemic infection; continued or repeated stress or strain; exposure to toxins, poisons, fumes, etc.; or other continued and repeated exposures to conditions of the work environment over a long period of time. For practical purposes, an occupational illness/disease or disability is any reported condition which doses not meet the definition of traumatic injury or disability as described above.

GENERAL NATURE CATEGORY	CODE	NATURE OF INJURY NAME
**NON-TRAUMATIC ILLNESS/DISEASE OR DISABILITY		
RESPIRATORY DISEASE	RA	ASBESTOSIS
	RB	BRONCHITIS
	RE	EMPHYSEMA
	RP	PNEUMOCONIOSIS
	RS	SILICOSIS
	R9	RESPIRATORY DISEASE, OTHER
VIROLOGICAL, INFECTIVE & PARASITIC DISEASES	VB	BRUCELLOSIS
	VC	COCCIDIOMYCOSIS
	VF	FOOD POISONING
	VH	HEPATITIS
	VM	MALARIA
	VS	STAPHYLOCOCCUS
	VT	TUBERCULOSIS
	V9	VIROLOGICAL/INFECTIVE/ PARASITIC—OTHER
DISABILITY, OCCUPATIONAL	DA	ARTHRITIS, BURSITIS
	DB	BACK STRAIN, BACK SPRAIN
	DC	CEREBRAL VASCULAR CONDITION; STROKE
	DD	ENDEMIC DISEASE (OTHER THAN CODE TYPES R&S)
	DE	EFFECT OF ENVIRONMENTAL CONDITION
	DH	HEARING LOSS
	DK	HEART CONDITION
	DM	MENTAL DISORDER, EMOTIONAL STRESS NERVOUS CONDITION
	DR	RADIATION
	DS	STRAIN, MULTIPLE
	DU	ULCER
	DV	OTHER VASCULAR CONDITIONS
	D9	DISABILITY, OTHER
SKIN DISEASE OR CONDITION	SB	BIOLOGICAL
	SC	CHEMICAL
	S9	DERMATITIS, UNCLASSIFIED

g. TYPE AND SOURCE OF INJURY/ILLNESS (CAUSE) - Type and Source Codes are used to describe what caused the incident. The Type Code stands for an ACTION and the Source Code for an OBJECT or SUBSTANCE. Together, they form a brief description of how the incident occurred. Where there are two different sources, code the initiating source of the incident (see example 1, below). Examples:

(1) An employee tripped on carpet and struck his head on a desk.
TYPE: 210 (fell on same level) SOURCE: 0110 (walking/working surface)

NOTE: This example would NOT be coded 120 (struck against) and 0140 (furniture).

(2) A Park Ranger contracted dermatitis from contact with poison ivy/ oak.
TYPE: 510 (contact) SOURCE: 0920 (plant)

(3) A lock and dam mechanic punctured his finger with a metal sliver while grinding a turbine blade.
TYPE: 410 (punctured by) SOURCE: 0830 (metal)

(4) An employee was driving a government vehicle when it was struck by another vehicle..
TYPE: 800 (traveling in) SOURCE: 0421 (government-owned vehicle, as driver)

NOTE: The Type Code 800, "Traveling In" is different from the other type codes in that its function is not to identify factors contributing to the injury or fatality, but rather to collect data on the type of vehicle the employee was operating or traveling in at the time of the incident.

Select the most appropriate TYPE and SOURCE identifier from the list below and enter the name on the line and the corresponding code in the appropriate box.

CODE	TYPE OF INJURY NAME
	STRUCK
0110	STRUCK BY
0111	STRUCK BY FALLING OBJECT
0120	STRUCK AGAINST
	FELL, SLIPPED, TRIPPED
0210	FELL ON SAME LEVEL
0220	FELL ON DIFFERENT LEVEL
0230	SLIPPED, TRIPPED (NO FALL)
	CAUGHT
0310	CAUGHT ON
0320	CAUGHT IN
0330	CAUGHT BETWEEN
	PUNCTURED, LACERATED
0410	PUNCTURED BY
0420	CUT BY
0430	STUNG BY
0440	BITTEN BY
	CONTACTED
0510	CONTACTED WITH (INJURED PERSON MOVING)
0520	CONTACTED BY (OBJECT WAS MOVING)
	EXERTED
0610	LIFTED, STRAINED BY (SINGLE ACTION)
0620	STRESSED BY (REPEATED ACTION)
	EXPOSED
0710	INHALED
0720	INGESTED
0730	ABSORBED
0740	EXPOSED TO
0800	TRAVELING IN

CODE	SOURCE OF INJURY NAME
0100	BUILDING OR WORKING AREA
0110	WALKING/WORKING SURFACE (FLOOR, STREET, SIDEWALKS, ETC)
0120	STAIRS, STEPS
0130	LADDER
0140	FURNITURE, FURNISHINGS, OFFICE EQUIPMENT
0150	BOILER, PRESSURE VESSEL
0160	EQUIPMENT LAYOUT (ERGONOMIC)
0170	WINDOWS, DOORS
0180	ELECTRICITY

CODE	SOURCE OF INJURY NAME
0200	ENVIRONMENTAL CONDITION
0210	TEMPERATURE EXTREME (INDOOR)
0220	WEATHER (ICE, RAIN, HEAT, ETC.)
0230	FIRE, FLAME, SMOKE (NOT TOBACCO)
0240	NOISE
0250	RADIATION
0260	LIGHT
0270	VENTILATION
0271	TOBACCO SMOKE
0280	STRESS (EMOTIONAL)
0290	CONFINED SPACE
0300	MACHINE OR TOOL
0310	HAND TOOL (POWERED: SAW, GRINDER, ETC.)
0320	HAND TOOL (NONPOWERED)
0330	MECHANICAL POWER TRANSMISSION APPARATUS
0340	GUARD, SHIELD (FIXED, MOVEABLE, INTERLOCK)
0350	VIDEO DISPLAY TERMINAL
0360	PUMP, COMPRESSOR, AIR PRESSURE TOOL
0370	HEATING EQUIPMENT
0380	WELDING EQUIPMENT
0400	VEHICLE
0411	AS DRIVER OF PRIVATELY OWNED/RENTAL VEHICLE
0412	AS PASSENGER OF PRIVATELY OWNED/RENTAL VEHICLE
0421	DRIVER OF GOVERNMENT VEHICLE
0422	PASSENGER OF GOVERNMENT VEHICLE
0430	COMMON CARRIER (AIRLINE, BUS, ETC.)
0440	AIRCRAFT (NOT COMMERCIAL)
0450	BOAT, SHIP, BARGE
0500	MATERIAL HANDLING EQUIPMENT
0510	EARTHMOVER (TRACTOR, BACKHOE, ETC.)
0520	CONVEYOR (FOR MATERIAL AND EQUIPMENT)
0530	ELEVATOR, ESCALATOR, PERSONNEL HOIST
0540	HOIST, SLING CHAIN, JACK
0550	CRANE
0551	FORKLIFT
0560	HANDTRUCK, DOLLY
0600	DUST, VAPOR, ETC.
0610	DUST (SILICA, COAL, ETC.)
0620	FIBERS
0621	ASBESTOS
0630	GASES
0631	CARBON MONOXIDE
0640	MIST, STEAM, VAPOR, FUME
0641	WELDING FUMES
0650	PARTICLES (UNIDENTIFIED)
0700	CHEMICAL, PLASTIC, ETC.
0711	DRY CHEMICAL—CORROSIVE
0712	DRY CHEMICAL—TOXIC
0713	DRY CHEMICAL—EXPLOSIVE
0714	DRY CHEMICAL—FLAMMABLE
0721	LIQUID CHEMICAL—CORROSIVE
0722	LIQUID CHEMICAL—TOXIC
0723	LIQUID CHEMICAL—EXPLOSIVE
0724	LIQUID CHEMICAL—FLAMMABLE
0730	PLASTIC
0740	WATER
0750	MEDICINE
0800	INANIMATE OBJECT
0810	BOX, BARREL, ETC.
0820	PAPER
0830	METAL ITEM, MINERAL
0831	NEEDLE
0840	GLASS
0850	SCRAP, TRASH
0860	WOOD
0870	FOOD
0880	CLOTHING, APPAREL, SHOES
0900	ANIMATE OBJECT
0911	DOG
0912	OTHER ANIMAL
0920	PLANT
0930	INSECT
0940	HUMAN (VIOLENCE)
0950	HUMAN (COMMUNICABLE DISEASE)
0960	BACTERIA, VIRUS (NOT HUMAN CONTACT)

CODE	SOURCE OF INJURY NAME
1000	PERSONAL PROTECTIVE EQUIPMENT
1010	PROTECTIVE CLOTHING, SHOES, GLASSES, GOGGLES
1020	RESPIRATOR, MASK
1021	DIVING EQUIPMENT
1030	SAFETY BELT, HARNESS
1040	PARACHUTE

INSTRUCTIONS FOR SECTION 6 — PUBLIC FATALITY

a. ACTIVITY AT TIME OF ACCIDENT—Select the activity being performed at the time of the accident from the list below. Enter the activity name on the line and the corresponding number in the box. If the activity performed is not identified on the list, select from the *most* appropriate primary activity area (water related, non-water related or other activity), the code number for "Other", and write in the activity being performed at the time of the accident.

WATER RELATED RECREATION

1. Sailing
2. Boating—powered
3. Boating—unpowered
4. Water skiing
5. Fishing from boat
6. Fishing from bank dock or pier
7. Fishing while wading
8. Swimming/supervised area
9. Swimming/designated area
10. Swimming/other area
11. Underwater activities (skin diving, scuba, etc.)
12. Wading
13. Attempted rescue
14. Hunting from boat
15. Other

NON-WATER RELATED RECREATION

16. Hiking and walking
17. Climbing (general)
18. Camping/picnicking authorized area
19. Camping/picnicking unauthorized area
20. Guided tours
21. Hunting
22. Playground equipment
23. Sports/summer (baseball, football, etc.)
24. Sports/winter (skiing, sledding, snowmobiling etc.)
25. Cycling (bicycle, motorcycle, scooter)
26. Gliding
27. Parachuting
28. Other non-water related

OTHER ACTIVITIES

29. Unlawful acts (fights, riots, vandalism, etc.)
30. Food preparation/serving
31. Food consumption
32. Housekeeping
33. Sleeping
34. Pedestrian struck by vehicle
35. Pedestrian other acts
36. Suicide
37. "Other" activities

b. PERSONAL FLOTATION DEVICE USED—If fatality was water-related was the victim wearing a person flotation device? Mark the appropriate box.

INSTRUCTIONS FOR SECTION 7—MOTOR VEHICLE ACCIDENT

a. TYPE OF VEHICLE—Mark appropriate box for each vehicle involved. If more than one vehicle of the same type is involved, mark both halves of the appropriate box. USACE vehicle(s) involved shall be marked in left half of appropriate box.

b. TYPE OF COLLISION—Mark appropriate box.

c. SEAT BELT—Mark appropriate box.

INSTRUCTIONS FOR SECTION 8—PROPERTY/ MATERIAL INVOLVED

a. NAME OF ITEM—Describe all property involved in accident. Property/material involved means material which is damaged or whose use or misuse contributed to the accident. Include the name, type, model; also include the National Stock Number (NSN) whenever applicable.

b. OWNERSHIP—Enter ownership for each item listed. (Enter one of the following: *USACE; OTHER GOVERNMENT; CONTRACTOR: PRIVATE)*

c. $ AMOUNT OF DAMAGE—Enter the total estimated dollar amount of damage (parts and labor), if any.

INSTRUCTIONS FOR SECTION 9—VESSEL/ FLOATING PLANT ACCIDENT

a. TYPE OF VESSEL/FLOATING PLANT—Select the most appropriate vessel/floating plant from list below. Enter name and place corresponding number in box. If item is not listed below, enter item number for "OTHER" and write in specific type of vessel/ floating plant.

VESSEL/FLOATING PLANTS

1. ROW BOAT
2. SAIL BOAT
3. MOTOR BOAT
4. BARGE
5. DREDGE/HOPPER
6. DREDGE/SIDE CASTING
7. DREDGE/DIPPER
8. DREDGE/CLAMSHELL, BUCKET
9. DREDGE/PIPE LINE
10. DREDGE/DUST PAN
11. TUG BOAT
12. OTHER

b. COLLISION/MISHAP—Select from the list below the object(s) that contributed to the accident or were damaged in the accident.

COLLISION/MISHAP

1. COLLISION W/OTHER VESSEL
2. UPPER GUIDE WALL
3. UPPER LOCK GATES
4. LOCK WALL
5. LOWER LOCK GATES
6. LOWER GUIDE WALL
7. HAULAGE UNIT
8. BREAKING TOW
9. TOW BREAKING UP
10. SWEPT DOWN ON DAM
11. BUOY/DOLPHIN/CELL
12. WHARF OR DOCK
13. OTHER

INSTRUCTIONS FOR SECTION 10—ACCIDENT DESCRIPTION

DESCRIBE ACCIDENT—Fully describe the accident. Give the sequence of events that describe what happened leading up to and including the accident. Fully identify personnel and equipment involved and their role(s) in the accident. Ensure that relationships between personnel and equipment are clearly specified. Continue on blank sheets if necessary and attach to this report.

INSTRUCTIONS FOR SECTION 11—CAUSAL FACTORS

a. Review thoroughly. Answer each question by marking the appropriate block. If any answer is yes, explain in item 13 below. Consider, as a minimum, the following:

(1) DESIGN—Did inadequacies associated with the building or work site play a role? Would an improved design or layout of the equipment or facilities reduce the likelihood of similar accidents? Were the tools or other equipment designed and intended for the task at hand?

(2) INSPECTION/MAINTENANCE—Did inadequately or improperly maintained equipment, tools, workplace, etc. create or worsen any hazards that contributed to the accident? Would better equipment, facility, work site or work activity inspections have helped avoid the accident?

(3) PERSON'S PHYSICAL CONDITION—Do you feel that the accident would probably not have occurred if the employee was in "good" physical condition? If the person involved in the accident had been in better physical condition, would the accident have been less severe or avoided altogether? Was over exertion a factor?

(4) OPERATING PROCEDURES—Did a lack of or inadequacy within established operating procedures contribute to the accident? Did any aspect of the procedures introduce any hazard to, or increase the risk associated with the work process? Would establishment or improvement of operating procedures reduce the likelihood of similar accidents?

(5) JOB PRACTICES—Were any of the provisions of the Safety and Health Requirements Manual (EM 385-1-1) violated? Was the task being accomplished in a manner which was not in compliance with an established job hazard analysis or activity hazard analysis? Did any established job practice (including EM 385-1-1) fail to adequately address the task or work process? Would better job practices improve the safety of the task?

(6) HUMAN FACTORS—Was the person under undue stress (either internal or external to the job)? Did the task tend toward overloading the capabilities of the person; i.e., did the job require tracking and reacting to many external inputs such as displays, alarms, or signals? Did the arrangement of the workplace tend to interfere with efficient task performance? Did the task require reach, strength, endurance, agility, etc., at or beyond the capabilities of the employee? Was the work environment ill-adapted to the person? Did the person need more training, experience, or practice in doing the task? Was the person inadequately rested to perform safely?

(7) ENVIRONMENTAL FACTORS—Did any factors such as moisture, humidity, rain, snow, sleet, hail, ice, fog, cold, heat, sun, temperature changes, wind, tides, floods, currents, dust, mud, glare, pressure changes, lightning, etc., play a part in the accident?

(8) CHEMICAL AND PHYSICAL AGENT FACTORS—Did exposure to chemical agents (either single shift exposure or long-term exposure) such as dusts, fibers (asbestos, etc.), silica, gases (carbon monoxide, chlorine, etc.,), mists, steam, vapors, fumes, smoke, other particulates, liquid or dry chemicals that are corrosive, toxic, explosive or flammable, by-products of combustion or physical agents such as noise, ionizing radiation, non-ionizing radiation (UV radiation created during welding, etc.) contribute to the accident/incident?

(9) OFFICE FACTORS—Did the fact that the accident occurred in an office setting or to an office worker have a bearing on its cause? For example, office workers tend to have less experience and training in performing tasks such as lifting office furniture. Did physical hazards within the office environment contribute to the hazard?

(10) SUPPORT FACTORS—Was the person using an improper tool for the job? Was inadequate time available or utilized to safely accomplish the task? Were less than adequate personnel resources (in terms of employee skills, number of workers, and adequate supervision) available to get the job done properly? Was funding available, utilized, and adequate to provide proper tools, equipment, personnel, site preparation, etc?

(11) PERSONAL PROTECTIVE EQUIPMENT—Did the person fail to use appropriate personal protective equipment (gloves, eye protection, hard-toed shoes, respirator, etc.) for the task or environment? Did protective equipment provided or worn fail to provide adequate protection from the hazard(s)? Did lack of or inadequate maintenance of protective gear contribute to the accident?

(12) DRUGS/ALCOHOL—Is there any reason to believe the person's mental or physical capabilities, judgement, etc., were impaired or altered by the use of drugs or alcohol? Consider the effects of prescription medicine and over the counter medications as well as illicit drug use. Consider the effect of drug or alcohol induced "hangovers".

b. WRITTEN JOB/ACTIVITY HAZARD ANALYSIS—Was a written Job/Activity Hazard Analysis completed for the task being performed at the time of the accident? Mark the appropriate box. *If one was performed, attach a copy of the analysis to the report.*

INSTRUCTIONS FOR SECTION 12—TRAINING

a. WAS PERSON TRAINED TO PERFORM ACTIVITY/TASK?—For the purpose of this section "trained" means the person has been provided the necessary information (either formal and/or on-the-job (OJT) training) to competently perform the activity/task in a safe and healthful manner.

b. TYPE OF TRAINING—Mark the appropriate box that best indicates the type of training; (classroom or on-the-job) that the injured person received before the accident happened.

c. DATE OF MOST RECENT TRAINING—Enter the month, day, and year of the last *formal* training completed that covered the activity-task being performed at the time of the accident.

INSTRUCTIONS FOR SECTION 13—CAUSES

a. DIRECT CAUSES—The direct cause is that single factor which most directly lead to the accident. See examples below.

b. INDIRECT CAUSES—Indirect causes are those factors which contributed to but did not directly initiate the occurrence of the accident.

Examples for section 13:

a. Employee was dismantling scaffold and fell 12 feet from unguarded opening.
Direct cause: failure to provide fall protection at elevation.
Indirect causes: failure to enforce USACE safety requirements; improper training/motivation of employee (possibility that employee was not knowledgeable of USACE fall protection requirements or was lax in his attitude towards safety); failure to ensure provision of positive fall protection whenever elevated; failure to address fall protection during scaffold dismantling in phase hazard analysis.

b. Private citizen had stopped his vehicle at intersection for red light when vehicle was struck in rear by USACE vehicle. (note USACE vehicle was in proper/safe working condition).
Direct cause: failure of USACE driver to maintain control of and stop USACE vehicle within safe distance.
Indirect cause: Failure of employee to pay attention to driving (defensive driving).

INSTRUCTIONS FOR SECTION 14—ACTION TO ELIMINATE CAUSE(S)

DESCRIPTION—Fully describe all the actions taken, anticipated, and recommended to eliminate the cause(s) and prevent reoccurrence of similar accidents/illnesses. Continue on blank sheets of paper if necessary to fully explain and attach to the completed report form.

INSTRUCTIONS FOR SECTION 15—DATES FOR ACTION

a. BEGIN DATE—Enter the date when the corrective action(s) identified in Section 14 will begin.

b. COMPLETE DATE—Enter the date when the corrective action(s) identified in Section 14 will be completed.

c. TITLE AND SIGNATURE—Enter the title and signature of supervisor completing the accident report. For a GOVERNMENT employee accident/illness the immediate supervisor will complete and sign the report. For PUBLIC accidents the USACE Project Manager/Area Engineer responsible for the USACE property where the accident happened shall complete and sign the report. For CONTRACTOR accidents the Contractor's project manager shall complete and sign the report and provide to the USACE supervisor responsible for oversight of that contractor activity. This USACE Supervisor shall also sign the report. Upon entering the information required in 15.d, 15.e and 15.f below, the responsible USACE supervisor shall forward the report for management review as indicated in Section 16.

d. DATE SIGNED—Enter the month, day, and year that the report was signed by the responsible supervisor.

e. ORGANIZATION NAME—For GOVERNMENT employee accidents enter the USACE organization name (Division, Branch, Section, etc.) of the injured employee. For PUBLIC accidents enter the USACE organization name for the person identified in block 15.c. For CONTRACTOR accidents enter the USACE organization name for the USACE office responsible for providing contract administration oversight.

f. OFFICE SYMBOL—Enter the latest complete USACE Office Symbol for the USACE organization identified in block 15.e.

INSTRUCTIONS FOR SECTION 16—MANAGEMENT REVIEW (1st)

1ST REVIEW—Each USACE FOA shall determine who will provide 1st management review. The responsible USACE supervisor in section 15.c shall forward the completed report to the USACE office designated as the 1st Reviewer by the FOA. Upon receipt, the Chief of the Office shall review the completed report, mark the appropriate box, provide substantive comments, sign, date, and forward to the FOA Staff Chief (2nd review) for review and comment.

INSTRUCTIONS FOR SECTION 17—MANAGEMENT REVIEW (2nd)

2ND REVIEW—The FOA Staff Chief (i.e., FOA Chief of Construction, Operations, Engineering, Planning, etc.) shall mark the appropriate box, review the completed report, provide substantive comments, sign, date, and return to the FOA Safety and Occupational Health Office.

INSTRUCTIONS FOR SECTION 18—SAFETY AND OCCUPATIONAL HEALTH REVIEW

3RD REVIEW—The FOA Safety and Occupational Health Office shall review the completed report, mark the appropriate box, ensure that any inadequacies, discrepancies, etc, are rectified by the responsible supervisor and management reviewers, provide substantive comments, sign, date and forward to the FOA Commander for review, comment, and signature.

INSTRUCTION FOR SECTION 19—COMMAND APPROVAL

4TH REVIEW—The FOA Commander shall (to include the person designated Acting Commander in his absence) review the completed report, comment if required, sign, date, and forward the report to the FOA Safety and Occupational Health Office. Signature authority shall not be delegated.

TRINITY
ANALYSIS & DEVELOPMENT CORP.
Environmental & Engineering Services

SAFETY COMPLIANCE AGREEMENT & EMERGENCY CONTACT SHEET

Site: _____

Contract No. _____

Project No. _____

SSHO: _____

I acknowledge that I have read the information in this Health and Safety Plan. I understand the site hazards as described and agree to comply with the contents of the plan.

Print Name	Signature	Company	Phone	Emergency Contact		
				Name	Relation	Phone

(For Safety Staff only)	REPORT NO.	EROC CODE	**UNITED STATES ARMY CORPS OF ENGINEERS ACCIDENT INVESTIGATION REPORT** *(For Use of this Form See Help Menu and USACE Suppl to AR 385-40)*	**REQUIREMENT CONTROL SYMBOL: CEEC-S-8(R2)**

1. ACCIDENT CLASSIFICATION

PERSONNEL CLASSIFICATION	INJURY/ILLNESS/FATAL	PROPERTY DAMAGE	MOTOR VEHICLE INVOLVED	DIVING
GOVERNMENT ☐ CIVILIAN ☐ MILITARY	☐	☐ FIRE INVOLVED ☐ OTHER	☐	☐
☐ CONTRACTOR	☐	☐ FIRE INVOLVED ☐ OTHER	☐	☐
☐ PUBLIC	☐ FATAL ☐ OTHER		☐	

2. PERSONAL DATA

a. Name *(Last, First, MI)*	b. AGE	c. SEX ☐ MALE ☐ FEMALE	d. SOCIAL SECURITY NUMBER	e. GRADE

f. JOB SERIES/TITLE	g. DUTY STATUS AT TIME OF ACCIDENT	h. EMPLOYMENT STATUS AT TIME OF ACCIDENT
	☐ ON DUTY ☐ TDY ☐ OFF DUTY	☐ ARMY ACTIVE ☐ ARMY RESERVE ☐ VOLUNTEER ☐ PERMANENT ☐ FOREIGN NATIONAL ☐ SEASONAL ☐ TEMPORARY ☐ STUDENT ☐ OTHER *(Specify)*

3. GENERAL INFORMATION

a. DATE OF ACCIDENT *(month/day/year)*	b. TIME OF ACCIDENT *(Military time)* hrs	c. EXACT LOCATION OF ACCIDENT	d. CONTRACTOR'S NAME (1) PRIME: (2) SUBCONTRACTOR:

e. CONTRACT NUMBER	f. TYPE OF CONTRACT	g. HAZARDOUS/TOXIC WASTE ACTIVITY
☐ CIVIL WORKS ☐ MILITARY ☐ OTHER *(Specify)*	☐ CONSTRUCTION ☐ SERVICE ☐ A/E ☐ DREDGE ☐ OTHER *(Specify)*	☐ SUPERFUND ☐ DERP ☐ IRP ☐ OTHER *(Specify)*

4. CONSTRUCTION ACTIVITIES ONLY *(Fill in line and corresponding code number in box from list - see help menu)*

a. CONSTRUCTION ACTIVITY	(CODE) #	b. TYPE OF CONSTRUCTION EQUIPMENT	(CODE) #

5. INJURY/ILLNESS INFORMATION *(Include name on line and corresponding code number in box for items e, f & g - see help menu)*

a. SEVERITY OF ILLNESS/INJURY	(CODE) #	b. ESTIMATED DAYS LOST	c. ESTIMATED DAYS HOSPITALIZED	d. ESTIMATED DAYS RESTRICTED DUTY

e. BODY PART AFFECTED	(CODE) #	g. TYPE AND SOURCE OF INJURY/ILLNESS	(CODE) #
PRIMARY		TYPE	
SECONDARY		SOURCE	
f. NATURE OF ILLNESS/INJURY			

6. PUBLIC FATALITY *(Fill in line and correspondence code number in box - see help menu)*

a. ACTIVITY AT TIME OF ACCIDENT	(CODE) #	b. PERSONAL FLOATATION DEVICE USED? ☐ YES ☐ NO ☐ N/A

7. MOTOR VEHICLE ACCIDENT

a. TYPE OF VEHICLE	b. TYPE OF COLLISION	c. SEAT BELTS	USED	NOT USED	NOT AVAILABLE
☐ PICKUP/VAN ☐ AUTOMOBILE ☐ TRUCK ☐ OTHER *(Specify)*	☐ SIDE SWIPE ☐ HEAD ON ☐ REAR END ☐ BROADSIDE ☐ ROLL OVER ☐ BACKING ☐ OTHER *(Specify)*	(1) FRONT SEAT			
		(2) REAR SEAT			

8. PROPERTY/MATERIAL INVOLVED

a. NAME OF ITEM	b. OWNERSHIP	c. $ AMOUNT OF DAMAGE
(1)		
(2)		
(3)		

9. VESSEL/FLOATING PLANT ACCIDENT *(Fill in line and correspondence code number in box from list - see help menu)*

a. TYPE OF VESSEL/FLOATING PLANT	(CODE) #	b. TYPE OF COLLISION/MISHAP	(CODE) #

10. ACCIDENT DESCRIPTION *(Use additional paper, if necessary)*

11. CAUSAL FACTOR(S) *(Read Instruction Before Completing)*

a. (Explain YES answers in item 13)

	YES	NO
DESIGN: Was design of facility, workplace or equipment a factor?	☐	☐
INSPECTION/MAINTENANCE: Were inspection & maintenance procedures a factor?	☐	☐
PERSON'S PHYSICAL CONDITION: In your opinion, was the physical condition of the person a factor?	☐	☐
OPERATING PROCEDURES: Were operating procedures a factor?	☐	☐
JOB PRACTICES: Were any job safety/health practices not followed when the accident occurred?	☐	☐
HUMAN FACTORS: Did any human factors such as, size or strength of person, etc., contribute to accident?	☐	☐
ENVIRONMENTAL FACTORS: Did heat, cold, dust, sun, glare, etc., contribute to the accident?	☐	☐

a. *(CONTINUED)*

	YES	NO
CHEMICAL AND PHYSICAL AGENT FACTORS: Did exposure to chemical agents, such as dust, fumes, mists, vapors or physical agents, such as, noise, radiation, etc., contribute to accident?	☐	☐
OFFICE FACTORS: Did office setting such as, lifting office furniture, carrying, stooping, etc., contribute to the accident?	☐	☐
SUPPORT FACTORS: Were inappropriate tools/resources provided to properly perform the activity/task?	☐	☐
PERSONAL PROTECTIVE EQUIPMENT: Did the improper selection, use or maintenance of personal protective equipment contribute to the accident?	☐	☐
DRUGS/ALCOHOL: In your opinion, was drugs or alcohol a factor to the accident	☐	☐

b. WAS A WRITTEN JOB/ACTIVITY HAZARD ANALYSIS COMPLETED FOR TASK BEING PERFORMED AT TIME OF ACCIDENT?

☐ YES *(If yes, attach a copy.)* ☐ NO

12. TRAINING

a. WAS PERSON TRAINED TO PERFORM ACTIVITY/TASK?	b. TYPE OF TRAINING.	c. DATE OF MOST RECENT FORMAL TRAINING.
☐ YES ☐ NO	☐ CLASSROOM ☐ ON JOB	(Month) (Day) (Year)

13. FULLY EXPLAIN WHAT ALLOWED OR CAUSED THE ACCIDENT; INCLUDE DIRECT AND INDIRECT CAUSES *(See instruction for definition of direct and indirect causes.) (Use additional paper, if necessary)*

a. DIRECT CAUSE

b. INDIRECT CAUSE(S)

14. ACTION(S) TAKEN, ANTICIPATED OR RECOMMENDED TO ELIMINATE CAUSE(S).

DESCRIBE FULLY:

15. DATES FOR ACTIONS IDENTIFIED IN BLOCK 14.

a. BEGINNING (Month/Day/Year)	b. ANTICIPATED COMPLETION (Month/Day/Year)

c. SIGNATURE AND TITLE OF SUPERVISOR COMPLETING REPORT	d. DATE *(Mo/Da/Yr)*	e. ORGANIZATION IDENTIFIER *(Div, Br, Sect)*	f. OFFICE SYMBOL
CORPS _____ CONTRACTOR _____			

16. MANAGEMENT REVIEW *(1st)*

a. ☐ CONCUR b. ☐ NON CONCUR c. COMMENTS

SIGNATURE	TITLE	DATE

17. MANAGEMENT REVIEW *(2nd - Chief Operations, Construction, Engineering, etc.)*

a. ☐ CONCUR b. ☐ NON CONCUR c. COMMENTS

SIGNATURE	TITLE	DATE

18. SAFETY AND OCCUPATIONAL HEALTH OFFICE REVIEW

a. ☐ CONCUR b. ☐ NON CONCUR c. ADDITIONAL ACTIONS/COMMENTS

SIGNATURE	TITLE	DATE

19. COMMAND APPROVAL

COMMENTS

COMMANDER SIGNATURE	DATE

*U.S. GOVERNMENT PRINTING OFFICE: 1993-0-791-757

10.	ACCIDENT DESCRIPTION *(Continuation)*

13a.	DIRECT CAUSE *(Continuation)*

13b.	INDIRECT CAUSES *(Continuation)*

14.	ACTION(S) TAKEN, ANTICIPATED, OR RECOMMENDED TO ELIMINATE CAUSE(S) *(Continuation)*

TRINITY
ANALYSIS & DEVELOPMENT CORP.
Environmental & Engineering Services

90 NW Beal Parkway, Suite A-2
Fort Walton Beach, Florida 32548
Office: (850) 243-0072
Fax: (850) 243-0045

Daily Tailgate Safety Meeting

Project Name:	**Date:**
Project/Phase No.	**Time**
Meeting Conducted by:	

Print Name ***Signature***

1. AWARENESS (e.g., special EHS concerns, pollution prevention, recent incidents, etc.):

2. OTHER ISSUES (HASP changes, new AHAs, attendee comments, etc.):

3. DISCUSSION OF DAILY ACTIVITIES/TASKS AND SAFETY MEASURES TO BE USED:

4. ATTENDEES (Print Name):	
1)	2)
3)	4)
5)	6)
7)	8)
9)	10)
11)	12)
13)	14)
15)	16)
17)	18)
19)	20)

This Site Safety Meeting Log documents the safety briefing conducted in accordance with 29 CFR 1910.120 *Hazardous Waste Operations and Emergency Response* as well as other applicable regulatory requirements. Personnel who perform work operations onsite are required to attend each safety briefing and acknowledge receipt of such briefings daily.

APPENDIX C

ACTIVITY HAZARD ANALYSIS

This page intentionally left blank.

TRINITY ANALYSIS & DEVELOPMENT CORP.
Environmental & Engineering Services

MOBILIZATION/DEMOBILIZATION ACTIVITY HAZARD ANALYSIS

Date Prepared: 2-19-2011

Project: **Melrose AFR** Job: **Mobilization/Demobilization**

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

Minimum Protective Clothing and Equipment:
PPE Level D: General work clothes

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	EM 385-1-1 (PARA REF)
Field engineering (survey of preliminary conditions) Driving to and from Air Force base from hotel Driving from one work site to the next Loading and unloading work vehicle at work site	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, containerize small equipment and secure container. 7. Wear seat belts. 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. Rollover protective structures (ROPS) are required on all heavy equipment, with the exception of trucks used for over-the-road hauling. 13. Inspect direct push equipment and maintained according to the manufacturer's recommendations.	16.A/18.A 16.B/18.B 08.B 16.B.08/18.B.03 16.B.01/18.B.03 16.B.02 16.B/18.B 16.M

TRINITY ANALYSIS & DEVELOPMENT CORP.
Environmental & Engineering Services

MOBILIZATION/DEMOBILIZATION ACTIVITY HAZARD ANALYSIS

Date Prepared: 2-19-2011

Project: **Melrose AFR** Job: **Mobilization/Demobilization** Risk Assessment Code (RAC): **L**

JOB STEPS	HAZARDS	ACTIONS TO ELIMINATE OR MINIMIZE HAZARDS	EM 385-1-1 (PARA REF)
	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 Corporate Health and Safety Officer 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.	16.M.03 16.M.07/11.E 16.M.07 11.I
	Dust	1. Minimize generation of dust. 2. Stay out of visible dust clouds. 3. Wet soil if necessary to eliminate visible dust.	06.A.04
	Noise	1. Wear hearing protection when operating or working near heavy equipment. 2. Refer to Hearing Protection program.	05.C.01
	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. Inspect areas daily and findings and recorded on daily inspection reports.	14.C
	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.	13.A.02 13.A.02 13.A.02
	Biological hazards	1. Use repellents and proper clothing for protection against insects including ticks and mosquitoes. 2. Wear protective clothing in areas where poison oak and poison ivy are present. 3. Wear protective clothing, including long pants and sturdy boots for protection against snakes and spiders.	06.D.01 06.D.02 06.D.01
	Material handling	1. Use safe lifting techniques, bending at the knees and lifting with the legs. 2. Use caution and do not twist the back when carrying a load. 3. Use mechanical devices to move loads when possible. 4. Wear protective gloves when handling materials.	14.A.01 14.A.01 14.A.04 05.A

TRINITY ANALYSIS & DEVELOPMENT CORP.
Environmental & Engineering Services

MOBILIZATION/DEMOBILIZATION ACTIVITY HAZARD ANALYSIS

Date Prepared: 2-19-2011

Project: **Melrose AFR** Job: **Mobilization/Demobilization** Risk Assessment Code (RAC): **L**

JOB STEPS	HAZARDS	ACTIONS TO ELIMINATE OR MINIMIZE HAZARDS	EM 385-1-1 (PARA REF)
	Cold stress	1. Wear cold weather clothing and provide shelter as needed based on site conditions. 2. Conduct temperature monitoring when temperatures fall below 45°F.	06.J.10 06.J.11
	Heat stress	1. Make drinking water available to all workers and encourage workers to drink small amounts of water frequently. 2. Adjust work/rest regimens during hot weather.	06.J.03 06.J.04
	Extreme weather	1. When there are warnings or indications of severe weather, monitor conditions and take precautions to protect personnel.	06.J.01
	Fire	1. Provide portable fire extinguishers in all equipment. 2. Inspect fire extinguishers monthly.	09.E 09.E
	On-Site Vehicle	1. Provide type II 16-unit first aid kits and make these kits accessible at the site.	03.B
MEC Avoidance	Explosion Hazards	1. MEC avoidance will be practiced at all times.	

THIS PAGE INTENTIONALLY BLANK

TRINITY ANALYSIS & DEVELOPMENT CORP.
Environmental & Engineering Services

WATER LEVEL MEASUREMENT AND MONITORING WELL GROUNDWATER SAMPLING ACTIVITY HAZARD ANALYSIS

Date Prepared: 2-19-2011

Project: **Melrose AFR** Job: **Monitoring Well Activities** Risk Assessment Code (RAC): **L**

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

Recommended Protective Clothing and Equipment:

PPE Level D:
General work clothes, safety glasses, steel-toed boots, nitrile gloves (when handling potentially contaminated materials)

JOB STEPS	HAZARDS	ACTIONS TO ELIMINATE OR MINIMIZE HAZARDS	EM 385-1-1 (PARA REF)
Water level measurement Well development Well purging Groundwater sampling	Lifting	1. Lift heavy items such as buckets of purge water and sample coolers using legs, not back 2. Use more than one person to lift heavy/bulky items such as generators or water tanks 3. Change protective gloves often	14.A.01 14.A.04
	Environmental Contamination	1. Wear proper PPE and minimize contact with contaminated equipment and groundwater 2. Containerize purge water in holding tank or other approved vessel	06.A.03 06.B.02
	Chemical Hazards	1. Review the chemical preservatives in all sample containers and review material safety data sheets if needed 2. Use recommended protective equipment including chemical resistant gloves and safety glasses with side shields	01.B.06 06.B.02
	Explosion Hazards	1. MEC avoidance will be practiced at all times.	

THIS PAGE INTENTIONALLY BLANK

TRINITY ANALYSIS & DEVELOPMENT CORP.
Environmental & Engineering Services

FIELD SAMPLING IDW MANAGEMENT AND DISPOSAL ACTIVITY HAZARD ANALYSIS

Date Prepared: 2-19-2011

Project: **Melrose AFR** Job: **Field Sampling IDW Management and Disposal** Risk Assessment Code (RAC): **L**

Minimum Protective Clothing and Equipment:

PPE Level D (outside exclusion zone):
General work clothes, safety glasses, steel-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	EM 385-1-1 (PARA REF)
	Material Handling	1. Use safe lifting techniques, bending at the knees and lifting with the legs 2. Use cution and do not twist the back when carrying a load 3. Use mechanical devices to move loads when possible 4. Wear protective gloves when handing materials	14.A.01 14.A.01 14.A.04 05.A
	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 will be recorded on daily inspection reports.	14.C
	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.	06.D.01 06.D.02 06.D.01
	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.	06.J.10 06.J.11

TRINITY ANALYSIS & DEVELOPMENT CORP.
Environmental & Engineering Services

FIELD SAMPLING IDW MANAGEMENT AND DISPOSAL ACTIVITY HAZARD ANALYSIS

Date Prepared: 2-19-2011

Project: **Melrose AFR** Job: **Field Sampling IDW Management and Disposal** Risk Assessment Code (RAC): **L**

JOB STEPS	HAZARDS	ACTIONS TO ELIMINATE OR MINIMIZE HAZARDS	EM 385-1-1 (PARA REF)
	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 will be adjusted during hot weather.	06.J.03 06.J.04
	Extreme weather	1. When there are warnings or indications of severe weather, conditions should be monitored and precautions taken to protect personnel.	06.J.01

TRINITY ANALYSIS & DEVELOPMENT CORP.
Environmental & Engineering Services

EQUIPMENT DECONTAMINATION ACTIVITY HAZARD ANALYSIS

Date Prepared: 2-19-2011

Project: **Melrose AFR** Job: **Equipment Decontamination**

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

Recommended Protective Clothing and Equipment:
PPE Level D: General work clothes, safety glasses, steel-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	EM 385-1-1 (PARA REF)
Scrape gross materials from sampling equipment Wash sampling equipment in Liquinox and water mix Rinse sampling equipment in clean rinse water Triple rinse sampling equipment with deionized water	Eye and hand safety	1. Wear safety glasses or goggles. 2. Use hand with protective glove or approved hand tools to remove gross material 3. Change protective gloves often	
	Dust	1. Minimize generation of dust. 2. Stay out of visible dust clouds. 3. Wet soil if necessary to eliminate visible dust.	06.A.04
	Noise	1. Wear hearing protection when operating or working near heavy equipment.	05.C.01

TRINITY ANALYSIS & DEVELOPMENT CORP.
Environmental & Engineering Services

EQUIPMENT DECONTAMINATION ACTIVITY HAZARD ANALYSIS

Date Prepared: 2-19-2011

Project: **Melrose AFR** Job: **Equipment Decontamination** Risk Assessment Code (RAC): **L**

JOB STEPS	HAZARDS	ACTIONS TO ELIMINATE OR MINIMIZE HAZARDS	EM 385-1-1 (PARA REF)
	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. Inspect work areas daily and record findings on daily inspection reports.	14.C
	Biological hazards	1. Use insect repellents and proper clothing for protection against insects including ticks and mosquitoes. 2. Use protective clothing in areas where poison oak and poison ivy are present. 3. Use protective clothing, including long pants and sturdy boots, for protection against snakes and spiders.	06.D.01 06.D.02 06.D.01
	Material handling	1. Use safe lifting techniques, bending at the knees and lifting with the legs. 2. Use caution and do not twist the back when carrying a load. 3. Wear protective gloves when handling materials.	14.A.01 14.A.04 05.A
	Cold stress	1. Provide cold weather clothing and shelter as needed based on site conditions. 2. Monitor air temperature monitoring when temperatures fall below 45°F.	06.J.10 06.J.11
	Heat stress	1. Make drinking water available to all workers and worker. Encourage workers to drink small amounts frequently. 2. Adjust work/rest regimens during hot weather.	06.J.03 06.J.04
	Extreme weather	1. When there are warnings or indications of severe weather, monitor weather conditions and take precautions to protect personnel.	06.J.01

APPENDIX D

MSDS Sheets

This page intentionally left blank

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

MATERIAL SAFETY DATA SHEET

Section 1 - CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

CHS Inc.
P.O. Box 64089
Mail station 525
St. Paul, MN 55164-0089

Transportation Emergency (CHEMTREC): 1-800-424-9300
Technical Information: 1-651-355-8443
MSDS Information: 1-651-355-8438

PRODUCT NAME: No. 1 DIESEL FUEL

MSDS: 0143-M2A0 - Rev. D (02/08/07)

COMMON NAME: No. 1 Distillate Fuel, No. 1 High Sulfur Diesel (Dyed)

No. 1 Low Sulfur Diesel (Dyed), No. 1 Ultra Low Sulfur Diesel (Dyed/Undyed)

CHEMICAL FORMULA: Mixture

CHEMICAL NAME: Petroleum Distillate

CHEMICAL FAMILY: A mixture of Paraffinic, Olefinic, Naphthenic, and Aromatic Hydrocarbon.

Section 2 - COMPOSITION AND INFORMATION ON INGREDIENTS

INGREDIENTS	PERCENTAGES (by weight)	PEL (OSHA) TWA	TLV (ACGIH) TWA	CAS #
Petroleum Distillates	0-100	N/D	200 ppm	8008-20-6
Biphenyl	0.5-1.5	0.2 ppm		92-52-4
Naphthalene	0-3	10 ppm		91-20-3
Xylene	0-2.5	100 ppm		1330-20-7
1,2,4-Trimethylbenzene	0-2		25 ppm	95-63-6

Note: The National Institute for Occupational Safety and Health has published a Recommended Exposure Limit (REL) of 100 mg/m^3 TWA or » 14 ppm based on an average molecular weight of 170 for kerosene like factions.
(TWA) - Time Weighted Average is the employee's average airborne exposure in any 8-hour work shift of a 40-hour work week which shall not be exceeded.
(STEL) - Short Term Exposure Limit is the employee's 15-minute time weighted average exposure which shall not be exceeded at any time during a work day unless another time limit is specified.

Section 3 - HAZARDS IDENTIFICATION

EMERGENCY OVERVIEW

A clear to light yellow liquid with a hydrocarbon odor. May contain dye.

OSHA HAZARD CLASSES

Based on OSHA definitions, the following ingredients in this product are hazardous. The OSHA physical and health hazard categories are shown below.

Petroleum Hydrocarbon - Combustible, toxic (moderate), target organ (skin).
1,2,4-Trimethylbenzene - Flammable, toxic, irritant, target organ (Central Nervous System, blood).

POTENTIAL HEALTH EFFECTS

ROUTES OF ENTRY: Eye Contact, Dermal, Inhalation, Ingestion.

ACUTE EFFECTS OF OVEREXPOSURE:

Eyes - Minor irritation

Skin - Slight irritation

Inhalation - Vapors may cause dizziness or asphyxiation

Ingestion - Central nervous system depression, peripheral nervous system depression, narcosis, asphyxiation, gastrointestinal disturbances. Aspiration of vomitus can cause serious pneumonitis, particularly in young children.

CHRONIC EFFECTS OF OVEREXPOSURE: Dermatitis from chronic exposure. Products of similar composition were tested on laboratory animals, and weak to moderately positive results were found in mouse skin cancer studies, mixed and inconsistent results were found in mutagenicity studies, and negative results were found in rat teratology studies. There is no direct evidence that this material causes skin cancer in humans. This material is not listed as a carcinogen by NTP, IARC, or OSHA.

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: May aggravate pre-existing dermatitis or respiratory illness.

CARCINOGENICITY:	Petroleum Hydrocarbon	**NTP:** No	**IARC:** No	**OSHA:** No
	1,2,4-Trimethylbenzene	**NTP:** No	**IARC:** No	**OSHA:** No

Section 4 - FIRST AID MEASURES

EMERGENCY AND FIRST AID PROCEDURES:

Eye Contact: If material contacts the eye, flush thoroughly with water for at least 15 minutes, occasionally lifting upper and lower lids, until no evidence of chemical remains. Get medical attention.

Skin Contact: Remove contaminated clothing. Wash affected areas with soap and water.

Inhalation: Move person to fresh air. If a large amount has been inhaled, keep victim warm and get medical attention. Begin rescue breathing procedures if not breathing.

Ingestion: Do **NOT** induce vomiting. Get medical attention immediately. If spontaneous vomiting occurs, lower victim's head in an effort to prevent vomits from entering the lungs. Never give anything by mouth to an unconscious person.

Section 5 - FIRE - FIGHTING MEASURES

FLASH POINT: 100-150°F (38-66°C) TCC **AUTO IGNITION TEMP:** 410° F

FLAMMABLE LIMITS IN AIR % BY VOLUME	**LOWER**	**UPPER**
	0.7	5.0

EXTINGUISHING MEDIA: Dry Chemical, Foam, Carbon Dioxide (CO_2), Water (fog pattern)

SPECIAL FIRE FIGHTING PROCEDURES: Water may be ineffective on flames, but should be used to keep fire-exposed containers cool. Water or foam sprayed into container of hot burning product could cause frothing and endanger fire fighters. Large fires, such as tank fires, should be fought with caution. If possible, pump the contents from the tank and keep adjoining structures cool with water. Avoid spreading burning liquid with water used for cooling purposes. Do not flush down public sewers. Avoid inhalation of vapors. Fire fighters should wear self-contained breathing apparatus.

UNUSUAL FIRE AND EXPLOSION HAZARDS: Vapors are heavier than air and may travel along the ground to a source of ignition (pilot light, heater, electric motor) some distance away. Containers, drums (even empty) can explode when heat (welding, cutting, etc.) is applied.

HAZARD RATINGS:	**NFPA 704:**	Health 1	Fire 2	Reactivity 0
	HMIS:	Health 1	Fire 2	Reactivity 0

Section 6 - ACCIDENTAL RELEASE MEASURES

STEPS TO TAKE IF MATERIAL IS RELEASED OR SPILLED: Remove all sources of ignition. Notify emergency response personnel as appropriate. If facility or operation has an "Oil or Hazardous Substance Contingency Plan", "Spill Prevention Control & Countermeasures (SPCC) Plan" or equivalent, activate its procedures. Prohibit persons not wearing protective equipment from entering the area. Stop leak at source, contain spill to prevent spreading. Small spills can be removed with inert absorbent. Dike areas of large spill to prevent runoff to sewers, streams, etc. Ventilate area. Avoid breathing vapors.

Section 7 - HANDLING AND STORAGE

HANDLING AND STORAGE: Transport, handle and store in accordance with OSHA Regulation 29 CFR 1910.106, and applicable D.O.T. Regulation. Caution: Misuse of empty containers can be hazardous. Empty containers can be hazardous since emptied containers retain product residue (vapor, liquid, and/or solid). Cutting or welding empty containers might cause fire, explosion or toxic fumes from residues.

Section 8 - EXPOSURE CONTROL - PERSONAL PROTECTION

ENGINEERING CONTROLS: Provide adequate local or dilution ventilation to keep vapors below permissible concentrations.

RESPIRATORY EQUIPMENT: Personnel should never enter areas of high concentrations without proper respiratory protection. If exposure limits for product or components are exceeded, NIOSH-approved respiratory protection equipment should be worn. Proper selection of respirators should be determined by adequately trained personnel, based on the contaminants, the degree of potential exposure and published respiratory protection factors. Self-contained breathing apparatus or supplied air respiratory protection required for entry into tanks, vessels, or other confined spaces containing kerosene.

EYE PROTECTION: Chemical type goggles or face shield where contact with liquid or mist may occur.

PROTECTIVE CLOTHING: Wear impervious clothing and gloves when contact with skin may occur.

OTHER (SAFETY SHOWERS, EYE WASH STATIONS, ETC.): Water should be available for flushing and washing when exposure exists.

Section 9 - PHYSICAL AND CHEMICAL PROPERTIES

APPEARANCE: A clear to light yellow liquid, may contain red dye.

ODOR: Hydrocarbon odor.

BOILING POINT: 340°F - 570° F

SPECIFIC GRAVITY (water=1): 0.82

VAPOR PRESSURE: < 50 mmHg @ 100°F

VAPOR DENSITY (air=1): >1

SOLUBLE IN WATER: Insoluble

EVAPORATION RATE (ether=1): >1

pH: N/D

Section 10 - STABILITY AND REACTIVITY

STABILITY:

STABLE _X_
UNSTABLE ___

INCOMPATIBILITY:

CONDITIONS TO AVOID: Heat, flame, all ignition sources and static electricity.
MATERIALS TO AVOID: Strong oxidizing agents.

HAZARDOUS DECOMPOSITION PRODUCTS: Carbon monoxide, carbon dioxide, and other petroleum decomposition products (hydrocarbons).

HAZARDOUS POLYMERIZATION: Has not been reported to occur under normal temperatures and pressures.

Section 11 - TOXICOLOGY INFORMATION

Note: CHS has not conducted specific toxicity tests on this product. Our hazard evaluation is based from similar ingredients, technical literature, and/or professional experience.

Section 12 - ECOLOGICAL INFORMATION

Note: CHS has not conducted specific ecological tests on this product.

Section 13 - DISPOSAL CONSIDERATION

WASTE DISPOSAL PROCEDURES: Recycle as much of the recoverable product as possible. Do not flush to drain or storm sewer or otherwise release to the environment. Dispose of non-recyclable material according to federal, state and local regulations.

Section 14 - TRANSPORTATION

DOT PROPER SHIPPING NAME: Fuel 0il #1

DOT HAZARD CLASS: Flammable Liquid

DOT IDENTIFICATION NUMBER: NA 1993

DOT EMER. RESPONSE GUIDE NO.: 128 (Formerly #27)

Proper Shipping Name-**Fuel Oil #1**; Hazard Class- **3**; UN/NA Identification #- **NA 1993**; **Packing Group III**; Placard- **FLAMMABLE LIQUID**.

Section 15 - REGULATORY INFORMATION

This product contains the following toxic chemicals subject to the reporting requirements of SARA Section 313 of the Emergency Planning and Community Right-To-Know Act of 1986 and of 40 CFR 372:

CAS Number	Chemical Name	Percent by Weight
95-63-6	1,2,4-Trimethylbenzene	0-2%
91-20-3	Naphthalene	0-3%

SARA SECTION 311-312 HAZARD CATEGORIES (40 CFR 370.2):

FIRE: Yes **SUDDEN RELEASE OF PRESSURE:** No **REACTIVE:** No **ACUTE:** Yes **CHRONIC:** Yes

Section 16 - OTHER INFORMATION

Prepared By: Hue Lam

Date: February 08, 2007

Title: EHS Compliance Specialist

Supersedes: December 24, 2003

Reason for Issue: Periodic review and update

THE INFORMATION CONTAINED IN THIS MSDS RELATES ONLY TO THE SPECIFIC MATERIAL IDENTIFIED. IT DOES NOT COVER USE OF THAT MATERIAL IN COMBINATION WITH ANY OTHER MATERIAL OR IN ANY PARTICULAR PROCESS. IN COMPLIANCE WITH 29 C.F.R. 1910.1200(g), CHS HAS PREPARED THIS MSDS IN SEGMENTS, WITH THE INTENT THAT THOSE SEGMENTS BE READ TOGETHER AS A WHOLE WITHOUT TEXTUAL OMISSIONS OR ALTERATIONS. CHS BELIEVES THE INFORMATION CONTAINED HEREIN TO BE ACCURATE, BUT MAKES NO REPRESENTATION, GUARANTEE, OR WARRANTY, EXPRESS OR IMPLIED, ABOUT THE ACCURACY, RELIABILITY, OR COMPLETENESS OF THE INFORMATION OR ABOUT THE FITNESS OF CONTENTS HEREIN FOR EITHER GENERAL OR PARTICULAR PURPOSES. PERSONS REVIEWING THIS MSDS SHOULD MAKE THEIR OWN DETERMINATION AS TO THE MATERIAL'S SUITABILITY AND COMPLETENESS FOR USE IN THEIR PARTICULAR APPLICATIONS.

CENEX® OUR ENERGY COMES THROUGH.™

Cenex® is a registered trademark of CHS Inc.

LIQUID AIR CORP -- ISOBUTYLENE IN AIR,0.01 %,DC 102573,101-350-N

==========

MSDS Safety Information

==========

FSC: 6665
NIIN: 01-214-8247
MSDS Date: 01/01/1992
MSDS Num: CFKHB
Product ID: ISOBUTYLENE IN AIR,0.01 %,DC 102573,101-350-N
MFN: 01
Responsible Party
Cage: 18197
Name: LIQUID AIR CORP
Address: 2700 POST OAK BLVD 18TH FLOOR
City: HOUSTON TX 77056
Info Phone Number: 713-624-8000
Emergency Phone Number: 800-231-1366/800-424-9300(CHEMTREC)
Preparer's Name: UNKNOWN
Review Ind: Y
Published: Y

==========

Contractor Summary

==========

Cage: 24274
Name: AIR LIQUID AMERICA CORP
Address: 2700 POST OAK DR
City: HOUSTON TX 77056-8229
Phone: 716-868-0440
Cage: 57631
Name: HNU SYSTEMS INC
Address: 160 CHARLEMONT ST
City: NEWTON HIGHLANDS MA 02161
Phone: 617/964-6690
Cage: 18197
Name: LIQUID AIR CORP
Address: 2121 N CALIFORNIA BLVD, STE 296
City: WALNUT CREEK CA 94596
Phone: 415-977-6500

==========

Item Description Information

==========

Item Manager: S9G
Item Name: CALIBRATION GAS CYL
Specification Number: NONE
Type/Grade/Class: NONE
Unit of Issue: EA
UI Container Qty: 1
Type of Container: CYLINDER

==========

Ingredients

==========

RTECS #: AX5275000
Name: AIR
% Wt: 100
Other REC Limits: NONE RECOMMENDED
OSHA PEL: NOT ESTABLISHED
ACGIH TLV: NOT ESTABLISHED

Cas: 115-11-7
RTECS #: UD0890000

Name: ISOBUTYLENE (DDRV PROVIDED % FOR ISOBUTYLENE)
% Wt: 0.01
Other REC Limits: NONE RECOMMENDED
OSHA PEL: NOT ESTABLISHED
ACGIH TLV: NOT ESTABLISHED
==========
Health Hazards Data
==========
LD50 LC50 Mixture: NOT RELEVANT
Route Of Entry Inds - Inhalation: YES
Skin: NO
Ingestion: NO
Carcinogenicity Inds - NTP: NO
IARC: NO
OSHA: NO
Effects of Exposure: TARGET ORGANS:NONE. ACUTE AND CHRONIC- NONE. THESE MIXTURES SHOULD BE CONSIDERED SIMILAR TO AIR AND WOULD THEREFORE CAUSE NO SYMPTOMS OF EXPOSURE.
Explanation Of Carcinogenicity: NONE
Signs And Symptions Of Overexposure: NONE
Medical Cond Aggravated By Exposure: NONE.
First Aid: NONE NEEDED.
==========
Handling and Disposal
==========
Spill Release Procedures: NOT RELEVANT
Neutralizing Agent: NOT RELEVANT
Waste Disposal Methods: NOT RELEVANT
Handling And Storage Precautions: STORE CYLINDERS SECURE, IN COOL, DRY, VENTILATED AREA BELOW 125F. PROTECT CYLINDERS FROM PHYSICAL DAMAGE. FULL & EMPTY CYLINDERS SHOULD BE SEGREGATED.
Other Precautions: VENTING OF AIR FROM CYLINDER MUST BE ACCOMPLISHED SLOWLY. USE A "FIRST IN-FIRST OUT" INVENTORY SYSTEM. CLOSE VALVE AFTER EACH USE AND WHEN EMPTY.
==========
Fire and Explosion Hazard Information
==========
Flash Point Text: NONE
Lower Limits: NOT RELEVANT
Upper Limits: NOT RELEVANT
Extinguishing Media: USE WATER FOG, CARBON DIOXIDE, FOAM, OR DRY CHEMICAL FOR SURROUNDING FIRE. KEEP FIRE-EXPOSED CYLINDERS COOL WITH WATER.
Fire Fighting Procedures: AS WITH ANY FIRE, WEAR PROTECTIVE CLOTHING AND NIOSH-APPROVED SELF-CONTAINED BREATHING APPARATUS IF NEEDED.
Unusual Fire/Explosion Hazard: AIR AT HIGH PRESSURES WILL ACCELERATE THE BURNING OF MATERIALS TO A GREATER RATE THAN THEY BURN AT ATMOSPHERIC PRESSURE.
==========
Control Measures
==========
Respiratory Protection: NONE NEEDED.
Ventilation: NONE
Protective Gloves: LEATHER WHEN HANDLING CYLINDERS
Eye Protection: GOGGLES RECOMMENDED
Other Protective Equipment: EAR PROTECTION WHEN VENTING AIR
Work Hygienic Practices: OBSERVE GOOD INDUSTRIAL HYGIENE PRACTICES AND RECOMMENDED PROCEDURES.
==========
Physical/Chemical Properties
==========

HCC: G3
NRC/State LIC No: NOT RELEVANT
B.P. Text: -318F (AIR)
Vapor Pres: UNKNOWN
Vapor Density: 1
Spec Gravity: NOT RELEVANT
Viscosity: NOT RELEVANT
Evaporation Rate & Reference: NOT RELEVANT (GAS)
Solubility in Water: SLIGHTLY
Appearance and Odor: COLORLESS, ODORLESS GAS
Percent Volatiles by Volume: 100
==========
Reactivity Data
==========
Stability Indicator: YES
Stability Condition To Avoid: HEATING CYLINDER
Materials To Avoid: NONE
Hazardous Decomposition Products: NONE
Hazardous Polymerization Indicator: NO
Conditions To Avoid Polymerization: NOT RELEVANT
==========
Toxicological Information
==========
==========
Ecological Information
==========
==========
MSDS Transport Information
==========
==========
Regulatory Information
==========
==========
Other Information
==========
==========
Transportation Information
==========
Responsible Party Cage: 18197
Trans ID NO: 115758
Product ID: ISOBUTYLENE IN AIR,0.01 %,DC 102573,101-350-N
MSDS Prepared Date: 01/01/1992
Review Date: 07/13/1998
MFN: 1
Tech Entry NOS Shipping Nm: 0.01% ISOBUTYLENE IN AIR.
Radioactivity: NOT RELEVANT
Net Unit Weight: 0.6 LB
Multiple KIT Number: 0
Review IND: Y
Unit Of Issue: EA
Container QTY: 1
Type Of Container: CYLINDER
==========
Detail DOT Information
==========
DOT PSN Code: DQQ
Symbols: G
DOT Proper Shipping Name: COMPRESSED GASES, N.O.S.
Hazard Class: 2.2
UN ID Num: UN1956

Label: NONFLAMMABLE GAS
Special Provision: B13
Non Bulk Pack: 302,305
Bulk Pack: 314,315
Max Qty Pass: 75 KG
Max Qty Cargo: 150 KG
Vessel Stow Req: A
==========
Detail IMO Information
==========
IMO PSN Code: EQH
IMO Proper Shipping Name: COMPRESSED GAS, N.O.S. o
IMDG Page Number: 2124
UN Number: 1956
UN Hazard Class: 2(2.2)
IMO Packaging Group: -
Subsidiary Risk Label: -
EMS Number: 2-04
MED First Aid Guide NUM: 620
==========
Detail IATA Information
==========
IATA PSN Code: HDO
IATA UN ID Num: 1956
IATA Proper Shipping Name: COMPRESSED GAS, N.O.S. *
IATA UN Class: 2.2
IATA Label: NON-FLAMMABLE GAS
Packing Note Passenger: 200
Max Quant Pass: 75KG
Max Quant Cargo: 150KG
Packaging Note Cargo: 200
==========
Detail AFI Information
==========
AFI PSN Code: HDO
AFI Symbols: *
AFI Proper Shipping Name: COMPRESSED GAS, N.O.S.
AFI Hazard Class: 2.2
AFI UN ID NUM: UN1956
Special Provisions: P5
Back Pack Reference: A6.3, A6.5,A6.6
==========
HAZCOM Label
==========
Product ID: ISOBUTYLENE IN AIR,0.01 %,DC 102573,101-350-N
Cage: 18197
Company Name: LIQUID AIR CORP
Street: 2121 N CALIFORNIA BLVD, STE 296
City: WALNUT CREEK CA
Zipcode: 94596
Health Emergency Phone: 800-231-1366/800-424-9300(CHEMTREC)
Date Of Label Review: 09/19/1997
Status Code: C
Label Date: 09/19/1997
==========
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.

LIQUINOX MSDS

Section 1 : PRODUCT AND COMPANY IDENTIFICATION

Chemical family: Detergent.

Manufacturer: Alconox, Inc.
30 Glenn St.
Suite 309
White Plains, NY 10603.

Manufacturer emergency phone number: 800-255-3924.
813-248-0585 (outside of the United States).

Supplier: Same as manufacturer.

Product name: Liquinox

Section 2 : INGREDIENT INFORMATION

C.A.S.	CONCENTRATION %	Ingredient Name	T.L.V.	LD/50	LC/50
25155-30-0	10-30	SODIUM DODECYLBENZENESULFONATE	NOT AVAILABLE	438 MG/KG RAT ORAL 1330 MG/KG MOUSE ORAL	NOT AVAILABLE

Section 3 : HAZARD IDENTIFICATION

Route of entry: Skin contact, eye contact, inhalation and ingestion.

Effects of acute exposure

Eye contact: May cause irritation.

Skin contact: Prolonged and repeated contact may cause irritation.

Inhalation: May cause headache and nausea.

Ingestion: May cause vomiting and diarrhea.
May cause gastric distress.

Effects of chronic exposure: See effects of acute exposure.

Section 4 : FIRST AID MEASURES

Skin contact: Remove contaminated clothing.
Wash thoroughly with soap and water.
Seek medical attention if irritation persists.

Eye contact: Check for and remove contact lenses.
Flush eyes with clear, running water for 15 minutes while holding eyelids open: if irritation persists, consult a physician.

Inhalation: Remove victim to fresh air.
If irritation persists, seek medical attention.

Ingestion: Do not induce vomiting, seek medical attention.
Dilute with two glasses of water.
Never give anything by mouth to an unconscious person.

Section 5 : FIRE FIGHTING MEASURES

Flammability: Not flammable.

Conditions of flammability: Surrounding fire.

Extinguishing media: Carbon dioxide, dry chemical, foam.
Water
Water fog.

Special procedures: Self-contained breathing apparatus required.
Firefighters should wear the usual protective gear.
Use water spray to cool fire exposed containers.

Auto-ignition temperature: Not available.

Flash point (°C), method: None

Lower flammability limit (% vol): Not applicable.

Upper flammability limit (% vol): Not applicable.

Explosion Data

Sensitivity to static discharge: Not available.

Sensitivity to mechanical impact: Not available.

Hazardous combustion products: Oxides of carbon (COx).
Hydrocarbons.

Rate of burning: Not available.

Explosive power: Containers may rupture if exposed to heat or fire.

Section 6 : ACCIDENTAL RELEASE MEASURES

Leak/Spill: Contain the spill.
Prevent entry into drains, sewers, and other waterways.
Wear appropriate protective equipment.
Small amounts may be flushed to sewer with water.
Soak up with an absorbent material.
Place in appropriate container for disposal.
Notify the appropriate authorities as required.

Section 7 : HANDLING AND STORAGE

Handling procedures and equipment: Protect against physical damage.
Avoid breathing vapors/mists.
Wear personal protective equipment appropriate to task.
Wash thoroughly after handling.
Keep out of reach of children.
Avoid contact with skin, eyes and clothing.
Avoid extreme temperatures.
Launder contaminated clothing prior to reuse.

Storage requirements: Store away from incompatible materials.
Keep containers closed when not in use.

Section 8 : EXPOSURE CONTROLS / PERSONAL PROTECTION

Precautionary Measures

Gloves/Type:

Wear appropriate gloves.

Respiratory/Type: None required under normal use.

Eye/Type:

Safety glasses recommended.

Footwear/Type: Safety shoes per local regulations.

Clothing/Type: As required to prevent skin contact.

Other/Type: Eye wash facility should be in close proximity.
Emergency shower should be in close proximity.

Ventilation requirements: Local exhaust at points of emission.

Exposure limit of material: Not available.

Section 9 : PHYSICAL AND CHEMICAL PROPERTIES

Physical state: Liquid.

Appearance & odor: Odourless.
Pale yellow.

Odor threshold (ppm): Not available.

Vapour pressure (mmHg): @ 20°C (68°F).
17

Vapour density (air=1): >1

Volatiles (%)

By volume: Not available.

Evaporation rate (butyl acetate = 1): < 1.

Boiling point (°C): 100 (212F)

Freezing point (°C): Not available.

pH: 8.5

Specific gravity @ 20 °C: (water = 1).
1.083

Solubility in water (%): Complete.

Coefficient of water\oil dist.: Not available.

VOC: None

Chemical family: Detergent.

Section 10 : STABILITY AND REACTIVITY

Chemical stability: Product is stable under normal handling and storage conditions.

Conditions of instability: Extreme temperatures.

Hazardous polymerization: Will not occur.

Incompatible substances: Strong acids.
Strong oxidizing agents.

Hazardous decomposition products: See hazardous combustion products.

Section 11 : TOXICOLOGICAL INFORMATION

LD50 of product, species & route: > 5000 mg/kg rat oral.

LC50 of product, species & route: Not available.

Sensitization to product: Not available.

Carcinogenic effects: Not listed as a carcinogen.

Reproductive effects: Not available.

Teratogenicity: Not available.

Mutagenicity: Not available.

Synergistic materials: Not available.

Section 12 : ECOLOGICAL INFORMATION

Environmental toxicity: No data at this time.

Environmental fate: No data at this time.

Section 13 : DISPOSAL CONSIDERATIONS

Waste disposal: In accordance with local and federal regulations.

Section 14 : TRANSPORT INFORMATION

D.O.T. CLASSIFICATION: Not regulated.

Special shipping information: Not regulated.

Section 15 : REGULATORY INFORMATION

Canadian Regulatory Information

WHMIS classification: Not controlled.

DSL status: Not available.

USA Regulatory Information

SARA hazard catagories sections 311/312: Immediate (Acute) Health Hazard: No.
Delayed (Chronic) Health Hazard: No.
Fire Hazard: No.
Sudden Release of Pressure: No.
Reactive: No.

SARA Section 313: None

TSCA inventory: All components of this product are listed on the TSCA inventory.

NFPA

Health Hazard: 1

Flammability: 0

Reactivity: 0

HMIS

Health Hazard: 1

Flammability: 0

Physical hazard: 0

PPE: A

Section 16 : OTHER INFORMATION

Supplier MSDS date: 2006/07/14

Data prepared by: Global Safety Management
3340 Peachtree Road, #1800
Atlanta, GA 30326

Phone: 877-683-7460
Fax: (877) 683-7462

Web: www.globalsafetynet.com
Email: info@globalsafetynet.com.

General note: This material safety data sheet was prepared from information obtained from various sources, including product suppliers and the Canadian Center for Occupational Health and Safety.

Material Safety Data Sheet

Catalog Number: 16880
Revision date: 26-Apr-2006

1. IDENTIFICATION OF THE SUBSTANCE/PREPARATION AND COMPANY INFORMATION

Catalog Number: 16880

Product name: 1 N HYDROCHLORIC ACID

Synonyms: Acide Chlorhydrique; Hydrogen Chloride
Supplier:
MP Biomedicals, LLC
29525 Fountain Parkway
Solon, OH 44139
tel: 440-337-1200

Emergency telephone number: CHEMTREC: 1-800-424-9300 (1-703-527-3887)

2. COMPOSITION/INFORMATION ON INGREDIENTS

Components	CAS Number	Weight %	ACGIH Exposure Limits:	OSHA Exposure Limits:
WATER	7732-18-5	90 - 100%	None	None
HYDROCHLORIC ACID	7647-01-0	1 - 5%	None	None

3. HAZARDS IDENTIFICATION

EMERGENCY OVERVIEW: May cause skin irritation and/or dermatitis

Principle routes of exposure: Skin
Inhalation: May cause irritation of respiratory tract
Ingestion: May be harmful if swallowed.
Skin contact: May cause allergic skin reaction
Eye contact: Avoid contact with eyes

ANSI Classification Corrosive
Statements of hazard MAY CAUSE ALLERGIC SKIN REACTION.
Statement of Spill or Leak - ANSI Label Eliminate all ignition sources. Absorb and/or contain spill with inert materials (e.g., sand, vermiculite). Then place in appropriate container. For large spills, use water spray to disperse vapors, flush spill area. Prevent runoff from entering waterways or sewers.

4. FIRST AID MEASURES

General advice: In the case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).
Inhalation: Move to fresh air. Call a physician immediately.
Skin contact: Rinse immediately with plenty of water and seek medical advice
Ingestion: Do not induce vomiting without medical advice.
Eye contact: In the case of contact with eyes, rinse immediately with plenty of water and seek medical advice.
Protection of first-aiders: No information available
Medical conditions aggravated by exposure: None known

5. FIRE FIGHTING MEASURES

Suitable extinguishing media: Use dry chemical, CO2, water spray or "alcohol" foam
Specific hazards: Burning produces irritant fumes.
Unusual hazards: None known
Special protective equipment for firefighters: As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear
Specific methods: Water mist may be used to cool closed containers.
Flash point: Not determined
Autoignition temperature: Not determined
NFPA rating:

NFPA Health:	1
NFPA Flammability:	1
NFPA Reactivity:	0

6. ACCIDENTAL RELEASE MEASURES

Personal precautions: Use personal protective equipment.
Environmental precautions: Prevent product from entering drains.
Methods for cleaning up: Sweep up and shovel into suitable containers for disposal.

7. HANDLING AND STORAGE

Storage:

Handling: Use only in area provided with appropriate exhaust ventilation.
Safe handling advice: Wear personal protective equipment.
Incompatible products: Oxidising and spontaneously flammable products

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

Engineering measures: Ensure adequate ventilation.
PERSONAL PROTECTIVE EQUIPMENT
Respiratory protection: Breathing apparatus only if aerosol or dust is formed.
Hand protection: Pvc or other plastic material gloves
Skin and body protection: Usual safety precautions while handling the product will provide adequate protection against this potential effect.
Eye protection: Safety glasses with side-shields
Hygiene measures: Handle in accordance with good industrial hygiene and safety practice.

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance and Odor Clear
Physical state: Liquid
Formula: HCl in H2O
Melting point/range: ~0ºC
Boiling point/range: ~100ºC
Density: ~1.0 g/ml
Vapor pressure: 190 mm Hg @ 25ºC
Evaporation rate: No data available

Vapor density:	No data available
Solubility (in water):	Soluble
Flash point:	Not determined
Autoignition temperature:	Not determined

10. STABILITY AND REACTIVITY

Stability:	Stable under recommended storage conditions.
Polymerization:	None under normal processing.
Hazardous decomposition products:	Thermal decomposition can lead to release of irritating gases and vapours such as carbon oxides.
Materials to avoid:	Strong oxidising agents
Conditions to avoid:	Exposure to air or moisture over prolonged periods.

11. TOXICOLOGICAL INFORMATION

Product Information
Acute toxicity

Components	RTECS Number:	Selected LD50s and LC50s
WATER	ZC0110000	Oral LD50 Rat = > 90 ml/kg
HYDROCHLORIC ACID	MW4025000	Inhalation LC50 Rat : 3124 ppm/1H Inhalation LC50 Mouse : 1108 ppm/1H

Chronic toxicity:	Chronic exposure may cause nausea and vomiting, higher exposure causes unconsciousness.
Local effects:	Symptoms of overexposure may be headache, dizziness, tiredness, nausea and vomiting.
Specific effects:	May include moderate to severe erythema (redness) and moderate edema (raised skin), nausea, vomiting, headache.
Primary irritation:	No data is available on the product itself.
Carcinogenic effects:	No data is available on the product itself.
Mutagenic effects:	No data is available on the product itself.
Reproductive toxicity:	No data is available on the product itself.

Components	NIOSH - Health Effects	NIOSH - Target Organs
HYDROCHLORIC ACID	Eye, mucous membrane, and skin irritation	skin, eyes, respiratory system

12. ECOLOGICAL INFORMATION

Mobility:	No data available
Bioaccumulation:	No data available
Ecotoxicity effects:	No data available
Aquatic toxicity:	May cause long-term adverse effects in the aquatic environment.

Components	U.S. DOT - Appendix B - Marine Pollutan	U.S. DOT - Appendix B - Severe Marine Pollutants	United Kingdom - The Red List:
WATER	Not Listed	Not Listed	Not Listed
HYDROCHLORIC ACID	Not Listed	Not Listed	Not Listed

Components	Germany VCI (WGK)	World Health Organization (WHO) - Drinking Water	Ecotoxicity - Fish Species Data
WATER	Not Listed	Not Listed	Not Listed
HYDROCHLORIC ACID	1; Fussnote 8	Not Listed	LC50 (48 hr) bluegill: 3.6 mg/L.

Components	Ecotoxicity - Freshwater Algae Data	Ecotoxicity - Microtox Data	Ecotoxicity - Water Flea Data
WATER	Not Listed	Not Listed	Not Listed
HYDROCHLORIC ACID	Not Listed	Not Listed	Not Listed

Components	EPA - ATSDR Priority List	EPA - HPV Challenge Program Chemical List	California - Priority Toxic Pollutants
WATER	Not Listed	Not Listed	Not Listed
HYDROCHLORIC ACID	Not Listed	Not Listed	Not Listed

Components	California - Priority Toxic Pollutants	California - Priority Toxic Pollutants
WATER	Not Listed	Not Listed
HYDROCHLORIC ACID	Not Listed	Not Listed

13. DISPOSAL CONSIDERATIONS

Waste from residues / unused products: Waste disposal must be in accordance with appropriate Federal, State, and local regulations. This product, if unaltered by use, may be disposed of by treatment at a permitted facility or as advised by your local hazardous waste regulatory authority. Residue from fires extinguished with this material may be hazardous.

Contaminated packaging: Do not re-use empty containers

14. TRANSPORT INFORMATION

UN/Id No: 1789

DOT:

Proper shipping name: Hydrochloric acid
IATA Hazard Label(s): Corrosive
Hazard Class 8 - Corrosive materials
Packing group: III

Emergency Response Guide Number (ERG): 157

Components	U.S. DOT - Appendix A Table 1 - Reportable Quantities
WATER	Not Listed
HYDROCHLORIC ACID	RQ = 5000 pounds (2270 kg); also listed as Hydrochloric acid

TDG (Canada):

WHMIS hazard class: E corrosive material

:

IMDG/IMO

Proper shipping name: Hydrochloric acid

IMDG - Hazard Classifications Not Applicable

Components	U.S. DOT - Appendix B - Marine Pollutan	U.S. DOT - Appendix B - Severe Marine Pollutants
WATER	Not Listed	Not Listed
HYDROCHLORIC ACID	Not Listed	Not Listed

IMO-labels:

15. REGULATORY INFORMATION

International Inventories

Components
WATER

Inventory - United States TSCA - Sect. 8(b)	Present
Canada DSL Inventory List -	Present
Australia (AICS):	Present
Inventory - China:	Present
EU EINECS List -	231-791-2; H2O
Korean KECL:	KE-35400
Philippines PICCS:	Present

Components
HYDROCHLORIC ACID

Inventory - United States TSCA - Sect. 8(b)	Present
Canada DSL Inventory List -	Present
Australia (AICS):	Present
Inventory - China:	Present
EU EINECS List -	231-595-7; ClH
Inventory - Japan:	1-215
Korean KECL:	KE-20189
Philippines PICCS:	Present

U.S. regulations:

Components	California Proposition 65 -	Massachusetts Right to Know List:	New Jersey Right to Know List:	Pennsylvania Right to Know List:
WATER	Not Listed	Not Listed	Not Listed	Not Listed
HYDROCHLORIC ACID	Not Listed	extraordinarily hazardous	sn 1012; sn 2909 (gas only)	environmental hazard

Components	Florida substance List:	Rhode Island Right to Know List:	Illinois - Toxic Air Contaminants	Connecticut - Hazardous Air Pollutants
WATER	Not Listed	Not Listed	Not Listed	Not Listed
HYDROCHLORIC ACID	[present]	Toxic, Flammable	Present on HAP list	No hazard limiting value has been established

Components	SARA 313 Emission reporting/Toxic Release of Chemicals	CERCLA/SARA - Section 302 Extremely Haz	NTP:	IARC:
WATER	Not Listed	Not Listed	None	None
HYDROCHLORIC ACID	form R reporting required for 1.0% de minimis concentration; (acid aerosols including mists, vapors, gas, fog, and other airborne forms of any particle size);	TPQ = 500 pounds; RQ = 5000 pounds (does not meet toxicity criteria but because of high production volume and recognized toxicity is considered a chemical of concern)	None	None

SARA 313 Notification: The above is your notification as to the SARA 313 listing for this product(s) pursuant to Section 313 of Title III of the Superfund Ammendments and Reauthorization Act of 1986 and 40 CFR Part 372.

If you are unsure if you are subject to the reporting requirements of Section 313, or need more information, please call the EPA Emergency Planning and Community Right-To-Know Information Hotline: (800) 535-0202 or (202) 479-2499 (in Washington, DC or Alaska).

State Notification: The above information is your notice as to the Right-to-Know listings of the stated product(s). Individual states will list chemicals for a variety of reasons including, but not limited to, the compounds toxicity; carcinogenic, tumorigenic and/or reproductive hazards; and the compounds environmental impact if accidentally released.

16. OTHER INFORMATION

Prepared by: Health & Safety
Disclaimer: The information and recommendations contained herein are based upon tests believed to be reliable. However, MP Biomedicals does not guarantee the accuracy or completeness NOR SHALL ANY OF THIS INFORMATION CONSTITUTE A WARRANTY, WHETHER EXPRESSED OR IMPLIED, AS TO THE SAFETY OF THE GOODS, THE MERCHANTABILITY OF THE GOODS, OR THE FITNESS OF THE GOODS FOR A PARTICULAR PURPOSE. Adjustment to conform to actual conditions of usage maybe required. MP Biomedicals assumes no responsibility for results obtained or for incidental or consequential damages, including lost profits arising from the use of these data. No warranty against infringement of any patent, copyright or trademark is made or implied.

End of Safety Data Sheet

ABBOTT Laboratories
Abbott Diagnostics Division (ADD)
100 Abbott Park Road
Abbott Park, IL 60064

Release Date: 9/28/04

REF ADD List Number	Product Name
7212-30	***1N Sulfuric Acid***

Components:

7212	**1 N Sulfuric Acid (1N H2SO4)**

Scroll down to display the MSDS as applicable.

Abbott Customers:
For additional information, please contact your Abbott Customer Support Center Representative by calling 1-800-527-1869, 1-800-323-9100, or 1-800-235-5396.

Abbott employees:
For additional information relative to the content of the MSDSs, please contact your local Safety Representative.

Material Safety Data Sheet

Release date 09/28/2004

Last alteration on 09/28/2004

*

1 Identification of Substance

· **Product name: 1 N Sulfuric Acid (1N H2SO4)**
· **ADD List number:** 7212
· **Manufacturer / Supplier:**
ABBOTT Laboratories
Abbott Diagnostics Division (ADD)
100 Abbott Park Road
Abbott Park, IL 60064
· **Department issuing MSDS:** Abbott Diagnostics Division Safety, Health and Environmental Assurance

*

2 Composition / Information on Ingredients

· **Chemical characterization:** Mixture of chemical and/or biological substances for diagnostic use.
· **Hazardous ingredients per OSHA criteria:**

7664-93-9 sulfuric acid	4.90%

*

3 Hazards Identification / Emergency Overview

· **Routes of Exposure:** None anticipated, when used as directed.
· **Classification system:**
The classification was made according to OSHA 29 CFR 1910.1200 and 1910.1030 and applicable European Community Directives, and is expanded upon from company and/or literature data.
Testing has been done to determine the hazards of this material.
· **National Fire Protection Association (NFPA) ratings (scale 0-4)**
Health = 1
Fire = 0
Reactivity = 0
· **Hazard Overview**
· **Health:** Possible skin and eye irritant
· **Fire:** Noncombustible
· **Reactivity:** Minimal Risk
· **Special Hazards:** None
· **Carcinogenicity information**
· **OSHA (Occupational Safety and Health Administration)**
None of the ingredients is listed.
· **NTP (National Toxicology Program)**
None of the ingredients is listed.
· **IARC (International Agency for Research on Cancer)**
7664-93-9 sulfuric acid listed in Group 1
· **Interpretation of the IARC listing** Group 1: The substance or mixture listed above is carcinogenic to humans.

*

4 First Aid Measures

· **After inhalation:** Remove from source of exposure. If irritation or signs of toxicity occur, seek medical attention.
· **After skin contact:** Wash effected area with soap and water. If irritation or signs of toxicity occur, seek medical attention.
· **After eye contact:** Flush with copious amounts of water. If irritation or signs of toxicity occur, seek medical attention.
· **After swallowing:** If irritation or signs of toxicity occur, seek medical attention.
· **Information for medical personnel:**
· **The following symptoms may occur:**
Cramps
Gastric or intestinal disorders
Nausea
See section 11 for further information.
Possibly skin and eye irritation.
· **Medical conditions aggravated by exposure:**
Pre-existing gastrointestinal tract ailments
See section 11 for further information.

© Abbott Laboratories

Product name: 1 N Sulfuric Acid (1N H2SO4)

Possibly pre-existing skin and eye ailments.

5 Fire Fighting Measures

· **Suitable extinguishing agents:**
Dry Chemical, CO2, water spray or regular foam. Fight larger fires with water spray, fog or regular foam.
· **Protective equipment:**
For large fires, wear appropriate heat and flame resistant personal protective equipment and a NIOSH/MSHA approved positive pressure, self contained breathing apparatus.

*

6 Accidental Release Measures

· **Safe work practices:**
If material is released or spilled, minimize exposure by using appropriate personal protective equipment as listed in section 8. If possible, stop leak. Keep unprotected persons away.
· **Measures for environmental protection:**
Prevent liquid and vapor from entering sewage system, storm drains, surface waters, and soil.
· **Measures for cleaning / collecting:**
Absorb with liquid-binding materials such as sand, diatomite, acid binders, or sawdust.
Wash spill area with appropriate cleaning materials.
Dispose of spilled and contaminated material in accordance with Federal, State and Local regulations.

7 Handling and Storage

· **Information for safe handling:** Avoid direct contact with material and wash after handling. Practice general safety precautions.
· **Information about protection against explosions and fires:** No special measures required.
· **Requirements to be met by storerooms and receptacles:**
Refer to the package insert or product label for additional information on storage conditions.
· **Information about storage in one common storage facility:** Store in original packaging.
· **Further information about storage conditions:** Protect from heat and direct sunlight.

*

8 Exposure Controls and Personal Protection

· **Components with Occupational Exposure Limits**

7664-93-9 sulfuric acid (4.90%)

PEL 1 mg/m³
REL 1 mg/m³
TLV STEL/C: 3 mg/m³
TWA: 1 mg/m³

· **General protective and hygienic measures:**
Always maintain good housekeeping. Do not eat, drink or store food and beverages in areas where chemicals are used. Wash hands before breaks and at the end of the workshift.
· **Breathing equipment:**
Not necessary if room is well-ventilated. Use appropriate NIOSH/MSHA air purifying respirator if airborne chemical concentrations exceed the exposure limit (if any) listed above.
· **Hand protection:** Wear impervious gloves if hand contact with the material is anticipated.
· **Eye protection:** Wear safety glasses or other protective eyewear. If splash potential exists, wear full face shield or goggles.
· **Body protection:** Wear laboratory coat or appropriate protective clothing when working with material.

*

9 Physical and Chemical Properties

· **Form:**	Liquid
· **Color:**	Colorless
· **Odor:**	Characteristic
· **Boiling point/Boiling range:**	Not determined
· **Flash point:**	Not applicable
· **Auto igniting:**	Product is not self-igniting.

© Abbott Laboratories

Product name: 1 N Sulfuric Acid (1N H2SO4)

· **Danger of explosion:** Product does not present an explosion hazard.
· **Density at 20°C (68°F):** 1.031 g/cm³
· **Solubility in / Miscibility with Water:** Fully miscible
· **pH-value at 20°C (68°F):** < 2.0
· **dynamic at 20°C (68°F):** 1 mPas
· **Water:** 95.1 %

10 Stability and Reactivity

· **Thermal decomposition / conditions to be avoided:** No decomposition if used according to specifications.
· **Dangerous reactions:** No dangerous reactions known.
· **Dangerous products of decomposition:** No dangerous decomposition products known.

* 11 Toxicological Information

· **LD50/LC50 values for hazardous ingredients per OSHA criteria:**
· **Ingredients (100% pure substance/s)**

7664-93-9 sulfuric acid

Oral	LD50		> 500 mg/kg (rat)
Dermal	LD50		> 1000 mg/kg (rabbit)
Inhalation	LC50	2 h	0.320-0.510 mg/l (mouse) TCLo = 3 mg/m3/24 weeks in humans for sulfuric acid.
	LC50	7 h	0.018 mg/l (guinea pig)
	Target Organ Effects		(human) Long-term exposure to sulfuric acid mist has caused erosion of teeth, irritation of the respiratory tract and gastrointestinal disturbances.

· **Primary toxicological effects of the final product:**
· **Skin irritation:**
May cause slight skin irritation.
May be irritating to skin.
· **Eye irritation:** May be irritating to the eyes.
· **Sensitization:** No sensitizing effects known.
· **Target organs/systems:**
Gastrointestinal tract
Skin and eye

* 12 Ecological Information

· **General notes:** Do not allow undiluted product or large quantities of it to reach ground water, water course, or sewage system.

13 Disposal Considerations

· **Recommendation for disposal of unused product:** Dispose in accordance with Federal, State and Local regulations.
· **Recommendation for disposal of packaging:** Dispose in accordance with Federal, State and Local regulations.
· **Recommended cleansing agent:** Water, if necessary with cleansing agents.

* 14 Transport Information

· **Road: DOT class** 8
· **Identification number:** UN1760
· **Packing group:** III
· **Proper shipping name:** CORROSIVE LIQUID, N.O.S. (SULPHURIC ACID)
· **Sea: IMDG Class** 8
· **UN Number:** 1760
· **Packing group:** III

© Abbott Laboratories

Product name: 1 N Sulfuric Acid (1N H2SO4)

· **Marine pollutant:** No
· **Proper shipping name:** CORROSIVE LIQUID, N.O.S. (SULPHURIC ACID)
· **Air: ICAO/IATA Class** 8
· **UN Number:** 1760
· **Packing group:** III
· **Proper shipping name:** CORROSIVE LIQUID, N.O.S. (SULPHURIC ACID)
· **Additional information:**
Testing has been performed to determine the proper transportation classification and packing group. The material was non-corrosive to skin and corrosive to steel and aluminum.

*

15 National and International Regulations

· **SARA (Superfund Amendments and Reauthorization Act of 1986 - USA):**
· **Section 302/304 (40CFR355.30 / 40CFR355.40):**
7664-93-9 sulfuric acid
· **Section 313 (40CFR372.65):**
7664-93-9 sulfuric acid
· **California Proposition 65 (USA):**
· **Chemicals known to cause cancer:**
The product does not contain listed substances.
· **Chemicals known to cause reproductive toxicity:**
The product does not contain listed substances.
· **Markings according to European guidelines:**
Observe the general safety regulations when handling chemicals.
The product does not require any hazard warnings according to respective European Community (EC) Directives.

16 Other Information

This information is based on our present knowledge. However, this shall not constitute a guarantee for any specific product features and shall not establish a legally valid contractual relationship.
· **Contact:**
- general information: ABBOTT Laboratories
Diagnostics Division
Safety, Health and Environmental Assurance
Department 3A4
100 Abbott Park Road
Abbott Park, IL 60064
Phone: 847-937-3386

- 24 hour EMERGENCY PHONE: 847-937-7970
· *** Sections marked with an asterisk (*) have been altered since the previous version.**

USA

© Abbott Laboratories

Material Safety Data Sheet

Catalog Number: 16881
Revision date: 26-Apr-2006

1. IDENTIFICATION OF THE SUBSTANCE/PREPARATION AND COMPANY INFORMATION

Catalog Number: 16881

Product name: 1 N SODIUM HYDROXIDE

Synonyms: Caustic Soda, solution; Lye, solution; Soda lye; Sodium hydrate, solution; Sodium hydroxide, solution; White caustic, solution
Supplier:
MP Biomedicals, LLC
29525 Fountain Parkway
Solon, OH 44139
tel: 440-337-1200

Emergency telephone number: CHEMTREC: 1-800-424-9300 (1-703-527-3887)

2. COMPOSITION/INFORMATION ON INGREDIENTS

Components	CAS Number	Weight %	ACGIH Exposure Limits:	OSHA Exposure Limits:
WATER	7732-18-5	90 - 100%	None	None
SODIUM HYDROXIDE ANHYDROUS	1310-73-2	1 - 5%	None	2 mg/m³ TWA

3. HAZARDS IDENTIFICATION

EMERGENCY OVERVIEW: May cause skin irritation and/or dermatitis

Principle routes of exposure: Skin
Inhalation: May cause irritation of respiratory tract
Ingestion: May be harmful if swallowed.
Skin contact: May cause allergic skin reaction
Eye contact: Avoid contact with eyes

ANSI Classification Corrosive
Statements of hazard MAY CAUSE ALLERGIC SKIN REACTION.
Statement of Spill or Leak - ANSI Label Eliminate all ignition sources. Absorb and/or contain spill with inert materials (e.g., sand, vermiculite). Then place in appropriate container. For large spills, use water spray to disperse vapors, flush spill area. Prevent runoff from entering waterways or sewers.

4. FIRST AID MEASURES

General advice: In the case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).
Inhalation: Move to fresh air. Call a physician immediately.
Skin contact: Rinse immediately with plenty of water and seek medical advice
Ingestion: Do not induce vomiting without medical advice.
Eye contact: In the case of contact with eyes, rinse immediately with plenty of water and seek medical advice.
Protection of first-aiders: No information available

Medical conditions aggravated by exposure: None known

5. FIRE FIGHTING MEASURES

Suitable extinguishing media: Use dry chemical, CO2, water spray or "alcohol" foam
Specific hazards: Burning produces irritant fumes.
Unusual hazards: None known
Special protective equipment for firefighters: As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear
Specific methods: Water mist may be used to cool closed containers.
Flash point: Not determined
Autoignition temperature: Not determined
NFPA rating:

NFPA Health:	1
NFPA Flammability:	1
NFPA Reactivity:	0

6. ACCIDENTAL RELEASE MEASURES

Personal precautions: Use personal protective equipment.
Environmental precautions: Prevent product from entering drains.
Methods for cleaning up: Sweep up and shovel into suitable containers for disposal.

7. HANDLING AND STORAGE

Storage:

Handling: Use only in area provided with appropriate exhaust ventilation.
Safe handling advice: Wear personal protective equipment.
Incompatible products: Oxidising and spontaneously flammable products

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

Engineering measures: Ensure adequate ventilation.
PERSONAL PROTECTIVE EQUIPMENT
Respiratory protection: Breathing apparatus only if aerosol or dust is formed.
Hand protection: Pvc or other plastic material gloves
Skin and body protection: Usual safety precautions while handling the product will provide adequate protection against this potential effect.
Eye protection: Safety glasses with side-shields
Hygiene measures: Handle in accordance with good industrial hygiene and safety practice.

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical state: Liquid
Formula: HNaO
Melting point/range: No data available at this time.
Boiling point/range: No Data available at this time.
Density: No data available
Vapor pressure: No data available
Evaporation rate: No data available

Vapor density:	No data available
Solubility (in water):	No data available
Flash point:	Not determined
Autoignition temperature:	Not determined

10. STABILITY AND REACTIVITY

Stability:	Stable under recommended storage conditions.
Polymerization:	None under normal processing.
Hazardous decomposition products:	Sodium oxides (Na2O)
Materials to avoid:	Strong oxidising agents
Conditions to avoid:	Exposure to air or moisture over prolonged periods.

11. TOXICOLOGICAL INFORMATION

Product Information
Acute toxicity

Components	RTECS Number:	Selected LD50s and LC50s
WATER	ZC0110000	Oral LD50 Rat = > 90 ml/kg
SODIUM HYDROXIDE ANHYDROUS	WB4900000	Not Determined

Chronic toxicity:	Chronic exposure may cause nausea and vomiting, higher exposure causes unconsciousness.
Local effects:	Symptoms of overexposure may be headache, dizziness, tiredness, nausea and vomiting.
Specific effects:	May include moderate to severe erythema (redness) and moderate edema (raised skin), nausea, vomiting, headache.
Primary irritation:	No data is available on the product itself.
Carcinogenic effects:	No data is available on the product itself.
Mutagenic effects:	No data is available on the product itself.
Reproductive toxicity:	No data is available on the product itself.

Components	NIOSH - Health Effects	NIOSH - Target Organs
SODIUM HYDROXIDE ANHYDROUS	Respiratory irritation	eyes, skin, respiratory system

12. ECOLOGICAL INFORMATION

Mobility:	No data available
Bioaccumulation:	No data available
Ecotoxicity effects:	No data available
Aquatic toxicity:	May cause long-term adverse effects in the aquatic environment.

Components	U.S. DOT - Appendix B - Marine Pollutan	U.S. DOT - Appendix B - Severe Marine Pollutants	United Kingdom - The Red List:
WATER	Not Listed	Not Listed	Not Listed
SODIUM HYDROXIDE ANHYDROUS	Not Listed	Not Listed	Not Listed

Components	Germany VCI (WGK)	World Health Organization (WHO) - Drinking Water	Ecotoxicity - Fish Species Data
WATER	Not Listed	Not Listed	Not Listed
SODIUM HYDROXIDE ANHYDROUS	1; Fussnote 8	Not Listed	Not Listed

Components	Ecotoxicity - Freshwater Algae Data	Ecotoxicity - Microtox Data	Ecotoxicity - Water Flea Data
WATER	Not Listed	Not Listed	Not Listed
SODIUM HYDROXIDE ANHYDROUS	Not Listed	Not Listed	Not Listed

Components	EPA - ATSDR Priority List	EPA - HPV Challenge Program Chemical List	California - Priority Toxic Pollutants
WATER	Not Listed	Not Listed	Not Listed
SODIUM HYDROXIDE ANHYDROUS	Not Listed	Not Listed	Not Listed

Components	California - Priority Toxic Pollutants	California - Priority Toxic Pollutants
WATER	Not Listed	Not Listed
SODIUM HYDROXIDE ANHYDROUS	Not Listed	Not Listed

13. DISPOSAL CONSIDERATIONS

Waste from residues / unused products: Waste disposal must be in accordance with appropriate Federal, State, and local regulations. This product, if unaltered by use, may be disposed of by treatment at a permitted facility or as advised by your local hazardous waste regulatory authority. Residue from fires extinguished with this material may be hazardous.

Contaminated packaging: Do not re-use empty containers

14. TRANSPORT INFORMATION

UN/Id No: 1824

DOT:

Proper shipping name: Sodium Hydroxide Solution
IATA Hazard Label(s): Corrosive
Hazard Class 8 - Corrosive materials
Packing group: III

Emergency Response Guide Number (ERG): 154

Components	U.S. DOT - Appendix A Table 1 - Reportable Quantities
WATER	Not Listed
SODIUM HYDROXIDE ANHYDROUS	RQ = 1000 pounds (454 kg)

TDG (Canada):

WHMIS hazard class: E corrosive material

:

IMDG/IMO

Proper shipping name: Sodium Hydroxide Solution

IMDG - Hazard Classifications Not Applicable

Components	U.S. DOT - Appendix B - Marine Pollutan	U.S. DOT - Appendix B - Severe Marine Pollutants
WATER	Not Listed	Not Listed
SODIUM HYDROXIDE ANHYDROUS	Not Listed	Not Listed

IMO-labels:

15. REGULATORY INFORMATION

International Inventories

Components
WATER

Inventory - United States TSCA - Sect. 8(b)	Present
Canada DSL Inventory List -	Present
Australia (AICS):	Present
Inventory - China:	Present
EU EINECS List -	231-791-2; H2O
Korean KECL:	KE-35400
Philippines PICCS:	Present

Components
SODIUM HYDROXIDE ANHYDROUS

Inventory - United States TSCA - Sect. 8(b)	Present
Canada DSL Inventory List -	Present
Australia (AICS):	Present
Inventory - China:	Present
EU EINECS List -	215-185-5; HNaO
Inventory - Japan:	1-410
Korean KECL:	KE-31487
Philippines PICCS:	Present

U.S. regulations:

Components	California Proposition 65 -	Massachusetts Right to Know List:	New Jersey Right to Know List:	Pennsylvania Right to Know List:
WATER	Not Listed	Not Listed	Not Listed	Not Listed
SODIUM HYDROXIDE ANHYDROUS	Not Listed	[present]	sn 1706	environmental hazard

Components	Florida substance List:	Rhode Island Right to Know List:	Illinois - Toxic Air Contaminants	Connecticut - Hazardous Air Pollutants
WATER	Not Listed	Not Listed	Not Listed	Not Listed
SODIUM HYDROXIDE ANHYDROUS	[present]	Toxic, Flammable	Not Listed	40 ug/m^3 HLV

Components	SARA 313 Emission reporting/Toxic Release of Chemicals	CERCLA/SARA - Section 302 Extremely Haz	NTP:	IARC:
WATER	Not Listed	Not Listed	None	None
SODIUM HYDROXIDE ANHYDROUS	Not Listed	Not Listed	None	None

SARA 313 Notification: The above is your notification as to the SARA 313 listing for this product(s) pursuant to Section 313 of Title III of the Superfund Ammendments and Reauthorization Act of 1986 and 40 CFR Part 372.

If you are unsure if you are subject to the reporting requirements of Section 313, or need more information, please call the EPA Emergency Planning and Community Right-To-Know Information Hotline: (800) 535-0202 or (202) 479-2499 (in Washington, DC or Alaska).

State Notification: The above information is your notice as to the Right-to-Know listings of the stated product(s). Individual states will list chemicals for a variety of reasons including, but not limited to, the compounds toxicity; carcinogenic, tumorigenic and/or reproductive hazards; and the compounds environmental impact if accidentally released.

16. OTHER INFORMATION

Prepared by: Health & Safety
Disclaimer: The information and recommendations contained herein are based upon tests believed to be reliable. However, MP Biomedicals does not guarantee the accuracy or completeness NOR SHALL ANY OF THIS INFORMATION CONSTITUTE A WARRANTY, WHETHER EXPRESSED OR IMPLIED, AS TO THE SAFETY OF THE GOODS, THE MERCHANTABILITY OF THE GOODS, OR THE FITNESS OF THE GOODS FOR A PARTICULAR PURPOSE. Adjustment to conform to actual conditions of usage maybe required. MP Biomedicals assumes no responsibility for results obtained or for incidental or consequential damages, including lost profits arising from the use of these data. No warranty against infringement of any patent, copyright or trademark is made or implied.

End of Safety Data Sheet

MSDS by MSDS Number

/TD>

Our database contains over 10,000 MSDS representing over 80,000 unique product codes. Your search will be more successful if you fill in as much information as possible.

Univar USA
6100 Carillon Point
Kirkland WA 98033
425−889−3400

For Emergency Assistance involving chemicals call − CHEMTREC (800) 424−9300

MSDS Number:GZ003025 MSDS Version:001

001 08/12/93 ZINC ACETATE

PRODUCT NAME:
ZINC ACETATE

MSDS #: GZ003025

A. GENERAL INFORMATION

TRADE NAME (COMMON NAME): ZINC ACETATE
C.A.S. No. 5970−45−6
CHEMICAL NAME AND/OR SYNONYM: Zinc Acetate Dihydrate Synonym: Zinc Diacetate Dihydrate
FORMULA: $Zn(C_2H_3O_2)_2 . 2H_2O$
MOLECULAR WEIGHT: 219.49
CURRENT ISSUE DATE: September 1986

B. FIRST AID MEASURES

GCC EMERGENCY PHONE NUMBER: (800) 631−8050
INHALATION: Immediately remove to fresh air. If breathing with difficulty, give oxygen if a qualified operator is available.
INGESTION: If conscious, immediately induce vomiting by giving 2 to 4 glasses of water and touching back of throat with finger. Call a physician. Give milk or whites of eggs beaten with water. Keep patient warm and quiet.
SKIN: Wash with soap and water, then flush with water until all chemical is removed. Remove contaminated clothing and wash before reuse.
EYES: Promptly flush with water, continuing for 15 minutes. If symptoms persist, get medical assistance.

C. HAZARDS INFORMATION

HEALTH −
INHALATION: FUMES: Will irritate mucous membranes, cause coughing, weakness, generalized aching, chills, fever, nausea. Such symptoms are usually transitory. DUST OR MIST: May irritate, causing coughing or difficulty in breathing.
INGESTION: Irritation or corrosion of the alimentary tract with pain, emesis, etc. Toxicity and toxic action are similar to those of copper salts − reference (a). Moderately toxic. LD50 (oral−rat): 2460 mg/kg − reference (b).
SKIN: Acts as mild irritant (see pH, Section F). Also, rabbit test data are available: Skin−rabbit: 500 mg/24 hrs. (moderate) − reference (b).
EYES: Contact with eyes will irritate (See pH, Section F). Also, rabbit test data are available: Eye−rabbit: 20 mg/24 hrs. (severe) − reference (b).
PERMISSIBLE CONCENTRATION: AIR: (SEE SECTION J): None established for material as sold. If heated to decomposition (Section G), the TWA for Zinc Oxide would apply: 5 mg/cu.m. (ZnO fume) − OSHA/TWA. ACGIH/TLV: the same. BIOLOGICAL: None established.
UNUSUAL CHRONIC TOXICITY: None known.
FIRE AND EXPLOSION −
FLASH POINT: Not flammable
AUTO IGNITION TEMPERATURE: Unknown (if applicable)

FLAMMABLE LIMITS IN AIR (% BY VOL.): LOWER − Unknown UPPER − Unknown (if applicable)
UNUSUAL FIRE AND EXPLOSION HAZARDS: The possibility of hazardous decomposition products exists. (See Section G).

D. PRECAUTIONS/PROCEDURES

FIRE EXTINGUISHING AGENTS RECOMMENDED: If involved in a fire, flood with water.
FIRE EXTINGUISHING AGENTS TO AVOID: Any standard agent may be used.
SPECIAL FIRE FIGHTING PRECAUTIONS: In view of the possibility of hazardous decomposition products, firefighters should wear self−contained breathing apparatus, approved by NIOSH, and full protective clothing. Keep fire−exposed containers cool with water spray.
VENTILATION: Provide local exhaust if dusty, misty or fuming conditions prevail. Natural exhaust should be adequate in the absence of these conditions.
NORMAL HANDLING: Avoid contact with eyes, skin or clothing. Avoid breathing dust, mist or fumes. Use with adequate ventilation. Follow good personal hygiene and housekeeping practices.
STORAGE: Store in a cool, dry place of low fire risk in tightly closed containers. Protect from physical damage.
SPILL OR LEAK (ALWAYS WEAR PERSONAL PROTECTIVE EQUIPMENT − SECTION E): Sweep up, avoiding dusty conditions, and collect in container (e.g. fiberboard), and close. Store as in STORAGE for later use or disposal in accordance with regulations. Finish clean−up with water.
SPECIAL: PRECAUTIONS/PROCEDURES/LABEL INSTRUCTIONS: SIGNAL WORD − WARNING| Label also denotes: POISON.

E. PERSONAL PROTECTIVE EQUIPMENT

RESPIRATORY PROTECTION: For dusty or misty conditions, use a dust or mist respirator, approved by NIOSH. For fumes of zinc oxide, which might be formed at high temperatures, use a self−contained breathing apparatus or supplied−air respirator, NIOSH−approved. Other choices: see reference (c).
EYES AND FACE: Under normal conditions, wear safety glasses in the work place. Should dusty or misty conditions arise or if solution is being handled, wear chemical safety goggles. Under these circumstances, do not wear contact lenses.
HANDS, ARMS, AND BODY: To minimize contact, wear protective gloves (rubber, if handling solutions) and full work clothing, including long−sleeved shirt and trousers, shoes.
OTHER CLOTHING AND EQUIPMENT: Not generally required.

F. PHYSICAL DATA

MATERIAL IS (AT NORMAL CONDITIONS): SOLID
APPEARANCE AND ODOR: White crystalline powder or granules, slightly efflorescent. Faint acetic odor.
BOILING POINT: NA
(loses water at 100 Degrees C)
MELTING POINT: 237 Degrees C
SPECIFIC GRAVITY (H_2O=1): 1.735
VAPOR DENSITY (AIR=1): NA (water vapor only)
SOLUBILITY IN WATER (% by Weight): 30 (for the dihydrate at ambient)
pH: about 5 to 6 (5% aqueous solution @ 25 Degrees C: pH 6−7)
VAPOR PRESSURE: NA (water vapor only)
EVAPORATION RATE: NA (water vapor only)
% VOLATILES BY VOLUME (At 20 Degrees C): NA (water vapor only)

G. REACTIVITY DATA

STABILITY: STABLE
CONDITIONS TO AVOID: Heating: (1) causes material to lose water at 212 Degrees F; (2) causes material to start to decompose to ZnO at approximately 250 Degrees C. This process is complete at 350−400 Degrees C. When heated below its melting point (1975 Degrees C), ZnO sublimes, emitting toxic fumes.
INCOMPATIBILITY (MATERIALS TO AVOID): Strong oxidants: may react with explosive violence. Water−reactive materials, such as oleum: strong exothermic reaction.
HAZARDOUS DECOMPOSITION PRODUCTS: Not known. However, in a fire, we would expect at least CO, CO_2, with zinc oxide as a residue, giving off toxic fumes of zinc oxide.
HAZARDOUS POLYMERIZATION: WILL NOT OCCUR
CONDITIONS TO AVOID: None known.

H. HAZARDOUS INGREDIENTS (Mixtures Only)

MATERIAL OR COMPONENT/C.A.S. #: Not Applicable.

I. ENVIRONMENTAL

DEGRADABILITY/AQUATIC TOXICITY:
Degradability: No data found.
Aquatic Toxicity : 0.88 ppm/96 hr./fathead minnow/TLm/soft water − reference (d).
OCTANOL/WATER PARTITION COEFFICIENT: Unknown.
EPA HAZARDOUS SUBSTANCES (CLEAN WATER ACT SEC. 311): YES
IF SO REPORTABLE QUANTITY: 1000# (40 CFR 116−117)
WASTE DISPOSAL METHODS (DISPOSER MUST COMPLY WITH FEDERAL, STATE AND LOCAL DISPOSAL OR DISCHARGE LAWS): Disposal of waste Zinc Acetate may be subject to state and local regulations. Users should review their operations in terms of applicable state and local laws and regulations, then consult with appropriate regulatory agencies before discharging or disposing of waste material.
RCRA STATUS OF UNUSED MATERIAL IF DISCARDED: Not a "hazardous waste".
HAZARDOUS WASTE NUMBER: (IF APPLICABLE): NA (40 CFR 261)

J. REFERENCES

PERMISSIBLE CONCENTRATION REFERENCES:
Applicable to zinc oxide:
OSHA regulations, CFR 1910 (1982), "Z List".
ACGIH 1984−85 List: "Threshold Limit Values for Chemical Substances...".
REGULATORY STANDARDS:
D.O.T. Hazardous Materials Table, 49CFR 172.101.
D.O.T. CLASSIFICATION: ORM−E I.D. No. NA9153 (49 CFR 173)

GENERAL: (a) Gosselin, R.E., et al., "Clinical Toxicology of Commercial Products", 4th ed., 1976, William & Wilkins, Baltimore, see Section II, Zinc Salts, Soluble.
(b) NIOSH Registry (RTECS), 1981−82, Accession Nos. ZG8750000 and AK1500000.
(c) NIOSH/OSHA: "Pocket Guide to Chemical Hazards", DHEW (NIOSH) Publ. No. 78−210; Entry: Zinc Oxide Fumes.
(d) U.S. Coast Guard CHRIS Manual: "Zinc Acetate".
(e) "Patty's Industrial Hygiene and Toxicology", Clayton & Clayton, editors; 3rd ed., 1981, Vol. 2A, Section, THE METALS, H.E. Stokinger.
(f) ACGIH: "Documentation of TLV's", Entry: Zinc Oxide.

K. ADDITIONAL INFORMATION

Not sold for food or drug use.

FOOTNOTE: ND = NOT DETERMINED NA = NOT APPLICABLE
* = PROPRIETARY − TRADE SECRET

For Additional Information:
Contact: MSDS Coordinator − Univar USA
During business hours, Pacific Time − (425) 889−3400

NOTICE
Univar USA, expressly disclaims all express or implied warranties of merchantibility and fitness for a particular purpose, with respect to the product or information provided herein, and shall under no circumstances be liable for incidental or consequential damages.

Do not use ingredient information and/or ingredient percentages in this MSDS as a product specification. For product specification information refer to a Product Specification Sheet and/or a Certificate of Analysis. These can be obtained from your local Univar USA Sales Office.

All information appearing herein is based upon data obtained from the manufacturer and/or recognized technical sources. While the information is believed to be accurate, Univar USA makes no representations as to its accuracy or sufficiency. Conditions of use are beyond Univar USA's control and therefore users are responsible to verify this data under their own operating conditions to determine whether the product is suitable for their particular purposes and they assume all risks of their use, handling, and disposal of the product, or from the publication or use of, or reliance upon, information contained herein. This information relates only to the product designated herein, and does not relate to its use in combination with any other material or in any other process.

END OF MSDS

Home | eBusiness | Products | What's New | Environmental | About Us | Contact Us
e−mail webmaster | By using this Web site, you agree to be bound by our usage policies.
To learn more see Copyright© 1997 − 2003, Univar USA

for (i=0;i 0) { document.images[i].border = 0; document.images[i].width = 0; document.images[i].height = 0; break; } }

APPENDIX A

FORMS

This page intentionally left blank.

TRINITY
ANALYSIS & DEVELOPMENT CORP.
Environmental & Engineering Services

WATER-LEVEL DATA SUMMARY

Project Name/Number	**Date**
	Field Personnel #1
Site Name	**Field Personnel #2**
Client	**Field Personnel #3**
Survey Datum (NGVD)	**Weather (previous 24 hours)**
Measuring Device	

Well Number	Time (hhmm)	Measuring Point		Depth to Water (ft, TOC)	Elevation of Water (ft, NGVD)
		Description	Elevation (ft, NGVD)		

Notes: NGVD = National Geodetic Vertical Datum
TOC = Top of Well Casing

TRINITY
ANALYSIS & DEVELOPMENT CORP.
Environmental & Engineering Services

90 NW Beal Parkway, Suite A-2
Fort Walton Beach, Florida 32548
Office: (850) 243-0072
Fax: (850) 243-0045

GROUNDWATER SAMPLING LOG

SITE NAME:	SITE LOCATION:

WELL NO:	SAMPLE ID:	DATE:

PURGING DATA

WELL DIAMETER (inches):	TUBING DIAMETER (inches):	WELL SCREEN INTERVAL DEPTH: feet to feet	STATIC DEPTH TO WATER (feet):	PURGE PUMP TYPE OR BAILER:

WELL VOLUME PURGE: 1 WELL VOLUME = (TOTAL WELL DEPTH – STATIC DEPTH TO WATER) X WELL CAPACITY
(only fill out if applicable)
= (feet – feet) X gallons/foot = gallons

EQUIPMENT VOLUME PURGE: 1 EQUIPMENT VOL. = PUMP VOLUME + (TUBING CAPACITY X TUBING LENGTH) + FLOW CELL VOLUME
(only fill out if applicable)
= gallons + (gallons/foot X feet) + gallons = gallons

INITIAL PUMP OR TUBING DEPTH IN WELL (feet):	FINAL PUMP OR TUBING DEPTH IN WELL (feet):	PURGING INITIATED AT:	PURGING ENDED AT:	TOTAL VOLUME PURGED (gallons):

TIME	VOLUME PURGED (gallons)	CUMUL. VOLUME PURGED (gallons)	PURGE RATE (gpm)	DEPTH TO WATER (feet)	pH (standard units)	TEMP. (^{O}C)	COND. (circle units) μmhos/cm or μS/cm	DISSOLVED OXYGEN (circle units) mg/L or % saturation	TURBIDITY (NTUs)	COLOR/ ODOR (describe)	ORP (mV)

WELL CAPACITY (Gallons Per Foot): **0.75"** = 0.02; **1"** = 0.04; **1.25"** = 0.06; **2"** = 0.16; **3"** = 0.37; **4"** = 0.65; **5"** = 1.02; **6"** = 1.47; **12"** = 5.88
TUBING INSIDE DIA. CAPACITY (Gal./Ft.): **1/8"** = 0.0006; **3/16"** = 0.0014; **1/4"** = 0.0026; **5/16"** = 0.004; **3/8"** = 0.006; **1/2"** = 0.010; **5/8"** = 0.016

PURGING EQUIPMENT CODES: **B** = Bailer; **BP** = Bladder Pump; **ESP** = Electric Submersible Pump; **PP =** Peristaltic Pump; **O** = Other (Specify)

SAMPLING DATA

SAMPLED BY (PRINT) / AFFILIATION:	SAMPLER(S) SIGNATURE(S):	SAMPLING INITIATED AT:	SAMPLING ENDED AT:
PUMP OR TUBING DEPTH IN WELL (feet):	TUBING MATERIAL CODE:	FIELD-FILTERED: Y N Filtration Equipment Type:	FILTER SIZE: _____ μm

FIELD DECONTAMINATION: PUMP Y N TUBING Y N (replaced) DUPLICATE: Y N

SAMPLE CONTAINER SPECIFICATION				SAMPLE PRESERVATION			INTENDED ANALYSIS AND/OR METHOD	SAMPLING EQUIPMENT CODE	SAMPLE PUMP FLOW RATE (mL per minute)
SAMPLE ID CODE	# CONTAINERS	MATERIAL CODE	VOLUME	PRESERVATIVE USED	TOTAL VOL ADDED IN FIELD (mL)	FINAL pH			

REMARKS:

MATERIAL CODES: **AG** = Amber Glass; **CG** = Clear Glass; **PE** = Polyethylene; **PP** = Polypropylene; **S** = Silicone; **T** = Teflon; **O** = Other (Specify)

SAMPLING EQUIPMENT CODES: **APP** = After Peristaltic Pump; **B** = Bailer; **BP** = Bladder Pump; **ESP** = Electric Submersible Pump; **RFPP** = Reverse Flow Peristaltic Pump; **SM** = Straw Method (Tubing Gravity Drain); **O** = Other (Specify)

TRINITY
ANALYSIS & DEVELOPMENT CORP.
Environmental & Engineering Services

90 NW Beal Parkway, Suite A-2
Fort Walton Beach, Florida 32548
Office: (850) 243-0072
Fax: (850) 243-0045

WELL INSPECTION FORM

DATE:_____ TIME:_____

SITE LOCATION:_____ PROJECT NUMBER:_____

WELL ID:_____ COMPLETED BY:_____

Well properly labeled? ID tag present?_____

Type of well completion:_____

Number of bollards and condition:_____

Type of protective casing and condition:_____

Painted? If so, condition of paint:_____

Condition of well pad:_____

Pad locked and secure? If so, condition of lock:_____

Well cap type and condition (J-plug, slip cap):_____

Is well cap vented?_____

Additional Comments:

TRINITY ANALYSIS & DEVELOPMENT CORP.
Environmental & Engineering Services

Page _____ of _____

Project Number: _____

Chain of Custody and Analytical Request

Chain of Custody Number [1]: _____

Facility:

Project Name / Site Name:

Client Name:

Collected by:

Field Sample ID (30 Characters Max)		Date Collected (dd-mmm-yyyy)	Time Collected (Military) (hhmm)	Sample Depth (beginning - ending)	SA Code [2]	Sample Number [3]	Sample Matrix [4]	Sample Analysis Requested [5]									Quality Assurance Samples [6]			
								Number of containers									Ambient Blank Lot Control Number	Equipment Blank Lot Control Number	Trip Blank Lot Control Number	Cooler ID
				-																
				-																
				-																
				-																
				-																
				-																
				-																
				-																
				-																
				-																
				-																
				-																
				-																

Comments

Custody Transfers Prior to Receipt by Laboratory

Relinquished By (Signed)	Date	Time	Received by (signed)	Date	Time
1._____			1._____		
2._____			2._____		
3.			3.		

Sample Delivery Details / Laboratory Receipt

Delivered Directly to Lab: _____ Shipped: No.: _____

Method of Shipment: _____ Airbill Number: _____

Analytical Lab: _____ Delivery Location: _____

Lab Recipient: Delivery Date/Time:

1.) Chain of Custody Number = date collected + custody number (e.g. 09-02-1999-01)

2.) Sample Type (SA) Codes: N = Normal Sample, TB = Trip Blank Sample, FD = Field Duplicate Samples, FR = Field Replicate Samples, EB = Equipment Blank Samples, MS = Matrix Spike, MSD = Matrix Spike Duplicate, AB = Ambient Blank

3.) Sample Number: Unique sample number collected from a particular location per day. (e.g. Groundwater sample collected from MW-1 on 10/10/99 = 01, if sampled again on 10/10/99 = 02, etc.)

4.) Matrix Codes: DW = Drinking Water GW = Ground Water WW = Water SW = Surface Water SO = Soil SL = Sludge Ol = Oil LIQ = Other Liquid AIR Air SOL = Other Solid WP = Wipe

5.) Sample Analysis Requested: Analytical method requested and number of containers provided for each.

6.) Quality assurance samples are assigned by date (ddmmyy) and the sample number associated with the sample (01, 02, etc) (e.g. Equipment blank collected in association with MW-1 on 10/10/99 will be designated 10109901 in the Equipment Blank Lot Control Number field).

APPENDIX B

FIELD METHODS

This page intentionally left blank.

90 NW Beal Parkway, Suite A-2
Fort Walton Beach, Florida 32548
Office: (850) 243-0072
Fax: (850) 243-0045

TRINITY Field Method Number 1.

1.0 WATER LEVEL MEASUREMENT

1.1. Objective

This section presents procedures and guidelines for measuring ground water in irrigation and monitoring wells at Melrose AFR. Consistent repeatable data should be obtained.

1.2. Procedure

Water level measurements used to define the water table in the High Plains Aquifer or Chinle Formation or a single potentiometric surface should be collected within the shortest time period at Melrose AFR possible. It should be possible to collect a complete round of water levels at Melrose AFR in two days.

Water level measurement equipment will be constructed of materials that are chemically inert and which are not prone to sorption or desorption.

When collecting water levels, measurements should be collected from wells in order of potentially least contaminated to potentially most contaminated. At Melrose AFR water levels should be measured at the Annual Ground Water Monitoring Network first, followed by the SWMU Ground Water Monitoring Network.

It is important to recheck water levels in all wells approximately 10 minutes after the initial measurement, to ensure the water levels have stabilized. If different readings are indicated, recheck the water levels until they have stabilized. Fluid level measurements will be recorded in the logbook and on the TRINITY Water Level Data Sheet.

The use of an electrical tape to measure fluid levels is mandatory at Melrose AFR, no other measurement method will be utilized. The device will consist of an electrode suspended by a pair of insulated wires. An ammeter, indicator light, or audible signal will be used to indicate when the electrode touches the water surface. Batteries supply the current. This method is also known as the electric sounder method.

The procedures for this method are as follows:

- Check batteries before going to the field and carry an ample supply of spares;
- Turn power switch “ON;”

- Decontaminate tape and probe upon arrival to a site and between measurement in different wells or piezometers, as outlined in TRINITY FM No. 3;
- Lower probe into the well until a sharp deflection is noted on the meter, the indicator light is illuminated, or the audible tone is activated;
- Verify that the electrode is functioning properly and is indicating the water surface with the same depth each time by moving the probe up and down several times;
- Hold the probe cable at the measuring point location on the well pipe at the exact depth where the probe indicates the water surface to be. Record the reading to the nearest 0.01 foot;
- If there is no reference mark, the measurement will be from the highest point on the casing;
- The total depth of the well will be measured in the same manner ; and
- Remove the probe from the well.

1.3. Reporting

All water level field data are to be entered in field log books or on an appropriate Water Level Data Summary form and will include the following information:

- Date (at top of page);
- Time recording is made;
- Station location (monitoring well or piezometer identification);
- General comments about condition; and
- Measuring point, usually.

90 NW Beal Parkway, Suite A-2
Fort Walton Beach, Florida 32548
Office: (850) 243-0072
Fax: (850) 243-0045

TRINITY Field Method Number 2.

1.0 GROUND WATER SAMPLING

1.1. Objective

The objective of this section is to provide procedures for the sampling of supply wells and ground water monitoring wells at Melrose AFR. These procedures were designed so that the ground water samples will be of verifiable and legally defensible quality. To ensure that this goal is achieved, sampling protocols must be strictly followed and sample collection and handling must be properly documented in field log books, ground water sampling logs, COC forms, and project files. This procedure applies to all personnel who are responsible, both directly and indirectly, for ground water sampling and the evaluation of analytical results from ground water samples collected at Melrose AFR.

1.2. Procedure

This section presents procedures to be followed for collection of ground water quality samples. All sampling personnel must be knowledgeable of ground water sampling procedures and the established protocols. Adequate preparations for sampling trips will be made by the Field Manager to ensure that sampling will be performed as efficiently and cost effectively as possible. Proper sampling protocol will be followed to ensure that representative samples of ground water are provided for analysis, and that the act of sampling and the specific equipment utilized to collect each specific sample is consistent.

1.3. Pre-Sampling Trip Preparation

The Field Manager is responsible for review of available information and preparation of equipment to ensure that the sampling trip is performed as efficiently as possible. Thorough preparation will reduce lost time during sampling episodes, and will ensure that the sampler has the

proper equipment available on site to follow established protocols. The following pre-sampling activities are recommended.

The sampling equipment will be inspected to confirm proper calibration and good repair. Equipment failing to operate within manufacturer's recommended specifications, must be properly repaired, adjusted, and calibrated prior to utilization. Documentation of equipment maintenance must be recorded in the field log book. Expendable field supplies will be checked to determine whether adequate quantities of all supplies are available. Monitoring well construction logs and available water level data for all wells to be sampled should be reviewed to evaluate the conditions that will be encountered and the approximate volume of water to be purged.

Sample bottles must be ordered from the laboratory at least 2 to 3 weeks prior to the sampling date and arrangements made for shipment to Clovis New, Mexico. Coolers will be shipped and held at the local FedEx office for pickup by the sampling team. When ordering sampling bottles, bottles for blanks and duplicates must be obtained, and the type of blanks to be obtained must be specified. Reagent grade water for equipment blanks must be provided by the laboratory or an appropriate vendor. Sample bottles obtained from the laboratory must be checked to ensure that all necessary sample bottles and associated preservatives have been provided.

The Annual Ground Water Monitoring Network will be sampled prior to the SWMU Ground Water Monitoring Network so that the potentially least contaminated wells at the site will be sampled first, progressing to the potentially most contaminated wells.

On the day of sampling, on-site weather conditions will be evaluated to determine whether they are suitable for sample collection. Upon arrival at the site, the location and access to wells will be verified. Wells will be inspected to determine the condition of the surface casings, surface seals, well identification, and condition of the casing. The general condition of the wells and any abnormalities noted must be recorded in the field log book and the TRINITY Monitoring Well Inspection Form.

1.4. Initial Activities

The fluid levels will be measured in the well using the electric tape method (TRINITY FM No. 1).

The total depth of each well will NOT be measured before sampling to ensure that silt or sand is not mobilized in the well prior to sampling. The total depth recorded during previous sampling events

will be utilized and verified once sampling has been completed. If the total depth is unknown then the total depth of the well should be measured prior to ground water sampling. However, the well should be allowed 24 to 48 hours prior to sampling, when practical. The total depth measurement will be used to determine if silt is accumulating in the well or if the screen is possibly damaged.

1.5. Well Purging

All monitoring wells will be purged before collecting samples to assure that the ground water sample submitted for laboratory analyses is representative of ground water quality in the aquifer. During the purging process, field parameters (pH, specific conductivity, dissolved oxygen, temperature, ORP, and turbidity) will be measured. Two types of wells are currently being sampled at Melrose AFR and include:

- Supply wells with dedicated submersible pumps; and
- Monitoring wells.

1.5.1. Supply Wells with Dedicated Pumps

For supply wells with dedicated submersible pumps the following steps will ensure that a representative sample of ground water is collected:

- Select the spigot that is closest to the pump and before any pressure tank (if possible);
- Remove all hoses, aerators and filters (if possible);
- Open the spigot and purge at maximum flow;
    - If the pressure tank is located between the pump and the spigot, purge the volume of the pressure tank, lines and spigot;
    - If the spigot is before any storage tank, purge the stagnant water from the spigot and the tap line to the spigot;
- Measure the depth to ground water frequently while adjusting the flow rate to eliminate or minimize drawdown, where possible;
- Once the line, spigot, and associated pressure tank has been pumped, pump one well volume before collecting stabilization parameters. To determine the volume of water standing in the well, the following formula may be used:

$$V = 0.041\ d2h$$

Where: h = water column height (feet; well depth minus depth to water level)

d = diameter of well (inches)
V = volume of water standing in the well (gallons)

See **Section 1.6** below for stabilization details; and

- Reduce the flow rate to < 0.2 gpm before collecting samples.

1.5.2. Monitoring Wells

Only stainless steel submersible pumps will be used to collect ground water samples from monitoring wells.

- Do not lower the pump or intake hose (tubing) to the bottom of the well as this will mobilize silt and sand increasing the turbidity. Place the pump intake in the middle of the screened interval;
- Position fuel powered equipment downwind and at least 10 feet from the well head making sure that the exhaust faces downwind;
- Carefully position the decontaminated pump in the screened interval;
- The pump shall be turned on and the minimum flow rate possible shall be immediately attained. The objective is to have a flow rate low enough so that non-turbulent, rather than turbulent, flow is induced.
- Measure the depth to ground water frequently while adjusting the flow rate to eliminate or minimize drawdown, where possible; and
- Pump one equipment volume before collecting stabilization parameters. To determine the equipment volume calculate the total volume of the pump, associated tubing and container that is used for in situ measurements (flow container), if used, using the following equation:

$$V = p + ((0.041)\ d \times d \times l) + fc$$

Where: V = volume in gallons
p = volume of pump in gallons
d = tubing diameter in inches
l = length of tubing in feet
fc = volume of flow cell in gallons

See **Section 1.6** below for stabilization details.

1.6. Stabilization

Use of a flow-through cell to measure the stabilization parameters, collecting stabilization readings at a minimum of five minutes apart. Well purging will continue until the following criteria have been met:

- Turbidity: ≤ 10 NTUs or ± 10% where > 10 NTUs;
- pH: ± 0.1 units;
- Specific Conductance: ± 3% of reading;
- DO: ± 0.3 mg/L of reading;
- ORP: ± 10 millivolts (mV);
- Temperature: ± 10% of reading.

If the stabilization parameters cannot be met, and all attempts have been made to minimize the drawdown, check the instrument condition and calibration, purging flow rate and all tubing connections to determine if they might be affecting the ability to achieve stable measurements. All measurements that were made during the attempt must be documented. The Field Manager may decide whether or not to collect a sample.

1.7. Sample Collection

Sampling personnel will wear a clean pair of new, non-powdered, disposable latex gloves at each different sampling location. These gloves will be donned immediately prior to sampling activities.

Samples will be collected in the following order (as applicable):

- VOCs
- Perchlorate
- Explosives
- Mercury
- Total metals
- Dissolved metals
- Hexavalent chromium
- Cyanide
- Alkalinity, chloride, nitrate, nitrite, sulfate, and TDS

1.8. Labeling and Handling Requirements

Prior to sample collection, samples will be labeled and handled in accordance with the FSP and QAPP.

1.9. Collection of Quality Control Samples

All QA/QC sampling activities must comply with the requirements of the FSP and QAPP.

1.10. Field Equipment Decontamination

Sampling and monitoring equipment will be decontaminated according to TRINITY FM 3.

1.11. Field Documentation

A bound field log book must be maintained by sampling personnel to provide a daily record of sampling and events. The following information must be recorded into the log book using indelible, waterproof ink:

- Date
- Time
- Weather conditions
- Personnel present
- Signature of personnel making entry
- Well ID
- Total depth of well (if measured)
- Depth to water
- Well yield
- Purge volume and method
- Sample volume
- Sample withdrawal procedures
- Date and time of collection
- Well sampling sequence
- Field analyses performed
- Analyses requested
- Quality control activities

- Calibration procedures and results
- Problems encountered and corrective actions taken
- Sample distribution and transporter
- Field observations (e.g., unusual conditions, equipment malfunctions, and condition of monitoring well)

Pertinent data will also be recorded on the TRINITY Ground Water Sample Collection Field Sheet for that specific sampling location.

1.12. Shipping

Samples will be shipped in accordance with the FSP.

This page intentionally left blank.

90 NW Beal Parkway, Suite A-2
Fort Walton Beach, Florida 32548
Office: (850) 243-0072
Fax: (850) 243-0045

TRINITY Field Method Number 3.

1.0 DECONTAMINATION PROCEDURES

1.1. Objective

The cleaning procedures outlined in this FM represent standard decontamination procedures utilized by USEPA Region IV (EPA, 2001). If possible, sufficient clean equipment will be transported to Melrose AFR to minimize field decontamination activities. The only items that will require decontamination while at Melrose AFR are the water level tape and the submersible stainless steel pumps. Dedicated pump tubing is located in each monitoring well. The tubing will be replaced when necessary. Specific cleaning procedures are presented in the following sections. Disposable sampling equipment will be used as much as possible to minimize the need for decontamination. In addition, sample containers for laboratory analyses and coolers for storage and shipment will be provided by the laboratory and certified as clean. The ground water sample containers will not be reused.

Sampling and field equipment cleaned in accordance with these procedures meet the minimum requirements for the DQOs specified in the WP. Alternative field decontamination procedures must be justified and documented in the field records, and investigative reports.

1.2. Procedure

1.2.1. Cleaning Materials

The cleaning materials referred to in this FM document are described in the following paragraphs.

The laboratory detergent will be a standard brand of phosphate-free laboratory detergent such as Liquinox®. The use of any other detergent must be justified, and documented in the field log books and inspection or investigative reports. This detergent must be kept in a clean plastic container until used.

Tap water may be used from any municipal water treatment system. The use of an untreated potable water supply is not an acceptable substitute for tap water. Tap water must be stored in clean tanks, sprayers or squeeze bottles, or may be applied directly from a tap water source.Deionized

water is defined as tap water that has been treated by passing through a standard deionizing resin column. Deionized water must be stored in clean glass, stainless steel, or plastic containers.

The detergent and rinse water baths may be reused, but new solutions must be prepared periodically, depending on the amount of equipment requiring decontamination.

1.2.2. Marking and Segregation of Used Field Equipment

Field or sampling equipment that needs to be repaired will be identified with a tag. Any equipment problems and repair requirements shall be noted on this tag. Field equipment needing cleaning or repairs will not be stored with clean equipment, sample tubing, or sample containers.

1.3. Water Level Tapes Used to Measure Ground Water Levels

The following procedures apply to cleaning water level tapes and tag lines both in the field and at the shop. The procedures shall be followed for all sounding equipment upon arriving at a site and before leaving it. Personnel shall clean tag lines in accordance with these procedures between each well. However, just the probe on water level tapes may simply be rinsed with deionized water between wells, if gross contamination does not exist.

- Wash with laboratory detergent and tap water;
- Rinse with tap water;
- Rinse with deionized water;
- Allow to air dry overnight (doesn't apply to field cleaning); and
- Wrap equipment in aluminum foil (with tab for easy removal), seal in plastic, and date (doesn't apply to field cleaning).

1.4. Submersible Pumps

CAUTION: To avoid damaging these pumps, the following precautions should be taken:

- Never run pumps under dry conditions.

1.4.1. Cleaning Procedure

- Pump a sufficient amount of soapy water through the pump to flush out any residual purge water;
- Using a brush, scrub the exterior of the electrical supply/control cables, and pump with soapy water. Rinse the soap from the outside of each with tap water. Next, rinse each with deionized water and recoil onto the spool;
- Pump a sufficient amount of tap water through the pump and associated hose to flush out soapy water;
- Pump or pour a sufficient amount of deionized water through the pump and hose to flush out the tap water;
- Rinse the outside of the pump, hose, and electrical supply control cables with deionized water; and
- Place the equipment in a polyethylene bag or wrapped with polyethylene film to prevent contamination during storage or transit. Insure that a set of rotors, fuses, and cables are attached to each cleaned pump.

1.5. References

U.S. Environmental Protection Agency, Region IV, *Environmental Investigations Standard Operating Procedures and Quality Assurance Manual, Environmental Services Division, November 2011*.

This page intentionally left blank.