

Work Plan for the Regional Compliance  
Restoration Program Preliminary  
Assessment/Site Inspection  
Schenectady Air National Guard Base  
Scotia, New York

Final

June 2014

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U.S. Army Corps of Engineers  
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Contract No. W912DR-12-D-0014  
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June 2014

# Work Plan for the Regional Compliance Restoration Program Preliminary Assessment/Site Inspection Schenectady Air National Guard Base Scotia, New York

## Final

## Qualified Environmental Professional Certification

I certify that I am currently a NYS registered professional engineer and that this Work Plan for Schenectady Air National Guard (ANG) was prepared in accordance with all applicable statutes and regulations and in substantial conformance with the DER Technical Guidance for Site Inspection and Remediation (DER-10) and that all activities were performed in full accordance with the DER-approved work plan and any DER-approved modifications.

Respectfully submitted,  
AECOM



June 24, 2014

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Registered Professional Engineer  
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# Table of Contents

<b>1</b>	<b>INTRODUCTION.....</b>	<b>1-1</b>
1.1	Scope and Objectives .....	1-1
1.2	Work Plan Organization.....	1-2
1.3	Project Organization and Responsibilities .....	1-2
1.4	Quality Assurance/Quality Control.....	1-2
1.5	Health and Safety Requirements.....	1-3
1.6	Public Affairs .....	1-3
1.7	Data Management.....	1-3
1.8	Schedule .....	1-4
1.9	SI Report .....	1-4
<b>2</b>	<b>SITE DESCRIPTION.....</b>	<b>2-1</b>
2.1	Site Topography and Drainage.....	2-1
2.2	Site Geology/Hydrogeology .....	2-1
<b>3</b>	<b>SITE HISTORY .....</b>	<b>3-1</b>
<b>4</b>	<b>PRELIMINARY PATHWAY EVALUATION .....</b>	<b>4-1</b>
4.1	Groundwater Pathway.....	4-1
4.2	Surface Water Pathway.....	4-1
4.3	Soil Exposure and Air Migration Pathways.....	4-1
<b>5</b>	<b>PRELIMINARY ASSESSMENT .....</b>	<b>5-1</b>
5.1	Regulatory Framework .....	5-2
5.2	AOC-Former Building 13 Area (ZZ007).....	5-2
5.2.1	Previous Investigation .....	5-2
5.2.2	Recommendation .....	5-2
5.3	AOC-Former Heating Oil UST #41, Former Building 4 (TU008) .....	5-2
5.3.1	Previous Investigation .....	5-2
5.3.2	Recommendations .....	5-3
5.4	AOC-Waste Water Treatment Plant (WWTP) Bypass UST near IRP Site 6 (TU009) .....	5-3
5.4.1	Previous Investigations.....	5-3
5.4.2	Recommendations .....	5-3
5.5	AOC-Former JP-8 Reclamation UST (TU010) .....	5-3
5.5.1	Previous Investigations.....	5-3
5.5.2	Recommendations .....	5-3
5.6	AOC-Building 19 Drains (DD011).....	5-4
5.6.1	Previous Investigations.....	5-4
5.6.2	Recommendations .....	5-4
5.7	AOC-Building 35 Drains (DD012).....	5-4
5.7.1	Previous Investigations.....	5-4
5.7.2	Recommendations .....	5-4
5.8	Summary .....	5-5
<b>6</b>	<b>SI FIELD OPERATIONS.....</b>	<b>6-1</b>
6.1	Site Preparation.....	6-1
6.2	Personnel Qualifications.....	6-1
6.3	Permits and Notifications.....	6-1
6.4	Sample Identification .....	6-2
6.5	Analyses.....	6-2
6.6	Subsurface Soil Sampling- Direct Push.....	6-2
6.7	Groundwater Sampling.....	6-3
6.8	IDW Management .....	6-3
6.9	Documentation .....	6-4
<b>7</b>	<b>REFERENCES.....</b>	<b>7-1</b>

## Appendices

Appendix A	Figures
Appendix B	Tier II UFP-QAPP
Appendix C	Accident Prevention Plan
Appendix D	Supporting Documentation
Appendix E	Laboratory Accreditation Certificate
Appendix F	Field Standard Operating Procedures

## List of Tables

Table ES-1. Summary of the Preliminary Assessment .....	vii
Table 1-1. Proposed Schedule- Schenectady ANGB.....	1-4
Table 5-1. Points of Contact: Schenectady ANGB .....	5-1
Table 5-2. Summary of the Preliminary Assessment .....	5-5
Table 6-1: Sampling Program .....	6-1

## List of Acronyms and Abbreviations

AOC	Area of Concern
ANG	Air National Guard
ANGB	Air National Guard Base
APP	Accident Prevention Plan
bgs	Below Ground Surface
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
COPC	Contaminants of Potential Concern
CP	Commissioner Policy
CPR	Cardiopulmonary Resuscitation
CSM	Conceptual Site Model
DoD	Department of Defense
DPT	Direct Push Technology
ECATS	Environmental Consulting and Training Services
EPA	Environmental Protection Agency
EESOH-MIS	Enterprise Environmental Safety and Occupational Health-Management Information System
ft.	Feet
GIS	Geographic Information Systems
GPS	Global Positioning System
GPR	Ground-Penetrating Radar
HAZWOPER	Hazardous Waste Operations and Emergency Response
IDW	Investigation Derived Waste
IRP	Installation Restoration Program
NFA	No Further Action
NYANG	New York Air National Guard
NYSDEC	New York State Department of Environmental Conservation
PA	Preliminary Assessment
PID	Photoionization Detector
PVC	Poly-vinyl chloride
QA	Quality Assurance
QAPP	Quality Assurance Project Plan
QC	Quality Control
SI	Site Inspection
SOP	Standard Operating Procedure
SVOC	Semivolatile Organic Compounds
TOGS	Technical and Operational Guidance Series
UFP	Uniform Federal Policy
U.S.	United States
USACE	United State Army Corps of Engineers
UST	Underground Storage Tank
VOC	Volatile Organic Compounds
WWTP	Wastewater Treatment Plant

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## Executive Summary

Under contract to the US Army Corps of Engineers Baltimore District and the Air National Guard, AECOM will conduct a Preliminary Assessment and Site Inspection at the Schenectady Air National Guard, 109th Airlift Wing, Schenectady Air National Guard Base (ANGB), Schenectady County, New York. Schenectady ANGB began operating at the Schenectady County Airport in 1948 as the 109th Fighter Squadron. From that time to present, various military aircraft support activities have taken place at the base. The major support operations include aircraft fueling, aircraft deicing, aircraft maintenance, aerospace ground equipment maintenance, ground vehicle maintenance, fueling of ground vehicles, and facilities maintenance.

Based on findings from a Trip Report conducted by BB&E in 2011, conducted under the One Clean environmental program, and a Phase I Environmental Baseline Survey 2006, six Areas of Concern (AOCs) have been identified as part of this contract, including:

- Former Building 13 Area (near Aerospace Ground Equipment Area);
- Former Heating Oil Underground Storage Tank (UST) #41, Former Building 4 (near Security Forces Squadron);
- Waste Water Treatment Plant (WWTP) Bypass UST near Site 6;
- Former JP-8 Reclamation UST at Building 29;
- Building 19 Drains; and
- Building 35 Drains.

Table ES-1 presents a summary of the Preliminary Assessment at Schenectady ANGB.

**Table ES-1. Summary of the Preliminary Assessment**

AOC ID Code	Site Description (EESOH-MIS Site ID)	Recommendation	Rationale
ZZ007	Former Building 13 Area	Site Inspection	Hazardous materials were used and hazardous waste generated at the former Building 13 area. No sampling or closure information could be located. Five borings are proposed in the former Building 13 area to collect soil and groundwater sample for analysis of volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), and metals.
TU008	Former Heating Oil UST #41, Former Building 4	Site Inspection	Sampling and closure documentation cannot be located. A ground penetrating radar survey will be used to confirm that the UST has been removed. Due to the possibility of leaks, five soil borings are proposed to collect soil and groundwater in the vicinity for analysis of VOCs and SVOCs.
TU009	WWTP Bypass UST near IRP Site 6	Site Inspection	The WWTP has been abandoned and the UST is no longer needed or functional. GPR will be used to locate the UST. Due to the possibility of leaks, four soil borings are proposed to collect soil and groundwater in the vicinity for analysis of VOCs, SVOCs, and metals.
TU010	Former JP-8 Reclamation UST	No Further Action	The JP-8 Reclamation UST has been closed by the New York State Department of Conservation, the monitoring wells have been decommissioned, and the tank closure letter provided.

**Table ES-1. Summary of the Preliminary Assessment (Continued)**

<b>AOC ID Code</b>	<b>Site Description</b>	<b>Recommendation</b>	<b>Rationale</b>
DD011	Building 19 Drains	Site Inspection	Building 19 formerly utilized acid neutralization areas. Disposal of corrosive chemicals in this manner could have caused deterioration and leakage from the drain system. Inspection will begin with a camera survey of the condition of the lines. If deterioration of the drains is detected, up to three soil borings are proposed to collect soil and groundwater for analysis of metals and pH.
DD012	Building 35 Drains	Site Inspection	Building 35 formerly utilized acid neutralization areas. Disposal of corrosive chemicals in this manner could have caused deterioration and leakage from the drain system. Inspection will begin with a camera survey of the condition of the lines. If deterioration of the drains is detected, up to three borings are proposed to collect soil and groundwater for analysis of metals and pH.

Note:

AOC ID Codes are the same as the Enterprise Environmental Safety and Occupational Health-Management Information System (EESOH-MIS) ID Codes

# 1 Introduction

Under contract to the US Army Corps of Engineers (USACE) Baltimore District and the Air National Guard (ANG), AECOM will conduct a Preliminary Assessment (PA) and Site Inspection (SI) at AOCs that have been identified by the ANG. This Work Plan addresses the AOCs located on Schenectady Air National Guard Base (ANGB) (Figure 1-1 in Appendix A).

The PA is an assessment of the AOC to determine if there is sufficient information that would indicate that a release at the AOC could impact human health and the environment. The PAs, which consist of a site visit and record research, were conducted in November 2013 and the results are summarized in Section 5. Based on the results of the PAs, some sites have been recommended for no further action and some AOCs require additional information through a SI to determine if they should be recommended for further Inspection.

The SI, which follows the PA in the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) process, is not intended as a full-scale study of the nature and extent of contamination. The United States Environmental Protection Agency (EPA) identifies the SI as the on-site investigation to determine what hazardous substances are present and if they are being released to the environment. Its purpose is to augment the data collected in the PA and to generate, if necessary, sampling and other field data to determine if further response action or remedial investigation is appropriate. The objective of performing the SI is to gather data necessary to make this determination.

## 1.1 Scope and Objectives

This PA/SI Work Plan defines the overall project objectives, presents the results from the PA, outlines the site history and presents the investigation tasks that will be conducted to achieve the project objectives. This Work Plan identifies the equipment, methods, and staffing necessary to perform the following tasks:

- Review the initial PA and summarize the findings and recommendations for no further action (NFA) or a SI.
- For AOCs that require additional investigation, incorporate relevant information into the SI approach;
- Gather site-specific information to evaluate the fate and transport mechanisms;
- Identify topography, vegetation, soil characteristics, climate, land use at the site and adjacent real estate, potential exposure pathways, and ground scars. and
- Collect and evaluate soil, sediment, surface water, and groundwater samples to determine if the concentrations of contaminants of potential concern (COPCs) are present in quantities or concentrations that require the ANG to further investigate the site. The COPCs are site specific and are provided in the discussion of each AOC in Section 5.

All work under this task order will be completed in accordance with all applicable and appropriate USACE and ANG policies, regulations and guidance, and Federal, State and local laws. Key references and policy documents for this investigation include, but are not limited to, the following:

- EPA Guidance for Performing Site Inspections Under CERCLA; Interim Final, September 1992 (<http://www.hanford.gov/dqo/project/level5/sicercla.pdf>)
- EPA Federal Facilities Remedial Site Inspection Summary Guide. July 2005. ([http://www.epa.gov/fedfac/pdf/ff\\_si\\_guide.pdf](http://www.epa.gov/fedfac/pdf/ff_si_guide.pdf))
- Air National Guard Readiness Center. 2009. *Air National Guard, Environmental Restoration Program, Investigation Guidance*. September.
- New York State Department of Environmental Conservation (NYSDEC). 2010. Commissioner Policy 51 (CP-51) / Soil Cleanup Guidance, 21 October.
- NYSDEC. 2004. Technical & Operational Guidance Series (TOGS), 1.1.1 Ambient Water Quality Standards and Guidance Values, June 1998, April 2000 Addendum, June 2004 Addendum.

## 1.2 Work Plan Organization

This PA/SI Work Plan is organized into the following seven sections:

**Section 1** provides an introduction to the project including the scope and objectives.

**Section 2** provides site background information including the site location and physical and environmental conditions.

**Section 3** provides historical information about the installation.

**Section 4** describes the exposure pathways at the installation.

**Section 5** summarizes the results of PA.

**Section 6** details the planned SI field operations that will be conducted to obtain required data including appropriate measures to ensure data quality and achievement of project objectives.

**Section 7** provides a list of references used in this Work Plan.

The following appendices are included in this Work Plan:

**Appendix A** presents the exhibits (figures, maps, tables, photos, etc.) referred to in the Work Plan.

**Appendix B** is the Uniform Federal Policy (UFP) – Tier II Quality Assurance Project Plan (QAPP). The Tier II QAPP is a streamlined version of the UFP-QAPP that includes worksheets applicable to an SI. This UFP-QAPP consists of the procedures/methods for contaminant sampling and analysis, and addresses all Quality Assurance (QA) and quality control (QC) methods used to control sampling activities on the project.

**Appendix C** is the Accident Prevention Plan (APP). A site-specific Health and Safety Plan detailing the field hazards and methodologies to mitigate these hazards to ensure safe working conditions are established for site workers is included as part of the APP.

**Appendix D** is supporting documentation, which includes the NYSDEC Spill #0704613 Closure Letter.

**Appendix E** contains all field-related Standard Operating Procedures (SOPs).

**Appendix F** contains the Laboratory Accreditation Certificate.

## 1.3 Project Organization and Responsibilities

The AECOM project organization is provided in Figure 1-2 (Appendix A). This figure also shows the communication pathways and lines of authority for the overall project. Details on personnel and subcontractor roles/responsibilities are presented in the UFP QAPP (Appendix B). For this SI, Mr. Mark MacEwan is the AECOM Project Manager, Ms. Jody Murata is the ANG Program Manager, Mr. Riadh Hossain is the USACE Project Manager, Mr. John Santacroce is the AECOM Task Manager, and Ms. Kimberly Kotkoskie is the Schenectady ANG Contact.

For the SI field operations, Ms. Greta White is the AECOM Field Operations Leader. She will supervise and coordinate all field activities and will act as the liaison between the installation and AECOM field staff, laboratory personnel, and the QA Manager.

The AECOM field team will be supported by office-based personnel including the Project Chemist (Ms. Devon Chicoine), Geographic Information Systems (GIS)/Data Manager (Ms. Brooke Perrigo), Health & Safety Manager (Mr. Mike Grasso, CSP), New York State regulatory specialist (Mr. Scott Underhill), and the QA Manager (Mr. John Maier).

## 1.4 Quality Assurance/Quality Control

The UFP-QAPP details the QA/QC procedures for the investigation activities that will be implemented to ensure the data quality objectives (DQOs) of the SI are achieved. The DQOs are qualitative and quantitative statements developed to clarify the study objectives, define the most appropriate data to collect under what conditions, and specify tolerable limits on decision errors that are used as the basis for establishing the quantity and quality of data needed to support decision-making. The specific DQOs are presented in the UFP QAPP (Appendix B).

The quality of analytical data will be assessed through the collection and analysis of field and laboratory QC samples. QC samples will be used to check the sampling methodology and analytical precision, accuracy and representativeness.



## 1.5 Health and Safety Requirements

Health and safety requirements for SI field activities are provided in the APP (Appendix C). Field investigations will be carried out in Level D personal protective equipment. Detailed job hazard analyses identifying the physical, chemical, and biological hazards that may be encountered at the site and the associated mitigation methods are presented in the APP.

All on-site personnel who may be exposed to hazardous conditions will be required to meet training requirements identified in Federal Regulation 29 CFR 1910.120 Hazardous Waste Operations and Emergency Response (HAZWOPER). At least one personnel trained in first aid and cardiopulmonary resuscitation (CPR) will be onsite during field activities. All training certificates for personnel (HAZWOPER 40-hour training; current HAZWOPER 8-hour refresher training; and first aid/CPR) will be maintained onsite by the Field Operations Lead.

All personnel and visitors who enter the site will be required to review the APP and sign the acknowledgement form, and site workers will be required to sign the daily tailgate safety meeting form. Safety issues that arise during implementation of site activities will be addressed during tailgate safety meetings held daily before the workday and will be documented in the daily tailgate safety meeting form.

## 1.6 Public Affairs

A project-specific community relations plan is not required for this investigation. AECOM will not disclose any data resulting from the SI to the news media, the public, regulatory agencies, or any other non-project-involved personnel. All press or public contacts will be referred to the ANG Program Manager, Ms. Jody Murata.

## 1.7 Data Management

Field and analytical data collected during this project are critical to site characterization efforts and the establishment of a conceptual site model (CSM). Investigation data will be recorded and maintained for future use and reporting. Logbooks and field data sheets will be used to record data collection activities. Project documentation will be collected and managed onsite during the field activities. Field and laboratory data will be recorded and entered into a computerized submission format in accordance with NGB/A70 Policy Letter A70 10-01 (NGB, 2010) and the Environmental Resources Program Information Management System (ERPIMS) Data Loading Handbook.

Field and laboratory data will be recorded and entered into a computerized submission format in accordance with NGB/A70 Policy Letter A70 10-01 (NGB, 2010) and the ERPIMS Data Loading Handbook. The field and analytical laboratory data required to complete Group 1, 2 and 3 data tables and satisfy ERPToolsX field, record and submission data validity requirements will be collected including:

- Sample site information
- Soil boring/sample location coordinates (latitude, longitude, elevation)
- Lithology/stratigraphy/hydrogeology
- Temporary/permanent groundwater monitoring well construction details
- Field tests (e.g., water level, temperature, pH, specific conductivity, turbidity)
- Sample type (e.g., normal, field QC), matrix, sampling method, collection date/time, depth interval
- Sample handling, preparation and analyses
- Sample results (analyte concentrations, dilutions, data qualifiers, method reporting/detection limits)

Samples collected during the SI will be analyzed by TriMatrix Laboratories using methods identified in the UFP-QAPP (Appendix B). Sample collection, data analysis, and data reporting are addressed in the Tier II UFP QAPP (Appendix B). GIS data will be compliant with the latest USACE and ANG spatial data requirements.

## 1.8 Schedule

The following table summarizes the planned schedule for the completion of key project activities.

**Table 1-1. Proposed Schedule- Schenectady ANGB**

Activities	Scheduled
Field Work Mobilization	Within 30 days of the approval of the Final Work Plan
Completion of the Field Work	Within 60 days of mobilization
Receipt of the Laboratory Data	30 days after demobilization
Prepare and Submit Draft PA/SI Report	90 days after receipt of the laboratory data
Prepare and Submit Draft Final PA/SI Report	60 days after receipt of review comments
Prepare and Submit Final PA/SI Report	60 days after receipt of Regulatory review comments

## 1.9 SI Report

AECOM will prepare and submit a Draft, Draft Final, and Final SI Report for Schenectady ANG to the ANG Program Manager, Ms. Jody Murata, and the USACE Baltimore Corps, Mr. Riadh Hossain. The SI Report will be comprehensive describing the site history and source of COPC, site setting, current and future land use, scope of project investigation activities, investigation results and updated CSM, the rationale and data used to arrive at conclusions/recommendations concerning contaminants, and the QA/QC procedures utilized to check assumptions and verify findings. Detailed maps of the site including areas of concern (AOCs), site boundaries, structures and other site-specific details will be provided. The SI Report will compile and analyze site data in a clear and concise manner as well as provide defensible justifications for recommendations.

Major elements of the SI Report will include:

### EXECUTIVE SUMMARY

#### 1.0 INTRODUCTION

#### 2.0 INSTALLATION DESCRIPTION

#### 3.0 ENVIRONMENTAL SETTING

#### 4.0 FIELD PROGRAM

##### 4.1 General Approach

##### 4.2 Geophysical Surveys

##### 4.3 Temporary Well/Groundwater Samples

##### 4.4 Soil Borings

##### 4.5 Groundwater Sampling (low flow discussion)

#### 5.0 INVESTIGATION RESULTS

##### 5.1 AOC (A-X)

##### 5.1.1 Field activities

##### 5.1.2 Investigation Results

##### 5.1.3 Conclusions and Recommendations

##### 5.Y Investigation-Derived Waste Management

##### 5.Z Deviations from the Work Plan

#### 6.0 CONCLUSIONS- Summary

#### 7.0 RECOMMENDATIONS- Summary

#### 8.0 REFERENCES

#### APPENDICES (as warranted)

##### APPENDIX A: BORING/WELL/PIEZOMETER LOGS

##### APPENDIX B: TEMPORARY WELL CONSTRUCTION DIAGRAMS

##### APPENDIX C: ANALYTICAL REPORTS

##### APPENDIX D: FIELD CHANGE REQUEST FORMS

##### APPENDIX E: DATA PACKAGE FOR HRS

##### APPENDIX F: INVESTIGATION-DERIVED WASTE MANAGEMENT (Data Tables, Correspondence, etc.)

##### APPENDIX G: CHAIN-OF-CUSTODY

## 2 Site Description

This section describes the topography and site conditions for Schenectady ANG.

### 2.1 Site Topography and Drainage

Schenectady Air National Guard Base (ANGB) is located in east-central New York State in the Mohawk River Valley, at the Schenectady County Airport, Scotia, New York (Figure 1-1). The airport is located in the Town of Glenville, New York, which is approximately 2 mi northeast of the Scotia central business center. The geographic coordinates of the site are 42°51'10"N latitude and 73°55'48"W longitude. Scotia lies along the northern banks of the Mohawk River, which flows in an easterly direction toward the Hudson River. The City of Schenectady, New York lies on the banks of the Mohawk River, southeast of the airport.

The ANGB occupies the southeast portion of Schenectady County Airport. The western and northern boundaries of the ANGB border the airport property. The eastern portion of the ANGB is bordered by Habel Lane. Runway 15-33 borders the western portion of the ANGB. The northwest section is bordered by Taxiway E and Maple Avenue is to the south. Schenectady ANGB is comprised of two areas totaling 124 acres. Schenectady ANGB is a tenant (by lease agreement) of the Schenectady County Airport Authority and is responsible only for the operation and maintenance of the ANGB. The Schenectady ANGB is separated into two locations: New York Air National Guard (NYANG) Main Parcel and NYANG South Parcel (ANG, 2006).

Topographic features in the area include the foothills of the Adirondack Mountains to the north and the Helderberg Escarpment, the northern extreme of the Allegheny Plateau, to the south. The Mohawk River runs in a general northwest to southeast direction through the area. Area landforms are relatively flat adjacent to the Mohawk River, where elevations are approximately 210 feet (ft.) above mean sea level along the riverbanks. The elevations at Schenectady ANGB range from approximately 300 ft. mean sea level to approximately 390 ft. mean sea level. The land that Schenectady ANGB is located on has been predominantly cleared, leveled with little topographic relief, and developed (ANG, 2006).

The Base is situated within 1 mile north of the Mohawk River. The Mohawk River drains approximately 65 percent of Schenectady County. Surface water channeled from Schenectady ANGB through a drainage system that runs south and east, which drains into the Mohawk River. The river's flow is regulated during the navigational season by a series of locks, as part of the New York State Barge Canal System. There are tributaries to the Mohawk River proximal to the ANGB, including Collins Creek and the Indian and Alplaus Kills.

Surface waters from Schenectady ANGB are conveyed through a system of drainage pipes, culverts, and ditches. Stormwater runoff from the ANGB flows into the Alplaus Kill via an unnamed creek. The Alplaus Kill flows for approximately 0.75 miles along Glenville's eastern boundary before emptying into the Mohawk River (ANG, 2006).

### 2.2 Site Geology/Hydrogeology

Bedrock units beneath Schenectady ANGB are deep, approximately 2,000- to 3,500-ft thick, and generally sloping to the south and southwest. The ANGB is underlain by the Ordovician Schenectady Formation and Canajoharie Shale which is shale interbedded with siltstones and sandstones. There are several linear bedrock ridges, aligned in a northeast-southwest direction, located in the vicinity of the ANGB. Glacial till covers bedrock over much of the ANGB and the surrounding area, which is a gray to dark gray, compact, tough, stony, salty to sandy clay with some cobbles and boulders. There are limited areas of thin sand and gravel lenses scattered within the till unit. The overall thickness of the till deposits over the ANGB ranges between approximately 10 and 30 ft. where the thickest areas correspond to the depressions in the bedrock surface. Lake Albany sands and silts, ranging between approximately 45- and 130-ft thick, overly the till deposits on the southern and southwestern portion of the ANGB (NYSGS 1990).

Most of the naturally occurring soils at and around Schenectady ANGB have been disturbed and/or removed, making soil classification difficult due to the variable characteristics and alteration from natural conditions. According to the United States (U.S.) Department of Agriculture Soil Conservation Service, the majority of the soils at Schenectady ANGB is composed of cut and fill material and *Urban Land - Colonie Complex*. This soil type consists of 70 percent Urban land, soils under structures or pavements, and 30 percent Colonie soils. These soils are predominately underlain by sandy material with variable permeability. The Colonie soils are deep, well drained to excessively drained, sandy soils. The other mapped soils beneath the ANGB consist of the following soils:

- *Lordstown Gravelly Silt Loam*—A moderately deep, well drained, medium textured soil on hilltops with slopes of 3-8 percent.
- *Hornells Silt Loam*—A moderately deep, moderately well drained, medium textured soil on bedrock controlled uplands with slopes of 3-8 percent.
- *Tuller-Brockport Complex*—Consists of 60 percent Tuller soils and 40 percent Brockport soils. The Tuller soils are shallow and somewhat poorly drained to poorly drained with a moderate permeability. The Brockport soils are moderately deep and somewhat poorly drained.
- *Burdette-Scriba Soils*—Consists of 65 percent Burdette soils and 35 percent Scriba soils. The Burdette soils are moderately deep, somewhat poorly drained, and medium texture. The Scriba soils are deep, somewhat poorly drained, and medium textured.
- *Nunda Soils*—These soils are deep, moderately well drained, sloping, medium textured, and extremely stony on calcareous glacial till plains.

Schenectady ANGB does not have high potential availability of large groundwater resources, although it lies close to the recharge zone of the Schenectady-Niskayuna Aquifer System, referred to as the “Schenectady Aquifer.” The Schenectady Aquifer consists of a complex and extensive bed of stratified drift and glacial outwash gravel deposits underlying the Mohawk River channel. These aquifer deposits are underlain by glacial till. The Schenectady Aquifer is one of the most productive in New York State (Town of Ballston 2004; U.S. EPA 2006). The aquifer supplies potable water to approximately 84 percent of the population of Schenectady County through municipal and private wells. This aquifer was designated as a “sole-source” aquifer in 1984 by the U.S. Environmental Protection Agency (EPA) (ANG, 2006).

On Schenectady ANGB, a clayey silt till, with some sand and gravel, covers the entire area and ranges in thickness from 1 ft. to greater than 12 ft. The water table in the Schenectady area generally mimics the topography of the land surface and, therefore, groundwater moves in the direction of land-surface slope. Regional groundwater flow at the ANGB is southeast toward the Mohawk River (ANG, 2006).

### 3 Site History

Schenectady ANGB began operating at the Schenectady County Airport in 1948 as the 109<sup>th</sup> Fighter Squadron. The organization was converted to a transport group during 1958 and was activated to full-time status in 1961, flying regular missions to Southeast Asia in support of active duty forces in Vietnam. The 109<sup>th</sup> Airlift Group received its first C-130s during 1971 and began supporting scientific research programs in 1975. In 1988, they began augmenting the U.S. Navy's support of the U.S. Antarctic Program by supporting operations at the McMurdo and Palmer stations, Antarctica, as well as at other research stations located in Antarctica and Greenland (ECATS 2003; Hueber *et al.* 1997). In 1996, the 109<sup>th</sup> Airlift Group was re-assigned as an Airlift Wing (ECATS 2003).

The main purpose of Schenectady ANGB is to provide organizational and maintenance support to the 109th Airlift Wing, which flies C-130H and ski-equipped LC-130H aircraft to support their Air Mobility Command and poplar airlift missions. The major support operations include aircraft fueling, aircraft deicing, aircraft maintenance, aerospace ground equipment maintenance, ground vehicle maintenance, fueling of ground vehicles, and facilities maintenance (ANG, 2006).

The facility also provides general airlift support throughout the ANGB and Air Mobility Command passenger/cargo systems. The unit services other polar customers, such as the North American Aerospace Defense and the Navy, in addition to polar rescue operations. The unit also has a mission to assist New York State in the event of disaster emergencies and civil disturbances. Currently, there are approximately 361 full-time personnel at Schenectady ANGB and approximately 1,177 personnel, including the weekend drill personnel (Hueber *et al.* 1997).

Six areas of concern (AOCs) at the Base have been identified and include:

- Former Building 13 Area;
- Former Heating Oil Underground Storage Tank (UST) #41, Former Building 4;
- Waste Water Treatment Plant (WWTP) Bypass UST near IRP Site 6;
- Former JP-8 Reclamation UST at Building 29;
- Building 19 Drains; and
- Building 35 Drains.

The AOCs presently are not included in any remediation program. The operational history, previous investigations, and recommendations for each site are discussed in Section 5 of this Work Plan.

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## 4 Preliminary Pathway Evaluation

The purpose of the preliminary pathway evaluation is to identify the migration pathways and evaluate available data, including potential contamination sources, potential hazardous waste quantity, contamination concentrations, and potential targets. The proposed scope of work (see Section 5) has been developed to address data gaps identified in the preliminary pathway evaluation.

### 4.1 Groundwater Pathway

A detailed description of site hydrogeology is included in Section 2.1 of this Work Plan. Potable water is supplied to only the NYANG Main Parcel by the municipal water supply from the Town of Glenville. There is no potable water supply to the NYANG South Parcel (ANG, 2006). There is a non-potable water supply source for the NYANG South Parcel to service the washrooms.

The Town of Glenville has five municipal water wells, which are supplied by the Schenectady Aquifer. These wells supply water to Schenectady ANGB and to most of the residences north and east of the ANGB. The Glenville wells are located approximately 5 miles west of the ANGB and are relatively shallow, between 50 and 60 ft. deep. The municipal water supply wells are installed at shallow depths into the bedrock since the bedrock formations in the Schenectady area have a low permeability and are poor sources of water. The groundwater in the bedrock primarily flows within the fractures and joints in the rock and within the weathered or fractured zone within the upper few feet of the bedrock surface (Buckhurst, Fish, Hutton, Katz, Inc. 1990).

According to the Schenectady County Planning Department (1978), wellhead aquifer protection areas have been established for the Scotia and Glenville wells fields for protection of the water supply. The wellhead protection zones are areas that surround the public supply wells and extend to the limits of the cone of depression. These two zones are located approximately 7 miles west of Schenectady ANGB. The aquifer recharge area, which is an area considered sensitive and significant to groundwater recharge, is located at the southern entrance of Schenectady ANGB (ANG, 2006).

### 4.2 Surface Water Pathway

A detailed description of site topography and drainage is included in Section 2.1 of this Work Plan. Surface runoff into tributaries to the Mohawk River, including Collins Creek and the Indian and Alplaus Kills, is a possibility.

### 4.3 Soil Exposure and Air Migration Pathways

A detailed site description is provided in Section 2 of this Work Plan. The population in Schenectady County was estimated to be 155,124 in 2012 (U.S. Department of Commerce, 2013). Land use in Schenectady County is primarily undeveloped forest, brushland, and water areas (over 50 percent of total county acreage). Agricultural land use is the next largest segment (24 percent), while residential land use comprises 13.8 percent of the County. The land use in the Town of Glenville surrounding the 109th Airlift Wing property is primarily suburban residential and undeveloped lands with some limited industrial and commercial uses (ANG, 2006). There is undeveloped land immediately across Habel Lane zoned as Medium Density Residential. The railroad lines located along the east side of Maple Avenue are zoned as Industrial and a Land Conservation Zone is located along the Mohawk River frontage south of the ANGB (Town of Glenville 2004). According to the Master Plan (Hueber *et al.* 1997), an Aquifer Protection Overlay District is present on the lands from Maple Avenue and eastward. The Aquifer Protection Zone area has been mapped to the south of the railroad tracks and to the southeast of the site (Schenectady County Planning Department 1978). There is a sign designating the Aquifer Protection Zone area at the railroad tracks and visible when entering onto the ANGB property (ANG, 2006). Therefore, if soil contamination exists, there could be leaching to the groundwater pathway. Additionally, there could be an air migration pathway concern at the site due to dust generation from contaminated soil.

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## 5 Preliminary Assessment

AECOM conducted the PA at Schenectady ANGB on 12 November 2013 to evaluate whether the AOCs proposed for investigation should be investigated or should be recommended for NFA. Locations of the five AOCs identified during the PA which are recommended for SI activities are shown on Figure 5-1 (Appendix A) and are discussed below with the recommendations. Site identifications are summarized on Table 5-2. Issuance of a letter of approval by NYSDEC implies concurrence with the recommendations in this Work Plan.

This effort is based on finding from the Trip Report conducted by BB&E in 2011, conducted under the One Clean environmental program, and a Phase I Environmental Baseline Survey in 2006. Table 5-1 below is a list of all persons interviewed during the PA.

**Table 5-1. Points of Contact: Schenectady ANGB**

Name	Position	Phone	E-mail Address	Mailing Address
Jody Murata	Program Manager	240-612-8120	<a href="mailto:Jody.Murata@ang.af.mil">Jody.Murata@ang.af.mil</a>	NGB/A7OR Sheppard Hall 3501 Fetchet Avenue Joint Base Andrews, MD 20762-5157
Kim Kotkoskie	Schenectady ANG Base Environmental Manager (109 EMO)	518-344-2341	<a href="mailto:kimberly.kotkoskie.1@ang.af.mil">kimberly.kotkoskie.1@ang.af.mil</a>	Schenectady ANGB 109 AW/EM 1 Air National Guard Road Scotia, NY 12302-9752
David Guest	Schenectady ANG (109 EMO)	-	<a href="mailto:david.guest@ang.af.mil">david.guest@ang.af.mil</a>	-
Michael Blake	Schenectady ANG (109 MXS)	-	<a href="mailto:michael.blake@ang.af.mil">michael.blake@ang.af.mil</a>	-
Mark Schaible	Schenectady ANG (109 LGRV)	-	<a href="mailto:mark.schaible@and.af.mil">mark.schaible@and.af.mil</a>	-
Tom Chico	Schenectady ANG WWTP Operator (109 CES)	-	<a href="mailto:thomas.chico@ang.af.mil">thomas.chico@ang.af.mil</a>	-
Gregg Waszmer	Schenectady ANG (109 CES)	-	<a href="mailto:gregg.waszmer@and.af.mil">gregg.waszmer@and.af.mil</a>	-
Kevin Hart	Schenectady ANG (109 LRS)	-	<a href="mailto:kevin.hart@and.af.mil">kevin.hart@and.af.mil</a>	-
Larry Phillips	Schenectady ANG (109 MXS)	-	<a href="mailto:larry.phillips@and.af.mil">larry.phillips@and.af.mil</a>	-
Veronica Allen	BB&E Senior Environmental Engineer	248-489-9636 ext 304 (o) 248.212.7770 (c)	<a href="mailto:vallen@bbande.com">vallen@bbande.com</a>	235 East Main Street, Suite 107 Northville, MI 48167
Mark MacEwan	Project Manager	703-706-0133 (o) 202-375-9353 (c)	<a href="mailto:Mark.MacEwan@aecom.com">Mark.MacEwan@aecom.com</a>	675 N. Washington Street Suite 300 Alexandria, VA 22314
John Santacroce	Task Manager	518-951-2265	<a href="mailto:John.Santacroce@aecom.com">John.Santacroce@aecom.com</a>	40 British American Boulevard, Latham, NY 12110
Greta White	AECOM Site Manager	518-951-2341	<a href="mailto:Greta.White@aecom.com">Greta.White@aecom.com</a>	40 British American Boulevard, Latham, NY 12110

## 5.1 Regulatory Framework

For Schenectady ANG, the PALs are based on the most stringent of the following screening criteria:

Soil New York State Department of Environmental Conservation (NYSDEC), 6 NYCRR Part 375, 14 December 2006, NYSDEC, Commissioner Policy (CP-51) / Soil Cleanup Guidance, 21 October 2010, and/or USEPA Regional Screening Levels (RSL) for Residential Soil (November 2013).

Groundwater: USEPA Maximum Contaminant Levels (MCLs), and either NYSDEC Technical & Operational Guidance Series (TOGS), 1.1.1 Ambient Water Quality Standards and Guidance Values, June 1998, April 2000 Addendum, June 2004 Addendum, or USEPA Regional Screening Level for Tapwater (November 2013).

The AOCs are regulated by the NYSDEC Department of Environmental Remediation since this SI is conducted under CERCLA. If evidence of a release is identified a spill number will be assigned and will be handled by the NYSDEC Department of Environmental Remediation. Soil standards must meet those listed in the NYSDECs Commissioner Policy (CP)-51 and groundwater concentrations in TOGS 1.1.1 groundwater (GA) standards must be met to get a "No Further Action" (NFA) letter for the site.

## 5.2 AOC-Former Building 13 Area (ZZ007)

Hazardous materials were used and hazardous waste generated at the former Building 13 area, which was demolished in the mid-1990s. The building was utilized as a maintenance facility at times with drum storage. The building had a concrete floor. No sampling or closure information could be located for this area (BB&E, 2011). Former Building 13 was located near the current Building 12.

### 5.2.1 Previous Investigation

No previous investigation associated with the hazardous materials and waste has been performed at the former Building 13 site. However, it should be noted that a groundwater monitoring well is located in the vicinity of this AOC. This monitoring well was evidently installed as part of a previous investigation not associated with this project.

### 5.2.2 Recommendation

Because sampling and closure documentation cannot be located for former Building 13, further investigation is recommended. Soil and groundwater in the vicinity should be sampled for analysis of volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), and metals.

Direct push technologies (DPT) will be utilized to core the soil for logging and sampling. Five borings will be conducted in the area of Former Building 13 at the four corners and center of the former building. One soil sample will be collected from the most impacted interval as identified by visual or olfactory evidence of contaminants, or elevated photoionization detector (PID) readings. The second soil sample will be collected from the interval above the groundwater and soil interface. Based on previous remedial actions conducted at Schenectady, groundwater is expected to be encountered at approximately 10 ft. below ground surface (bgs) and will be sampled via retractable screen and peristaltic pump or bladder pump. Six groundwater samples will be collected; one at each boring and the sixth from a previously installed downgradient monitoring well. See Figure 5-2 for proposed sample locations.

## 5.3 AOC-Former Heating Oil UST #41, Former Building 4 (TU008)

Former Building 4 was utilized as a vehicle maintenance facility before its removal in the early 1995. Underground storage tank (UST) #41 was a 6,000-gallon heating oil tank associated with the building. Records of removal and/or sampling of the tank pit during removal are not available.

### 5.3.1 Previous Investigation

No previous investigations have been performed at the Former Heating Oil UST #41, Former Building 4 site.

### 5.3.2 Recommendations

Because sampling and closure documentation cannot be located for the removal of UST #41 at former Building 4, further investigation is recommended. Soil and groundwater in the vicinity of the former UST will be sampled for analysis of VOCs and SVOCs.

The location of the UST at former Building 4 cannot be pinpointed since Building 4 no longer exists. Due to this ambiguity, the investigation will begin with a ground-penetrating radar (GPR) survey to confirm the absence of the underground structure and help locate subsurface utilities. DPT will then be utilized for soil logging and sampling. Four borings will be conducted in each direction around the UST. If no UST is found during the GPR survey, an additional boring will be conducted from the center, where the UST was suspected. One soil sample will be collected from each soil boring from the most impacted interval as identified by visual or olfactory evidence of contaminants, or elevated PID readings. A second soil sample will be collected from the interval immediately above the groundwater and soil interface. Groundwater will be sampled at each boring location via retractable screen and peristaltic pump or bladder pump. Soil and groundwater samples will be analyzed for VOCs and SVOCs. See Figure 5-3 for proposed sample locations.

## 5.4 AOC-Waste Water Treatment Plant (WWTP) Bypass UST near IRP Site 6 (TU009)

A 7,000-gallon UST was utilized by the WWTP for bypass during 1982 – 1983 when the lagoons were being emptied for cleaning. The tank had one inlet pipe and was pumped out daily. The WWTP was demolished in 2002. According to Schenectady ANG personnel, the UST is still in place and partially filled with sand.

### 5.4.1 Previous Investigations

No previous investigations have been performed at the WWTP Bypass UST.

### 5.4.2 Recommendations

Since the WWTP has been demolished and the UST is no longer needed or functional, the UST is recommended to be removed (although, this is not part of the scope of this PA/SI project). Soil and groundwater in the vicinity of the UST will be sampled for analysis of VOCs, SVOCs, and metals.

DPT will be utilized for soil logging and sampling. GPR will be utilized to locate the UST prior to DPT drilling. Four borings will be conducted in each direction around the UST. Two soil samples will be collected from each soil boring: one from the most impacted interval as identified by visual or olfactory evidence of contaminants, or elevated PID readings and the second soil sample collected from the interval immediately above the groundwater and soil interface. Groundwater will be sampled at each boring location via retractable screen and peristaltic pump or bladder pump. See Figure 5-4 for proposed sample locations.

## 5.5 AOC-Former JP-8 Reclamation UST (TU010)

The former JP-8 reclamation UST, Tank 293, was located outside the Petroleum, Oil, and Lubricant Pumphouse and was removed on 4 November 2010.

### 5.5.1 Previous Investigations

During removal of the JP-8 Reclamation UST (also known as Tank #293 in the NYSDEC system) in 2010, an eight-inch band of visually stained soil was observed on the floor of the excavation. However, these stained soils were considered to be associated with a previous spill at the nearby POL pumphouse (Spill #0704613), which was being actively remediated at the time. Soil was excavated to remove the JP-8 Reclamation UST and the area was backfilled with clean material. Representative samples from the excavated soils were tested for gasoline range organics, but results were below the detection limit (Precision, 2010).

### 5.5.2 Recommendations

Upon excavation, the JP-8 Reclamation UST and piping were reported to be in excellent condition with no signs of leakage. The stained soils observed during removal of the UST were determined to be associated with another source (historic spill # 0704613), which has since been closed by the NYSDEC on January 23, 2013. All monitoring wells associated with the historic spill have been decommissioned. Tank Closure Report for Tank #293, disposal records, and the Spill Closure Report are

provided. Appendix D. No further action is necessary with regard to this UST. Therefore, no additional investigative samples are recommended for this site.

## **5.6 AOC-Building 19 Drains (DD011)**

Building 19, (Composite Aircraft Maintenance Facility) contained a former Battery/Acid Neutralization room. The pipes from the sinks carried the spent liquids to the sanitary sewer. Disposal of corrosive chemicals in this manner could have caused deterioration and leakage from the drain system

### **5.6.1 Previous Investigations**

No previous investigations have been performed in the Building 19 drains.

### **5.6.2 Recommendations**

Because disposal of neutralized acids may have damaged the drain lines leading to leakage from the drain system, further investigation is recommended. Investigation will begin with a camera survey of the condition of the lines with evidence of deterioration guiding further investigation.

If deterioration of the drains is detected, up to three borings will be completed at locations determined by the evidence collected during the camera survey. One boring will be completed inside the building, in or near the Battery/Acid Neutralization room if assessable. The door width inside of operating facilities, ceiling height, and nearby equipment may create logistical problems of maneuvering a drill rig inside the building. Two additional borings will be completed outside of Building 19. Using DPT, the borings will be pushed to groundwater, expected to be approximately 10 ft. bgs. Up to six soil samples (two from each boring) will be collected from the depth interval equal to that of the drain line and immediately above the groundwater and soil interface for analysis of metals and pH. Up to three groundwater samples (from the three potential boring locations) will be collected via retractable screen and peristaltic pump for analysis of metals (filtered and unfiltered) and pH. See Figure 5-5 for proposed sample locations.

## **5.7 AOC-Building 35 Drains (DD012)**

Building 35, (Vehicle Maintenance) contained a former Battery/Acid Neutralization room. Pipes from the sinks carried the spent liquids to the sanitary sewer. Disposal of corrosive chemicals in this manner could have caused deterioration and leakage from the drain system.

### **5.7.1 Previous Investigations**

No previous investigations have been performed in the Building 35 drains.

### **5.7.2 Recommendations**

Because disposal of neutralized acids may have damaged the drain lines leading to leakage from the drain system, further investigation is recommended. Investigation will begin with a camera survey of the condition of the lines with evidence of deterioration guiding further investigation.

If deterioration of the drains is detected, up to three borings shall be performed at locations determined by the evidence collected during the camera survey. One boring will be completed inside the building, in or near the Battery/Acid Neutralization room if assessable. The door width inside of operating facilities, ceiling height, and nearby equipment may create logistical problems of maneuvering a drill rig inside the building. Two additional borings will be completed outside of Building 35. Using DPT, the borings will be pushed to groundwater, expected to be approximately 10 ft. bgs. Up to six soil samples (two from each boring) will be collected from the depth interval equal to that of the drain line and from the interval immediately above the groundwater and soil interface for analysis of metals and pH. Up to three groundwater samples (from the three potential boring locations) will be collected via retractable screen and peristaltic pump for analysis of metals (filtered and unfiltered) and pH. See Figure 5-6 for proposed sample locations.

## 5.8 Summary

Table 5-2 outlines which AOCs have been proposed for no further action and which sites are recommended for additional investigation. The field sampling approach for these sites is summarized in Section 6.

**Table 5-2. Summary of the Preliminary Assessment**

AOC ID Code	Site Description	Recommendation	Rationale
ZZ007	Former Building 13 Area	Site Inspection	Hazardous materials were used and hazardous waste generated at the former Building 13 area. No sampling or closure information could be located. Five borings are proposed in the former Building 13 area to collect soil and groundwater sample for analysis of VOCs, SVOCs, and metals. In addition, one groundwater sample will be collected from the a previously installed downgradient monitoring well
TU008	Former Heating Oil UST #41, Former Building 4	Site Inspection	Sampling and closure documentation cannot be located. A GPR survey will be used to confirm that the UST has been removed. Due to the possibility of leaks, five soil borings are proposed to collect soil and groundwater in the vicinity for analysis of VOCs and SVOCs.
TU009	WWTP Bypass UST	Site Inspection	The WWTP has been demolished and the UST is no longer needed or functional. The UST is recommended for removal. Due to the possibility of leaks, four soil borings will be conducted to collect soil and groundwater in the vicinity for analysis of VOCs, SVOCs, and metals.
TU010	Former JP-8 Reclamation UST	No Further Action	The JP-8 Reclamation UST has been closed by the New York State Department of Conservation, the monitoring wells have been decommissioned, and the tank closure letter provided.
DD011	Building 19 Drains	Site Inspection	Building 19 formerly utilized acid neutralization areas. Disposal of corrosive chemicals in this manner could have caused deterioration and leakage from the drain system. Inspection will begin with a camera survey of the condition of the lines. If deterioration of the drains is detected, up to three borings are proposed to collect soil and groundwater for analysis of metals and pH.
DD012	Building 35 Drains	Site Inspection	Building 35 formerly utilized acid neutralization areas. Disposal of corrosive chemicals in this manner could have caused deterioration and leakage from the drain system. Inspection will begin with a camera survey of the condition of the lines. If deterioration of the drains is detected, up to three borings are proposed to collect soil and groundwater for analysis of metals and pH.

Note:

AOC ID Codes are the same as the Enterprise Environmental Safety and Occupational Health-Management Information System (EESOH-MIS) ID Codes

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## 6 SI Field Operations

This section summarizes the SI field activities proposed for the sites at Schenectady ANG. The field investigation operations consist of site preparation activities including the mobilization/demobilization of field team personnel and equipment, utility clearance, direct push and subsurface and groundwater sampling for contaminants including VOCs, SVOCs, and metals. Specific details concerning sampling activities are presented in the UFP QAPP (Appendix B). Health and safety requirements for SI field activities are provided in the APP (Appendix C).

**Table 6-1: Sampling Program**

AOC ID Code	Site Description	Estimated Number of Borings	Depth of Borings (ft. bgs)	Analysis Required	Figure Showing Sampling Locations
ZZ007	Former Building 13 Area	5	10**	<b>Soil:</b> 10 samples -VOCs, SVOCs, Metals <b>Groundwater:</b> 6 samples - VOCs, SVOCs, Metals (includes one sample from a previously installed downgradient monitoring well)	Figure 5-2
TU008	Former Heating Oil UST #41, Former Building 4	5	10**	<b>Soil:</b> up to 10 samples – VOCs, SVOCs <b>Groundwater:</b> up to 5 samples – VOCs, SVOCs	Figure 5-3
TU009	WWTP Bypass UST near IRP Site 6	4	10**	<b>Soil:</b> 8 samples -VOCs, SVOCs, Metals <b>Groundwater:</b> 4 samples - VOCs, SVOCs, Metals	Figure 5-4
DD011	Building 19 Drains	3	10**	<b>Soil:</b> 6 samples – metals, pH <b>Groundwater:</b> 3 samples – metals, pH	Figure 5-5
DD012	Building 35 Drains	3	10**	<b>Soil:</b> 6 samples – metals, pH <b>Groundwater:</b> 3 samples – metals, pH	Figure 5-6

\*\*Depth of boring is estimated based on past experience at the site. Actual drilling depth will be based on the depth to groundwater as observed in the soil boring.

### 6.1 Site Preparation

The site preparation activities for the SI field investigation operations include mobilization/ demobilization of field team personnel and equipment. No vegetation clearance is planned during field investigation activities; rather the field team will work around existing site vegetation.

### 6.2 Personnel Qualifications

All personnel mobilized to the site will meet applicable Occupational Safety and Health Administration training including hazardous waste operations and emergency response (HAZWOPER) training and medical surveillance requirements as specified in the APP (Appendix C).

### 6.3 Permits and Notifications

Public water, sanitary sewer, natural gas and communication lines exist underground within the NYANG property. Utility clearance will be conducted by Schenectady ANG. AECOM will complete the utility clearance request (AF Form 103) and submit it to the Base Civil Engineer 30 days before site activates begin.

## 6.4 Sample Identification

The sample identification number will consist of an alphanumeric designation related to the installation, site, event, media type, and consecutive number, according to the following conventions:

Installation: **Schenectady**

Site: **SC-xxx** = Schenectady (Note: site identification codes are located in Table 6-1)

Media Type: **SB** = Subsurface Soil, **GW** = Groundwater

Consecutive Number: 01, 02, 03, etc.

Depth: Depth below ground surface (feet)

Sample Type: MS for matrix spike

For example, the sample identification number for the first subsurface soil sample at the Building 13 Area will be: SC-B13-SB01-6. Matrix Spike sample identification numbers will be followed with a "MS".

Trip blank (TB), equipment blank (EB), and blind duplicate samples will be identified as follows:

Trip Blanks = SC-TB-date (mmddyr)

Equipment Blanks = SC-EB-date (mmddyr)

Blind Duplicate= SCAOC ID-DUP-Date-Media Type

## 6.5 Analyses

Samples will be analyzed for the following analytes: VOCs by EPA Method 8260C, SVOCs by EPA Method 8270B, and metals by EPA Method 6010C/7471A. Samples will be shipped to TriMatrix Laboratories, LLC, a Department of Defense (DoD) Environmental Laboratory Accreditation Program approved laboratory that is experienced in handling environmental samples, holds a New York State certification to perform the analytical methods required, and meets DoD Installation Restoration QA Program requirements (See Appendix E for laboratory certifications). The laboratory will provide analytical results within 30 days of sample receipt. Data validation/review will be conducted on all laboratory results in accordance with procedures specified in the QAPP.

## 6.6 Subsurface Soil Sampling- Direct Push

Prior to the start of the boring the location will be hand cleared to 4 feet bgs. Soil samples will be collected via DPT. A GeoProbe® DT325 dual tube sampling system (or equivalent) will be used to collect continuous soil cores to the target depth. Borings will be advanced to depths ranging from 10 to 25 ft., or to probe refusal, whichever occurs first. If refusal is encountered before the desired depth of sample location, one attempt will be made adjacent to the original location to collect a soil sample below the depth of refusal. Soil cores will be collected in disposable 2.1-inch outer diameter 60-inch long thin-walled clear poly-vinyl chloride (PVC) tube liners.

Continuous soil sampling will be accomplished by advancing a 4- or 5-foot coring barrel fitted with dedicated, disposable PVC liners. The soil core will be screened for VOCs immediately upon opening the sleeve with a photoionization detector (PID) utilizing an 11.7 electron-Volt bulb. Details regarding the air monitoring procedures and specific action levels are provided in the APP. The soils from the core will be screened with the PID in open air and after containerizing in a plastic zipper bag. The soil core will be logged for lithologic descriptions by a field geologist. Observations and measurements will be recorded on a soil-boring log. Photographs will also be taken of the boring cores. At a minimum, depth interval, recovery thickness, PID concentrations, moisture, relative density, color (using a Munsell soil color chart), and texture (using the Unified Soil Classification System) will be recorded. Additional observations to be recorded may include detectable odors, groundwater or perched water depth, organic material, cultural debris, or color changes indicating staining.

Two subsurface soil samples will be collected from each direct push location. Samples will be collected from depth intervals where field screening or observations indicate the potential presence of contaminants or at the vadose zone. The first sample is intended to be collected from within the vadose zone, if groundwater is below the depth of hand auger clearance or from the first sampling interval if groundwater was encountered during hand auger clearance. The second sample will be collected from the interval observed with the highest VOC concentration measured with the PID or from the bottom of the boring if no VOC concentrations are measured beyond those PID concentrations measured in ambient air.



VOC samples will be collected using a sampling corer (Terra Core or equivalent) and in accordance with SOP 3-21 (see Appendix F). Each sample will be collected into laboratory-supplied glassware and submitted to the laboratory for analysis of selected parameters. The laboratory method detection limits for these analytes are presented in the UFP-QAPP (Attachment B). Samples will be packaged on ice and transported daily via overnight commercial carrier under standard chain-of-custody procedures to the laboratory.

Field duplicate samples will be collected at a rate of 10% and analyzed for the same parameters as the accompanying samples. Matrix spike and matrix spike duplicates will be collected at the rate of 5% and analyzed for the same parameters as the accompanying samples. Trip blanks will accompany each cooler containing samples for VOC analysis and will be analyzed for select VOCs. Equipment blanks will not be prepared or analyzed unless a deviation from this plan requires sample handling using non-dedicated equipment. If non-dedicated sampling equipment is used, an equipment blank will be collected and will be analyzed for the same analytes as the groundwater samples. A temperature blank shall be placed in each cooler to ensure that samples are preserved at or below four degrees Celsius during shipment.

DPT borings created will be abandoned at completion of sampling activities. Borings in grass will be abandoned by backfilling with bentonite chips. Borings in asphalt shall be abandoned by backfilling with bentonite chips to approximately 6 inches bgs, and the remainder of the borehole will be patched with asphalt cold patch. The surface will be restored at each location to match the surrounding area.

## 6.7 Groundwater Sampling

Groundwater samples will be collected from temporary wells installed using DPT methodology at the locations listed in Table 5-2. The borehole for the temporary wells will be created using a GeoProbe® DT325 dual-tube sampling system (or equivalent). Once the hole has been pushed to depth, a 5 ft. section of 1-inch Schedule 40 PVC screen will be installed in the borehole with sufficient casing to reach ground surface. Approximately 4 ft. of the screen will penetrate the groundwater table with 1 ft extending above the interface. Temporary wells will be installed at boring locations ranging in depth from 10 to 25 ft. If refusal is encountered before the desired depth of sample location, one attempt will be made adjacent to the original location to collect a groundwater sample below the depth of refusal. Filter sand will be placed in the annulus surrounding the well screen to a depth of 1 ft. above the top of screen. A 2 ft. thick bentonite seal will be placed above the filter sand and hydrated with distilled water. Following installation, the temporary wells will be allowed to equilibrate with the surrounding formation until they contain a sufficient amount of water to fill the required sample containers. Samples will be collected via low-flow sampling methods using peristaltic or bladder pumps. One groundwater sample is to be collected from an existing permanent monitoring well in the area of former Building 13. The sample collected from this well will also be attained following low-flow sampling methods using a peristaltic or bladder pump. Groundwater samplers will be decontaminated between boring locations (See SOP 3-14 in Appendix F).

Each sample will be collected into laboratory-supplied glassware and submitted to the laboratory for analysis of selected parameters. The laboratory method detection limits for these analytes are presented in the UFP-QAPP located in Appendix B. Samples will be packaged on ice and transported daily via overnight commercial carrier under standard chain-of-custody procedures to the laboratory.

Field duplicate samples will be collected at a rate of 10% and analyzed for the same parameters as the accompanying samples. Matrix spike and matrix spike duplicates will be collected at the rate of 5% and analyzed for the same parameters as the accompanying samples. Trip blanks will accompany each cooler containing samples for VOC analysis and will be analyzed for select VOCs. Equipment blanks will not be prepared or analyzed unless a deviation from this plan requires sample handling using non-dedicated equipment. If non-dedicated sampling equipment is used, an equipment blank will be collected and will be analyzed for the same analytes as the groundwater samples. A temperature blank shall be placed in each cooler to ensure that samples are preserved at or below four degrees Celsius during shipment.

## 6.8 IDW Management

IDW generated will be containerized in 55-gallon drums and placed on secondary containment. IDW will be sampled and characterized for waste profiling and the results returned within one week. The IDW will be labeled and stored within the fenced in area of the facility until it is disposed of by a licensed disposal subcontractor within 30 days of demobilization. IDW will be managed in accordance with ANG Policy 05-1 for IDW (ANG, 2009). AECOM will be responsible for arranging transportation and disposal of the IDW. AECOM will provide the NYSDEC with the results, volume, and name of the disposal facility prior to transportation of the waste off-site.

## **6.9 Documentation**

The field logbook will serve as the primary record of field sampling activities. Entries will be made chronologically and in sufficient detail to allow the writer or a knowledgeable reviewer to reconstruct each day's events (See SOP 3-02, Logbooks for additional information).

## 7 References

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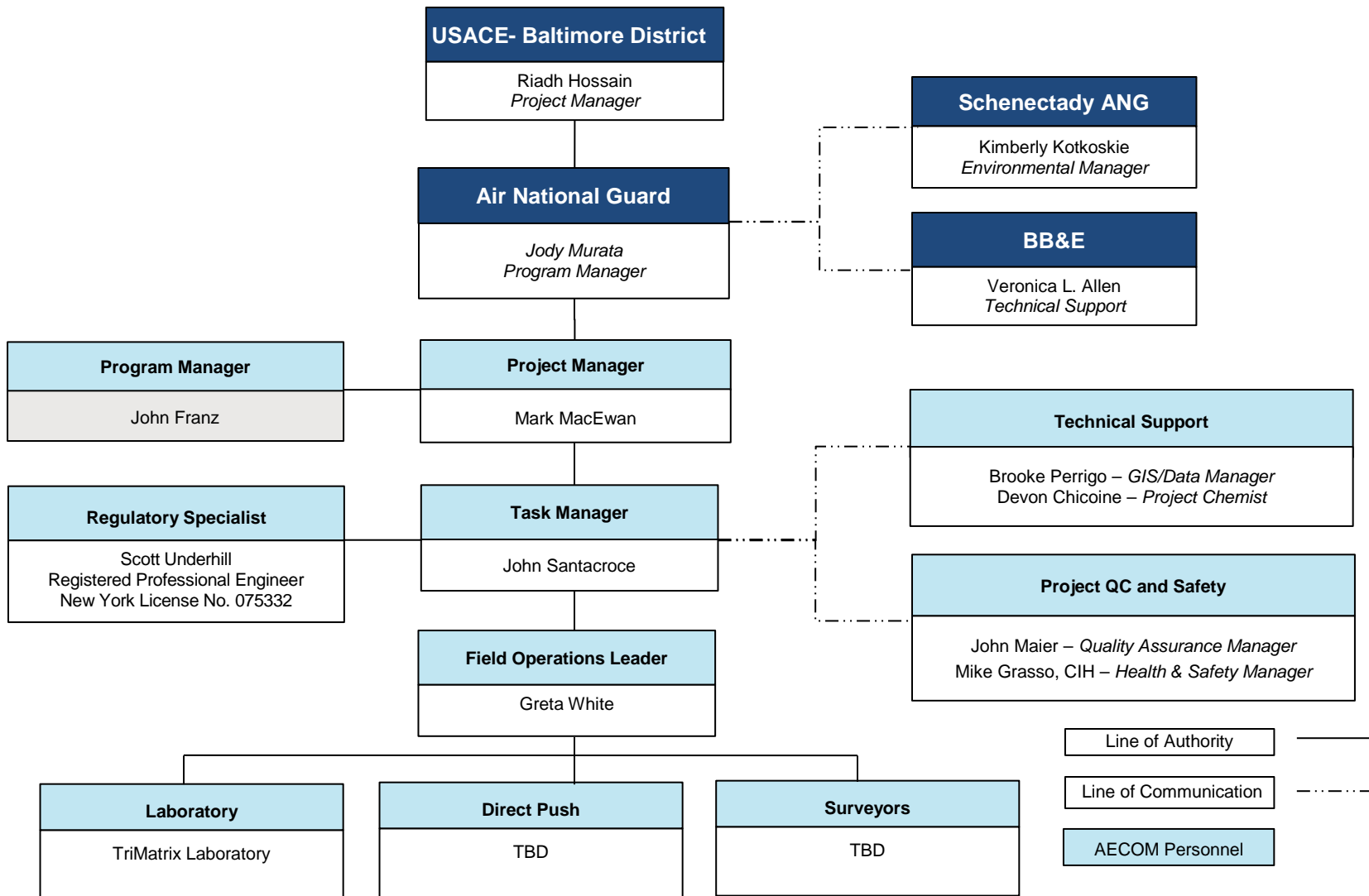
## **Appendix A**

### **Figures**



CONTRACT NO 60308608		Schenectady Air National Guard Base		
CARTOGRAPHY BY A. Weber				
CHECKED BY M. Donahue	DATE December 2013	Figure 1-1 Schenectady Air National Guard Base Vicinity Map Scotia, New York		
SCALE 1" = 650'	SHEET 1 of 1			
Fig_1-1_Schenectady_ANGB_Vicinity.mxd				





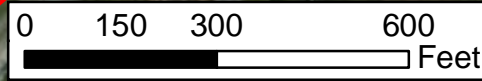
**Figure 1-2: Organization Chart**




N

## Legend

Schenectady ANGB Boundary





CONTRACT NO 60308608		Schenectady Air National Guard Base		
CARTOGRAPHY BY A. Weber				
CHECKED BY M. Donahue	DATE December 2013	<div>Figure 5-1</div> <div>Schenectady Air National Guard Base</div> <div>Areas of Concern Locations</div> <div>Scotia, New York</div>		
SCALE 1" = 300'	SHEET 1 of 1			
Fig_5-1_Schenectady_ANGB_Vicinity.mxd				

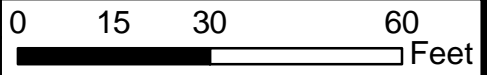





**Legend**


 Existing Monitoring Well  
 Proposed Sampling Location

Note: Natural gas lines exist near this AOC and their location will be confirmed prior to any intrusive work.




CONTRACT NO 60308608		Schenectady Air National Guard Base		
CARTOGRAPHY BY A. Weber				
CHECKED BY M. Donahue	DATE December 2013	Figure 5-2 Schenectady Air National Guard Base AOC-B13 SI Sampling Location Scotia, New York		
SCALE 1" = 30'	SHEET 1 of 1			
Fig. 5-2_Schenectady_Sampling_Locations_AOC-B13.mxd				





CONTRACT NO 60308608		Schenectady Air National Guard Base		
CARTOGRAPHY BY A. Weber				
CHECKED BY M. Donahue	DATE December 2013	<div>Figure 5-3</div> <div>Schenectady Air National Guard Base</div> <div>AOC-Former Heating Oil UST 41 SI Sampling Location</div> <div>Scotia, New York</div>		
SCALE 1" = 30'	SHEET 1 of 1			
Fig. 5-3.Schenectady_Sampling_Locations_AOC-UST41.mxd				

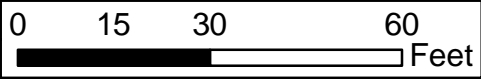







### Legend

-  Proposed Sampling Locations
-  Approximate Location of Feature



CONTRACT NO 60308608		Schenectady Air National Guard Base		
CARTOGRAPHY BY A. Weber				
CHECKED BY M. Donahue		<div>Figure 5-4 Schenectady Air National Guard Base AOC-WWTP-Bypass UST SI Sampling Location Scotia, New York</div>		
DATE December 2013				
SCALE 1" = 30'				
Fig_5-4_Schenectady_Sampling_Locations_AOC-WWTPbypass.mxd				

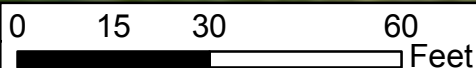
Source: Microsoft, 2011




# Legend

✕ Proposed Sampling Locations

Note: Boring locations are proposed. Final boring locations will be based on the results of the video inspection of drains and pipelines.



CONTRACT NO 60308608		Schenectady Air National Guard Base		
CARTOGRAPHY BY A. Weber				
CHECKED BY M. Donahue		DATE December 2013		
SCALE 1" = 30'		SHEET 1 of 1		
Fig. 5-5 Schenectady_Sampling_Locations_AOC-19.mxd		Figure 5-5 Schenectady Air National Guard Base AOC-Building 19 Drains SI Sampling Location Scotia, New York		



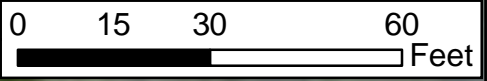



N

### Legend

X

Proposed Sampling Locations



CONTRACT NO 60308608		Schenectady Air National Guard Base		
CARTOGRAPHY BY A. Weber				
CHECKED BY M. Donahue	DATE December 2013	<div>Figure 5-6</div> <div>Schenectady Air National Guard Base</div> <div>AOC-Building 35 Drains SI Sampling Location</div> <div>Scotia, New York</div>		
SCALE 1" = 30'	SHEET 1 of 1			
Fig. 5-6_Schenectady_Sampling_Locations_AOC-35.mxd				

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## **Appendix B**

### **Tier II UFP-QAPP**

## **APPENDIX B**

# **TIER II QUALITY ASSURANCE PROJECT PLAN**

## **FINAL**

Regional Compliance Restoration Program  
Preliminary Assessment/Site Inspection at  
Schenectady Air National Guard



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**QAPP WORKSHEET #1 – TITLE AND APPROVAL PAGE**

**FINAL QUALITY ASSURANCE PROJECT PLAN  
SCHENECTADY ANG**

**June 2014**

**Regional Compliance Restoration Program  
Preliminary Assessment/Site Inspection at  
Multiple Air National Guard Installations Northeast**

**Prepared for:**

**US Army Corps of Engineers  
10 South Howard Street  
Room 10000-S  
Baltimore, MD 21201-2505**

**Prepared by:**

**AECOM  
675 North Washington Street  
Suite 300  
Alexandria, VA 22314**

**Prepared under:**

**Contract Number: W912DR-12-D-0014  
Task Order: 0001**

**Review Signatures:**

John Santacroce  
Task Manager



June 24, 2014

Signature

Date

Devon Chicoine  
Project Chemist



June 24, 2014

Signature

Date

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## **EXECUTIVE SUMMARY**

This Tier II Quality Assurance Project Plan (QAPP) has been prepared by AECOM to support the proposed Preliminary Assessment (PA)/Site Inspection (SI) at the Schenectady Air National Guard Base, Scotia, New York. This QAPP is intended to ensure that environmental data collected and compiled are scientifically sound, of known and documented quality, and suitable for intended uses. This work is being done under the US Army Corps of Engineers (USACE), Baltimore District, Contract W912DR-12-D-0014, Task Order 0001, for the Air National Guard (ANG).

This QAPP is Appendix B to the PA/SI Work Plan. The USACE and the ANG are following the CERCLA process for the investigations at Schenectady ANG.

With the concurrence of the USACE, this Tier II QAPP was developed based on guidance from the current version of the Department of Defense (DoD) Quality Systems Manual (QSM) and the Uniform Federal Policy (UFP) for Implementing Environmental Quality Systems. It consists of text and selected UFP worksheets containing detailed procedures/methods for sampling and analyses including the associated quality assurance/quality control (QA/QC) methods used during the environmental investigation process, and serves as a guideline for the field activities and data quality assessment.

The PA/SI involves the following areas of concern (AOCs) at Schenectady ANG:

- Former Building 13 Area;
- Former Heating Oil UST #41, Former Building 4;
- Waste Water Treatment Plant (WWTP) Bypass UST near IRP Site 6;
- Former JP-8 Reclamation UST at Building 29;
- Building 19 Drains; and
- Building 35 Drains.

Contaminants of potential concern (COPCs) may be present at the AOCs from past operations. However, environmental sampling to evaluate potential impacts from COPC releases or closure documentation for former underground storage tanks (USTs) or other decommissioned facilities are not available. The objective of this SI to evaluate the presence and to further define the nature and extent of COPCs at the facility AOCs listed above.

This objective will be accomplished by performing the following field and laboratory activities: 1) site preparation activities including the mobilization/demobilization of field team personnel and equipment; 2) utility clearance for subsurface investigations; 3) sampling and analyses of soil and groundwater to evaluate potential impacts from released COPCs; and 4) documentation of sampling locations and conditions. The results of the SI field investigation will be used to determine if a response action or remedial investigation is appropriate for any of the AOCs.

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## CONTENTS

QAPP Worksheet #1 – Title and Approval Page.....	1
Acronyms and Abbreviations .....	6
QAPP Worksheet #3 – Distribution List.....	9
QAPP Worksheet #5 – Project Organizational Chart .....	11
QAPP Worksheet #6 – Communication Pathways.....	13
QAPP Worksheet #9 – Project Scoping Session Participants Sheet .....	17
QAPP Worksheet #10 – Conceptual Site Model .....	18
QAPP Worksheet #11 – Project Quality Objectives/Systematic Planning Process Statements .....	19
QAPP Worksheet #12 – Measurement Performance Criteria Table .....	23
QAPP Worksheet #14 – Summary of Project Tasks .....	25
QAPP Worksheet #15 – Reference Limits and Evaluation Table.....	29
QAPP Worksheet #17 – Sampling Design and Rationale .....	45
QAPP Worksheet #18 – Sampling Locations and Methods/SOP Requirements Table.....	47
QAPP Worksheet #19 – Analytical SOP Requirements Table .....	48
QAPP Worksheet #20 – Field Quality Control Sample Summary Table .....	49
QAPP Worksheet #21 – Project Sampling SOP References Table .....	50
QAPP Worksheet #23 – Analytical SOP References Table .....	51
QAPP Worksheet #28 – LABORATORY QC Samples Table .....	53
QAPP Worksheet #30 – Analytical Services Table .....	65
QAPP Worksheets #34 – 36: Data Verification and Validation (Steps I and IIa/IIb) Process Table .....	67

## ACRONYMS AND ABBREVIATIONS

µg/kg	Micrograms per kilogram
µg/L	Micrograms per liter
ANG	Air National Guard
ANGB	Air National Guard Base
APP	Accident Prevention Plan
AST	Aboveground Storage Tank
AW	Air Wing
BB&E	BB&E Consulting Engineers and Professionals
CAS	Chemical Abstract Service
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act of 1980
COC	Chain of Custody
COPC	Contaminant of Potential Concern
CRP	Compliance Restoration Program
DoD	Department of Defense
DGPS	Differential Global Positioning System
DIUF	Deionized Ultra-Filtered
DL	Detection Limit
DPT	Direct Push Technology
DQI	Data Quality Indicator
DQO	Data Quality Objective
DW	Dry Well
EB	Equipment Blank
EDD	Electronic Data Deliverable
EPA	Environmental Protection Agency
ERPIMS	Environmental Resources Program Information Management System
EESOH-MIS	Enterprise Environmental Safety and Occupational Health-Management Information System
FID	Flame Ionization Detector
GC	Gas Chromatography
GIS	Geographic Information System
GPS	Global Positioning System
IDW	Inspection-derived Waste
IS	Internal Standards
LCS	Laboratory Control Sample
LF	Leach Field
LOD	Limit of Detection
LOQ	Limit of Quantitation
MB	Method Blank
MCL	Maximum Contaminant Level
mg/kg	Milligrams per kilogram
mg/L	Milligrams per liter
MS/MSD	Matrix Spike/Matrix Spike Duplicate
OWS	Oil Water Separator
PA	Preliminary Assessment
PAL	Project Action Limit
PID	Photo Ionization Detector
QA	Quality Assurance
QAPP	Quality Assurance Project Plan

QC	Quality Control
RPD	Relative Percent Difference
RSL	Regional Screening Levels
SD	Standard Deviation
SI	Site Inspection
SOP	Standard Operating Procedure
SVOC	Semivolatile Organic Compounds
TB	Trip Blank
TPH-DRO	Total Petroleum Hydrocarbons Diesel-Range Organics
TPH-GRO	Total Petroleum Hydrocarbons Gasoline-Range Organics
TPH-ORO	Total Petroleum Hydrocarbons Oil-Range Organics
UFP	Uniform Federal Policy
USACE	United States Army Corps of Engineers
UST	Underground Storage Tank
VOC	Volatile Organic Compounds
WP	Work Plan
WS	Worksheet



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### QAPP WORKSHEET #3 – DISTRIBUTION LIST

Name of QAPP Recipients	Title/Role	Organization	Telephone Number (Optional)	E-mail Address or Mailing Address	Document Control Number (Optional)
Riadh Hossain	Project Manager	USACE-Baltimore District	410-962-2342	<a href="mailto:Riadh.hossain@usace.army.mil">Riadh.hossain@usace.army.mil</a>	N/A
Jody Murata	Program Manager	ANG	703-730-7215 240-612-8120	<a href="mailto:Jody.Murata@ang.af.mil">Jody.Murata@ang.af.mil</a>	N/A
Kim Kotkoskie	Environmental Manager	Schenectady ANG	518-344-2341	<a href="mailto:kimberly.kotkoskie.1@ang.af.mil">kimberly.kotkoskie.1@ang.af.mil</a>	N/A
Mark MacEwan	Program Manager	AECOM	703-706-0133	<a href="mailto:Mark.macewan@aecom.com">Mark.macewan@aecom.com</a>	N/A
John Santacroce	Task Manager	AECOM	518-951-2200	<a href="mailto:John.Santacroce@aecom.com">John.Santacroce@aecom.com</a>	N/A
Michael Grasso, CIH	Health and Safety Manager	AECOM	607-227-5716	<a href="mailto:Michael.Grasso@aecom.com">Michael.Grasso@aecom.com</a>	N/A
Greta White	Field Team Leader	AECOM	518-951-2200	<a href="mailto:Greta.White@aecom.com">Greta.White@aecom.com</a>	N/A
Devon Chicoine	Project Chemist	AEOCM	703-706-0544	<a href="mailto:Devon.Chicoine@aecom.com">Devon.Chicoine@aecom.com</a>	N/A
Brooke Perrigo	Geographic Information System (GIS)/Data Manager	AECOM	703-706-0138	<a href="mailto:brooke.perrigo@aecom.com">brooke.perrigo@aecom.com</a>	N/A
Phil Komar	Laboratory Manager	TriMatrix	616-846-9528	<a href="mailto:komarp@trimatrixlabs.com">komarp@trimatrixlabs.com</a>	N/A

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## **QAPP WORKSHEET #5 – PROJECT ORGANIZATIONAL CHART**

The organization chart is Figure 1-2 located in Appendix A of the Work Plan.

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## QAPP WORKSHEET #6 – COMMUNICATION PATHWAYS

Communication Drivers	Responsible Entity	Name	Phone Number	Procedure (Timing, Pathways, etc.)
Army Point of Contact	USACE Project Manager	Riadh Hossain	410-962-2342	AECOM will submit all formal deliverables to Riadh Hossain
Air National Guard	ANG Program Manager	Jody Murata	240-612-8120	All materials and information about the project will be forwarded to the ANG Program Managers by Riadh Hossain
Manages all Project Phases	AECOM Project Manager	Mark MacEwan	703-706-0133	Mark MacEwan is AECOM's liaison to USACE Project Manager. Notifies USACE Project Manager of field related QA/QC problems by phone or email by close of business (COB) the next business day.
Manages all Installation Activities	AECOM Task Manager	John Santacroce	518-951-2200	Notify Project Manager by phone and email of changes and obtain approval within 2 working days.
Real time modification, notification, and approval	AECOM QA Officer	John Maier	703-706-0548	Notify Task Manager by phone and email of changes and obtain approval within 2 working days.
QAPP changes in the field	AECOM Field Team Leader	Greta White	518-951-2200	Notify QA Officer by phone and email of changes within COB the same day.
Daily Field QC Reports	AECOM Field Team Leader	Greta White	518-951-2200	E-mail daily QC reports to Project Manager.
Field sampling activities coordination with laboratory	AECOM Project Chemist	Devon Chicoine	703-706-0544	The Project Chemist will contact the laboratory by e-mail to order the necessary sample containers and appropriate shipping for delivery on site before field sampling begins and throughout the project.
Daily COC reports and shipping documentation	AECOM Field Team Leader	Greta White	518-951-2200	Chain of custodies (COCs) and shipping records will be submitted via fax or e-mail to the Project Chemist at the end of each day that samples are collected.
Sample shipment coordination with laboratory	AECOM Field Team Leader	Greta White	518-951-2200	Coordinate with the laboratory on days of sample shipment to inform it of anticipated shipment arrival dates, including number of coolers shipped. Provide laboratory with COCs, shipment tracking numbers, and any other pertinent information
Laboratory results	TriMatrix Laboratory Project Manager	Phil Komar	616-846-9528	Laboratory results will be reported to the Project Chemist in accordance with the laboratory SOW.

## WORKSHEET #6 COMMUNICATION PATHWAYS (CONTINUED)

Communication Drivers	Responsible Entity	Name	Phone Number	Procedure (Timing, Pathways, etc.)
Reporting laboratory data quality issues	TriMatrix Laboratory Project Manager	Phil Komar	616-846-9528	QA/QC issues that potentially affect data usability will be reported by the Laboratory Project Manager to the Project Chemist by e-mail within 1 business day.
Field and analytical corrective actions	AECOM Project Chemist	Devon Chicoine	703-706-0544	The Project Chemist will immediately notify the Project Manager and Program QC Manager by e-mail of field or analytical procedures that were not performed in accordance with the planning documents. The Project Chemist, in coordination with the Program QC Manager, will complete documentation of the nonconformance, and corrective actions to be taken. The Project Chemist will verify that the corrective actions have been implemented.
Release of analytical data	AECOM Project Chemist	Devon Chicoine	703-706-0544	The Project Chemist will review faxed/e-mailed data to verify that data quality objectives are met as described in the planning documents before the data are released.
Sampling procedure revision during field activities	AECOM Field Team Leader	Greta White	518-951-2200	The Field Team Leader will prepare a field change request for any changes in sampling procedures that occur because of conditions in the field. This request will be submitted to the Project Manager for approval prior to initiation of the change.
Data usability	AECOM Project Chemist and Field Team Leader	Devon Chicoine / Greta White	703-706-0544 / 518-951-2200	The Project Chemist will notify the Project Manager of any data usability issues that are identified during data analysis or validation immediately. Similarly, the Field Team Leader will notify the Project Manager of any field conditions, sample collection techniques, or sample shipping issues that impact data usability at the end of the same day of occurrence or earlier as deemed appropriate.

---

**WORKSHEET #6 COMMUNICATION PATHWAYS (CONTINUED)**

Communication Drivers	Responsible Entity	Name	Phone Number	Procedure (Timing, Pathways, etc.)
Corrective action, audit, findings, and management review records	AECOM QA Officer	Devon Chicoine	703-706-0544	Problems or audit findings indicating QAPP not being properly implemented will be reported to John Santacroce within 24 hours of problem notation.
QAPP Amendments Approval	ANG Program Manager	Jody Murata	703-730-7215 240-612-8120	Any changes to the QAPP that would impact the project specific DQOs must be approved by USACE before changes can be implemented.



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## QAPP WORKSHEET #9 – PROJECT SCOPING SESSION PARTICIPANTS SHEET

There was no formal project scoping session associated with this project. The information presented below was ascertained from the SI Kickoff Meeting and the Site visit and is therefore provided for information purposes.

Project Name: <u>Regional Compliance Restoration Program (CRP)</u> Preliminary Assessment/Site Inspection (PA/SI) Projected Date(s) of Sampling: <u>Spring 2014</u>				Site Name: <u>Schenectady ANG</u> Site Location: <u>Scotia, New York</u>	
<b>Date of Session: 19 November 2013</b>					
<b>Scoping Session Purpose: SI Kickoff Meeting and Site Visit</b>					
Name	Title	Affiliation	Phone #	E-mail Address	Project Role
Jody Murata	Program Manager	ANG	240-612-8120	<a href="mailto:Jody.Murata@ang.af.mil">Jody.Murata@ang.af.mil</a>	Program Management
Veronica Allen	Senior Environmental Engineer	BB&E	248-489-9636 ext 304 (o) 248.212.7770 (c )	<a href="mailto:vallen@bbande.com">vallen@bbande.com</a>	Technical Support
Kim Kotkoskie	Base Environmental Manager	Schenectady ANG	518-344-2341	<a href="mailto:kimberly.kotkoskie.1@ang.af.mil">kimberly.kotkoskie.1@ang.af.mil</a>	Installation Contact-Environmental Manager
Mark MacEwan	Project Manager	AECOM	703-706-0133 (o) 202-375-9353 (c)	<a href="mailto:Mark.MacEwan@aecom.com">Mark.MacEwan@aecom.com</a>	Project Manager
Megan Donahue	Deputy Project Manager	AECOM	703-706-9417 (o) 808-375-0410 (c)	<a href="mailto:Megan.Donahue@aecom.com">Megan.Donahue@aecom.com</a>	Deputy Project Manager
John Santacroce	Task Manager	AECOM	518-951-2200	<a href="mailto:John.Santacroce@aecom.com">John.Santacroce@aecom.com</a>	Installation Project Manager
Greta White	Geologist	AECOM	518-951-2200	<a href="mailto:Greta.White@aecom.com">Greta.White@aecom.com</a>	Field Team Leader

AECOM conducted the PA at Schenectady ANG on November 12, 2013 to evaluate whether the sites proposed for investigation should be investigated or should be recommended for No Further Action. Locations of the 6 sites and areas of concern (AOC) are shown in Figure 5-1 (Appendix A) and the results of PA are discussed in Section 5 of the Work Plan. This QAPP will only address sites that have been proposed for additional investigation.

---

## **QAPP WORKSHEET #10 – CONCEPTUAL SITE MODEL**

### **Ground Water Pathway**

A detailed description of site hydrogeology is located included in Section 2.1 of the Work Plan. Potable water is supplied to only the NYANG Main Parcel by the municipal water supply from the Town of Glenville. There is no potable water supply to the NYANG South Parcel (ANG, 2006).

The Town of Glenville has five municipal water wells which are supplied by the Schenectady Aquifer. These wells supply water to Stratton ANGB and to most of the residences north and east of the ANGB. The Glenville wells are located approximately 5 mi west of the ANGB and are relatively shallow, between 50 and 60 ft deep. The municipal water supply wells are installed at shallow depths into the bedrock since the bedrock formations in the Schenectady area have a low permeability and are poor sources of water. The groundwater in the bedrock primarily flows within the fractures and joints in the rock and within the weathered or fractured zone within the upper few feet of the bedrock surface (Buckhurst, Fish, Hutton, Katz, Inc. 1990).

According the Schenectady County Planning Department (1978), wellhead aquifer protection areas have been established for the Scotia and Glenville wells fields for protection of the water supply. The wellhead protection zones are areas that surround the public supply wells and extend to the limits of the cone of depression. These two zones are located approximately 7 mi west of Stratton ANGB. The aquifer recharge area, which is an area considered sensitive and significant to groundwater recharge, is located at the southern entrance of Stratton ANGB (ANG, 2006).

### **Surface Water Pathway**

A detailed description of site topography and drainage is located included in Section 2.1 of the Work Plan. Surface runoff into tributaries to the Mohawk River, including Collins Creek and the Indian and Alplaus Kills, is a possibility.

### **Soil Exposure and Air Migration Pathways**

A detailed site description is provided in Section 2 of the Work Plan. The population in Schenectady County was estimated to be 155,124 in 2012 (U.S. Department of Commerce, 2013). Land use in Schenectady County is primarily undeveloped forest, brushland, and water areas (over 50 percent of total county acreage). Agricultural land use is the next largest segment (24 percent), while residential land use comprises 13.8 percent of the County. The land use in the Town of Glenville surrounding the 109th Airlift Wing property is primarily suburban residential and undeveloped lands with some limited industrial and commercial uses (ANG, 2006). There is undeveloped land immediately across Habel Lane zoned as Medium Density Residential. The railroad lines located along the east side of Maple Avenue are zoned as Industrial and a Land Conservation Zone is located along the Mohawk River frontage south of the ANGB (Town of Glenville 2004). According to the Master Plan (Hueber *et al.* 1997), an Aquifer Protection Overlay District is present on the lands from Maple Avenue and eastward. The Aquifer Protection Zone area has been mapped to the south of the railroad tracks and to the southeast of the site (Schenectady County Planning Department 1978). There is a sign designating the Aquifer Protection Zone area at the at the railroad tracks and visible when entering onto the ANGB property (ANG, 2006). Therefore, if soil contamination exists, the soil exposure and air migration pathway may be of concern at the site.

## **QAPP WORKSHEET #11 – PROJECT QUALITY OBJECTIVES/SYSTEMATIC PLANNING PROCESS STATEMENTS**

### **1. State the Problem (Step 1)**

Potential releases of COPCs to the environment may have occurred during historic operations at the following AOCs:  
Former Building 13 Area;  
Former Heating Oil UST #41, Former Building 4;  
Waste Water Treatment Plant (WWTP) Bypass UST near IRP Site 6;  
Building 19 Drains; and  
Building 35 Drains.

### **2. Identify the Goal of the Study (Step 2)**

Evaluate from a CERCLA-release perspective, the environmental presence of COPCs at the identified AOCs and the potential for their migration. Recommendations for further investigation will be developed for AOCs where COPCs are detected above Project Action Levels (PALs), which are based on specified screening criteria. No further action will be recommend for AOCs where COPCs are not detected above PALs.

For Schenectady ANG, the PALs are bases on are based on the most stringent of the following screening criteria:

Soil: New York State Department of Environmental Conservation (NYSDEC), Commissioner Policy (CP-51) / Soil Cleanup Guidance, 21 October 2010, or USEPA Regional Screening Levels (RSL) for Residential Soil (November 2013).

Groundwater: USEPA Maximum Contaminant Levels (MCLs), and either NYSDEC Technical & Operational Guidance Series (TOGS), 1.1.1 Ambient Water Quality Standards and Guidance Values, June 1998, April 2000 Addendum, June 2004 Addendum, or USEPA Regional Screening Level for Tapwater (November 2013).

### **3. Identify information inputs (Step 3)**

Soil and groundwater samples will be collected at each AOC as defined in the Work Plan and analyzed for the COPCs based on CP-51 and TOGS guidance. The COPCs include volatile organic compounds (VOCs) and semivolatile organic compounds (SVOCs), metals, and pH.

### **4. Define the boundaries of the study (Step 4)**

Boundaries to each site are limited to the immediate AOC.

### **5. Develop the analytical approach (Step 5)**

COPCs are limited to the products associated with the AOC and are listed above.

VOC, SVOC, metals, and pH analyses methods and their respective PALs for soil and groundwater matrices are provided in Worksheet #15. VOC sand SVOC analyses data will be evaluated against their respective PALs for use in the following project decisions:

- If the concentrations of VOCs, SVOCs, metals, and pH in soil and groundwater at a particular AOCs are all below their respective PALs, a no further action determination will be recommended with respect to an environment release..
- If the concentrations of VOCs, SVOCs, metals, and pH in soil or groundwater at a particular AOCs are above a PAL, recommendations for potential further action at that location including the selection of revised PALs and, if warranted, additional site investigation and COPC delineation will be developed.

### **6. Specify performance or acceptance criteria (Step 6)**

The objective of this section is to complete the following:

- Identify potential sources of study error (i.e., field error, analytical error)

- Establish and identify the methods used to reduce potential sources of error
- Determine how decision errors will be managed during the project

Sampling Strategy: The SI sampling design was developed to detect COPCs that may have been released to the environment (soil and groundwater) at the AOCs at Schenectady ANG as the result of historic releases.

Sources of Error: Sources of error in the SI may be divided into two main categories: sampling errors and measurement errors. A sampling error occurs when the sampling design, planning, and implementation do not provide for a representative range of heterogeneity at the site. A measurement error occurs because of performance variance from laboratory instrumentation, analytical methods, and operator error. The EPA identifies the combination of all these errors as a “total study error” (USEPA 2006). One objective of the investigation is to reduce the total study error so that decision-makers can be confident that the data collected accurately represent the chemical characteristics of the site.

Managing Decision Error: The investigation will utilize decision-error minimization techniques in sampling design, sampling methodologies, and laboratory measurement of mercury. Possible decision errors will be minimized during the field investigation by using the following methods:

- Use standard field sampling methodologies.
- Use applicable analytical methods for sample analysis by a competent analytical laboratory certified by the DoD Environmental Laboratory Accreditation Program (ELAP) to reduce measurement errors.
- Confirm analytical data to identify and control potential laboratory error and sampling error by using spikes, blanks, and replicated samples.

Decision errors associated with judgmental sampling are based on sample design and measurement errors. Assuming that the best possible professional judgment was used to develop the judgmental sampling plan (i.e., position sampling locations), the most important decision errors will be associated with field and laboratory techniques involved in the collection and analysis of the data.

Sampling Methodologies and Procedures: Possible decision errors generated by sampling errors will be minimized during the field investigation by applying standardized field sampling methodologies (discussed on Worksheets #14 and #21). Sampling activities will be performed in accordance with the Standard Operating Procedures (SOPs) specified in this QAPP.

Laboratory Measurement of VOC, SVOC, metals, and pH: Possible decision errors generated by laboratory measurement errors will be minimized by using applicable analytical methods (discussed on Worksheet #23) for sample analysis by a competent analytical laboratory evaluated and certified by the DoD ELAP.

Managing Laboratory Sampling Error: Control of potential laboratory error and sampling error will be minimized using spikes, blanks, and duplicates. Sampling error may be introduced when the laboratory chemist selects a single portion of the field sample for laboratory analysis. However, this issue is less relevant to the discrete sampling approach as sub-sampling is generally not implemented at the laboratory.

## **7. Develop the plan for obtaining data (Step 7)**

Direct push technology (DPT) will be used to collect subsurface soil and groundwater samples.

The sampling design for the site was developed to optimize resources and generate data to satisfy the PALs. Details of the sampling design and rationale are provided on Worksheet #17 and sample locations and analysis conducted at each location are identified on Worksheet #18.

Field Data Logs: All sample information will be transcribed into a field logbook and/or onto field data sheets, as described in SOP 3-02.

Analytical Laboratory Sample Management: The sample matrix, number of samples, and number and type of laboratory quality assurance/quality control (QA/QC) samples are summarized on Worksheets #18 and 20. Details on the analytical group, sample volumes, sample container specifications, preservation requirements, and maximum holding times are summarized on Worksheet #19.

The laboratory will provide full electronic data deliverable files, portable document format (PDF) files of the data deliverables for all project data, and a hard copy of data deliverables for all results including results from secondary subcontract laboratories. Designated samples will be used to obtain necessary subsamples for laboratory QC measurements (i.e., analytical sample duplicate and sample matrix spike/matrix spike duplicate [MS/MSD]). Tasks will be completed using the laboratory SOPs summarized on Worksheet # 23.

AECOM will provide data validation services and verify and evaluate the usability of the data as identified on Worksheets #34 - 36: Verification and Validation (Steps I and IIA/IIB) Process Table.

Upon receipt of a laboratory data package and the associated electronic database deliverables (EDD), AECOM will perform data management tasks required to ensure that all analyses were performed in accordance with project requirements. The data management requirements include conducting data verification and data validation to determine the usability of the data for the original project objectives.

#### Data Verification

Initially, laboratory deliverables are received at AECOM in both pdf (laboratory data report) and EDD formats. When the data verification process described below is complete, laboratory data reports and EDDs will be transmitted to staff chemists or the data validation subcontractor who will perform data validation.

#### Laboratory Report Verification

AECOM will perform data verification on every report submitted by a laboratory. Upon receipt of the laboratory deliverables, a data management staff member will perform the following actions:

- The deliverable will be inspected to verify that results were received for each requested analysis for each sample. If a result is missing, the staff member will determine whether the laboratory submitted a deficiency report that accounts for the missing data.
- The data deliverable will be inspected for completeness based on the requirements specified in this plan. Inspection will verify only that all required report elements are present, not that the data within the report are complete.

#### Electronic Data Verification

All analytical results are required to be submitted to AECOM in a format that meets the requirements of the Environmental Restoration Program Information Management System (ERPIMS). Data files will be uploaded to ERPIMS by AECOM. Once it has been verified that each EDD meets format requirements, it will be loaded into the project's electronic database management program as "unvalidated" for user access on the network. These analytical results will be considered preliminary until data validation is complete.

The EDDs will be compared to the pdf version of the laboratory data report by AECOM data management coordinators. This review will be performed on 10 percent of the electronic data results. If a discrepancy is identified, the laboratory will be required to correct the error. The laboratory will also be required to determine if the error was a simple mistake or was caused by a systematic problem in data reduction and reporting.

#### Electronic Data Verification

All analytical results are required to be submitted in a format that meets the requirements of the ERPIMS. After the AECOM database manager verifies that each EDD meets format requirements, it will be loaded

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## QAPP WORKSHEET #12 – MEASUREMENT PERFORMANCE CRITERIA TABLE

Matrix Concentration Level	Soil Low			
QC Sample	Analytical Group	Frequency	Data Quality Indicators (DQIs)	Measurement Performance Criteria
Trip Blank (VOCs only)	VOCs, SVOCs, metals, pH	One per cooler containing VOC samples	Bias/Accuracy	No analytes detected > ½ RL and >0 1/10 the amount measured in any sample or 1/10 the regulatory limit (whichever is greater). Blank result must not otherwise affect sample results. For common laboratory contaminants (acetone and methylene chloride), no analytes detected > RL
Equipment Rinsate Blank <sup>1</sup>		One per twenty samples per matrix per type of sampling equipment used	Bias/Accuracy	No analytes detected > ½ RL and >0 1/10 the amount measured in any sample or 1/10 the regulatory limit (whichever is greater). Blank result must not otherwise affect sample results. For common laboratory contaminants (acetone and methylene chloride), no analytes detected > RL
Cooler Temperature Blank		One per cooler	Accuracy/ Representativeness	Temperature Cool to ≤ 6 degrees Celsius.
Field Duplicate		One per ten samples per matrix	Precision	Relative Percent Difference (RPD) ≤ 20% if both results are ≥5 x LOQ
Matrix Spike/Matrix Spike Duplicate		Submitted: One per twenty samples per matrix (Analyzed: One per ten samples per matrix)	Bias/Accuracy/ Precision (lab)	RPD ≤ 20%; Recovery 80-120%

Notes:

(1) = If dedicated or disposable equipment is used to collect samples then equipment blank will not be collected.



Matrix Concentration Level		Groundwater Low		
QC Sample	Analytical Group	Frequency	Data Quality Indicators (DQIs)	Measurement Performance Criteria
Trip Blank (VOCs only)	VOCs, SVOCs, metals, pH	One per cooler containing VOC samples	Bias/Accuracy	No analytes detected > ½ RL and >0 1/10 the amount measured in any sample or 1/10 the regulatory limit (whichever is greater). Blank result must not otherwise affect sample results. For common laboratory contaminants (acetone and methylene chloride), no analytes detected > RL
Equipment Rinsate Blank <sup>1</sup>		One per twenty samples per matrix per type of sampling equipment used	Bias/Accuracy	No analytes detected > ½ RL and >0 1/10 the amount measured in any sample or 1/10 the regulatory limit (whichever is greater). Blank result must not otherwise affect sample results. For common laboratory contaminants (acetone and methylene chloride), no analytes detected > RL
Cooler Temperature Blank		One per cooler	Accuracy/ Representativeness	Temperature Cool to ≤ 6 degrees Celsius.
Field Duplicate		One per ten samples per matrix	Precision	RPD ≤ 20% if both results are ≥5 x LOQ
Matrix Spike/Matrix Spike Duplicate		Submitted: One per twenty samples per matrix (Analyzed: One per ten samples per matrix)	Bias/Accuracy/ Precision (lab)	RPD ≤ 20%; Recovery 80-120%

Notes:

(1) = If dedicated or disposable equipment is used to collect samples then equipment blank will not be collected.

## **QAPP WORKSHEET #14 – SUMMARY OF PROJECT TASKS**

Project-specific SOPs and Field Forms for field tasks referenced in this worksheet are identified by title in Worksheet #21 and copies of each SOP are provided in Appendix E of the Work Plan. The field tasks are as follows:

- Mobilization/Demobilization
- Sample Collection and Sample Handling Tasks
- Monitoring Equipment Calibration
- Land Surveying
- Ground Penetrating Radar
- Soil/Groundwater Sampling
- IDW Management
- Field Documentation Procedures
- Quality Control Tasks
- Other Project-Related Tasks

### Mobilization/Demobilization

Mobilization will consist of the delivery of all equipment, materials, and supplies to the site, complete assembly (in satisfactory working order) of all such equipment at the site, and secure storage at the site of all such materials and supplies, along with the acquisition of personnel and vehicle base access badges. The Field Team Leader or designee will coordinate with the Schenectady ANG point of contact to identify appropriate locations for the temporary storage of equipment and supplies. Site-specific health and safety training for all field personnel and subcontractors will be conducted as part of site mobilization.

Demobilization will consist of the prompt and timely removal of all equipment, materials, and supplies from the site following completion of the work. Demobilization also includes the cleanup and removal of waste generated during the performance of the investigation. Investigation derived waste will be managed in accordance with SOP 3-05 located in Appendix E of the Work Plan.

### Sample Collection and Sample Handling Tasks

The sampling and analysis program is outlined in Worksheets 10 and 18. Sample collection and handling will be in accordance with the SOPs listed in Worksheet 21. Sample labeling will be in accordance with SOP-3-03. Methods for sample handling will be in accordance with SOP-3-04. Sample containers will be provided in “certified-clean” condition (I-Chem 300 or equivalent) from the analytical laboratory. The selection of sample containers, sample preservation, packaging, and shipping will be in accordance with SOP-3-04.

#### Monitoring Equipment Calibration

Field equipment will be calibrated in accordance with manufacturer's guidance by the Field Operations Leader or designee. Documentation of the field equipment calibration is required. Field equipment will be calibrated at the beginning and end of each day, unless otherwise stated by the equipment manufacturer (See SOP 3-20)

#### Land Surveying

Land surveying activities will be performed by a Professional Land Surveyor at the site and the background locations to locate, mark, and acquire coordinates and elevations of sampling locations and pertinent site features. Land-surveying activities will be conducted after collection of the soil/groundwater samples. Coordinates of surveyed locations will be referenced to the North American Datum 1983 and/or the Universal Transverse Mercator World Geodetic System.

#### Ground Penetrating Radar and Video Inspection of the Pipeline

GPR will be used to locate underground objects such as USTs or piping or verify that they are not present. GPR surveys will be conducted in accordance with the procedures described in AECOM SOP 3-09. The video inspection of the pipeline will be conducted by a subcontractor.

#### Soil/Groundwater Sampling

Subsurface soil samples will be collected using direct push technology (DPT) in accordance with SOP 3-17, SOP-3-21. All soil samples will be collected as discrete grab samples. Any visual signs of potential contamination (such as soil staining) will be noted in the log book. Ground water samples will be collected from temporary monitoring wells installed using DPT and in accordance with SOP-3-17

#### IDW Management

IDW generated will be containerized in 55-gallon drums. IDW will be sampled and characterized for waste profiling and the results returned within one week. The IDW will be labeled and stored within the fenced in area of the facility until it is disposed of by a licensed disposal subcontractor within 30 days of demobilization. IDW will be managed in accordance with ANG Policy 05-1 for IDW (ANG, 2009). AECOM will be responsible for arranging transportation and disposal of the IDW.

#### Field Documentation Procedures

Field documentation will be performed in accordance with SOP-3-02. Matrix-specific sample log sheets will be maintained for each sample collected. In addition, sample collection information will be recorded in bound field notebooks. Samples will be packaged and shipped according to SOP-3-04.

A summary of field activities will be properly recorded in indelible ink in a bound logbook with consecutively numbered pages that cannot be removed. If an incorrect entry is made, striking a single line through the incorrect information will make the correction; and the person making the correction will initial and date the change. Logbooks will be assigned to field personnel and stored in a secured area when not in use. Boring logs, sampling forms, and other field forms will also be used to document field activities.

Boring logs, sampling forms, and other field forms will also be used to document field activities.

#### Quality Control Tasks

QC samples including trip blanks, equipment blanks, field duplicates and matrix spike/matrix spike duplicates will be collected at frequencies listed in Worksheet #20.

#### Additional Project-Related Tasks

Additional project-related tasks include:

- Analytical Tasks
- Data Management
- Data Tracking
- Data Storage, Archiving, and Retrieval
- Data Security

#### Electronic Data

- Data Review
- Project Reports

#### Analytical Tasks

Chemical analyses will be performed by TriMatrix Laboratories, which is a current Department of Defense (DoD) Environmental Laboratory Accreditation Program-accredited laboratory for these analyses. Copies of the pertinent laboratory accreditations are included in Appendix F of the SI Work Plan. Analyses will be performed in accordance with the analytical methods identified in Worksheets 19 and 30. TriMatrix Laboratories will meet the screening criteria specified in Worksheet #15 and will perform the chemical analyses following the laboratory-specific SOPs identified in Worksheet 23. Copies of the Laboratory SOPs are available upon request.

The analytical data packages provided by TriMatrix Laboratories will be in a Contract Laboratory Program-like format and will be fully validatable and contain raw data, summary forms for all sample and laboratory method blank data, and summary forms containing all method-specific QC information (results, percent recoveries [%Rs], RPDs, relative standard deviations, percent differences or percent drifts [%Ds], etc.).

#### Data Management

The principal data generated for this project will be from field data and laboratory analytical data. The field logbooks for this project will be categorized and maintained in the project files after the completion of the field program. The field logbooks will be titled based on date and activity. The data handling procedures to be followed by TriMatrix Laboratories will meet the requirements of DoD and AECOM's technical specifications. The Chemist (or designee) is responsible for the overall tracking and control of data generated for the project.

#### Data Tracking

Data are tracked from generation to archiving in the AECOM project-specific files. The Project Chemist (or designee) is responsible for tracking the samples collected and shipped to TriMatrix Laboratories. Upon receipt of the data packages from TriMatrix Laboratories, the AECOM Project Chemist will monitor the data validation effort, which includes verifying that the data packages are complete and results for all samples have been delivered by TriMatrix Laboratories.

#### Data Storage, Archiving, and Retrieval

The data packages received from TriMatrix Laboratories are tracked in the data validation logbook. After the data are validated, the data packages are entered into the AECOM file system and archived in secure files. The field records including field log books, sample logs, chain-of-custody records, and field calibration logs will be submitted by the Field Team Leader to be entered into the AECOM file system prior to archiving in secure project files. Project files are audited for accuracy and completeness. At the completion of the contract, the records will be stored by AECOM.

#### Data Security

Access to AECOM project files is restricted to designated personnel only. Records can only be borrowed temporarily from the project file using a sign-out system. The AECOM Data Manager maintains the electronic data files, and access to the data files is restricted to qualified personnel only. File and data backup procedures are routinely performed.

#### Electronic Data

All electronic data will be compiled into an Environmental Resources Program Information Management System (ERPIMS) Electronic Data Deliverable (EDD) and loaded into ERPIMS.

#### Data Review

Data validation (Level IV) will be conducted on all laboratory results.

#### Project Reports

All data will be presented in the SI Report

## QAPP WORKSHEET #15 – REFERENCE LIMITS AND EVALUATION TABLE

Matrix: Soil  
Analytical Group: VOCs

Analyte	CAS Number	Project Action Limit (µg/kg)	Project Action Limit Reference	Laboratory-specific Quantitation Limits		
				LOQ (µg/kg)	LOD (µg/kg)	DL (µg/kg)
Acetone	67-64-1	50	CP-51	15	5	1.73
Benzene	71-43-2	60	CP-51	1	0.2	0.048
Bromobenzene	108-86-1	300	N-RSL	2	0.2	0.14
Bromochloromethane	74-97-5	160	N-RSL	1	0.5	0.113
Bromodichloromethane	75-27-4	0.27	C-RSL	1	0.2	0.0613
Bromoform	75-25-2	62	C-RSL	2	0.2	0.105
Bromomethane	74-83-9	7.3	N-RSL	4	0.2	0.0696
n-Butylbenzene	104-51-8	3900	N-RSL	1	0.5	0.127
sec-Butylbenzene	135-98-8	7800	N-RSL	2	0.5	0.12
tert-Butylbenzene	98-06-6	5900	CP-51	2	0.2	0.054
Carbon Disulfide	75-15-0	820	N-RSL	1	0.2	0.12
Carbon Tetrachloride	56-23-5	0.61	C-RSL	2	0.2	0.11
Chlorobenzene	108-90-7	290	N-RSL	1	0.2	0.0504
Chloroethane	75-00-3	15000	N-RSL	2	1	0.26
Chloroform	67-66-3	0.29	C-RSL	1	0.2	0.0665
Chloromethane	74-87-3	120	N-RSL	1	1	0.233
2-Chlorotoluene	95-49-8	1600	N-RSL	1	0.2	0.064
4-Chlorotoluene	106-43-4	1600	N-RSL	1	0.5	0.182
1,2-Dibromo-3-chloropropane	96-12-8	0.0054	C-RSL	5	1	1
Dibromochloromethane	124-48-1	0.68	C-RSL	1	0.2	0.12
1,2-Dibromoethane	106-93-4	0.034	C-RSL	3	0.2	0.092
Dibromomethane	74-95-3	25	N-RSL	3	0.5	0.119

Analyte	CAS Number	Project Action Limit (µg/kg)	Project Action Limit Reference	Laboratory-specific Quantitation Limits		
				LOQ (µg/kg)	LOD (µg/kg)	DL (µg/kg)
1,2-Dichlorobenzene	95-50-1	1900	N-RSL	1	0.5	0.173
1,3-Dichlorobenzene	541-73-1	N/A	N/A	1	0.2	0.0536
1,4-Dichlorobenzene	106-46-7	2.4	C-RSL	1	0.2	0.0504
Dichlorodifluoromethane	75-71-8	94	N-RSL	2	1	0.264
1,1-Dichloroethane	75-34-3	3.3	C-RSL	2	0.2	0.0897
1,2-Dichloroethane	107-06-2	0.43	C-RSL	1	0.5	0.114
1,1-Dichloroethene	75-35-4	240	N-RSL	2	0.2	0.0846
cis-1,2-Dichloroethene	156-59-2	160	N-RSL	1	0.2	0.0509
trans-1,2-Dichloroethene	156-60-5	150	N-RSL	1	0.5	0.123
1,2-Dichloropropane	78-87-5	0.94	C-RSL	3	0.2	0.095
1,3-Dichloropropane	142-28-9	1600	N-RSL	2	0.2	0.054
2,2-Dichloropropane	594-20-7	N/A	N/A	1	0.2	0.0557
1,1-Dichloropropene	563-58-6	N/A	N/A	2	0.2	0.0586
cis-1,3-Dichloropropene	10061-01-5	N/A	N/A	1	0.2	0.0923
trans-1,3-Dichloropropene	10061-02-6	N/A	N/A	3	0.2	0.2
Ethylbenzene	100-41-4	5.4	C-RSL	1	0.2	0.2
Hexachlorobutadiene	87-68-3	6.2	C-RSL	3	0.5	0.144
2-Hexanone	591-78-6	210	N-RSL	10	1	0.254
Isopropylbenzene	98-82-8	2100	N-RSL	1	0.2	0.0851
4-Isopropyltoluene	99-87-6	N/A	N/A	1	0.2	0.0536
Methylene Chloride	74-87-3	120	N-RSL	15	1	0.34
2-Butanone (MEK)	78-93-3	300	CP-51	10	1	0.915
4-Methyl-2-pentanone (MIBK)	108-10-1	5300	N-RSL	10	0.5	0.129
Naphthalene	91-20-3	3.6	C-RSL	5	0.2	0.0809
n-Propylbenzene	103-65-1	3400	N-RSL	1	0.2	0.0764

Analyte	CAS Number	Project Action Limit (µg/kg)	Project Action Limit Reference	Laboratory-specific Quantitation Limits		
				LOQ (µg/kg)	LOD (µg/kg)	DL (µg/kg)
Styrene	100-42-5	6300	N-RSL	1	0.2	0.0846
1,1,1,2-Tetrachloroethane	630-20-6	1.9	C-RSL	1	0.5	0.12
1,1,2,2-Tetrachloroethane	79-34-5	0.56	C-RSL	2	0.2	0.0621
Tetrachloroethene	127-18-4	22	C-RSL	2	0.2	0.0544
Toluene	108-88-3	700	CP-51	2	0.5	0.144
1,2,3-Trichlorobenzene	87-61-6	49	N-RSL	2	0.5	0.189
1,2,4-Trichlorobenzene	120-82-1	22	C-RSL	2	0.2	0.0544
1,1,1-Trichloroethane	71-55-6	680	CP-51	2	0.2	0.0699
1,1,2-Trichloroethane	79-00-5	1.1	C-RSL	2	0.5	0.139
Trichloroethene	79-01-6	0.91	C-RSL	2	0.2	0.0594
Trichlorofluoromethane	75-69-4	790	N-RSL	2	0.2	0.0504
1,2,3-Trichloropropane	96-18-4	0.005	C-RSL	2	0.5	0.117
1,2,4-Trimethylbenzene	95-63-6	62	N-RSL	1	0.5	0.134
1,3,5-Trimethylbenzene	108-67-8	780	N-RSL	1	0.5	0.164
Vinyl Chloride	75-01-4	0.06	C-RSL	1	0.2	0.111
Xylene, Meta + Para	179601-23-1	N/A	N/A	2	1	0.227
Xylene, Ortho	95-47-6	690	N-RSL	1	0.2	0.0865

**Notes:**

The Project Action Limit (PAL) references for soil are: CP-51 = NYSDEC Commissioner Policy-51 Soil Cleanup Guidance or Residential RSL – USEPA Regional Screening Level for Soil (November 2013) whichever is the more stringent.

CAS – Chemical Abstracts Service

µg/kg – micrograms per kilogram

N-RSL – Noncarcinogen RSL

C-RSL – Carcinogen RSL

N/A – Not applicable



**Matrix: Water**  
**Analytical Group: VOCs**

Analyte	CAS Number	Project Action Limit (µg/L)	Project Action Limit Reference	Laboratory-specific Quantitation Limits		
				LOQ (µg/L)	LOD (µg/L)	DL (µg/L)
Acetone	67-64-1	50	TOGs 1.1.1	5	2	1.73
Benzene	71-43-2	5	MCL	1	1	0.319
Bromobenzene	108-86-1	5	TOGs 1.1.1	1	0.25	0.11
Bromochloromethane	74-97-5	5	TOGs 1.1.1	1	1	0.299
Bromodichloromethane	75-27-4	50	TOGs 1.1.1	1	0.5	0.122
Bromoform	75-25-2	50	TOGs 1.1.1	1	1	0.245
Bromomethane	74-83-9	5	TOGs 1.1.1	1	1	0.234
n-Butylbenzene	104-51-8	5	TOGs 1.1.1	1	0.5	0.203
sec-Butylbenzene	135-98-8	5	TOGs 1.1.1	1	1	0.229
tert-Butylbenzene	98-06-6	5	TOGs 1.1.1	1	1	0.25
Carbon Disulfide	75-15-0	720	Tapwater	5	1	0.282
Carbon Tetrachloride	56-23-5	5	MCL	1	1	0.229
Chlorobenzene	108-90-7	100	MCL	1	0.5	0.214
Chloroethane	75-00-3	5	TOGs 1.1.1	1	0.5	0.222
Chloroform	67-66-3	7	TOGs 1.1.1	1	1	0.255
Chloromethane	74-87-3	190	Tapwater	1	0.5	0.201
2-Chlorotoluene	95-49-8	180	Tapwater	1	1	0.27
4-Chlorotoluene	106-43-4	190	Tapwater	1	0.5	0.179
1,2-Dibromo-3-chloropropane	96-12-8	0.2	MCL	1	1	0.635
Dibromochloromethane	124-48-1	5	TOGs 1.1.1	1	0.5	0.139
1,2-Dibromoethane	106-93-4	0.05	MCL	1	1	0.233
Dibromomethane	74-95-3	5	TOGs 1.1.1	1	0.5	0.154
1,2-Dichlorobenzene	95-50-1	600	MCL	1	0.5	0.118
1,3-Dichlorobenzene	541-73-1	3	TOGs 1.1.1	1	0.5	0.169

Analyte	CAS Number	Project Action Limit (µg/L)	Project Action Limit Reference	Laboratory-specific Quantitation Limits		
				LOQ (µg/L)	LOD (µg/L)	DL (µg/L)
1,4-Dichlorobenzene	106-46-7	75	MCL	1	0.25	0.111
Dichlorodifluoromethane	75-71-8	5	TOGs 1.1.1	1	1	0.229
1,1-Dichloroethane	75-34-3	5	TOGs 1.1.1	1	1	0.279
1,2-Dichloroethane	107-06-2	5	MCL	1	0.5	0.147
1,1-Dichloroethene	75-35-4	7	MCL	1	0.5	0.207
cis-1,2-Dichloroethene	156-59-2	70	MCL	1	0.5	0.202
trans-1,2-Dichloroethene	156-60-5	100	MCL	1	0.5	0.218
1,2-Dichloropropane	78-87-5	5	MCL	1	0.5	0.177
1,3-Dichloropropane	142-28-9	5	TOGs 1.1.1	1	0.5	0.133
2,2-Dichloropropane	594-20-7	5	TOGs 1.1.1	1	1	0.301
1,1-Dichloropropene	563-58-6	5	TOGs 1.1.1	1	1	0.27
cis-1,3-Dichloropropene	10061-01-5	0.4	TOGs 1.1.1	1	1	0.282
trans-1,3-Dichloropropene	10061-02-6	0.4	TOGs 1.1.1	1	0.5	0.145
Ethylbenzene	100-41-4	700	MCL	1	1	0.273
Hexachlorobutadiene	87-68-3	0.26	Tapwater	1	1	0.291
2-Hexanone	591-78-6	34	Tapwater	5	2	1.51
Isopropylbenzene	98-82-8	390	Tapwater	1	1	0.226
4-Isopropyltoluene	99-87-6	5	TOGs 1.1.1	1	1	0.302
Methyl tert-Butyl Ether	1634-04-4	12	Tapwater	1	0.25	0.103
Methylene Chloride	74-87-3	5	TOGs 1.1.1	1	1	0.243
2-Butanone (MEK)	78-93-3	50	TOGs 1.1.1	5	2	1.62
4-Methyl-2-pentanone (MIBK)	108-10-1	1000	Tapwater	5	2	1.44
Naphthalene	91-20-3	0.14	Tapwater	5	1	0.559
n-Propylbenzene	103-65-1	5	TOGs 1.1.1	1	0.5	0.145
Styrene	100-42-5	100	MCL	1	0.5	0.123
1,1,1,2-Tetrachloroethane	630-20-6	0.5	Tapwater	1	0.5	0.182

Analyte	CAS Number	Project Action Limit (µg/L)	Project Action Limit Reference	Laboratory-specific Quantitation Limits		
				LOQ (µg/L)	LOD (µg/L)	DL (µg/L)
1,1,2,2-Tetrachloroethane	79-34-5	0.066	Tapwater	1	0.5	0.217
Tetrachloroethene	127-18-4	5	MCL	1	0.5	0.16
Toluene	108-88-3	1000	MCL	1	1	0.285
1,2,3-Trichlorobenzene	87-61-6	5	TOGs 1.1.1	2	1	0.229
1,2,4-Trichlorobenzene	120-82-1	70	MCL	2	0.25	0.0713
1,1,1-Trichloroethane	71-55-6	200	MCL	1	1	0.297
1,1,2-Trichloroethane	79-00-5	5	MCL	1	0.5	0.224
Trichloroethene	79-01-6	5	MCL	1	1	0.244
Trichlorofluoromethane	75-69-4	5	TOGs 1.1.1	1	0.25	0.107
1,2,3-Trichloropropane	96-18-4	0.00065	Tapwater	1	1	0.267
1,2,4-Trimethylbenzene	95-63-6	5	TOGs 1.1.1	1	0.5	0.189
1,3,5-Trimethylbenzene	108-67-8	5	TOGs 1.1.1	1	0.5	0.199
Vinyl Chloride	75-01-4	2	MCL	1	0.5	0.135
Xylene, Meta + Para	179601-23-1	N/A	N/A	2	0.5	0.214
Xylene, Ortho	95-47-6	5	TOGs 1.1.1	1	1	0.228

**Notes:**

The PAL references are MCLs, or either TOGS 1.1.1 =NYSDEC Technical and Operational Guidance 1.1.1 Ambient Water Quality Standards and Guidance Values, or Tapwater based on the USEPA Regional Screening Level for Water (November 2013), whichever is the more stringent.

CAS – Chemical Abstracts Service

µg/L – micrograms per liter

MCL – USEPA Maximum Contaminant Level

N/A – Not applicable

**Matrix: Soil**  
**Analytical Group: SVOCs**

Analyte	CAS Number	Project Action Limit (µg/kg)	Project Action Limit Reference	Laboratory-specific Quantitation Limits		
				LOQ (µg/kg)	LOD (µg/kg)	DL (µg/kg)
Acenaphthene	83-32-9	3400	N-RSL	16.7	16.7	4.63
Acenaphthylene	208-96-8	100000	CP-51	16.7	16.7	4.17
Anthracene	120-12-7	17000	N-RSL	16.7	16.7	4.01
Benzo(a)anthracene	56-55-3	0.15	C-RSL	16.7	8.33	2.75
Benzo(a)pyrene	50-32-8	0.015	C-RSL	16.7	8.33	2.3
Benzo(b)fluoranthene	205-99-2	0.15	C-RSL	16.7	8.33	1.91
Benzo(k)fluoranthene	207-08-9	1.5	C-RSL	16.7	8.33	1.95
Benzo(g,h,i)perylene	191-24-2	100000	CP-51	16.7	8.33	1.89
Benzoic Acid	65-85-0	240000	N-RSL	167	167	69.2
Benzyl Alcohol	100-51-6	6100	N-RSL	16.7	16.7	4.61
4-Bromophenyl Phenyl Ether	101-55-3	N/A	N/A	16.7	16.7	4.04
Butyl Benzyl Phthalate	85-68-7	260	C-RSL	33.3	16.7	4
Carbazole	86-74-8	N/A	N/A	167	16.7	4.03
4-Chloro-3-methylphenol	59-50-7	6100	N-RSL	16.7	16.7	5
4-Chloroaniline	106-47-8	2.4	C-RSL	66.7	16.7	8.85
Bis(2-chloroethoxy)methane	111-91-1	180	N-RSL	16.7	16.7	4.05
Bis(2-chloroethyl) Ether	111-44-4	0.21	C-RSL	16.7	16.7	3.95
Bis(2-chloroisopropyl) Ether	108-60-1	4.6	C-RSL	16.7	6.67	3.67
2-Chloronaphthalene	91-58-7	6300	N-RSL	16.7	16.7	4.91
2-Chlorophenol	95-57-8	390	N-RSL	16.7	16.7	3.94
4-Chlorophenyl Phenyl Ether	7005-72-3	N/A	N/A	16.7	16.7	3.8
Chrysene	218-01-9	15	C-RSL	16.7	16.7	3.89
Dibenz(a,h)anthracene	53-70-3	0.015	C-RSL	16.7	8.33	1.91
Dibenzofuran	132-64-9	78	N-RSL	16.7	16.7	4.9

Analyte	CAS Number	Project Action Limit (µg/kg)	Project Action Limit Reference	Laboratory-specific Quantitation Limits		
				LOQ (µg/kg)	LOD (µg/kg)	DL (µg/kg)
Di-n-butyl Phthalate	84-74-2	6100	N-RSL	66.7	33.3	13.5
1,2-Dichlorobenzene	95-50-1	1900	N-RSL	16.7	16.7	5.47
1,3-Dichlorobenzene	541-73-1	N/A	N/A	16.7	16.7	5.66
1,4-Dichlorobenzene	106-46-7	2.4	C-RSL	16.7	16.7	4.82
3,3'-Dichlorobenzidine	91-94-1	1.1	C-RSL	833	666	278
2,4-Dichlorophenol	120-83-2	180	N-RSL	33.3	16.7	4.08
Diethyl Phthalate	84-66-2	49000	N-RSL	16.7	6.67	4.84
2,4-Dimethylphenol	105-67-9	1200	N-RSL	167	133.3	36.3
Dimethyl Phthalate	131-11-3	N/A	N/A	16.7	16.7	4.72
4,6-Dinitro-2-methylphenol	534-52-1	4.9	N-RSL	167	66.6	21.4
2,4-Dinitrophenol	51-28-5	120	N-RSL	167	167	55.8
2,4-Dinitrotoluene	121-14-2	1.6	C-RSL	33.3	8.33	3.28
2,6-Dinitrotoluene	606-20-2	0.33	C-RSL	16.7	6.67	4.01
Di-n-octyl Phthalate	117-84-0	610	N-RSL	16.7	16.7	3.87
1,2-Diphenylhydrazine	122-66-7	0.61	C-RSL	16.7	8.33	3.36
Bis(2-ethylhexyl) Phthalate	117-81-7	35	C-RSL	33.3	16.7	11.5
Fluoranthene	206-44-0	2300	N-RSL	16.7	16.7	4.47
Fluorene	86-73-7	2300	N-RSL	16.7	16.7	4.03
Hexachlorobenzene	118-74-1	0.3	C-RSL	16.7	16.7	4.75
Hexachlorobutadiene	87-68-3	6.2	C-RSL	16.7	16.7	4.58
Hexachloroethane	67-72-1	12	C-RSL	16.7	16.7	5.01
Indeno(1,2,3-cd)pyrene	193-39-5	0.15	C-RSL	16.7	3.33	2.68
Isophorone	78-59-1	510	C-RSL	16.7	16.7	3.85
2-Methylnaphthalene	91-57-6	230	N-RSL	16.7	16.7	4.56
2-Methylphenol	95-48-7	3100	N-RSL	16.7	8.33	3.55
3+4-Methylphenol	108-39-4	3100	N-RSL	32.3	8.33	3.67

Analyte	CAS Number	Project Action Limit (µg/kg)	Project Action Limit Reference	Laboratory-specific Quantitation Limits		
				LOQ (µg/kg)	LOD (µg/kg)	DL (µg/kg)
Naphthalene	91-20-3	3.6	C-RSL	16.7	16.7	5.6
2-Nitroaniline	88-74-4	610	N-RSL	16.7	8.33	3.58
3-Nitroaniline	99-09-2	N/A	N/A	330	33.3	16.4
4-Nitroaniline	100-01-6	24	C-RSL	330	33.3	24.5
Nitrobenzene	98-95-3	4.8	C-RSL	16.7	16.7	4.6
4-Nitrophenol	100-02-7	N/A	N/A	667	167	102
2-Nitrophenol	88-75-5	N/A	N/A	16.7	16.7	4.47
N-Nitroso-dimethylamine	62-75-9	0.0023	C-RSL	33.3	6.67	3.31
N-Nitroso-diphenylamine	86-30-6	99	C-RSL	16.7	8.33	3.44
N-Nitroso-di-n-propylamine	621-64-7	0.069	C-RSL	16.7	16.7	4.04
Pentachlorophenol	87-86-5	0.89	C-RSL	167	33.3	13.2
Phenanthrene	85-01-8	N/A	N/A	16.7	16.7	4.08
Phenol	108-95-2	330	CP-51	167	16.7	3.89
Pyrene	129-00-0	1700	N-RSL	16.7	16.7	4.31
1,2,4-Trichlorobenzene	120-82-1	22	C-RSL	16.7	16.7	4.43
2,4,6-Trichlorophenol	88-06-2	44	C-RSL	16.7	8.33	2.53
2,4,5-Trichlorophenol	95-95-4	6100	N-RSL	16.7	16.7	4.49

Notes:

CAS – Chemical Abstracts Service

µg/kg – micrograms per kilogram

The Project Action Limit (PAL) references for soil are: CP-51 = NYSDEC Commissioner Policy-51 Soil Cleanup Guidance or Residential RSL – USEPA Regional Screening Level for Soil (November 2013) whichever is the more stringent,

N-RSL – Noncarcinogen RSL

C-RSL – Carcinogen RSL

N/A – Not applicable

**Matrix: Water**  
**Analytical Group: SVOCs**

Analyte	CAS Number	Project Action Limit (µg/L)	Project Action Limit Reference	Laboratory-specific Quantitation Limits		
				LOQ (µg/L)	LOD (µg/L)	DL (µg/L)
Acenaphthene	83-32-9	20	TOGs 1.1.1	0.5	0.05	0.0323
Acenaphthylene	208-96-8	N/A	N/A	0.5	0.05	0.0171
Anthracene	120-12-7	50	TOGs 1.1.1	0.5	0.1	0.0615
Benzo(a)anthracene	56-55-3	0.002	TOGs 1.1.1	0.5	0.1	0.0454
Benzo(a)pyrene	50-32-8	0.2	MCL	0.5	0.1	0.0403
Benzo(b)fluoranthene	205-99-2	0.002	TOGs 1.1.1	0.5	0.1	0.0581
Benzo(k)fluoranthene	207-08-9	0.002	TOGs 1.1.1	0.5	0.1	0.0596
Benzo(g,h,i)perylene	191-24-2	N/A	N/A	0.5	0.1	0.0609
Benzoic Acid	65-85-0	58000	Tapwater	5	2	0.478
Benzyl Alcohol	100-51-6	1500	Tapwater	0.5	0.1	0.0486
4-Bromophenyl Phenyl Ether	101-55-3	N/A	N/A	0.5	0.1	0.0428
Butyl Benzyl Phthalate	85-68-7	14	Tapwater	1	0.2	0.0557
Carbazole	86-74-8	N/A	N/A	0.5	0.1	0.07
4-Chloro-3-methylphenol	59-50-7	1100	Tapwater	0.5	0.2	0.115
4-Chloroaniline	106-47-8	0.32	Tapwater	1	0.25	0.102
Bis(2-chloroethoxy)methane	111-91-1	5	TOGs 1.1.1	0.5	0.05	0.0184
Bis(2-chloroethyl) Ether	111-44-4	0.012	Tapwater	0.5	0.05	0.0237
Bis(2-chloroisopropyl) Ether	108-60-1	0.31	Tapwater	0.5	0.05	0.0258
2-Chloronaphthalene	91-58-7	550	Tapwater	0.5	0.05	0.0171
2-Chlorophenol	95-57-8	71	Tapwater	0.5	0.05	0.0267
4-Chlorophenyl Phenyl Ether	7005-72-3	N/A	N/A	0.5	0.1	0.048
Chrysene	218-01-9	2.9	Tapwater	0.5	0.1	0.0453
Dibenz(a,h)anthracene	53-70-3	0.0029	Tapwater	0.5	0.2	0.113
Dibenzofuran	132-64-9	5.8	Tapwater	0.5	0.05	0.0408

Analyte	CAS Number	Project Action Limit (µg/L)	Project Action Limit Reference	Laboratory-specific Quantitation Limits		
				LOQ (µg/L)	LOD (µg/L)	DL (µg/L)
Di-n-butyl Phthalate	84-74-2	670	Tapwater	1	0.5	0.135
1,2-Dichlorobenzene	95-50-1	600	MCL	0.5	0.05	0.0396
1,3-Dichlorobenzene	541-73-1	N/A	N/A	0.5	0.05	0.041
1,4-Dichlorobenzene	106-46-7	75	MCL	0.5	0.05	0.0197
3,3'-Dichlorobenzidine	91-94-1	0.11	Tapwater	10	0.5	0.124
2,4-Dichlorophenol	120-83-2	50	TOGs 1.1.1	0.5	0.2	0.0915
Diethyl Phthalate	84-66-2	11000	Tapwater	0.5	0.2	0.0651
2,4-Dimethylphenol	105-67-9	270	Tapwater	1	0.25	0.168
Dimethyl Phthalate	131-11-3	50	TOGs 1.1.1	0.5	0.1	0.0455
4,6-Dinitro-2-methylphenol	534-52-1	1.2	Tapwater	5	2	1.02
2,4-Dinitrophenol	51-28-5	50	TOGs 1.1.1	5	5	1.16
2,4-Dinitrotoluene	121-14-2	0.2	Tapwater	0.5	0.1	0.0475
2,6-Dinitrotoluene	606-20-2	0.042	Tapwater	0.5	0.1	0.0801
Di-n-octyl Phthalate	117-84-0	50	TOGs 1.1.1	0.5	0.1	0.0766
1,2-Diphenylhydrazine	122-66-7	0.067	Tapwater	0.5	0.1	0.0805
Bis(2-ethylhexyl) Phthalate	117-81-7	6	MCL	0.5	0.5	0.113
Fluoranthene	206-44-0	50	TOGs 1.1.1	0.5	0.1	0.0627
Fluorene	86-73-7	50	TOGs 1.1.1	0.5	0.1	0.0413
Hexachlorobenzene	118-74-1	1	MCL	0.5	0.1	0.0627
Hexachlorobutadiene	87-68-3	0.26	Tapwater	0.5	0.1	0.0395
Hexachloroethane	67-72-1	0.79	Tapwater	0.5	0.1	0.0418
Indeno(1,2,3-cd)pyrene	193-39-5	0.029	Tapwater	0.5	0.2	0.0798
Isophorone	78-59-1	50	TOGs 1.1.1	0.5	0.05	0.045
2-Methylnaphthalene	91-57-6	27	Tapwater	0.5	0.05	0.0149
2-Methylphenol	95-48-7	720	Tapwater	0.5	0.2	0.0475



Analyte	CAS Number	Project Action Limit (µg/L)	Project Action Limit Reference	Laboratory-specific Quantitation Limits		
				LOQ (µg/L)	LOD (µg/L)	DL (µg/L)
3+4-Methylphenol	108-39-4	720	Tapwater	5	0.2	0.0566
Naphthalene	91-20-3	0.14	Tapwater	0.5	0.05	0.0307
2-Nitroaniline	88-74-4	5	TOGs 1.1.1	0.5	0.5	0.116
3-Nitroaniline	99-09-2	5	TOGs 1.1.1	1	0.5	0.244
4-Nitroaniline	100-01-6	3.3	Tapwater	1	1	0.33
Nitrobenzene	98-95-3	0.12	Tapwater	0.5	0.2	0.0585
4-Nitrophenol	100-02-7	N/A	N/A	5	5	1.25
2-Nitrophenol	88-75-5	N/A	N/A	0.5	0.2	0.0475
N-Nitroso-dimethylamine	62-75-9	0.00042	Tapwater	0.5	0.1	0.046
N-Nitroso-diphenylamine	86-30-6	10	Tapwater	0.5	0.1	0.0676
N-Nitroso-di-n-propylamine	621-64-7	0.0093	Tapwater	0.5	0.1	0.0753
Pentachlorophenol	87-86-5	1	MCL	0.5	0.5	0.126
Phenanthrene	85-01-8	50	TOGs 1.1.1	0.5	0.1	0.0426
Phenol	108-95-2	4500	Tapwater	0.5	0.05	0.0337
Pyrene	129-00-0	50	TOGs 1.1.1	0.5	0.1	0.0656
1,2,4-Trichlorobenzene	120-82-1	70	MCL	0.5	0.05	0.0266
2,4,6-Trichlorophenol	88-06-2	3.5	Tapwater	0.5	0.25	0.0851
2,4,5-Trichlorophenol	95-95-4	890	Tapwater	0.5	0.25	0.0992

**Notes:**

CAS – Chemical Abstracts Service

µg/L – micrograms per liter

MCL – USEPA Maximum Contaminant Level

The PAL references are MCLs, or either TOGS 1.1.1 =NYSDEC Technical and Operational Guidance 1.1.1 Ambient Water Quality Standards and Guidance Values, or Tapwater based on the USEPA Regional Screening Level for Water (November 2013), whichever is the more stringent.

N/A – Not applicable

**Matrix: Soil**  
**Analytical Group: Metals 6010C / 6020A / 7471B**

Analyte	CAS Number	Project Action Limit (mg/kg)	Project Action Limit Reference	Laboratory-specific Quantitation Limits		
				LOQ (mg/kg)	LOD (mg/kg)	DL (mg/kg)
Aluminum	7429-90-5	10000	CP-51	10	5	1.36
Antimony	7440-36-0	12	CP-51	0.1	0.05	0.0243
Arsenic	7440-38-2	0.61	C-RSL	0.1	0.05	0.0163
Barium	7440-39-3	350	CP-51	0.1	0.02	0.0122
Beryllium	7440-41-7	7.2	CP-51	0.1	0.05	0.0195
Cadmium	7440-43-9	2.5	CP-51	0.05	0.01	0.0033
Calcium	7440-70-2	N/A	N/A	50	50	20.2
Chromium	7440-47-3	0	C-RSL	0.1	0.05	0.0139
Cobalt	7440-48-4	20	CP-51	0.1	0.02	0.0064
Copper	7440-50-8	50	CP-51	0.1	0.1	0.0254
Iron	7439-89-6	2000	CP-51	5	2	0.619
Lead	7439-92-1	63	CP-51	0.1	0.02	0.0066
Magnesium	7439-95-4	N/A	N/A	50	25	7.1
Manganese	7439-96-5	0	C-RSL	0.1	0.1	0.0234
Mercury	7439-97-6	0.18	CP-51	0.05	0.017	0.0061
Nickel	7440-02-0	30	CP-51	0.1	0.05	0.0161
Potassium	7440-09-7	N/A	N/A	50	10	7.13
Selenium	7782-49-2	3.9	CP-51	0.1	0.1	0.0327
Silver	7440-22-4	2	CP-51	0.05	0.01	0.0039
Sodium	7440-23-5	N/A	N/A	50	25	6.03
Thallium	7440-28-0	0.78	N-RSL	0.05	0.01	0.0026
Vanadium	7440-62-2	39	CP-51	0.1	0.04	0.0097
Zinc	7440-66-6	109	CP-51	1	1	0.28

Notes:

The Project Action Limit (PAL) references for soil are: Residential RSL - USEPA Regional Screening Level for Soil (November 2013) or CP-51 – NYSCED Commissioner Policy-51 Soil Cleanup Guidance. The more conservative value of the two guidelines was chosen.

CAS – Chemical Abstracts Service

N-RSL – Noncarcinogen RSL for Residential Soil

C-RSL – Carcinogen RSL for Residential Soil

CP-51 – NYSCED Commissioner Policy-51 Soil Cleanup Guidance

N/A – Not applicable

mg/kg – milligrams per kilogram

**Matrix: Water**  
**Analytical Group: Metals 6010C / 6020A / 7471B**

Analyte	CAS Number	Project Action Limit (µg/L)	Project Action Limit Reference	Laboratory-specific Quantitation Limits		
				LOQ (µg/L)	LOD (µg/L)	DL (µg/L)
Aluminum	7429-90-5	2000	TOGS 1.1.1	100	50	13.1
Antimony	7440-36-0	6	Tapwater	1	0.5	0.148
Arsenic	7440-38-2	10	MCL	1	0.5	0.177
Barium	7440-39-3	2000	MCL	1	0.5	0.136
Beryllium	7440-41-7	3	TOGS 1.1.1	1	0.4	0.111
Cadmium	7440-43-9	10	TOGS 1.1.1	0.2	0.1	0.0385
Calcium	7440-70-2	N/A	N/A	500	500	230
Chromium	7440-47-3	100	MCL	1	0.5	0.195
Cobalt	7440-48-4	4.7	Tapwater	1	0.2	0.05
Copper	7440-50-8	1000	TOGS 1.1.1	1	0.5	0.127
Iron	7439-89-6	600	TOGS 1.1.1	10	10	6.53
Lead	7439-92-1	15	MCL	1	0.5	0.152
Magnesium	7439-95-4	35000	TOGS 1.1.1	500	500	143
Manganese	7439-96-5	600	TOGS 1.1.1	1	0.5	0.141
Mercury	7439-97-6	1.4	TOGS 1.1.1	0.2	0.1	0.0551
Nickel	7440-02-0	200	TOGS 1.1.1	1	0.5	0.171
Potassium	7440-09-7	N/A	N/A	100	100	32.9
Selenium	7782-49-2	20	TOGS 1.1.1	1	1	0.31
Silver	7440-22-4	71	Tapwater	0.2	0.1	0.0367
Sodium	7440-23-5	500	TOGS 1.1.1	500	500	127
Thallium	7440-28-0	0.5	TOGS 1.1.1	1	0.1	0.0268
Vanadium	7440-62-2	63	Tapwater	1	0.2	0.0657
Zinc	7440-66-6	4700	Tapwater	10	4	1.5

Notes:

The PAL references are either MCLs or Tapwater based on the USEPA Regional Screening Level for Water (November 2013) or NYSDEC Technical and Operational Guidance 1.1.1 Ambient Water Quality Standards and Guidance Values (TOGs 1.1.1). The more conservative value of the two guidelines was chosen.

CAS – Chemical Abstracts Service

MCL – Maximum Contaminant Level

TOGS 1.1.1 – NYSDEC Technical and Operational Guidance 1.1.1 Ambient Water Quality Standards and Guidance Values

µg/L – micrograms per liter

N/A – Not applicable

## QAPP WORKSHEET #17 – SAMPLING DESIGN AND RATIONALE

This section describes sampling locations, methods, and rationale for the field investigation activities to be conducted as part of the SI at Schenectady ANG. All referenced field SOPs are presented in Appendix E of the SI Work Plan.

### Subsurface Soil/Ground Water Sampling

As described in Sections 5 and 6 of the Work Plan and summarized on Worksheet #18, subsurface soil and groundwater samples (if encountered) (including QC and QA samples) will be collected to confirm the presence of COPC at each of the 11 identified AOCs

Soil samples will be collected using DPT methods. Samples will be collected with certified clean, disposable sample scoops. Soil/sediment will be removed and transferred to a disposable aluminum container or re-sealable plastic bag. Samples for volatile organic compounds (VOCs) will be collected prior to sample homogenization to avoid volatilizing analytes. Terra Core (or equivalent ) sample container kits containing vials for both low-level and high-level analysis, will be used for VOC samples. VOC samples will be collected and the remaining soil will then be homogenized for the additional analyses. Homogenization will consist of mixing the soil sample until a uniform color, texture, and particle size. Any non-homogenous particles, organic matter, and projectile debris will be removed from the samples. After homogenization, the sample will be transferred to the appropriate sample container for laboratory analysis and placed in a cooler on ice. The required sample containers, preservatives, and holding times are specified on Worksheet 19.

Groundwater samples will be collected using a bladder or peristaltic pump as described in the Work Plan. VOC samples will be the first samples collected after the wells have been purged. The required sample containers, preservatives, and holding times are specified on Worksheet 19.

As specified in the Work Plan, the sample identification number will consist of an alphanumeric designation related to the installation, site, event, media type, and consecutive number, according to the following conventions:

Installation: **Schenectady**

Site: **SC-xxx** = Schenectady (Note: site identification codes are located in Table 6-1)

Media Type: **SB** = Subsurface Soil, **GW** = Groundwater

Consecutive Number: 01, 02, 03, etc.

Depth: Depth below ground surface (feet)

Sample Type: D for duplicate

The sample identification number for the first subsurface soil sample at the Building 13 Area will be: SC-B13-SB01-6. Duplicate sample identification numbers will be followed with a "D".

Trip blank (TB) and equipment blank (EB) QC samples will be identified as follows:

Trip Blanks = SC-TB-date (mmddyy)

Equipment Blanks = SC-EB-date (mmddyy)

Samples will be analyzed for VOCs, SVOCs, metals, and pH. Samples will be packaged on ice and transported daily via overnight commercial carrier under standard chain-of-custody procedures to Trimatrix Laboratories. The laboratory will provide analytical results within 30 days of sample receipt. Data validation (Level IV) will be conducted on all laboratory results.

The field logbook will serve as the primary record of field sampling activities. Entries will be made chronologically and in sufficient detail to allow the writer or a knowledgeable reviewer to reconstruct each day's events.

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## QAPP WORKSHEET #18 – SAMPLING LOCATIONS AND METHODS/SOP REQUIREMENTS TABLE

Site ID	Site Description	Number of Borings	Depth of Borings (ft bgs)	Analysis Required	Sampling SOP References
ZZ007	Former Building 13 Area	5	10	<b>Soil:</b> 10samples -VOCs, SVOCs, Metals <b>Groundwater:</b> 6 samples - VOCs, SVOCs, Metals (includes one sample from a previously installed down-gradient monitoring well)	<b>AECOM SOPs</b> 3-02 Logbooks 3-03 Recordkeeping, Sample Labeling and Chain-of-Custody 3-04 Sample Handling, Storage, and Shipping 3-05 IDW Management 3-06 Equipment Decontamination 3-17 Direct Push Sampling Techniques 3-20 Operation and Calibration of a PID 3-21 Surface and Subsurface Soil Sampling 3-37 Grab Ground Water Sampling Techniques
TU008	Former Heating Oil UST #41, Former Building 4	5	10	<b>Soil:</b> up to 10 samples – VOCs, SVOCs <b>Groundwater:</b> up to 5 samples – VOCs, SVOCs	
TU009	Waste Water Treatment Plant (WWTP) Bypass UST near IRP Site 6	4	10	<b>Soil:</b> 8 samples -VOCs, SVOCs, Metals <b>Groundwater:</b> 4 samples - VOCs, SVOCs, Metals	
DD011	Building 19 Drains	2	10	<b>Soil:</b> 4 samples – metals, pH <b>Groundwater:</b> 2 samples – Metals, pH	
DD012	Building 35 Drains	3	10	<b>Soil:</b> 6 samples – metals, pH <b>Groundwater:</b> 3 samples – Metals, pH	

Note:

AOC ID Names are the same as the Enterprise Environmental Safety and Occupational Health-Management Information System (EESOH-MIS) ID Codes



## QAPP WORKSHEET #19 – ANALYTICAL SOP REQUIREMENTS TABLE

Matrix	Analytical Group	Analytical and Preparation Method/ SOP Reference	Containers (Number, Size, and Type)	Sample Volume	Preservation Requirements (Chemical, Temperature, Light Protected)	Maximum Holding Time (Preparation/Analysis) <sup>2</sup>
Soil	VOCs	SW-846 5035A/8260C; SOPs GR-04-105, GR-04-104	3 - 5 gram (g) Terracores into blank tare weighted 40 milliliter (mL) clear glass vials	5g (gram)	Cool to (4 ± 2) °C (high conc. sample following preservation with methanol); Freeze < -7 °C but > -20 °C (low conc. sample until analysis)	Freeze at laboratory within 48 hours of collection. At laboratory, add methanol to one vial within 48 hours of collection. 14 days from collection to analysis.
	SVOCs	SW-846 3550B/8270D; SOPs GR-09-103, GR-04-103	1-8oz wide mouth clear glass jar	8oz	Cool to (4 ± 2) °C	14 days to extraction; 40 days analysis
	Total Metals	SW-846 3050B/6010C/6020A/7471A; SOPs GR-01-137, GR-01-100, GR-01-129, GR-01-139, GR-01-123	1- 8oz wide mouth clear glass jar	8oz	Cool to (4 ± 2) °C	180 days to analysis (ICP and ICPMS metals); 28 days (Mercury)
	pH	SW-846 9045C; SOP GR-07-113	1- 8oz wide mouth clear glass jar	8 oz	Cool to (4 ± 2) °C	24 hours from sample receipt at laboratory
Ground Water	VOCs	SW-846 5030B/8260C; SOP GR-04-104	3 - 40mL clear glass vials	40mL	Hydrochloric acid (HCl) to pH <2; Cool to (4 ± 2) °C	14 days to analysis
	SVOCs	SW-846 3510C/8270C; SOPs GR-09-101, GR-04-103	2 - 1L (liter) amber glass bottles	1000mL	Cool to (4 ± 2) °C	7 days to extraction; 40 days analysis
	Total Metals	SW-846 3010A/3020A/6010C/6020A/7470A; SOPs GR-01-147, GR-01-148, GR-01-100, GR-01-129, GR-01-140, GR-01-123	1- 500mL polyethylene	500mL	Nitric acid (HNO <sub>3</sub> ) to pH <2; Cool to (4 ± 2) °C	180 days to analysis (ICP and ICPMS metals); 28 days (Mercury)
	pH	Test performed in the field.				

## QAPP WORKSHEET #20 – FIELD QUALITY CONTROL SAMPLE SUMMARY TABLE

Matrix	Analytical Group	Concentration Level	Number of Samples	No. of Field Duplicates	No. of MS/MSDs	Total No. of Samples to Lab
Soil	VOCs	Low to Moderate	28	3	2	33
	SVOCs	Low to Moderate	28	3	2	33
	Metals	Low to Moderate	30	3	2	35
	pH	Not Applicable	12	1	1	14
Groundwater <sup>1</sup>	VOCs	Low to Moderate	15	2	1	18
	SVOCs	Low to Moderate	15	2	1	18
	Metals (total-unfiltered)	Low to Moderate	16	2	1	19
	Metals (dissolved-field filtered)	Low to Moderate	16	2	1	19
Trip Blank	VOC	Low to Moderate	5	0	0	5
Equipment Blank	VOCs	Low to Moderate	2	0	0	2
	SVOCs	Low to Moderate	2	0	0	2
	Metals	Low to Moderate	2	0	0	2
	pH	Not Applicable	2	0	0	2

Notes:

<sup>1</sup> Groundwater pH test performed in the field using water quality meter

Category B deliverables will be obtained from the lab.

If IDW samples are required, the field will take TCLP (VOCs, SVOCs, Metals, Pesticides, and Herbicides); sulfide, cyanide, flashpoint, and pH.

## QAPP WORKSHEET #21 – PROJECT SAMPLING SOP REFERENCES TABLE

Reference Number	Title, Revision Date and / or Number	Originating Organization of Sampling SOP	Equipment Type	Modified for Project Work? (Y/N)	Comments
SOP-3-02	Logbooks	AECOM	Permanent ink markers, logbooks	N	None
SOP-3-03	Record Keeping, Sample Labeling, and Chain-of-Custody Procedures	AECOM	Permanent ink markers, forms	N	None
SOP-3-04	Sample Handling, Storage, and Shipping Procedures	AECOM	Permanent ink markers, forms	N	None
SOP-3-05	IDW Management	AECOM	DOT approved 55-gallon and material to cover waste to protect from weather (e.g., plastic covering); Hazardous /non-hazardous waste drum labels (weatherproof); Permanent marking pens; Inventory forms for project file; plastic garbage bags, zip lock storage bags, roll of plastic sheeting;	N	None
SOP-3-06	Equipment Decontamination	AECOM	Phosphate-free detergent; Isopropyl Alcohol; Tap water; Deionized Ultra-Filtered (DIUF) Water; plastic buckets or washbasins; brushes; and polyethylene sheeting.	N	None
SOP-3-17	Direct Push Sampling Techniques	AECOM	Boring Logs; Spoons or scoops; Sample kit (bottles, labels, custody records and tape, cooler, ice), if laboratory analysis is required; sample collection pan; folding rule or tape measure; Plastic sheeting; Utility knife; Field project notebook/pen.	N	None
SOP-3-21	Surface and Subsurface Soil Sampling	AECOM	Stainless steel bowls; stainless steel trowels; appropriate sample containers for laboratory analysis; personal protective equipment; logbook; cooler and ice for preservation; and stakes and flagging to document sampling location	N	None
SOP-3-37	Grab Ground Water Sampling Techniques	AECOM	Peristaltic or bladder pump, Teflon or Teflon-lined tubing, water level and water quality meters,	N	None

## QAPP WORKSHEET #23 – ANALYTICAL SOP REFERENCES TABLE

TriMatrix Laboratories, LLC  
Phil Komer  
616-846-9528

Lab SOP Number	Title, Revision Date, and/or Number	Definitive or Screening Data	Matrix and Analytical Group	Instrument	Organization Performing Analysis	Modified for Project Work (Y/N)
GR-01-100	Inductively Coupled Plasma Atomic Emission Spectroscopy-Perkin Elmer OPTIMA-3300DV/5300DV, 07/12/13 -- rev. 6.0, 6010C	Definitive	Water and Soil - Metals	Perkin Elmer ICP 3000, 3300DV, 5300DV	TriMatrix	N
GR-01-123	Mercury by semi-Automated Cold Vapor Atomic Absorption, 05/25/13 -- rev. 5.9, 7470A/7471A	Definitive	Water and Soil - Metals	PSA Millennium Cold Vapor Analyzer	TriMatrix	N
GR-01-129	Inductively Coupled Plasma Mass Spectrometry Perkin Elmer ELAN-6000/6100 and Nexion 300, 10/25/13 -- rev. 4.2, 6020A	Definitive	Water and Soil - Metals	Perkin Elmer ELAN ICP/MS 6000, 6100 Nexion 300	TriMatrix	N
GR-01-137	Block Digestion of Solids for ICP and ICPMS, 02/13/13, rev 1.7, 3050B	Definitive	Soil - Metals	Environmental Express Hot Block	TriMatrix	N
GR-01-139	Block Digestion of Mercury in Soil, Waste, and Oil, 05/25/13 -- rev. 0.3, 7471B	Definitive	Soil - Metals	Environmental Express Hot Block	TriMatrix	N
GR-01-140	Digestion of Mercury in Water, Wastewater and Aqueous Waste, 10/25/13 -- rev 0.5, 7470A	Definitive	Water - Metals	Environmental Express Hot Block	TriMatrix	N
GR-01-147	Block Digestion of Total Metals in Water for ICP, 02/13/13 -- rev 0.5, 3010A	Definitive	Water - Metals	Environmental Express Hot Block	TriMatrix	N
GR-01-148	Block Digestion of Aqueous Samples and Extracts for Total/Dissolved Metals by ICPMS, 10/04/13, rev 0.4, 3020A	Definitive	Water - Metals	Environmental Express Hot Block	TriMatrix	N
GR-04-103	Base/Neutral/Acid Compounds by Gas Chromatography/Mass Spectrometry, 12/02/13, rev. 5.8, 8270D	Definitive	Water and Soil - SVOCs	GC/MSD	TriMatrix	N

Lab SOP Number	Title, Revision Date, and/or Number	Definitive or Screening Data	Matrix and Analytical Group	Instrument	Organization Performing Analysis	Modified for Project Work (Y/N)
GR-04-104	Volatile Organic Compounds by Purge and Trap Capillary Column Gas Chromatography/Mass Spectrometry, 04/25/13, rev 4.8, 5030B/8260C	Definitive	Water and Soil - VOCs	GC/MSD	TriMatrix	N
GR-04-105	Closed System Purge and Trap Extraction for Volatile Organic Compounds, 12/26/13, rev. 1.4, 5035A	Definitive	Soil - VOCs	P&T Autosampler	TriMatrix	N
GR-04-108	Volatile Organic Compounds by Purge and Trap Capillary Column Gas Chromatography/Mass Spectrometry, 01/15/14, rev 0.1, 5030B/8260C	Definitive	Water and Soil - VOCs	GC/MSD	TriMatrix	N
GR-09-101	The Extraction of Base Neutrals and Acids from Water, 01/15/14, rev 3.6, 3510C	Definitive	Water - SVOCs	NA	TriMatrix	N
GR-09-103	Extraction of BNA Semi-Volatiles from Soil, Sediment and Sludge, 01/31/13, rev. 3.8, 3550C	Definitive	Soil - SVOCs	NA	TriMatrix	N
GR-15-100	Sample Receipt and Log-In, 12/23/13, rev. 3.4	NA	Sample Login and Storage	NA	TriMatrix	N
GR-15-101	Bottle Order Preparation, 10/25/13, rev 0.3	NA	Sample Container Preparation	NA	TriMatrix	N
GR-15-102	Laboratory Waste Disposal Guidelines, 12/02/13, rev 2.4	NA	Sample Waste Disposal	NA	TriMatrix	N

## QAPP WORKSHEET #28 – LABORATORY QC SAMPLES TABLE

<b>Matrix</b>	Soil
<b>Analytical Group</b>	VOCs
<b>Analytical Method/ SOP Reference</b>	SW-846 8260C / SOP GR-04-104

QC Sample:	Frequency/ Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Method Blank	One per preparatory batch of up to 20 samples.	No analytes detected > 1/2 RL and greater than 1/10 the regulatory limit (whichever is greater). Blank result must not otherwise affect sample results. For common laboratory contaminants, no analytes detected > RL.	Correct the problem. If required, reprep and reanalyze the method blank and all samples processed with the contaminated blank.	Analyst / Laboratory Area Supervisor	Contamination / Bias	No analytes detected > 1/2 RL and greater than 1/10 the regulatory limit (whichever is greater). Blank result must not otherwise affect sample results. For common laboratory contaminants, no analytes detected > RL.
Laboratory Control Sample (LCS) containing all analytes to be reported, including surrogates	One per preparatory batch of up to 20 samples.	QC acceptance criteria specified in DoD QSM v4.1, if available. Otherwise use in-house limits.	Correct problem, then reprep and reanalyze the LCS and all samples in the associated preparatory batch for failed analytes, if sufficient sample material is available.	Analyst / Laboratory Area Supervisor	Accuracy / Bias	QC acceptance criteria specified in DoD QSM v4.1, if available. Otherwise use in-house limits.
Matrix Spike (MS)	One per preparatory batch of up to 20 samples.	For matrix evaluation use QC acceptance criteria specified for LCS.	Examine results of LCS. If both the LCS and MS/MSD are unacceptable, re-prepare and analyze the associated samples and QC, otherwise report and narrate.	Analyst/ Laboratory Area Supervisor	Accuracy / Bias	For matrix evaluation use QC acceptance criteria specified for LCS.

QC Sample:	Frequency/ Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Matrix Spike Duplicate (MSD)	One per preparatory batch of up to 20 samples.	MSD: For matrix evaluation, use QC acceptance criteria specified for LCS. MSD: $RPD \leq 30\%$ (between MS and MSD).	Examine results of LCS. If both the LCS and MS/MSD are unacceptable, re-prepare and analyze the associated samples and QC, otherwise report and narrate.	Analyst / Laboratory Area Supervisor	Precision / Accuracy / Bias	MSD: For matrix evaluation, use QC acceptance criteria specified for LCS. MSD: $RPD \leq 30\%$ (between MS and MSD).
Internal Standards (IS) verification	Every field sample, standard, and QC sample	Retention times for internal standards must be $\pm 30$ seconds from retention time of the midpoint standard in the ICAL and the responses within -50% to +100% of ICAL midpoint standard.	Inspect mass spectrometer and/or gas chromatograph for malfunctions. Reanalysis of samples analyzed while system was malfunctioning is mandatory.	Analyst / Laboratory Area Supervisor	Precision / Accuracy / Bias	Retention times for internal standards must be $\pm 30$ seconds from retention time of the midpoint standard in the ICAL and the responses within -50% to +100% of ICAL midpoint standard.
Surrogate spike	All field and QC samples.	Percent recoveries: 1,2-Dichloroethane-d4 66-124; Dibromofluoromethane 78-121; Toluene-d8 85-115%; 4-Bromofluorobenzene 85-120%	For QC and field samples, correct problem then reprep and reanalyze all failed samples for failed surrogates in the associated preparatory batch, if sufficient sample material is available. If obvious chromatographic interference with surrogate is present, reanalysis may not be necessary.	Analyst / Laboratory Area Supervisor	Accuracy / Bias	Percent recoveries: 1,2-Dichloroethane-d4 66- 124; Dibromofluoromethane 78-121; Toluene-d8 85-115%; 4-Bromofluorobenzene 85- 120%

<b>Matrix</b>	Water
<b>Analytical Group</b>	VOCs
<b>Analytical Method/ SOP Reference</b>	SW-846 8260C / SOP GR-04-108

<b>QC Sample:</b>	<b>Frequency/ Number</b>	<b>Method/SOP QC Acceptance Limits</b>	<b>Corrective Action</b>	<b>Person(s) Responsible for Corrective Action</b>	<b>Data Quality Indicator (DQI)</b>	<b>Measurement Performance Criteria</b>
Method Blank	One per preparatory batch of up to 20 samples.	No analytes detected > 1/2 RL and greater than 1/10 the regulatory limit (whichever is greater). Blank result must not otherwise affect sample results. For common laboratory contaminants, no analytes detected > RL.	Correct the problem. If required, reprep and reanalyze the method blank and all samples processed with the contaminated blank.	Analyst / Laboratory Area Supervisor	Contamination / Bias	No analytes detected > 1/2 RL and greater than 1/10 the regulatory limit (whichever is greater). Blank result must not otherwise affect sample results. For common laboratory contaminants, no analytes detected > RL.
Laboratory Control Sample (LCS) containing all analytes to be reported, including surrogates	One per preparatory batch of up to 20 samples.	QC acceptance criteria specified in DoD QSM v4.2, if available. Otherwise use in-house limits.	Correct problem, then reprep and reanalyze the LCS and all samples in the associated preparatory batch for failed analytes, if sufficient sample material is available.	Analyst / Laboratory Area Supervisor	Accuracy / Bias	QC acceptance criteria specified in DoD QSM v4.2, if available. Otherwise use in-house limits.
Matrix Spike (MS)	One per preparatory batch of up to 20 samples.	For matrix evaluation use QC acceptance criteria specified for LCS.	Examine results of LCS. If both the LCS and MS/MSD are unacceptable, re-prepare and analyze the associated samples and QC, otherwise report and narrate.	Analyst/ Laboratory Area Supervisor	Accuracy / Bias	For matrix evaluation use QC acceptance criteria specified for LCS.



QC Sample:	Frequency/ Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Matrix Spike Duplicate (MSD)	One per preparatory batch of up to 20 samples.	MSD: For matrix evaluation, use QC acceptance criteria specified for LCS. MSD: $RPD \leq 30\%$ (between MS and MSD).	Examine results of LCS. If both the LCS and MS/MSD are unacceptable, re-prepare and analyze the associated samples and QC, otherwise report and narrate.	Analyst / Laboratory Area Supervisor	Precision / Accuracy / Bias	MSD: For matrix evaluation, use QC acceptance criteria specified for LCS. MSD: $RPD \leq 30\%$ (between MS and MSD).
Internal Standards (IS) verification	Every field sample, standard, and QC sample	Retention times for internal standards must be $\pm 30$ seconds from retention time of the midpoint standard in the ICAL and the responses within -50% to +100% of ICAL midpoint standard.	Inspect mass spectrometer and/or gas chromatograph for malfunctions. Reanalysis of samples analyzed while system was malfunctioning is mandatory.	Analyst / Laboratory Area Supervisor	Precision / Accuracy / Bias	Retention times for internal standards must be $\pm 30$ seconds from retention time of the midpoint standard in the ICAL and the responses within -50% to +100% of ICAL midpoint standard.
Surrogate spike	All field and QC samples.	Percent recoveries: 1,2-Dichloroethane-d4 70-120%; Dibromofluoromethane 85-115%; Toluene-d8 85-120%; 4-Bromofluorobenzene 75-120%	For QC and field samples, correct problem then reprep and reanalyze all failed samples for failed surrogates in the associated preparatory batch, if sufficient sample material is available. If obvious chromatographic interference with surrogate is present, reanalysis may not be necessary.	Analyst / Laboratory Area Supervisor	Accuracy / Bias	Percent recoveries: 1,2-Dichloroethane-d4 70-120%; Dibromofluoromethane 85-115%; Toluene-d8 85-120%; 4-Bromofluorobenzene 75- 120%

<b>Matrix</b>	Soil
<b>Analytical Group</b>	SVOCs
<b>Analytical Method/ SOP Reference</b>	SW-846 8270D / SOP GR-04-103

<b>QC Sample:</b>	<b>Frequency/ Number</b>	<b>Method/SOP QC Acceptance Limits</b>	<b>Corrective Action</b>	<b>Person(s) Responsible for Corrective Action</b>	<b>Data Quality Indicator (DQI)</b>	<b>Measurement Performance Criteria</b>
Method Blank	One per preparatory batch of up to 20 samples.	No analytes detected > 1/2 RL and greater than 1/10 the regulatory limit (whichever is greater). Blank result must not otherwise affect sample results. For common laboratory contaminants, no analytes detected > RL.	Correct the problem. If required, reprep and reanalyze the method blank and all samples processed with the contaminated blank.	Analyst / Laboratory Area Supervisor	Contamination / Bias	No analytes detected > 1/2 RL and greater than 1/10 the regulatory limit (whichever is greater). Blank result must not otherwise affect sample results. For common laboratory contaminants, no analytes detected > RL.
Laboratory Control Sample (LCS) containing all analytes to be reported, including surrogates	One per preparatory batch of up to 20 samples.	QC acceptance criteria specified in DoD QSM v4.2, if available. Otherwise use in-house limits.	Correct problem, then reprep and reanalyze the LCS and all samples in the associated preparatory batch for failed analytes, if sufficient sample material is available.	Analyst / Laboratory Area Supervisor	Accuracy / Bias	QC acceptance criteria specified in DoD QSM v4.2, if available. Otherwise use in-house limits.
Matrix Spike (MS)	One per preparatory batch of up to 20 samples.	For matrix evaluation use QC acceptance criteria specified for LCS.	Examine results of LCS. If both the LCS and MS/MSD are unacceptable, re-prepare and analyze the associated samples and QC, otherwise report and narrate.	Analyst/ Laboratory Area Supervisor	Accuracy / Bias	For matrix evaluation use QC acceptance criteria specified for LCS.
Matrix Spike Duplicate (MSD)	One per preparatory batch of up to 20 samples.	MSD: For matrix evaluation, use QC acceptance criteria specified for LCS. MSD: $RPD \leq 30\%$ (between MS and MSD).	Examine results of LCS. If both the LCS and MS/MSD are unacceptable, re-prepare and analyze the associated samples and QC, otherwise report and narrate.	Analyst / Laboratory Area Supervisor	Precision / Accuracy / Bias	MSD: For matrix evaluation, use QC acceptance criteria specified for LCS. MSD: $RPD \leq 30\%$ (between MS and MSD).

QC Sample:	Frequency/ Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Internal Standards (IS) verification	Every field sample, standard, and QC sample	Retention times for internal standards must be $\pm 30$ seconds from retention time of the midpoint standard in the ICAL and the responses within -50% to +100% of ICAL midpoint standard.	Inspect mass spectrometer and/or gas chromatograph for malfunctions. Reanalysis of samples analyzed while system was malfunctioning is mandatory.	Analyst / Laboratory Area Supervisor	Precision / Accuracy / Bias	Retention times for internal standards must be $\pm 30$ seconds from retention time of the midpoint standard in the ICAL and the responses within -50% to +100% of ICAL midpoint standard.
Surrogate spike	All field and QC samples.	Nitrobenzene-d5 35-100; 2-Fluorobiphenyl 45-105; o-Terphenyl 30-125; Phenol-d6 40-100; 2-Fluorophenol 35-105; 2,4,6-Tribromophenol 35-125	For QC and field samples, correct problem then prep and reanalyze all failed samples for failed surrogates in the associated preparatory batch, if sufficient sample material is available. If obvious chromatographic interference with surrogate is present, reanalysis may not be necessary.	Analyst / Laboratory Area Supervisor	Accuracy / Bias	Nitrobenzene-d5 35-100; 2-Fluorobiphenyl 45-105; o-Terphenyl 30-125; Phenol-d6 40-100; 2-Fluorophenol 35-105; 2,4,6-Tribromophenol 35-125

<b>Matrix</b>	Water
<b>Analytical Group</b>	SVOCs
<b>Analytical Method/ SOP Reference</b>	SW-846 8270D / SOP GR-04-103

<b>QC Sample:</b>	<b>Frequency/ Number</b>	<b>Method/SOP QC Acceptance Limits</b>	<b>Corrective Action</b>	<b>Person(s) Responsible for Corrective Action</b>	<b>Data Quality Indicator (DQI)</b>	<b>Measurement Performance Criteria</b>
Method Blank	One per preparatory batch of up to 20 samples.	No analytes detected > 1/2 RL and greater than 1/10 the regulatory limit (whichever is greater). Blank result must not otherwise affect sample results. For common laboratory contaminants, no analytes detected > RL.	Correct the problem. If required, reprep and reanalyze the method blank and all samples processed with the contaminated blank.	Analyst / Laboratory Area Supervisor	Contamination / Bias	No analytes detected > 1/2 RL and greater than 1/10 the regulatory limit (whichever is greater). Blank result must not otherwise affect sample results. For common laboratory contaminants, no analytes detected > RL.
Laboratory Control Sample (LCS) containing all analytes to be reported, including surrogates	One per preparatory batch of up to 20 samples.	QC acceptance criteria specified in DoD QSM v4.2, if available. Otherwise use in-house limits.	Correct problem, then reprep and reanalyze the LCS and all samples in the associated preparatory batch for failed analytes, if sufficient sample material is available.	Analyst / Laboratory Area Supervisor	Accuracy / Bias	QC acceptance criteria specified in DoD QSM v4.2, if available. Otherwise use in-house limits.
Matrix Spike (MS)	One per preparatory batch of up to 20 samples.	For matrix evaluation use QC acceptance criteria specified for LCS.	Examine results of LCS. If both the LCS and MS/MSD are unacceptable, re-prepare and analyze the associated samples and QC, otherwise report and narrate.	Analyst/ Laboratory Area Supervisor	Accuracy / Bias	For matrix evaluation use QC acceptance criteria specified for LCS.
Matrix Spike Duplicate (MSD)	One per preparatory batch of up to 20 samples.	MSD: For matrix evaluation, use QC acceptance criteria specified for LCS. MSD: $RPD \leq 30\%$ (between MS and MSD).	Examine results of LCS. If both the LCS and MS/MSD are unacceptable, re-prepare and analyze the associated samples and QC, otherwise report and narrate.	Analyst / Laboratory Area Supervisor	Precision / Accuracy / Bias	MSD: For matrix evaluation, use QC acceptance criteria specified for LCS. MSD: $RPD \leq 30\%$ (between MS and MSD).

QC Sample:	Frequency/ Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Internal Standards (IS) verification	Every field sample, standard, and QC sample	Retention times for internal standards must be $\pm 30$ seconds from retention time of the midpoint standard in the ICAL and the responses within -50% to +100% of ICAL midpoint standard.	Inspect mass spectrometer and/or gas chromatograph for malfunctions. Reanalysis of samples analyzed while system was malfunctioning is mandatory.	Analyst / Laboratory Area Supervisor	Precision / Accuracy / Bias	Retention times for internal standards must be $\pm 30$ seconds from retention time of the midpoint standard in the ICAL and the responses within -50% to +100% of ICAL midpoint standard.
Surrogate spike	All field and QC samples.	Nitrobenzene-d5 40-110; 2-Fluorobiphenyl 50-110; o-Terphenyl 50-135; Phenol-d6 10-115; 2-Fluorophenol 20-110; 2,4,6-Tribromophenol 40-125	For QC and field samples, correct problem then reprep and reanalyze all failed surrogates in the associated preparatory batch, if sufficient sample material is available. If obvious chromatographic interference with surrogate is present, reanalysis may not be necessary.	Analyst / Laboratory Area Supervisor	Accuracy / Bias	Nitrobenzene-d5 40-110; 2-Fluorobiphenyl 50-110; o-Terphenyl 50-135; Phenol-d6 10-115; 2-Fluorophenol 20-110; 2,4,6-Tribromophenol 40-125

<b>Matrix</b>	Soil
<b>Analytical Group</b>	Metals
<b>Analytical Method/ SOP Reference</b>	SW-846 6010C/7471A / SOPs GR-01-100, GR-01-123

<b>QC Sample:</b>	<b>Frequency/ Number</b>	<b>Method/SOP QC Acceptance Limits</b>	<b>Corrective Action</b>	<b>Person(s) Responsible for Corrective Action</b>	<b>Data Quality Indicator (DQI)</b>	<b>Measurement Performance Criteria</b>
Method Blank	One per preparatory batch of up to 20 samples.	No analytes detected > 1/2 RL and greater than 1/10 the regulatory limit (whichever is greater). Blank result must not otherwise affect sample results. For common laboratory contaminants, no analytes detected > RL.	Correct the problem. If required, reprep and reanalyze the method blank and all samples processed with the contaminated blank.	Analyst / Laboratory Area Supervisor	Contamination / Bias	No analytes detected > 1/2 RL and greater than 1/10 the regulatory limit (whichever is greater). Blank result must not otherwise affect sample results. For common laboratory contaminants, no analytes detected > RL.
Laboratory Control Sample (LCS) containing all analytes to be reported	One per preparatory batch of up to 20 samples.	QC acceptance criteria specified in DoD QSM v4.2.	Correct problem, then reprep and reanalyze the LCS and all samples in the associated preparatory batch for failed analytes, if sufficient sample material is available.	Analyst / Laboratory Area Supervisor	Accuracy / Bias	QC acceptance criteria specified in DoD QSM v4.2.
Matrix Spike (MS)	One per preparatory batch of up to 20 samples.	For matrix evaluation use QC acceptance criteria specified in QSM v4.2 for LCS.	Examine results of LCS. If both the LCS and MS/MSD or MS/DUP are unacceptable, re-prepare and analyze the associated samples and QC, otherwise report and narrate.	Analyst/ Laboratory Area Supervisor	Accuracy / Bias	For matrix evaluation, use QC acceptance criteria specified for LCS in DoD QSM v4.2.

QC Sample:	Frequency/ Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Matrix Spike Duplicate (MSD) or Sample Duplicate (DUP)	One per preparatory batch of up to 20 samples.	MSD: For matrix evaluation, use QC acceptance criteria specified in DoD QSM v4.2 for LCS. MSD or sample duplicate: RPD ≤ 20% (between MS and MSD or sample and sample duplicate).	Examine results of LCS. If both the LCS and MS/MSD or MS/DUP are unacceptable, re- prepare and analyze the associated samples and QC, otherwise report and narrate.	Analyst / Laboratory Area Supervisor	Precision / Accuracy / Bias	MSD: For matrix evaluation, use QC acceptance criteria specified in DoD QSM v4.2 for LCS. MSD or sample duplicate: RPD ≤ 20% (between MS and MSD or sample and sample duplicate).
Serial Dilution (aka Dilution test)	One per preparatory batch for samples with concentration > 50 x LOQ.	Five-fold dilution must agree within ± 10% of the original measurement.	Perform Post Digestion Spike (PDS) addition.	Analyst / Laboratory Area Supervisor	Precision / Accuracy	Five-fold dilution must agree within ± 10% of the original measurement.
Post Digestion Spike (PDS)	When serial dilution fails or analyte concentration in all samples < 50 x LOD.	Recovery within 75- 125%.	Run all associated sample in the preparatory batch by method of standard additions (MSA) or qualify results.	Analyst / Laboratory Area Supervisor	Precision / Accuracy	Recovery within 75- 125%.
Internal Standards (IS) (ICP only)	NA.	IS intensity within 70- 125% of intensity of the IS in the ICAL.	Reanalyze sample at 5-fold dilution with addition of appropriate amounts of internal standards.	Analyst / Laboratory Area Supervisor	Accuracy / Bias	IS intensity within 70- 125% of intensity of the IS in the ICAL.

<b>Matrix</b>	Water
<b>Analytical Group</b>	Metals
<b>Analytical Method/ SOP Reference</b>	SW-846 6020A / SOP GR-01-129

<b>QC Sample:</b>	<b>Frequency/ Number</b>	<b>Method/SOP QC Acceptance Limits</b>	<b>Corrective Action</b>	<b>Person(s) Responsible for Corrective Action</b>	<b>Data Quality Indicator (DQI)</b>	<b>Measurement Performance Criteria</b>
Method Blank	One per preparatory batch of up to 20 samples.	No analytes detected > 1/2 RL and greater than 1/10 the regulatory limit (whichever is greater). Blank result must not otherwise affect sample results. For common laboratory contaminants, no analytes detected > RL.	Correct the problem. If required, reprep and reanalyze the method blank and all samples processed with the contaminated blank.	Analyst / Laboratory Area Supervisor	Contamination / Bias	No analytes detected > 1/2 RL and greater than 1/10 the regulatory limit (whichever is greater). Blank result must not otherwise affect sample results. For common laboratory contaminants, no analytes detected > RL.
Laboratory Control Sample (LCS) containing all analytes to be reported	One per preparatory batch of up to 20 samples.	QC acceptance criteria specified in DoD QSM v4.2, if available. Otherwise use in-house limits.	Correct problem, then reprep and reanalyze the LCS and all samples in the associated preparatory batch for failed analytes, if sufficient sample material is available.	Analyst / Laboratory Area Supervisor	Accuracy / Bias	QC acceptance criteria specified in DoD QSM v4.2, if available. Otherwise use in-house limits.
Matrix Spike (MS)	One per preparatory batch of up to 20 samples.	For matrix evaluation use QC acceptance criteria specified for LCS.	Examine results of LCS. If both the LCS and MS/MSD or MS/DUP are unacceptable, re-prepare and analyze the associated samples and QC, otherwise report and narrate.	Analyst/ Laboratory Area Supervisor	Accuracy / Bias	For matrix evaluation use QC acceptance criteria specified for LCS.



QC Sample:	Frequency/ Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Matrix Spike Duplicate (MSD) or Sample Duplicate (DUP)	One per preparatory batch of up to 20 samples.	MSD: For matrix evaluation, use QC acceptance criteria specified for LCS. MSD or sample duplicate: $RPD \leq 20\%$ (between MS and MSD or sample and sample duplicate).	Examine results of LCS. If both the LCS and MS/MSD or MS/DUP are unacceptable, re-prepare and analyze the associated samples and QC, otherwise report and narrate.	Analyst / Laboratory Area Supervisor	Precision / Accuracy / Bias	MSD: For matrix evaluation, use QC acceptance criteria specified for LCS. MSD or sample duplicate: $RPD \leq 20\%$ (between MS and MSD or sample and sample duplicate).
Serial Dilution (aka Dilution test)	One per preparatory batch for samples with concentration > 50 x LOQ.	Five-fold dilution must agree within $\pm 10\%$ of the original measurement.	Perform Post Digestion Spike (PDS) addition.	Analyst / Laboratory Area Supervisor	Precision / Accuracy	Five-fold dilution must agree within $\pm 10\%$ of the original measurement.
Post Digestion Spike (PDS)	When serial dilution fails or analyte concentration in all samples < 50 x LOD.	Recovery within 75-125%.	Run all associated sample in the preparatory batch by method of standard additions (MSA) or qualify results.	Analyst / Laboratory Area Supervisor	Precision / Accuracy	Recovery within 75-125%.
Internal Standards (IS)	NA.	IS intensity within 30-120% of intensity of the IS in the ICAL.	Reanalyze sample at 5-fold dilution with addition of appropriate amounts of internal standards.	Analyst / Laboratory Area Supervisor	Accuracy / Bias	IS intensity within 30-120% of intensity of the IS in the ICAL.

## QAPP WORKSHEET #30 – ANALYTICAL SERVICES TABLE

Matrix	Analytical Group	Sample Locations/ID Number	Analytical Method	Data Package Turnaround Time	Laboratory / Organization (name and address, contact person and telephone number)	Backup Laboratory / Organization (name and address, contact person and telephone number)
Subsurface Soil and Groundwater	VOCs, SVOCs, Metals, and pH	See Worksheet #18	SW-8260C, SW-8270D, SW-846 6010C/7471A, SW-846 9045C	21 calendar days	Phil Komar TriMatrix Laboratory 616-846-8529 Corporate / Laboratory 5560 Corporate Exchange Court Grand Rapids, Michigan 49512	N/A

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## QAPP WORKSHEETS #34 – 36: DATA VERIFICATION AND VALIDATION (STEPS I AND IIA/IIB) PROCESS TABLE

Data Review Input	Description	Responsible for Verification (name, organization)	Step I/IIa/IIb <sup>1</sup>	Internal/External
Project Readiness Review	Project readiness review to be performed by AECOM Project Manager and USACE Project Manager, including Work Plan and Accident Prevention Plan (APP) reviews.	Mark MacEwan, Project Manager, AECOM	I	External
Project Plan Review and Site-Specific Training	Verification that all on-site personnel have read and understand the data collection/quality requirements outlined in the project plans (including WP, APP, QAPP, SOPs), and have received site-specific training on these requirements	Greta White, Field Team Leader, AECOM	I	External
Personnel Qualifications	Personnel Qualifications will be verified, inclusive of reviewing resumes and training records, to ensure that all required safety training (e.g., OSHA training, medical surveillance, etc.) and experience requirements have been completed for each crew member, inclusive of subcontractors.	Mark MacEwan, Project Manager, AECOM	I	External
Equipment Check-out	Equipment verification and training will be conducted by each technical lead to verify their personnel or subcontract personnel have access to functional equipment for use in field activities and the operators are proficient in the use of this equipment.	Greta White, Field Team Leader, AECOM	I	External
Chain-of-Custody Forms	The AECOM Field Team Leader or designee will review and sign each chain-of-custody form to verify that all samples listed are included in the shipment to the laboratory and the sample information is accurate. The chain-of-custody forms will be signed by the sampler and a copy will be retained for the project file, the AECOM Project Manager, and the Subcontract Data Validator.	Greta White, Field Team Leader, AECOM	I	External
Chain-of-Custody Forms	The Laboratory Sample Custodian will review the sample shipment for completeness and integrity and will sign accepting the shipment.	Laboratory Sample Custodian	I	Internal
Chain-of-Custody Forms	The data validator will check that the chain-of-custody form was signed and dated by the AECOM sample shipper or designee relinquishing the samples and also by the Laboratory Sample Custodian receiving the samples for analyses. The data validator will confirm that the custody and integrity of the samples were maintained from collection to analysis and that custody records are complete and any deviations are recorded.	Devon Chicoine, Data Validator, AECOM	I	External

Data Review Input	Description	Responsible for Verification (name, organization)	Step I/IIa/IIb <sup>1</sup>	Internal/External
Field SOPs/Field Logs/Sample Collection	Confirm that all sampling SOPs were followed. Verify that deviations have been documented and performance criteria have been achieved, that samples were correctly identified, that sampling location coordinates are accurate, and that documentation establishes an unbroken chain of custody from sample collection to report generation. Verify that the correct sampling and analytical procedures were applied. Verify that the QAPP was followed as written and that any deviations are documented.	Mark MacEwan, Project Manager, or Task Manager, John Santacroce, or designee, AECOM	IIa	External
Sample Tables	Proposed samples verified to have been collected.	Greta White, Field Team Leader, AECOM	IIa	External
Sample Log Sheets	Log sheets completed as samples are collected in the field, are verified for completeness, and are maintained at the project office.	Greta White, Field Team Leader, AECOM	IIa	External
Field QC Samples	Verify that field QC samples listed in Worksheet #12 were collected as required.	Greta White, Field Team Leader, AECOM	IIa	External
Sample Coordinates	Sample locations will be validated to be correct and in accordance with the QAPP (compare map of proposed locations to map of actual locations).	Greta White, Field Team Leader, AECOM	IIa	External
Analytical SOPs	Confirm that all laboratory SOPs were followed. Verify that the correct analytical methods/SOPs were applied.	Laboratory Quality Assurance Manager	IIa	Internal
Documentation of Method QC Results	Establish that all method QC samples were analyzed and in control as listed in the analytical SOPs. If method QA is not in control, the Laboratory Quality Assurance Manager will contact AECOM for guidance prior to report preparation.	Laboratory Quality Assurance Manager	IIa	Internal
Analytical Data Packages	All analytical data packages will be verified internally for completeness by the laboratory performing the work. The Laboratory Quality Assurance Manager will sign the case narrative for each data package.	Laboratory Quality Assurance Manager	IIa	Internal
Analytical Data Packages	Verify that the data package contains all the elements required by the laboratory Master Services Agreement and laboratory work order. Missing information will be requested from the laboratory, and data validation (if applicable) will be suspended until missing data are received.	Devon Chicoine, Data Validator, AECOM	IIa	External

Data Review Input	Description	Responsible for Verification (name, organization)	Step I/IIa/IIb <sup>1</sup>	Internal/External
Documentation of Analytical Reports for Completeness	Confirm that the required analytical samples have been collected, appropriate sample identifications have been used, and correct analytical methods have been applied. Data Validator will verify that elements of the data package required for validation are present, and if not, the laboratory will be contacted and the missing information will be requested. Validation will be performed as described in Worksheet #34 - 36. Verify all data have been transferred correctly and completely to the final SQL database.	Devon Chicoine, Data Validator, AECOM	IIa	External
Electronic Data Deliverables	The electronic data will be compared to the chain-of-custody form and hard copy data package to verify accuracy and completeness.	Devon Chicoine, Data Validator, AECOM	IIa	External
Analytical Data Packages	Data validation will be conducted by AECOM on the fixed laboratory data.	Devon Chicoine, Data Validator, AECOM	IIb	External
Analytical Data Packages (in addition to Level III Validation)	<u>Data Results:</u> Verify that the summary form results are consistent with those presented on the EDD. <u>Project Quantitation Limits for Sensitivity:</u> Verify that the LOQs and LODs listed in Worksheet #15 were achieved.	Devon Chicoine, Data Validator, AECOM	IIa/IIb	External
Data Validation Report	Data validation reports will be generated according to the AECOM SOPs presented under "Analytical Data Packages" in this table.	Devon Chicoine, Data Validator, AECOM	IIa/IIb	External
Project Action Limits	Discuss the impact of matrix interferences or sample dilutions performed, because of the high concentration of one or more contaminants, on the other target compounds reported as not detected. Document this usability issue and inform the AECOM Project Chemist, who will inform the Project Manager.	Devon Chicoine, Data Validator, AECOM	IIa/IIb	External
QAPP QC Sample Documentation	Verify that all QC samples specified in the QAPP were collected and analyzed and that the associated results were within prescribed QAPP acceptance limits. Verify that QC samples and standards prescribed in analytical SOPs were analyzed and within the prescribed control limits. If any significant QC deviations occur, the Laboratory Quality Assurance Manager shall have contacted the project chemist or Project manager.	Devon Chicoine, Project Chemist, AECOM	IIa/IIb	External
Analytical Data Deviations	Determine the impact of any deviation from sampling or analytical methods, SOP requirements, and matrix interferences on the analytical results.	Devon Chicoine, Project Chemist, AECOM	IIa/IIb	External

**Notes:**

1. IIa=compliance with methods, procedures, and contracts (see Table 10, page 117, UFP-QAPP manual, V.1, March 2005).  
IIb=comparison with measurement performance criteria in the QAPP (see Table 11, page 118, UFP-QAPP manual, V.1, March 2005).

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## **Appendix C**

### **Accident Prevention Plan**



# ACCIDENT PREVENTION PLAN

Regional Compliance Restoration Program  
Preliminary Assessment/Site Investigation  
at Multiple Air National Guard Installations  
Northeast

Schenectady Air National Guard Base  
Scotia, New York

**Contract Number: W912DR-12-D-0014**  
**Work Order Number: 0001**

***Prepared for:***

US Army Corps of Engineers  
10 South Howard Street  
Room 10000-S  
Baltimore, MD 21201-2505

***Prepared by:***

AECOM  
675 North Washington Street, Suite 300  
Alexandria, VA 22314

Project No: 60308608

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# Table of Contents

1	SIGNATURE SHEET .....	1-1
2	BACKGROUND INFORMATION.....	2-1
2.1	Contractor .....	2-1
2.2	Contract Number .....	2-1
2.3	Project Name .....	2-1
2.4	Project Description.....	2-1
2.4.1	Description of Work to Be Performed .....	2-1
2.4.2	Project Location .....	2-1
2.4.3	Project Phases of Work .....	2-2
2.5	AECOM's Accident Experience .....	2-2
3	STATEMENT OF SAFETY AND HEALTH POLICY .....	3-1
4	RESPONSIBILITIES AND LINES OF AUTHORITY .....	4-1
4.1	Statement of Responsibility .....	4-1
4.2	Personnel Responsible for Safety .....	4-1
4.2.1	Program Manager [Mr. John Franz, V.P., P.E.].....	4-2
4.2.2	Regional SH&E Manager [Michael Grasso, CIH] .....	4-2
4.2.3	Project Manager [Mr. Mark MacEwan, P.E.] .....	4-2
4.2.4	Site Safety and Health Officer [TBD] .....	4-3
4.2.5	Site Supervisor.....	4-3
4.2.6	Field Personnel.....	4-3
4.3	Competent Person Work Requirements.....	4-4
4.4	Lines of Authority .....	4-4
4.5	Safety Disciplinary Policy .....	4-4
4.6	Manager and Supervisor Accountability .....	4-5
5	SUBCONTRACTORS AND SUPPLIERS.....	5-1
5.1	List of Subcontractors .....	5-1
5.2	Regulatory Requirements.....	5-1
5.3	Subcontractor and Supplier Identification.....	5-2
6	TRAINING .....	6-1
6.1	Indoctrination Training .....	6-1
6.2	Mandatory Training and Certifications.....	6-1
6.3	Training Schedule.....	6-1
6.4	Emergency Response Training .....	6-2
6.5	Periodic Safety and Health Training .....	6-2
6.6	Safety Bulletin Board .....	6-2
7	SAFETY AND HEALTH INSPECTIONS.....	7-1
7.1	Daily Job Site Safety and Health Inspection .....	7-1
7.2	External Inspections and certifications .....	7-1
8	ACCIDENT REPORTING .....	8-1
8.1	Accident Investigation.....	8-1
8.2	Accident Notification .....	8-1
8.3	Monthly Exposure Report .....	8-2
8.4	Reports .....	8-2
9	PLANS (PROGRAMS, PROCEDURES) REQUIRED BY THE SAFETY MANUAL.....	9-1
9.1	Layout Plans .....	9-1
9.2	Hazard Communication (HAZCOM) Program .....	9-1
9.3	Emergency Response Plan .....	9-1

9.4	Firefighting Plan.....	9-1
9.5	Respiratory Protection Plan.....	9-1
9.6	Health Hazard Control Program .....	9-1
9.7	Site Sanitation.....	9-1
9.8	Abrasive Blasting .....	9-1
9.9	Confined Space .....	9-1
9.10	Hazardous Energy Control Plan.....	9-2
9.11	Access and Haul Road Plan.....	9-2
9.12	Plan for Prevention of Alcohol and Drug Abuse.....	9-2
9.13	Excavation Plan.....	9-2
9.14	Lead Abatement Plan .....	9-2
9.15	Asbestos Abatement Plan .....	9-2
9.16	Critical Lifts .....	9-2
9.17	Demolition Plan .....	9-2
9.18	Fall Protection Plan .....	9-2
9.19	Steel Erection Plan.....	9-2
9.20	Night Operations.....	9-2
9.21	PCB Plan .....	9-2
9.22	Heat and Cold Stress Plan .....	9-2
9.23	Wild Land Fire Management Plan .....	9-2
9.24	Medical Support.....	9-3
	Off Site Medical Support.....	9-3
	On-Site Medical Support.....	9-3
9.25	Process Safety Management Plan .....	9-4
9.26	Site Safety and Health Plan for HTRW Work.....	9-4
10	RISK MANAGEMENT PROCESSES.....	10-1

## List of Attachments

Attachment A	AECOM OSHA 300 Form
Attachment B	AECOM Safety and Health Policy Statement
Attachment C	AECOM SH&E Standard Operating Procedures Table of Contents
Attachment D	Hazard Communication Program
Attachment E	Respiratory Protection Plan
Attachment F	Sanitation Plan
Attachment G	Alcohol and Drug Abuse Policy
Attachment H	Cold Stress Prevention Plan and Heat Stress Prevention Plan
Attachment I	Site Safety and Health Plan

## List of Figures

Figure 4-1	Safety Organization Chart .....	4-1
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## List of Tables

Table 2-1 United States Recordable Cases and Rates .....	2-2
Table 7-1 Safety and Health Inspection Requirements .....	7-1

## List of Acronyms and Abbreviations

ACGIH	American Conference of Governmental Industrial Hygienists
AHA	Activity Hazard Analysis
ANSI	American National Standards Institute
APP	Accident Prevention Plan
BCT	BRAC Cleanup Team
BRAC	Base Realignment and Closure
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
cDCE	cis-1,2-dichloroethene
CFR	Code of Federal Regulations
CIH	Certified Industrial Hygienist
CHST	Construction Health and Safety Technician
CPR	Cardiopulmonary Resuscitation
CSP	Certified Safety Professional
DCE	Dichloroethene
DOT	Department of Transportation
EM	Engineering Manual
ERP	Emergency Response Plan
ERT	Emergency Response Team
FFRAG	Former Fort Ritchie Army Garrison
HAZWOPER	Hazardous Waste Operations and Emergency Response
HSA	Hollow-Stem Auger
HSI	Hazardous Substance Inventory
HTRW	Hazardous Toxic Radiological Waste
IAW	In Accordance With
IDW	Investigation-Derived Waste
ISCO	In Situ Chemical Oxidation
LOC	Level of Concern
LOD	Limit of Detection
LTGM	Long-Term Groundwater Monitoring
LTGMP	Long-Term Groundwater Monitoring Plan
LTM	Long-Term Monitoring
LUC	Land Use Control
LUCRD	Land Use Control Remedial Design
MCL	Maximum Contaminant Level
MDE	Maryland Department of the Environment
MDL	Method Detection Limit
mg/L	milligrams per liter
MRL	Method Reporting Limit
MS	Matrix Spike
MSD	Matrix Spike Duplicate
MSDS	Material Safety Data Sheet
NFPA	National Fire Protection Association
NIOSH	National Institute of Occupational Safety and Health

OSHA Occupational Safety and Health Administration  
OU4 Operable Unit 4

PCE Tetrachloroethene  
PEL Permissible Exposure Limit  
PM Project Manager  
POV Privately Owned Vehicle  
PPE Personal Protective Equipment

QAPP Quality Assurance Project Plan  
QC Quality Control

RBC Risk-Based Concentration  
RI Remedial Investigation  
ROD Record of Decision

SH&E Safety, Health & Environmental  
SI Site Investigation  
SOPs Standard Operating Procedures  
SOW Statement of Work  
SSHO Site Safety and Health Officer  
SSHP Site Safety and Health Plan  
SZ Support Zone

TCE Trichloroethene  
TCL Target Compound List  
TLV Threshold Limit Value

U.S. United States  
USACE United States Army Corps of Engineers  
USEPA United States Environmental Protection Agency

WP Work Plan

µg/L micrograms per liter

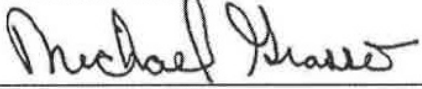


# 1 Signature Sheet

This Accident Prevention Plan (APP) was prepared for employees performing site investigation activities under the ANG2013NEASTCRP contract at multiple Air National Guard Sites in the Northeastern United States. It was prepared based on the best available information regarding the physical and chemical hazards known or suspected to be present at the project sites. While it is not possible to discover, evaluate, and protect in advance against all possible hazards that may be encountered during the completion of the project, adherence to the safety and health program requirements of this APP will significantly reduce the potential for occupational injury.

Plan Concurrence:

Plan Concurrence:



Michael Grasso, CIH  
Site Safety and Health Officer, AECOM

Date: March 12, 2014

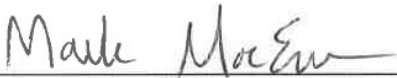
Plan Approver:



Russell Reynolds, CSP  
Safety and Health Manager, AECOM

Date: March 12, 2014

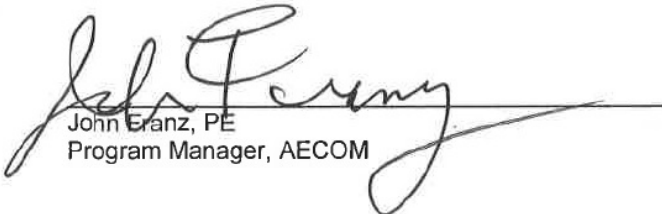
Plan Concurrence:



Mark MacEwan, PE  
Project Manager, AECOM

Date: 13 March 2014

Plan Concurrence:



John Franz, PE  
Program Manager, AECOM

Date: 13 March 2014

## 2 Background Information

### 2.1 Contractor

The prime contractor for the Regional Compliance Restoration Program (CRP) Preliminary Assessment/Site Investigation (PA/SI) at Multiple Air National Guard Installations, Northeast is AECOM.

### 2.2 Contract Number

The project is being conducted under the USACE Baltimore District contract numbers W912DR-12-D-0014, Task/Delivery Order No. 0001.

### 2.3 Project Name

The project name is Regional Compliance Restoration Program (CRP) Preliminary Assessment/Site Investigation (PA/SI) at Multiple Air National Guard Installations, Northeast (hereinafter, ANG2013NEASTCRP).

### 2.4 Project Description

The primary objective of the Task Order is to collect data to support PA/SI reports at multiple Air National Guard Installations. NGB/A7OR's goal for the PA/SI is to obtain either a No Further Action (NFA) decision with regulatory concurrence, or determine the presence of contamination and identify the Data Quality Objectives (DQOs) required for conducting follow on Remedial Investigations at the AOCs that do not meet the criteria for No Further Action (NFA).

AECOM will conduct PAs/SIs at nineteen subject installations. This APP is applicable to the Schenectady ANGB, Scotia, New York.

#### 2.4.1 Description of Work to Be Performed

ANG2013NEASTCRP PA/SI activities are being performed under the Comprehensive Environmental Response Compensation and Liability Act (CERCLA). The state and federal environmental agencies in which the respective site resides is the regulatory lead for this project. The field investigation tasks planned as part of the field operations at the various installations include:

- **Utility Clearance and Geophysical Survey.** Utility clearance will be conducted by Schenectady ANG. A geophysical survey, if required, will be conducted by a subcontractor.
- **Concrete Coring.** If required, concrete coring will be conducted to access subsurface soils for sampling.
- **Soil Borings and Soil Sample Collection.** Soil samples will be collected at designated locations via direct-push technology (DPT). A GeoProbe® DT325 dual-tube sampling system (or equivalent) will be used to collect continuous soil cores to the target depth. Borings will be advanced to depths ranging from 10 to 25 ft, or to probe refusal, whichever occurs first.
- **Monitoring Well Installation.** Temporary wells will be installed using DPT methodology, consisting of 1 inch Schedule 40 PVC screen that will be installed in the borehole, ranging in depth from 10 to 25 ft; filter sand will be placed in the annulus surrounding the well screen to a depth of 1 foot above the top of screen.
- **Groundwater Measurement and Sampling.** Groundwater samples will be collected from the temporary wells. Samples will be collected via low-flow sampling methods using bladder pumps.

#### 2.4.2 Project Location

Location maps of each ANG installation included in this task order are provided in the Work Plan.

### 2.4.3 Project Phases of Work

The project phases of work and hazardous activities requiring Activity Hazards Analyses (AHAs) in the SSHP include the following:

- Mobilization and Demobilization;
- Soil Borings and Soil Sample Collection;
- Groundwater Sampling; and
- Concrete Coring

### 2.5 AECOM's Accident Experience

AECOM Environment utilizes the skills and capabilities from across its global environmental operations. AECOM Environment is devoted to providing quality environmental services to its global clients and provides a blend of global reach, local knowledge, innovation, and technical excellence in delivering solutions that enhance and sustain the world's built, natural, and social environments. AECOM Environment's activities are primarily classified in the Engineering Services industry (NAICS 54133).

AECOM's recordable cases and rates for United States-based projects are presented in Table 2-1. A copy of AECOM's latest OSHA 300 log is located in Attachment A.

**Table 2-1  
United States Recordable Cases and Rates**

Year	Hours Worked	EMR	TRI	TRI Rate	DART	DART Rate
2013	10,997,854	0.53	28	0.51	110	0.22
2012	21,531,000	0.66	57	0.53	661	0.16
2011	21,466,000	0.64	61	0.57	580	0.23
2010	26,228,258	0.71	63	0.48	1,223	0.24

**Notes:**

EMR = Experience Modification Rate (interstate)

TRI = Total Recordable Incident

DART = Days Away Restricted Transferred

### 3 Statement of Safety and Health Policy

AECOM management and employees are fully committed to providing a safe and healthful workplace for all employees and maintaining compliance with the Safety, Health and Environment policy. AECOM's current corporate safety and health policy statement detailing this commitment is included at Attachment B.

## 4 Responsibilities and Lines of Authority

### 4.1 Statement of Responsibility

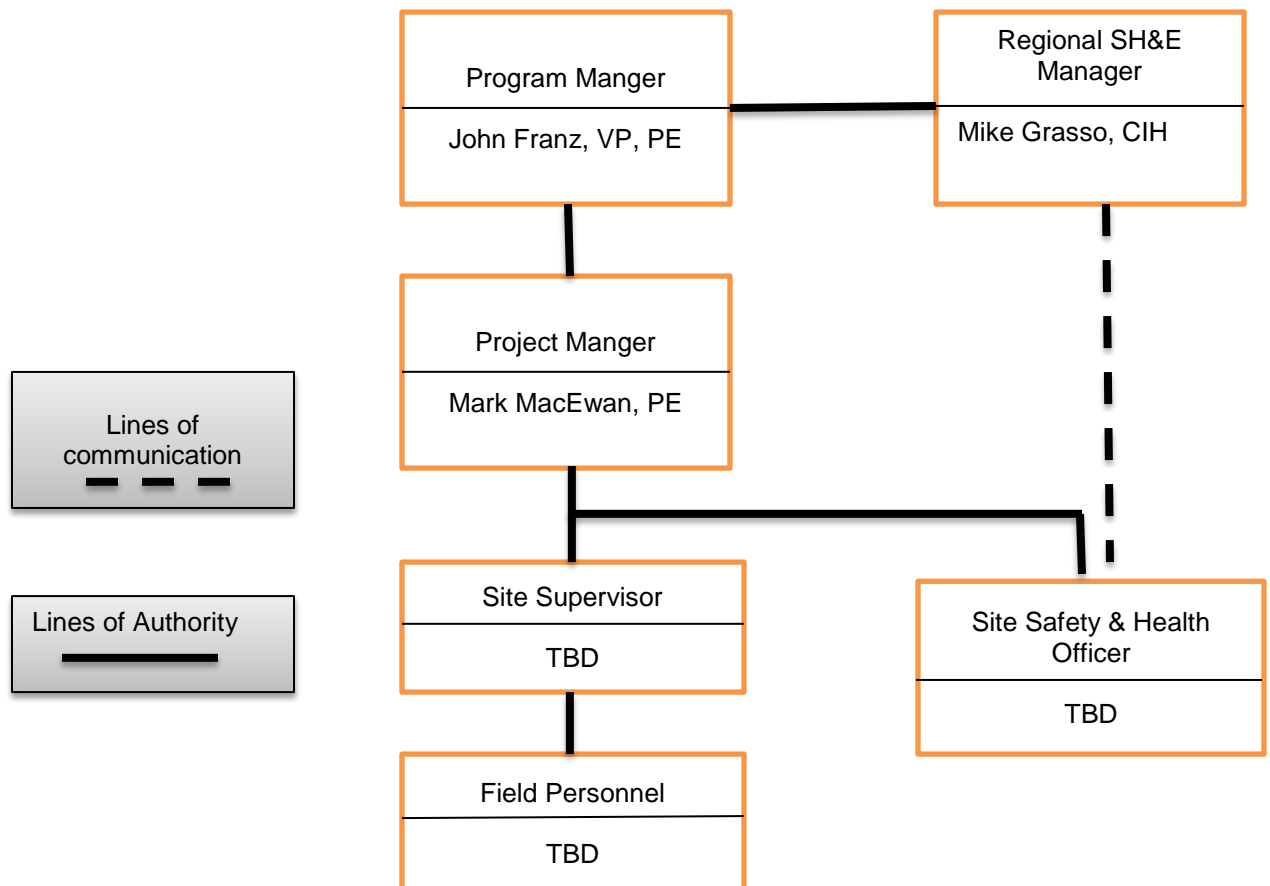
AECOM has the ultimate responsibility for the successful implementation and management of the ANG2013NEASTCRP safety and health program.

### 4.2 Personnel Responsible for Safety

All personnel are responsible for continuous adherence to the safety and health procedures presented in this APP and attached SSHP during the performance of work. No person may work in a manner that conflicts with the intent of, or the inherent safety and environmental precautions expressed in these procedures. After due warnings, the company will dismiss from the site any person who violates safety procedures.

The AECOM organization chart for the management of safety at both the corporate and project level for the ANG2013NEASTCRP project is presented as Figure 4-1. The positions/responsibilities presented in the organization chart are discussed below.

**Figure 4-1  
Safety Organization Chart**



#### **4.2.1 Program Manager [Mr. John Franz, V.P., P.E.]**

The AECOM Program Manager is responsible for supporting the establishment and oversight of the overall health and safety program presented in the APP. The Program Manager will sign the APP prior to final submittal.

#### **4.2.2 Regional SH&E Manager [Michael Grasso, CIH]**

The AECOM SH&E Manager is a Certified Safety Professional (CSP) with over 10 years of experience in managing safety and occupational health at hazardous waste site cleanup operations.

The SH&E Manager is responsible for developing, maintaining, and overseeing the implementation of the APP and SSHP. The SH&E Manager will approve the APP and SSHP prior to final submittal. Specific responsibilities of the SH&E Manager includes the following:

- Approve the appointment of the Site Safety and Health Officer (SSHO) and ensure that he/she has the appropriate training and competencies to perform the duties;
- Participate in quality control (QC) planning such as development of Quality Control Plans, safety and health checklists, and perform design and system safety analyses as appropriate;
- Visits the project as needed to audit the effectiveness of the safety and health program;
- Provide safety and health expectations and flow down requirements for subcontractor statements of work;
- Be available on a 24-hour basis for consultation with the SSHO during on-site emergencies or as needed;
- Coordinate any modifications to the safety plans with the SSHO and PM, as required;
- Evaluate occupational exposure monitoring/air sampling data and adjust APP/SSHP requirements as necessary;
- Provide continued support for upgrading and/or downgrading the level of personal protective equipment (PPE);
- Participate in the investigation of unplanned events, high loss potential incidents, and accidents; and
- Assist in development of on-site training, which will be provided by the SSHO.

#### **4.2.3 Project Manager [Mr. Mark MacEwan, P.E.]**

The AECOM Project Manager (PM) represents the company in all aspects of the project work and is responsible for the following:

- Providing leadership by, among other things, setting an example for all site personnel through actions and words regarding the importance of proper health and safety practices and holding project staff accountable for safety performance;
- Coordinating all work performed by AECOM personnel and subcontractors for the project;
- Ensuring the APP/SSHP is approved prior to commencing field operations;
- Ensuring all required PPE, other types of equipment and instruments, safety incentives, and other safety-related items are budgeted and provided;
- Ensuring that subcontractor Statements of Work include appropriate safety provisions and expectations;
- Ensuring that safety and health requirements are covered during kickoff meetings;
- Participating in the investigation of, and ensuring that unplanned events, high loss potential incidents, and accidents are properly reported to USACE;
- Notifying the Regional SH&E Manager of any changes in the scope of work or site conditions, and ensuring that the APP/SSHP is updated to address new hazards;

- Immediately stopping operations in the event of an emergency or serious hazard, in order to protect personnel and the environment; and
- Preparing and submitting required work progress reports.

#### **4.2.4 Site Safety and Health Officer [TBD]**

The AECOM SSHO will be responsible for managing, implementing, and enforcing AECOM's health and safety program in accordance with the accepted APP. The SSHO will be a competent person that can identify existing and predictable hazards in the working environment or working conditions that are dangerous to personnel, and who has authorization to take prompt corrective measures to eliminate them. The SSHO will have the authority and is responsible for the following actions:

- Review investigation operations to implement the APP/SSHP;
- Inspect site activities to identify safety and occupational health deficiencies and correct them;
- Coordinate changes/modifications to the APP/SSHP with the Regional SH&E Manager, PM, and Site Supervisor;
- Conduct project-specific OSHA training;
- Ensure all field personnel, including any subcontractor personnel assigned to the project, have satisfied requirements for training and medical surveillance as specified by 29 CFR 1910.120, and that records of training and medical approval are available and maintained for each person;
- Oversee compliance with the APP/SSHP procedures and OSHA regulations;
- Serve as a member of the QC staff on matters relating to safety and health;
- Stop work if unacceptable safety and health conditions exist, and take necessary action to re-establish and maintain safe working conditions;
- Review operations and maintenance records of air monitoring equipment required at a site for airborne contaminants and prepare air monitoring reports; and
- Maintain all required safety and health records (e.g., OSHA 300 Logs, incident/accident reports, training certificates and qualifications, equipment checklists, safety plans, air monitoring data and reports, etc.) throughout the life of the project.

#### **4.2.5 Site Supervisor**

The Site Supervisor will manage the on-site investigation operations in accordance with the approved Work Plan and APP/SSHP. The Site Supervisor will coordinate all on-site personnel and equipment conducting investigation operations in a safe manner. The Site Supervisor will coordinate all work with the SSHO to address all safety concerns adequately. The Site Supervisor will immediately stop work in the event of an emergency or serious hazard in order to protect personnel and the environment. The Site Supervisor will work with the Regional SH&E Manager, PM, and SSHO in coordinating changes/modifications to the APP/SSHP, as needed.

#### **4.2.6 Field Personnel**

Field Personnel will be responsible for understanding and following the APP/SSHP and performing their work in a safe and responsible manner. Specific responsibilities will include the following:

- Act in a responsible manner at all times in order to prevent incidents, injury, and/or exposure to themselves and their co-workers;
- Report any and all incidents, including near misses, to the Site Supervisor or SSHO;
- Attend and participate in all daily health and safety tailgate meetings;
- Participate in the development of AHAs as required, and follow the provisions as outlined in the final AHAs;
- Follow instructions and directions of the Site Supervisor and SSHO;

- Utilize the prescribed PPE provided for each task;
- Following all field safety procedures for safe work practices (e.g., the buddy system, communication, site control, decontamination, evacuations, and related emergency procedures);
- Perform only those tasks they have been instructed to perform if they are trained, qualified, and capable of performing safely at the time of assignment;
- Report any personal condition that could affect their safety and/or the safety of co-workers (e.g., fatigue, drowsiness, severe illness, impairment by prescription medications, influence by drugs and alcohol, emotional stress, or other condition); and
- Ensure that no work tasks are performed in deviation from the APP/SSHP and/or the initial instructions of the Site Supervisor and SSHO.

### 4.3 Competent Person Work Requirements

In order to complete investigation tasks, an OSHA-designated competent person must be on site to perform the required daily inspections of equipment and/or operations. No work will be performed unless a designated competent person is present on the job site. The training requirements for competent persons are specified in the SH&E SOP 202, *Competent Person Designation* (refer to Attachment C).

### 4.4 Lines of Authority

Figure 4-1 illustrates the lines of authority for the personnel responsible for project safety.

### 4.5 Safety Disciplinary Policy

Employee non-compliance with safety requirements is taken very seriously by AECOM management. Personnel not following procedures are warned and counseled on the proper safety procedures and if the problem persists, are again counseled with notations made in their permanent record. Continued non-compliance can lead to termination of employment.

AECOM has developed the following progressive discipline policy for the violation of safety requirements. Extremely careless or reckless violations may result in immediate termination.

**First Violation:** An oral warning will be given for the first violation of a SH&E requirements depending on the severity of the violation. The employee will be informed by his or her supervisor of the violation and of the correct safe practice or procedure. The supervisor will review with the employee all applicable safety and health workplace requirements and guidelines. The employee must sign a statement indicating understanding of those requirements and guidelines. The supervisor should inform the employee that future violations will result in higher levels of discipline and may lead to dismissal.

**Second Violation:** The employee may be given a written warning for the second documented safety and health requirement violation. This warning will specifically identify the violation. The warning will also refer the employee to applicable safety and health requirements and guidelines for review, and also show the date the employee previously read and signed the statement of understanding of safety and health requirements and guidelines. The employee, the employee's supervisor, the department head, Human Resources, and the employee's personnel file receive copies of the warning.

**Third Violation:** the employee may be given a final warning for the third documented violation of safety and health requirements or guidelines. This warning will specifically identify the violation. It will also state that any further violation of safety and health requirements and guidelines will result in dismissal. All persons who receive a copy of the previously written warning will receive a copy of the final warning.

**Any Subsequent Violation:** the employee may be dismissed for a subsequent violation. If dismissed, the employee will receive a letter specifically identifying the violation of the safety and health requirement or guideline, as well as rights of appeal through the grievance process.

**Immediate Termination:** On occasion, an employee will commit a violation of a safety and health requirement or guideline that is so careless and reckless, or that so endangers life or property, that it can be considered imminently dangerous. When this occurs, an employee may be dismissed immediately,



without benefit of any warnings. An employee dismissed in this fashion will receive a letter specifically identifying the violation and setting out his/her right of appeal within the grievance process.

Discipline for Subcontractor Personnel: If noncompliance actions are committed by subcontractor personnel, AECOM will recommend that the employer discipline the employee. If the action continues, AECOM will have the employer remove the employee from the site.

Documentation: Employee warnings and disciplinary actions will be documented using AECOM's Corporate Memorandum format in a manner consistent with the requirements of this policy.

#### **4.6 Manager and Supervisor Accountability**

Managers and supervisors are responsible for enforcing safety and health as part of their job descriptions. They are ultimately responsible for protecting the welfare of the employees, as well as minimizing the potential liability associated with on-the-job accidents. Annual performance reviews and incentive plans for managers and supervisors include the assessment of both the individual's safety performance as well as their project safety performance.

## 5 Subcontractors and Suppliers

Various subcontractors and suppliers will be used to execute the project, subcontractors selection will be based on their safety compliance history with OSHA, prior experience with AECOM, the USACE, and their Experience Modification Rating (EMR). AECOM will use subcontractor and suppliers with an EMR of less than or equal to one.

Subcontractors and suppliers are required to provide a safe and healthful working environment for employees that are free from recognized hazards that are causing or likely to cause harm to their employees and other project personnel.

Subcontractors and suppliers are responsible for compliance with the safety and health requirements found in EM 385-1-1 (3 November 2008). In addition, subcontractors and suppliers are responsible for compliance with the safety and health requirements set forth in the APP.

Subcontractors working on the project site are required to designate a competent person –who can identify existing and predicable hazards in the working environment or working conditions that are, dangerous to personnel and who has authorization to take prompt corrective measures to eliminate them.

The subcontractor shall immediately correct any unsafe conditions that are brought to its attention. When unsafe conditions are not corrected to the satisfaction of AECOM work will be stopped. The work stoppage will be in place until the corrective steps to eliminate the unsafe conditions are taken.

Where the subcontractor fails to correct the unsafe conditions and/or repeatedly fails to comply with the safety and health requirements as found in EM 385-1-1, or the requirements of this AAP and specific safety plans, AECOM will take the following action:

- Stop work until the conditions are corrected to the satisfaction of AECOM.
- Meet with the subcontractors management team
- Send a written notice of non-compliance to the subcontractor, AECOM Procurement and Project Managers.
- Initiate contract termination procedures.

Personnel refusing or repeatedly failing to comply with AECOM job safety requirements, or supervisors failing to enforce compliance with these and referenced standards shall be, promptly disciplined by their employer, which at AECOM's discretion, and may include removal from the project.

### 5.1 List of Subcontractors

The following subcontractors will be utilized for the ANG2013NEASTCRP field activities:

- Driller for concrete coring/soil boring/sampling/well installation;
- Geophysics to locate potential leach fields/underground storage tanks/utilities
- Land Surveyor to locate soil borings and monitoring wells;
- Waste transportation and disposal subcontractor for removal and disposal of investigation-derived waste (IDW); and
- Various suppliers for field sampling equipment and health and safety supplies.

### 5.2 Regulatory Requirements

The work performed shall comply with the safety and health requirements as found in EM 385-1-1 and OSHA Construction Industry Standards (29 CFR 1926). Where, the safety requirements of EM 385-1-1 and of this APP vary from the 29 CFR 1926, the most stringent requirement shall be followed.

Subcontractors and suppliers are required to provide a safe and healthful working environment for employees that are free from recognized hazards that are causing or likely to cause harm to their employees and other project personnel.

Subcontractors and suppliers are responsible for compliance with the safety and health requirements as found in EM 385-1-1 (3 November 2008). In addition, subcontractors and suppliers are responsible for compliance with the safety and health requirements set forth in the APP.

### **5.3 Subcontractor and Supplier Identification**

The following subcontractors will be utilized for the ANG2013NEASTCRP field activities:

- Driller for concrete coring/soil boring/sampling/well installation;
- Geophysics to locate potential leach fields/underground storage tanks/utilities
- Land Surveyor to locate soil borings and monitoring wells;
- Waste transportation and disposal subcontractor for removal and disposal of investigation-derived waste (IDW); and
- Various suppliers for field sampling equipment and health and safety supplies.

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## 6 Training

### 6.1 Indoctrination Training

Prior to the first work shift or visit, all personnel shall receive safety indoctrination given by the SSHO or delegate. The indoctrination shall be relevant to the work being undertaken and pertinent provisions of the AAP and the project health and safety plan. Indoctrination shall include but not be limited to:

- Requirements and responsibilities for accident prevention and maintaining safe and healthful work environments;
- General safety and health policies and procedures and pertinent provisions of this APP;
- Employee and supervisor responsibilities for reporting all accidents;
- Provisions for medical facilities and emergency response and procedures for obtaining medical treatment or emergency assistance;
- Procedures for reporting and correcting unsafe conditions or practices;
- Job hazards and the means to control/eliminate those hazards, including applicable activity hazard analyses; and project specific training

### 6.2 Mandatory Training and Certifications

AECOM will verify that personnel under their control have received the necessary safety training. Training shall comply with the USACE and OSHA's Safety and Health training requirements. Documentation and certificates of training will be kept on site and available for inspection by Government Designated Authority (GDA). At minimum, depending on the tasks performed and the hazards involved, personnel shall be trained on the following:

- Hazardous Communication/Right to Know
- Control of hazardous energy (lockout)
- 40-hour HazWoper training
- 8-hour HazWoper annual refresher training
- 8-hour HazWoper Supervisor training
- 30 hour Construction Safety Awareness training ( supervisors and SSHO)
- First aid and CPR training (at least two) from each employer
- Personal protective equipment

As site condition and hazards change, employees shall be trained on the following:

- Confined space
- Fall prevention/protection
- Respiratory protection
- Lead Hazards
- Asbestos

### 6.3 Training Schedule

Mandatory training will be conducted off-site by either an in-house training program or by outside instructors. As applicable, training will be conducted on-site by the Supervisors, or by outside resources.

When supervisory personnel has reason to believe that any person who has already been trained does not have the understanding and skill required the person will be retained by the SSHO or supervisory personnel or by an outside trainer.

Circumstances where retraining is required include, but not limited to situations where:

- Changes in the workplace render previous training obsolete
- New products (PPE) or equipment is introduced into the workplace
- Training expires (i.e. lift truck, first aid etc.)

#### **6.4 Emergency Response Training**

As part of the emergency response plan personnel will be trained in the following:

- First aid and CPR (two employees per shift)
- Location and use of alarm and communication system
- Location and use of fire extinguishers
- Location of first aid kit, telephone and spill control supplies
- Routes of escape and location of evacuation assembly area

#### **6.5 Periodic Safety and Health Training**

Safety meetings will held at the beginning of each job and at least weekly thereafter, according to the various circumstances involved or when necessary to clear working procedures. The safety meetings will be conducted by the site Supervisor. Project personnel shall attend the safety meeting and sign a meeting roster to confirm attendance. Safety Meeting for non- English speaking personnel will be held in the persons native language.

Safety meetings shall be conducted to review past activities, plan for new or changed operations, review pertinent aspects of appropriate AHA (by trade), establish safe working procedures for anticipated hazards, and provide pertinent safety and health training and motivation.

As part of the safety meeting, employee feedback (comments, questions, health or safety concerns) are welcomed. Issues addressed in the safety meetings will be documented and shall include the date, attendees, subjects discussed and names of individual(s) who conducted the meeting.

#### **6.6 Safety Bulletin Board**

Projects are anticipated to be short term in nature, using a mobile crew. For long duration projects where a field office is established a safe bulletin board will be erected and maintained.

A safety bulletin board to increase employee's safety awareness and convey the company's safety message will be installed on long term projects. The following items shall be posted on the Bulletin Board:

- Map denoting the route to the nearest emergency care facility.
- Emergency phone numbers.
- Safety and Health promotional posters.
- Date of last lost workday injury.
- Citation and Notice. If a Citation and Notice is received, it must be posted until all violations are abated
- OSHA and/or USACE required postings.

The following will be mounted on or adjacent to the bulletin board or a notice will be posted that states the location of the documents which will be accessible on the site by all workers.

- Copy of current activity hazard analysis/analyses (AHA)
- Copy of the most up-to-date accident prevention plan (APP)
- OSHA Form 300A
- Copy of Safety deficiency tracking log

## 7 Safety and Health Inspections

### 7.1 Daily Job Site Safety and Health Inspection

Due to the short duration and limited nature of the PA/SI field work, and multiple locations of the ANG facilities, the ANG2013NEASTCRP project SSHO may designate a qualified and competent person to conduct site specific daily job site health and safety inspections. The site specific SSHO will conduct daily jobsite health and safety inspections/audits to identify new or previously unidentified hazards, verify the effectiveness of hazard control measures, observe workers performing tasks, and provide feedback to workers. Deficiencies noted during the daily inspection will be corrected immediately, or work will be stopped in the affected area until the deficiency is corrected. The daily jobsite health and safety inspection will be documented in the SSHO logbook.

Identified safety and health issues and deficiencies, and the actions, timetable, and responsibility for correcting the deficiencies, will be recorded on an inspection form. Follow-up inspections to ensure correction of any identified deficiencies will also be conducted and documented on an inspection form.

AECOM will establish a safety and occupational health deficiency tracking log that list and monitors the status of safety and health deficiencies in chronological order. The log will be posted on a project safety bulletin board, be updated daily, and will provide the following information:

- Date of deficiency;
- Description of deficiency;
- Name of person responsible for correcting deficiency;
- Projected resolution date; and
- Date actually resolved.

Table 7-1 lists the safety and health inspection requirements for the ANG2013NEASTCRP anticipated field operations.

**Table 7-1  
Safety and Health Inspection Requirements**

<b>What</b>	<b>Who</b>	<b>When</b>	<b>Documentation</b>
General Site Conditions	SSHO	Daily	Log Book
	SSHO	Weekly	Safety Inspection Form
	Project Manager	Monthly	Safety Inspection Form
	SH&E Manager	Quarterly	Safety Inspection Form
Tools and Equipment	Users	Daily	Tag and Remove Defective Items from Service
Personal Protective Equipment	SSHO	Initial/Monitor use Daily	Log Book

### 7.2 External Inspections and certifications

External inspections are not expected for this project. In the event that an OSHA or other regulatory agency inspection, AECOM will immediately notify and provide USACE the opportunity to accompany AECOM on the inspection. AECOM will provide USACE a copy of any citations or reports issued by the inspector and any corrective action responses to the citation(s) or report(s).



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## 8 Accident Reporting

All incidents, no matter how minor, are to be reported immediately (within 24 hours) by employees to their immediate supervisor or manager. Supervisors are responsible for ensuring that all incidents are reported immediately, subsequently documented, and investigated so that corrective action can be initiated to prevent a reoccurrence. The Supervisor shall facilitate and personally assist in the investigation of all incidents. Documents pertaining to an incident analysis must be complete and accurate.

AECOM employee is injured and requires medical treatment, the Site Supervisor will contact the Regional SH&E Manager, AECOM's Incident Reporting Line at (800) 348-5046, the PM and CO immediately. The Site Supervisor will initiate a written report, using the Supervisor's Report of Incident form (S3NA-004-PR). The Site Supervisor will complete the first two sections of this form and forward to the PM for completion of Section 3. The report will then be provided to the Regional SH&E Manager before the end of the following shift.

For OSHA recordable injuries and illnesses, high visibility accidents (any mishap which generate publicity and/or high visibility) and property damage accidents resulting in at least \$2,000 in damages, AECOM will conduct an accident investigation to establish the root cause(s) of the accident, complete the Contractor Significant Incident Report (CSIR) form, USACE Accident Report Form 3394, and provide the report to the CO within five calendar days of the accident.

### 8.1 Accident Investigation

All accidents, no matter how minor, are subject to investigation. Reasonably, an accident causing death or serious injury will require a more thorough analysis than one resulting in a first-aid case. Any near-miss incident that might have caused harm and steady reoccurrence of minor injuries (first-aid cases) also requires investigating. Supervisory personnel shall initiate the analysis as soon after the incident as possible.

The primary focus of the investigation is to determine why the incident occurred, what actions should be taken to prevent it from reoccurring, and if employee training or retraining is required. Investigations are not intended to be faultfinding, but should seek to identify any unsafe conditions or acts that must be corrected. Such information serves an important purpose to help management learn from past mistakes in order to prevent and control hazards and potential incidents on future projects.

Questions that should be asked during an incident investigation include the following:

- **What happened?**  
The investigation should describe what took place to prompt the investigation (injury, damage to property, etc.).
- **Why did the incident happen?**  
The investigator must obtain all the facts surrounding the incident (who was involved, what caused the incident to occur, were employee(s) qualified to perform the task, etc.).
- **What needs to be done to prevent reoccurrence?**  
The investigator must determine what aspect of the operation or process needs additional attention. The purpose of this portion of the investigation is not to fix blame, but to give constructive recommendations for improving the work environment by establishing safe work practices or correcting unsafe conditions

### 8.2 Accident Notification

The CO and the AECOM Project Manager and Regional SH&E Manager shall be notified immediately, but not later than four hours, after any accident meeting the definition of Recordable Injuries or Illnesses

or High Visibility Accidents, property damage equal to or greater than \$2,000, or any weight handling equipment accident. Information shall include:

- Contractor name; contract title; type of contract; name of activity,
- Installation, or location where accident occurred;
- Date and time of accident;
- Name(s) of personnel injured; extent of property damage, if any;
- Extent of injury, if known; and
- A brief description of the accident (to include type of construction equipment used, PPE used, etc.).

As necessary preserve the conditions and evidence on the accident site until the Government investigation team arrives on site and Government investigation is conducted.

### **8.3 Monthly Exposure Report**

Monthly exposure reporting to the CO is required to be attached to the monthly billing request. This report is a compilation of employee-hours worked each month for all site workers, both prime and subcontractor. The monthly exposure as prepared by AECOM will also include type of incidents (e.g., first aid, near hits, exposure to hazardous chemicals, OSHA recordables).

### **8.4 Reports**

All incidents noted above with the exception of near miss accidents require the preparation of ENG. 3394, and AECOM Incident Report, which are available electronically from the Corporate Safety Office. ENG 3394 must be provided to the CO and EH&S Manager within five calendar days of the accident.

An incident log for: recording daily first-aid treatment, near misses, exposures and other incidents that are not otherwise reportable will be maintained on the project site. The log shall be furnished to the GDA representative upon request. AECOM will maintain a log of work-related injuries and illnesses (OSHA 300-A) in accordance with OSHA requirements.

## 9 Plans (Programs, Procedures) Required by the Safety Manual

Based on the scope of site investigation activities, all applicable safety plans, programs, and procedures to address risk and compliance requirements were identified and are described below.

### 9.1 Layout Plans

During the project work plan phase, the site layout will be planned to show the work sites, administrative areas, access and egress routes and parking areas. Staging areas for the temporary storage of equipment and supplies, as well as waste materials, will be sited. Location maps are provided in the Work Plan.

### 9.2 Hazard Communication (HAZCOM) Program

Included as Attachment D to this Accident Prevention Plan is AECOM's written hazard communication program (S3NA-507-PR) addressing as a minimum, the following: training (to include potential safety and health effects from exposure), labeling, current inventory of hazardous chemicals on site, and the location and use of Material Safety Data Sheets (MSDSs).

### 9.3 Emergency Response Plan

An Emergency Response Plan is included in the Site Safety and Health Plan (Attachment J to this Accident Prevention Plan). This Emergency Response Plan includes site-specific emergency procedures to ensure employee safety in case of fire or other emergency, including emergency telephone numbers and reporting instructions for ambulance, physician, hospital, fire, and police. Also a map of directions to the nearest hospital(s). The plan also includes Spill Response Procedures including organizations with telephone numbers of individuals to contact in the event of a spill.

### 9.4 Firefighting Plan

AECOM personnel will not be engaged in firefighting activities. Regardless of the size and nature of the fire, and AECOM's ability to respond, all fires will be reported immediately to the local fire department.

### 9.5 Respiratory Protection Plan

AECOM's Respiratory Protection Plan (S3NA-519-PR) is included as Attachment E to this Accident Prevention Plan.

### 9.6 Health Hazard Control Program

Activity Hazard Analyses (AHA's) shall consider all substances, agents and environments that present a hazard and will recommend hazard control measures. Engineering and administrative controls shall be used to control hazards. In cases where engineering or administrative controls are not feasible, PPE may be used. The AHA shall serve as certification that a hazard assessment has been conducted.

### 9.7 Site Sanitation

AECOM's Sanitation Plan is included as Attachment F to this Accident Prevention Plan.

### 9.8 Abrasive Blasting

Not applicable

### 9.9 Confined Space

Not applicable

**9.10 Hazardous Energy Control Plan**

Not applicable

**9.11 Access and Haul Road Plan**

Not applicable

**9.12 Plan for Prevention of Alcohol and Drug Abuse**

AECOM's plan for prevention of Alcohol and Drug Abuse is included as Attachment G to the Accident Prevention Plan. This plan meets the minimum requirements of DFAR 252.223-7004.

**9.13 Excavation Plan**

Not applicable

**9.14 Lead Abatement Plan**

Not applicable

**9.15 Asbestos Abatement Plan**

Not applicable

**9.16 Critical Lifts**

Not applicable

**9.17 Demolition Plan**

Not applicable

**9.18 Fall Protection Plan**

Not applicable

**9.19 Steel Erection Plan**

Not applicable

**9.20 Night Operations**

Not applicable

**9.21 PCB Plan**

Not applicable

**9.22 Heat and Cold Stress Plan**

The SSHO has the authority to stop work or restrict work when ice, snow, lightening or other weather condition poses a potential risk to site personnel. AECOM's Cold Stress Prevention Plan (S3NA-505-PR) and Heat Stress Prevention Plan( S3NA- 511- PR) are included as Attachment H to this Accident Prevention Plan.

**9.23 Wild Land Fire Management Plan**

This section is not applicable to the tasks being performed for this project.

## **9.24 Medical Support**

The AECOM's Occupational Medical Program has been established to ensure that the health of all employees is not compromised by potential exposure to hazardous substances and physical agents encountered in the workplace. The program requires that prompt first aid and medical treatment be given to those that are injured on the job.

AECOM personnel performing on-site work that may result in exposure to contaminant-related health and safety hazards are enrolled in the medical surveillance program that complies with OSHA standard 29 CFR 1910.120 (f)/29 CFR 1926.62 (f). They will have successfully completed a pre-placement occupational physical examination and annually thereafter. The medical surveillance program meets the following requirements:

- The physician's opinion concerning the employees' abilities to perform the assigned work shall be provided to the Regional SH&E Manager,
- The required written physician's opinion shall be made available upon request,
- All medical records are maintained in accordance with 29 CFR 1910.1020,
- Examinations are given at least once every 12 months unless the attending physician believes a longer interval (not greater than biennially) is appropriate, and
- Examinations are administered by a licensed physician who is certified by the American Board of Preventive Medicine.

AECOM will certify that all 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.

### **Off Site Medical Support**

The off-site consulting physician for AECOM's Occupational Medical Program is Peter Greaney, M.D. Dr. Greaney is a board certified Occupational Physician (American Board of Preventive Medicine). The Doctor can be reached at:

WorkCare  
300 South Harbor Blvd  
Suite 600  
Anaheim, CA 92868  
800-455-6155

### **On-Site Medical Support**

On-site medical support will consist of individuals trained in first aid and CPR. As required by EM385-1-1 Section 3 a first aid kit(s) that meet the requirements of ANSI Z308.1-2003 will be maintained on site. At least two employees on each shift will be qualified to administer first aid. The first aid qualified people are as follows:

- Site supervisor
- SSHO

**9.25 Process Safety Management Plan**

This section is not applicable to the tasks being performed for this project.

**9.26 Site Safety and Health Plan for HTRW Work**

See the site-specific SSHP, Attachment I to this APP.

## 10 Risk Management Processes

Detailed site specific hazards and controls will be provided in the activity hazard analysis (AHA) for each phase of the operation (each Major Definable Feature of Work as defined by the Contractor Quality Control Plan). The AHA's will provide information on how the requirements of major sections of EM 385-1-1 will be met. Particular attention shall be paid to:

- Physical Hazards
  - Struck by
  - Caught in or between
  - Electrical shock
  - Falls
  - Noise
  - Fire/explosion
  - Confined Space
- Health Hazards
  - Chemicals
  - Biological (flora and fauna)
  - Non-ionizing radiation ( intense light)
  - Heat and cold stress
  - Musculoskeletal disorder (MSD)

The control measures that will be employed to manage the risk follow the hierarchy of controls, which are as follows:

- Elimination ( design it out) **Most Effective Control**
- Substitution ( use something else)
- Engineering controls (isolation, guarding)
- Administrative controls ( training, work schedule signage)
- Personal protective equipment **Least Effective Control**

The AHAs will be considered a “living document” with revisions incorporated based on actual work activities being performed. The contents of the AHAs will be communicated to affected personnel before work begins and shall be periodically reviewed with affected personnel thereafter.

The specific AHAs identifying the project-specific task hazards and controls are presented in the SSHP, Attachment J to this APP



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## **Attachment A**

### **AECOM OSHA 300 Form**

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# Summary of Work-Related Injuries and Illnesses

Using the Log, count the individual entries you made for each category. Then write the totals below, making sure you've added the entries from every page of the log. If you had no cases write "0."

## Number of Cases

Total number of deaths	Total number of cases with days away from work	Total number of cases with job transfer or restriction	Total number of other recordable cases
0	10	7	37
(G)	(H)	(I)	(J)

## Number of Days

Total number of days away from work	Total number of days of job transfer or restriction
399	262
(K)	(L)

## Injury and Illness Types

Total number of...			
(M)			
(1) Injury	47	(4) Poisoning	0
(2) Skin Disorder	0	(5) Hearing Loss	0
(3) Respiratory Condition	0	(6) All Other Illnesses	7

## Establishment information

Your establishment name AECOM Technical Services, Inc

US Locations \_\_\_\_\_

Industry description (e.g., Manufacture of motor truck trailers)  
Engineering and Consulting

Standard Industrial Classification (SIC), if known (e.g., SIC 3715)

OR North American Industrial Classification (NAICS), if known (e.g., 336212)

5 4 1 3 3 0

## Employment Information

Annual average number of employees 10765

Total hours worked by all employees last year 21,531,000

## Sign here

I certify that I have examined this document and that to the best of my knowledge the entries are true, accurate, and complete.

  
\_\_\_\_\_  
Company executive  
724-695-9353  
Phone

VP-SHA E  
\_\_\_\_\_  
Title  
1-30-13  
\_\_\_\_\_  
Date

--

Year 2012

						Establishment name City		State									
Identify the person			Describe the case			Classify the case											
(A) Case No.	(B) Employees Name	(C) Job Title	(D) Date of injury or onset of illness  (mo./day)	(E) Where the event occurred (e.g. Loading dock north end)	(F) Describe injury or illness, parts of body affected, and object/substance that directly injured or made person ill (e.g. Second degree burns on right forearm from acetylene torch)	CHECK ONLY ONE box for each case based on the most serious outcome for that case:				Enter the number of days the injured or ill worker was:		Check the "injury" column or choose one type of illness:					
						Death	Days away from work	Remained at work		Days Away From Work (days) (K)	On job transfer or restriction (days) (L)	(M)  Injury	Skin Disorder	Respiratory Condition	Poisoning	Hearing Loss	All other illnesses
								Job transfer or restriction (I)	Other recordable cases (J)								
						(G)	(H)	(I)	(J)	(K)	(L)	(1)	(2)	(3)	(4)	(5)	(6)
2012.01.11.18. A7374C0D91E F		Superintendent	1/11/2012	293 Court Street Project, Binghamton, NY	Disconnected a camlock fitting and hose became stuck. Hose snapped back when force was applied striking EE face causing cut lip, 2 broken teeth and 4 cracked teeth				x			x					
2012.01.13.03. 400F36BF0C0D		Environmental Planner	1/12/2012	Columbus Road in Mansfield, New Jersey	Stepping on a mid rail of a wooden fence in order to climb over to take site photographs, the mid rail broke and the employee fell head first resulting in C-1 vertebrae fracture with lost time		x			180		x					
2012.01.12.14. CDF902C0C0B C		Const Inspector II	1/12/2012	Montgomery outer loop job site, Montgomery, AL	RT elbow contusion, lower back strain, employee struck by excavator counterweight, knocked to the ground. RX - anti-inflammatory/relaxant				x			x					
2012.01.19.13. B8D3FF2D298 D		Construction Foreman	1/19/2012	Pier 6 in Fairfield, MD	Leaving the pier and his foot hit the slight raised asphalt at the end causing him to fall forward causing a fracture LT lower arm (radius)		x			7		x					
2012.01.23.05. F76164F4C886		Project Controls	1/19/2012	1003 Bishop St., Honolulu, HI	Sitting at desk reaching for a trash can EE fell out of chair, striking head on windowsill causing laceration to forehead and 11 stitches.				x			x					
2012.02.13.13. B7D61DEF70B 3		Construction Inspect	2/7/2012	Dumbarton Bridge Area, Newark CA	Unsecured steel plate slipped when sloped on wall and struck employee's right foot resulting in fractured toe (4th/5th) and prescription medication				x			x					
2012.02.28.11. 384541793B1C		Benefits	2/17/2012	515 SFlower St, 10th Fl, Los Angeles, CA	Pain in right wrist while performing office tasks (typing etc) requiring hard brace, physical therapy and RX.				x								x
2012.02.17.14. EE198DFCD9A 9		Laborer	2/17/2012	293 Court Street Project, Binghamton, NY	Dislocation of right ankle when stepped down from waste trailer and rolled right ankle requiring lost time with hard cast.		x			58	36	x					

Identify the person				Describe the case		Classify the case													
(A) Case No.	(B) Employees Name	(C) Job Title	(D) Date of injury or onset of illness  (mo./day)	(E) Where the event occurred (e.g. Loading dock north end)	(F) Describe injury or illness, parts of body affected, and object/substance that directly injured or made person ill (e.g. Second degree burns on right forearm from acetylene torch)	CHECK ONLY ONE box for each case based on the most serious outcome for that case:				Enter the number of days the injured or ill worker was:		Check the "injury" column or choose one type of illness:							
						Death		Days away from work		Remained at work		Days Away From Work (down) (K)	On job transfer or restriction (days) (L)	(M) Injury (1)	Skin Disorder (2)	Respiratory Condition (3)	Poisoning (4)	Hearing Loss (5)	All other illnesses (6)
								Job transfer or restriction (I)	Other recordable (J)										
						(G)	(H)	(I)	(J)	(K)	(L)	(1)	(2)	(3)	(4)	(5)	(6)		
2012.03.01.09.3700ED7D7F8 A		Sr Tech	2/28/2012	8400 West Block Ryan Road, Sheybogan, WI	Lifting a density testing machine ( weighing 40 lbs) from ground level to just higher than the bed of a his truck resulting in LT shoulder strain with RX for pain and inflammation				x			x							
2012.03.12.11.C89B3C68733 C		Designer 1	3/8/2012	1755 Fairway Dr. San Leandro, CA	Mild concussion after hitting head on scaffolding while wearing a hard hat requiring RX for pain and work restrictions			x			14	x							
2012.03.26.07.F96A42E26063		Proposal Speicalist	3/12/2012	AECOM office, Newport Beach CA	Ulnar Nerve irritation from resting elbows (bilateral) on workstation requiring rx for inflammation				x								x		
2012.03.21.05.9F6F6660704E		Inspector	3/13/2012	Henry Hudson Pkwy GWB Ramp New York	Neck, RT shoulder, RT arm, RT Elbow and lower back pain from motor vehicle accident requiring physical therapy and restricted duty			x			5	x							
2012.04.12.04.2F377CC7CAD D		Scientist-Tech Spc 3	4/11/2012	Culvert at Kivett Dr., Greensboro, NC	Slipped on a downed tree while surveying and fell on left side. Diagnosis of pain in left flank requiring RX treatment.				x			x							
2012.11.29.05.028443CA7048		Env Compliance	4/15/2012	1001 Bishop Street,Suite 1600 ASB Tower, Honolulu,	Ergo request for support due to back and shoulder pain requiring PT				x								x		
2012.04.24.10.058F4F514D59		Project Accountant	4/20/2012	Intersection of 13th and I Streets, Sacramento, C	Sprain or strain of cervical spine, strain shoulder, trapezius muscle sprain or strain of lumbar region from motor vehicle accident resulting in lost time		x			2	6	x							
2012.05.01.12.0CE82AC54902		Billr	4/30/2012	AECOM Office workstation, Alexandria VA	Contusion to lower back and Lumbar strain when falling from office chair resulting in RX for pain and physical therapy				x			x							
2012.05.01.13.858C3D4A25A6		Project Accountant	5/1/2012	Atlanta officeOne Midtown Plaza, (workstation), GA	LT forearm pain from repetitive motion causing tendonitis requiring physical therapy				x								x		
2012.05.04.02.824E1FF57928		Inspector	5/2/2012	I 95 SRI Interchange, Christiana DE	Minor bruises to the hands and shins plus abrasions to both forearms; received Rx (800 mg Motrin & 10 mg Flexiril) for pain.				x			x							
2012.05.14.07.CAEA13AC914 5		Tech III	5/10/2012	Edwards AFB Staging area CA	RT eye irritation when using a grinder to cut a steel drum. Requiring optical exam and flush of eye and RX for vicodin and gentymycin ointment				x			x							
2012.05.15.07.3794EDD8EFF 2		Engineer I	5/14/2012	I-95 bridge over Branywine Creek, Wilmington, DE	Walking down a bridge embankment, the EE slipped on the mud, tripped over a tree branch/stump, and rolled/twisted his RT ankle requiring work restrictions and PT			x			9	x							
2012.05.24.10.09817B3A6207		Const. Manager	5/21/2012	Delaware River Project, Wilmington/New Castle, DE	Contusion to the RT shin/leg when he slipped on debris requiring light duty and RX			x			30	x							
2012.05.23.15.F7F33D72B5D A		Archaeological Field	5/21/2012	Solar Genesis field area, Blythe, CA	Rash on both ankles and feet from working outside in heat requiring RX (kenalog shot) for treatment.				x			x							

Identify the person				Describe the case		Classify the case											
(A) Case No.	(B) Employees Name	(C) Job Title	(D) Date of injury or onset of illness  (mo./day)	(E) Where the event occurred (e.g. Loading dock north end)	(F) Describe injury or illness, parts of body affected, and object/substance that directly injured or made person ill (e.g. Second degree burns on right forearm from acetylene torch)	CHECK ONLY ONE box for each case based on the most serious outcome for that case:				Enter the number of days the injured or ill worker was:		Check the "injury" column or choose one type of illness:					
												(M)					
						Death	Days away from work	Remained at work		Days Away From Work (days) (K)	On job transfer or restriction (days) (L)	Injury (1)	Skin Disorder (2)	Respiratory Condition (3)	Poisoning (4)	Hearing Loss (5)	All other illnesses (6)
		Job transfer or restriction (I)	Other recordable injury (J)														
						(G)	(H)	(I)	(J)			(1)	(2)	(3)	(4)	(5)	(6)
2012.06.04.05. F8191232E6C8		Chief Inspector	5/21/2012	Albany and West Street, NY, NY	Twisted LT Ankle in the rain stepping off curb resulting in ankle sprain with - Bruise from heel to arch on LT ankle requiring steroid injections and ankle brace for ankle sprain.				x			x					
2012.05.30.11. D0625A98F4FA		Administrator	5/30/2012	Office trailer; 5000 Overlook Ave., Washington DC	Right foot sprain; on the later aspect of her right mid foot when running downstairs to get supplies requiring RX for Ibuprofen				x			x					
2012.06.01.12. 59938FDF5221		Traffic Incident Mgm	6/1/2012	Broward Turnpike, I-595, Miami FL	RT shoulder impingment and full thickness tear and required surgery resulting from motor vehicle accident		x			52	47	x					
2012.06.18.10. 028F55F07E33		Air Quality Tech	6/1/2012	Freeport McMoran, Claypool, AZ	Chondromacia of left knee from stairs when carrying equipment and received PT and RX for inflammation			x			26	x					
2012.06.14.10. 56B5B38D8631		CAD Operator	6/12/2012	Honolulu AECOM office	Neck sprain, sprain of unspecified site of wrist, thoracic sprain from repetitive motion requiring RX and wrist brace		x			14		x					
2012.07.19.06. DD4CF20600C D		Associate	7/9/2012	AECOM-Flower Street Office	LT Shoulder and elbow tendonitis due to long work hours, employee recieved Rx strength Voltaren Topical 1 %				x			x					
2012.07.13.09. CE43AB3390D 0		Project Manager	7/12/2012	4500 Wilma Lane, Arlington, TX	Employee boosting themselves, loosing balance body weight straining elbow causing medial epicondylitis LT elbow. Physical therapy required.				x			x					
2012.07.26.19. 4FA0A2DBBC2 E		Wildlife Technician	7/15/2012	Constitution pipeline field area,Richmondville, NY	Bee stings to right ankle and left thigh requiring RX for swelling				x			x					
2012.07.18.10. C2137DFF29D 9		Cost Engineer	7/18/2012	7301 World Way West, Los Angeles, CA 90045	Twisted right ankle and back contusion when slipped out of her shoe went getting up at workstation requiring RX				x			x					
2012.08.31.06. EECEB5D773C 3		Inspector II, Constr	8/5/2012	Lab Office Famingdale NY	Lower back pain from moving cylinders weighing approx 30lbs each requiring RX for pain and physical therapy				x			x					
2012.08.07.05. F43302198E1E		Inspector IV, Constr	8/6/2012	Cocke County field area, Del Rio, TN	Heel got caught on the edge of the basket and he fell backward onto his RT shoulder resulting in surgery, RX and work restrictions.		x			30	5	x					
2012.10.04.05. 41E9A198C2C A		Toxicologist	8/12/2012	Muskogee Pure Oil field Muskogee, OK	tick bite to lateral chest after field work requiring RX for lymes disease prevention				x								x
2012.08.13.11. F0E98815A4D8		Manager, Constructio	8/13/2012	I75/SR78 Ft Myers Florida	Out in field stepped in hole causing sprain to RT ankle requiring RX				x			x					
2012.08.30.10. 5EFDD3EF0A 6		Mechanical Engineer	8/17/2012	GUS - Richland, WA - 825 Goethals Drive	Moving server rack and hurt RT shoulder when pulling dr ordered therapeutic exercises, and may have recommended a cortosone shot.				x			x					

Identify the person				Describe the case		Classify the case													
(A) Case No.	(B) Employees Name	(C) Job Title	(D) Date of injury or onset of illness  (mo./day)	(E) Where the event occurred (e.g. Loading dock north end)	(F) Describe injury or illness, parts of body affected, and object/substance that directly injured or made person ill (e.g. Second degree burns on right forearm from acetylene torch)	CHECK ONLY ONE box for each case based on the most serious outcome for that case:				Enter the number of days the injured or ill worker was:		Check the "injury" column or choose one type of illness:							
						Death		Days away from work		Remained at work		Days Away From Work (down) (K)	On job transfer or restriction (days) (L)	(M) Injury (1)	Skin Disorder (2)	Respiratory Condition (3)	Poisoning (4)	Hearing Loss (5)	All other illnesses (6)
								Job transfer or restriction (I)	Other recordable (J)										
						(G)	(H)	(I)	(J)			(K)	(L)	(1)	(2)	(3)	(4)	(5)	(6)
2012.08.24.04.0DA7998C9E33		Design CADD Operator	8/20/2012	AECOM - Convoy	Back pain from lifting a water bottle onto the water cooler resulting in chiropractic treatment				x					x					
2012.08.27.08.F36002AB27E6		Technician II, Engin	8/27/2012	16595 BROWNVILLE RD. Northport AL	Little finger LT hand cut with saw blade requiring 6 stitches				x					x					
2012.09.04.14.E6FE72B6660D		Engineer III	8/29/2012	430 East River Avenue, Barron, WI 54812	EE with reaction to insect bite to RT arm and subsequent infection requiring RX for inflammation and infection.				x										x
2012.08.30.19.98B6F5D63161		Fisheries Biologist	8/30/2012	Tule River California	Stumbled and fell on a boulder and a small sharp stick punctured LT thumb upon impact requiring stitches				x					x					
2012.09.28.13.33DCC626C88D		Engineer II	9/10/2012	OMF Building, Cleveland Street, St. Paul, MN	Twisted RT knee, slipped going around a parked truck, RX for anti-inflammatory			x				24		x					
2012.09.17.15.88D172E895A8		Technician	9/13/2012	US Health Works, Folsom Blvd, Sacramento CA	Temporary Loss of Consciousness during blood draw for annual required physical				x					x					
2012.10.15.09.9D40DE6FAB09		Scientist I, Geology	10/15/2012	Augusta, MI; Staging Area E-2, 5140 River Road	Inguinal strain, LT groin, lifting/pulling cinder block from from mud in river			x				5		x					
2012.10.23.14.C82CCD0E559D		Scientist III	10/22/2012	Constitution Pipeline area, Oneonta, NY	EE's RT eye contacted by twig when bending causing subconjunctival hemorrhage resulting in RX antibiotics.				x					x					
2012.10.29.19.5B9A56B59096		Const Inspector	10/25/2012	4th Ave job site, Tucson, AZ	Sprained left elbow, shoulder discomfort requiring therapy exercise				x					x					
2012.10.29.14.77215D2D470F		Senior ITS Engineer	10/26/2012	I-495 Wilmington, DE	Broken bone in right foot when stepped on a rock and twisted ankle in field.		x					2	40	x					
2012.11.01.12.2D277A0206CB		Technician III, Engi	11/1/2012	Sheboygan Falls site South Cleveland St, WI	Exiting vehicle on passenger side and caught left foot on seat and fell landing on RT foot and wrenching his LT shoulder resulting in lost time, PT and RX.		x					52	15	x					
2012.11.08.06.7FDD3B587A0B		Chemical Engineer	11/7/2012	HWY-101 and I-110 , Los Angeles	Wrist Sprain, bruises, soreness, fractured rib as a result of a Motor Vehicle Accident/air bag deployment. Bone fracture, pain Rx and restricted work days, PT.		x					2		x					
2012.11.15.07.6EE4141203FC		Project Manager	11/13/2012	JFK Airport Terminal NY	Debris in eye resulting in a scratch to eye; treated with Rx eye drops.				x					x					
2012.12.12.11.7555E05ABAB8		Wildlife Biologist	12/10/2012	Field Area San Bernadino CA	tick to the middle back area w/ target rash resulting in doxycycline rx				x					x					



Identify the person				Describe the case		Classify the case													
(A) Case No.	(B) Employee's Name	(C) Job Title	(D) Date of injury or onset of illness (mo./day)	(E) Where the event occurred (e.g. Loading dock north end)	(F) Describe injury or illness, parts of body affected, and object/substance that directly injured or made person ill (e.g. Second degree burns on right forearm from acetylene torch)	CHECK ONLY ONE box for each case based on the most serious outcome for that case:				Enter the number of days the injured or ill worker was:		Check the "injury" column or choose one type of illness:							
						Death		Days away from work		Remained at work		Days Away From Work (days) (K)	On job transfer or restriction (days) (L)	(M) Injury (1)	Skin Disorder (2)	Respiratory Condition (3)	Poisoning (4)	Hearing Loss (5)	All other illnesses (6)
								Job transfer or restriction (I)	Other recordable (J)										
						(G)	(H)	(I)	(J)	(K)	(L)								
2012.12.18.13.7CCC1DAF2B3B		Wildlife Biologist	12/10/2012	Field Areal San Bernadino CA	Rash Associated with Poison Oak Exposure, Rx				x										x
2012.12.17.05.84ACC4252FF3		Resident Eng I	12/15/2012	Ala Wai Blvd at Niu St Honolulu HI	rear ended while stopped in traffic by another vehicle resulting in lumbar sprain, neck sprain, pain thoracic spine resulting in RX and PT				x			x							
2012.12.26.09.2CE24C3C7894		SVP Market Segment	12/18/2012	Denver CO airport taxi	struck head on taxi door latch resulting in stitches				x			x							
2012.12.18.11.0592C439DDB2		Project Billing Spec	12/18/2012	I-5 No, Mission Viejo, CA	complaints of discomfort to mid-upper back and neck resulting in RX and therapy				x			x							
						0	10	7	37	399	262	47	0	0	0	0	0	7	

1

Injury

Skin Disorder

Respiratory Condition

Poisoning

Hearing Loss

All other illnesses

Page

1 of 1

(1)

(2)

(3)

(4)

(5)

(6)

## **Attachment B**

### **AECOM Safety and Health Policy Statement**

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# Safety, Health and Environment Policy Statement

## PURPOSE

The purpose of this policy is to:

- Establish and maintain a framework for a safe and healthy workplace for all AECOM employees and minimize our impact on the environment.
- Outline expectations relative to compliance with governing occupational safety, health and environmental legislation.

## COMMITMENT

AECOM is committed to protecting the safety and health of our employees and meeting our obligations with respect to the protection of others affected by our activities. We are also committed to protecting and preserving the natural environment in which we operate. We will actively seek to conserve energy, water and natural resources and to recycle and reduce waste where appropriate during the execution of our business activities. We will be good corporate citizens by striving to ensure that our facilities and operations do not pose unreasonable safety or environmental risks, and by participating in community-related activities that promote excellence in safety, health and environmental practices. In all of our activities, we will develop and implement appropriate systems and procedures designed to comply with applicable laws, legislation, licensing requirements and stakeholder expectations. AECOM will plan and design its processes, facilities and projects in a manner that reduces risks and impacts during their entire life cycle, consistent with the direction and objectives of our clients.

## OBJECTIVES

Our ultimate goals are simple and are derived from AECOM's Core Values:

- Prevent work-related injuries or illnesses.
- Prevent damage to property and/or equipment from our activities.
- Prevent adverse impacts to the environment from our ongoing projects or operations.

## IMPLEMENTATION

In order to guide the implementation efforts required by this policy, the Geography and Business Line Chief Executives and their respective safety teams, will collaborate to establish Safety, Health and Environment (SH&E) programs that:

- Embrace the AECOM SH&E Life Preserving Principles and this policy statement.
- Comply with all applicable safety, health and environmental rules and regulations at the local, state, provincial and national levels.
- Meet client requirements.
- Where no specific regulation exists, comply with AECOM standards and appropriate industry practices.
- Report on performance relative to short- and long-term SH&E metrics designed to help achieve established goals.
- Consult with, listen to, and respond to employees, customers and partners in order to continuously improve their SH&E performance. The establishment of formal SH&E committees, with documented charters, is recognized as an effective tool for this purpose.
- Recognize those who contribute to their improved SH&E Performance.

## AECOM EMPLOYEE RESPONSIBILITIES

All employees will be responsible for:

- Conducting themselves in accordance with directives, standards and procedures established by the applicable SH&E program.
- Temporarily suspending their personal work activities and requesting guidance from their supervisor before continuing a task when they identify a condition or practice that creates a serious safety, health or environmental risk.
- Immediately reporting safety, health and/or environmental incidents to their supervisor.

## POLICY REVIEW

This policy will be formally reviewed annually. However, if substantial changes occur in legislation, organization and/or other business drivers, changes may be made on an interim basis.

## COMMUNICATION

This policy is to be displayed prominently in all permanent and temporary offices of AECOM where employee information is normally communicated. An electronic version will also be posted on the AECOM intranet.

A copy of this policy will be provided to entities working for, or on behalf of, AECOM and will also be made available to other stakeholders upon request.

Signature: \_\_\_\_\_



John M. Dionisio  
Chairman and CEO

Date: \_\_\_\_\_

10-1-2013

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## **Attachment C**

### **AECOM SH&E Standard Operating Procedures Table of Contents**

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## TABLE OF CONTENTS

No.	TITLE	REVISION DATE
<b>000 SERIES – SH&amp;E ESSENTIALS</b>		
000	SH&E Manual	January 2013
001	Safe Work Standards and Rules	June 2012
002	Stop Work Authority for Unsafe Work	December 2010
003	SH&E Training	October 2011
004	Incident Reporting	November 2012
005	Driver and Vehicle Safety Program	August 2012
006	Safety Moments	March 2013
<b>100 SERIES – OFFICE</b>		
101	Emergency Response Planning	March 2011
102	Ergonomics	December 2010
103	Housekeeping	December 2010
104	Manual Lifting	December 2010
105	Office Safety Programs	January 2013
106	Fire Protection	December 2010
107	Violence in the Workplace	December 2010
108	California Injury and Illness Prevention Program	March 2011
<b>200 SERIES – PROJECT MANAGEMENT</b>		
201	Client Site Requirements	December 2012
202	Competent Person Designation	October 2011
203	Emergency Response Planning, Field	March 2011
204	Environmental Compliance	October 2011
205	Equipment Inspections & Maintenance	December 2010
206	Fire Protection, Field	December 2010
207	Medical Services and First Aid	March 2013
208	Personal Protective Equipment Program	December 2010
209	Project Hazard Assessment and Planning	October 2011
210	Project Safety Meetings	October 2011
211	Regulatory Inspections	February 2013
212	Site Inspections	October 2011
213	Subcontractors	October 2010
214	Site Safety Officer	October 2011



<b>No.</b>	<b>TITLE</b>	<b>REVISION DATE</b>
<b>300 SERIES – FIELD (COMMON)</b>		
301	Confined Spaces	December 2010
302	Electrical, General	December 2010
303	Excavation and Trenching	March 2011
304	Fall Protection	March 2011
305	Hand and Power Tools	March 2011
306	Highway and Road Work	December 2010
307	Housekeeping, Worksite	December 2010
308	Manual Lifting, Field	December 2010
309	Mobile or Heavy Equipment	March 2011
310	Rigging, Hoisting, Cranes and Lifting Devices	December 2010
311	Scaffolding	March 2011
312	Stairways and Ladders	March 2011
313	Wildlife, Plants and Insects	March 2011
314	Working Alone & Remote Travel	March 2011
315	Water, Working Around	March 2011
<b>400 SERIES – FIELD (UNCOMMON)</b>		
401	Aircraft Charters	October 2011
402	All Terrain Vehicles (ATVs)	March 2011
403	Avalanches	March 2011
404	Commercial Motor Vehicles	March 2011
405	Drilling and Boring	March 2011
406	Electrical Lines, Overhead	March 2011
407	Electrofishing	March 2011
408	Elevated Work Platforms and Aerial Lifts	March 2011
409	Forklifts (operation of)	March 2011
410	Hazardous Energy Control	March 2011
411	Machine Guarding	March 2011
412	Powder-Actuated Tools	March 2011
413	Process Safety Management	October 2010
414	Railway Sites	June 2012
415	RCRA Regulated Facilities	October 2011
416	Tunnel and Underground Work	March 2011
417	Utilities, Underground	March 2011

<b>No.</b>	<b>TITLE</b>	<b>REVISION DATE</b>
418	Welding, Cutting and Other Hot Work	March 2011
419	Water, Marine Operations, Boating	March 2011
420	Water, Underwater Diving	October 2011
<b>500 SERIES – INDUSTRIAL HYGIENE (CHEMICAL, BIOLOGICAL, RADIOLOGICAL)</b>		
501	Asbestos	March 2011
502	Benzene	March 2011
503	Bloodborne Pathogen Program	March 2013
504	Cadmium	March 2011
505	Cold Stress Prevention	October 2011
506	Compressed Gases	March 2011
507	Hazardous Materials Communication / WHMIS	October 2011
508	Hazardous Materials Handling, Shipping, and Manifesting	June 2012
509	Hazardous Waste Operations and Emergency Response	December 2010
510	Hearing Conservation Program	December 2010
511	Heat Stress Prevention	March 2011
512	Laboratory Safety	March 2011
513	Lead	March 2011
514	Munitions and Explosives of Concern/Unexploded Ordnance	March 2011
515	Nanotechnology	March 2011
516	Radiation Safety Programs	March 2011
517	Radiation, Non-ionizing	March 2011
518	Radiation, Gauge Source Program	March 2011
519	Respiratory Protection Program	December 2010
520	Spill Response, Incidental	December 2010
521	Decontamination	October 2011
522	Hydrogen Sulfide	October 2011
<b>600 SERIES – INCIDENT &amp; MEDICAL MANAGEMENT</b>		
601	Recordkeeping	October 2011
602	Exposure Monitoring	October 2011
603	Incident Investigation and Review	March 2013
604	Medical Records	October 2011
605	Medical Surveillance Program	November 2012
606	Modified Duty Program	October 2011
607	Post Incident Medical Management	October 2011

<b>No.</b>	<b>TITLE</b>	<b>REVISION DATE</b>
<b>700 SERIES – SH&amp;E PROGRAM MANAGEMENT</b>		
701	Rules and Regulatory Review	October 2010
702	SH&E Organizational Reporting Structure & Supporting Roles	October 2011
703	SH&E Manual and Procedures Review	October 2010
704	SH&E Program Auditing	March 2011
705	SH&E Program Monitoring and Reporting	October 2010

## **Attachment D**

### **Hazard Communication Program**

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## S3NA-507-PR Hazardous Materials Communication / WHMIS

### 1.0 Purpose and Scope

- 1.1 Provides a Hazard Communication Program so that AECOM employees are informed of the hazards of the chemicals to which they may be exposed in the course of their work by way of container labeling and other forms of warning, material safety data sheets (MSDS), and employee training.
- 1.2 This procedure applies to all AECOM North America based employees and operations.
- 1.3 The program applies to the use of any hazardous substances which are known to be present in the workplace in such a manner that employees may be exposed under normal conditions of use or in a foreseeable emergency.

### 2.0 Terms and Definitions

Additional definitions can be found in the Hazardous Material Regulations (HMR), the Transportation of Dangerous Goods (TDG) Regulations, and the International Air Transport Association (IATA) Dangerous Goods Regulation (DGR).

- 2.1 **Acute Effect:** An adverse effect on the human body with immediate onset of symptoms.
- 2.2 **Article:** A manufactured item: (1) which is formed to a specific shape or design during manufacture; (2) which has end use function(s) dependent in whole or in part upon its shape or design during end use; and, (3) which does not release or otherwise result in exposure to, a hazardous chemical, under normal conditions of use.
- 2.3 **Carcinogen:** Those chemicals appearing in any of the following reference sources are established as carcinogens for hazard communication purposes:
  - National Toxicology Program (NTP) Annual Report on Carcinogens.
  - International Agency for Research on Cancer (IARC) Monographs, Volumes 1-34. Note: The Registry of Toxic Effects of Chemical Substances published by NIOSH indicates whether a substance has been found by NTP or IARC to be a potential carcinogen.
- 2.4 **Chemical Name:** The scientific designation of a substance in accordance with the nomenclature system developed by the International Union of Pure and Applied Chemistry or the system developed by the Chemical Abstracts Service.
- 2.5 **Chronic Effect:** An adverse effect on the human body with symptoms which develop slowly over a long period of time or which frequently recur.
- 2.6 **Combustible Liquid:** Any liquid having a flash point at or above 100°F (37.8°C) but below 200°F (93.3°C), except any mixture having components with flash points of 200°F (93.3°C), or higher, the total volume of which makes up 99% or more of the total volume of the mixture.
- 2.7 **Common Name:** Any designation or identification such as code name, code number, trade name or brand name used to identify a substance other than by its chemical name.
- 2.8 **Container:** Any bag, barrel, bottle, box, can, cylinder, drum, reaction vessel, storage tank or the like that contains a hazardous chemical. For purposes of this Safety Operating Procedure (SOP) and Occupational Safety and Health Administration (OSHA) standard, pipes or piping systems, and engines, fuel tanks, or other operating systems in a vehicle are not considered to be containers.
- 2.9 **Establishment:** Any separate and distinct AECOM office, laboratory or other company facility.
- 2.10 **Exposure:** Any situation arising from work operations where an employee may ingest, inhale, absorb through the skin or eyes or otherwise come into contact with a hazardous substance.

- 2.11 **Flammable:** A substance that falls into one of the following categories:
- **Flammable Aerosol:** An aerosol that when tested by the method described in 16 CFR 1500.45, yields a flame projection exceeding 18 inches at full valve opening or flashback (a flame extending back to the valve) at any degree of valve opening;
  - **Flammable Gas:** A gas that at ambient temperature and pressure:
    - Forms a flammable mixture with air at a concentration of 13% of volume or less; or
    - Forms a range of flammable mixtures with air wider than 12% by volume, regardless of the lower limit.
  - **Flammable Liquid:** Any liquid having a flash point below 100°F (37.8°C), except any mixture having components with flash points of 100°F (37.8°C) or higher, the total of which make up 99% or more of the total volume of the mixture.
  - **Flammable Solid:** A solid, other than a blasting agent or explosive as defined in 8 CCR 5237(a), that is liable to cause fire through friction, absorption of moisture, spontaneous chemical change or retained heat from manufacturing or processing or which can be ignited readily and when ignited burns so vigorously and persistently as to create a serious hazard.
    - A chemical shall be considered to be a flammable solid if, when tested by the method described in 16 CFR 1500.44, it ignites and burns with a self-sustained flame at a rate greater than one-tenth of an inch per second along its major axis.
- 2.12 **Flash Point:** Minimum temperature of a liquid at which it gives off sufficient vapors to form an ignitable mixture with the air near the surface of the liquid or within the container used.
- 2.13 **Hazardous Chemical:** Those chemicals appearing in any of the following reference sources are established as hazardous chemicals for hazard communication purposes.
- 29 CFR Part 1910, Subpart Z, Toxic and Hazardous Substances, OSHA.
  - Hazardous Products Act, R.C.S. 1985, c. H-3, section 2, Canada
  - For operations within the state of California, the list of hazardous substances prepared by the California Director of Industrial Relations pursuant to Labor Code Section 6382. The concentrations and footnotes, which are applicable to the list, shall be understood to modify the same substance on all other source lists or hazard determinations set forth in § 8 CCR 5194(d)(3)(B) and (d)(5)(D).
- 2.14 **Hazardous Substance:** A hazardous chemical or carcinogen, or a product or mixture containing a hazardous chemical or carcinogen provided that:
- The hazardous chemical is 1% or more of the mixture or product or 2% if the hazardous chemical exists as an impurity in the mixture; or
  - The carcinogen is 0.1% or more of the mixture or product.
  - Manufacturers, importers and distributors will be relied upon to perform the appropriate hazard determination for the substances they produce or sell.
- 2.15 The following materials are not covered by the Hazard Communication Standard:
- Any hazardous waste as defined by the Solid Waste Disposal Act, as amended by the Resource Conservation and Recovery Act of 1976, as amended (42 USC 6901 et seq.) when subject to regulations issued under that act by the Environmental Protection Agency.
  - Tobacco or tobacco products
  - Wood or wood products. Note: Wood dust is not exempt since the hazards of wood dust are not "self-evident" as are the hazards of wood or wood products
  - Consumer products (including pens, pencils, adhesive tape) used in the work place under typical consumer usage
  - Articles (i.e. plastic chairs)
  - Foods, drugs, or cosmetics intended for personal consumption by employees while in the work place

Foods, drugs, cosmetics in retail store packaged for retail sale

- Any drug in solid form used for direct administration to the patient (i.e., tablets or pills)

2.16 **Hazardous Substance Inventory (HSI) / WHMIS Log:** A listing of all chemicals stored or used at an office or project site. Note that the list may be imbedded in a project Health and Safety Plan.

2.17 **Immediate Use:** Means that the hazardous chemical will be under the control of and used only by the person who transfers it from a labeled container and only within the work shift in which it is transferred.

2.18 **MSDS:** A Material Safety Data Sheet prepared pursuant to state and federal regulations, OSHA Form 174 and Canada regulations (Controlled Products regulations, schedule 1).

2.19 **MSDS Administrator:** The individual or group designated by the Office Manager to maintain the establishment-specific inventory list or log and the MSDS binder required if that establishment uses or stores hazardous substances.

2.20 **NFPA:** A system of categories, colors and numbers was created to provide basic hazard information. It enables firefighters and other emergency personnel to easily decide whether or not to evacuate an area or proceed with emergency control operations. The three principal categories of identification are Health, Flammability and Instability. A numerical range of "0 to 4" indicates the severity of the hazard. A "4" indicates the most severe and a "0" indicates a minimal hazard.

2.21 **Mixture:** Any solution or intimate admixture of two or more substances which do not react chemically with each other.

2.22 **Reactivity:** A measure of the tendency of a substance to undergo chemical reaction with the release of energy.

2.23 **Solubility:** The ability of substance to blend and mix uniformly with another.

2.24 **Specific Gravity (density):** Ratio of the weight of a substance to the weight of the same volume of another substance. As used in this directive, specific gravity or density refers to the weight of substance as compared to the weight of an equal volume of water.

2.25 **Vapor Density:** The weight of a vapor-air mixture resulting from the vaporization of a volatile liquid at equilibrium temperature and pressure conditions, as compared with the weight of an equal volume of air under the same conditions.

2.26 **WHMIS:** The Workplace Hazardous Materials Information System (WHMIS) is Canada's national hazard communication standard. The key elements of the system are cautionary labeling of containers of WHMIS "controlled products", the provision of material safety data sheets (MSDSs) and worker education and training programs.

### 3.0 Attachments

3.1 None

### 4.0 Procedure

#### 4.1 Roles and Responsibilities

##### 4.1.1 Region SH&E Managers will:

- Audit their regional offices to assure that they maintain an establishment-specific Hazardous Substance Inventory (HSI).
- Audit their regional offices to assure that if an establishment-specific HSI is required, that MSDSs are available for each substance listed on the HSI.
- Provide interpretation of MSDSs and hazard information for WHMIS labels/NFPA labels and other information to assist in training employees.
- Provide hazard communication training to AECOM employees and file documents of this training in the Corporate SH&E office.



Review MSDS for adequacy of completion to meet the OSHA and Canadian standard and returning them to supplier, if necessary.

4.1.2 **Office Managers** will:

- Have an operations-specific, written hazard communication program which at least describes how the requirements of this Procedure and the US OSHA and Canadian Hazard Communication requirements for labels and other forms of warning, material safety data sheets, and employee information and training will be met.
- Appoint an MSDS administrator for their establishment if they store or use hazardous substances.
- Confirm, if required, that the MSDS Administrator maintains an HSI for their establishment.
- Confirm that MSDS are available for all substances listed on their establishment's HSI.
- Confirm that a copy of this Procedure and the site-specific MSDS are available to all employees. Employees shall be instructed in the location of this Procedure and the MSDS.
- Confirm that all employees in their office affected by the HAZCOM standard are provided with the appropriate training, including new employees.

4.1.3 **Project Managers (field task managers, supervisors)** will:

- Confirm that all employees under their supervision have received the initial and periodic training required by this SOP prior to assigning employees to tasks involve the use of, or potential exposure to, hazardous substances.
- Notify employees of hazardous substances covered by this SOP that are used in their work area.
- Determine the potential fire, toxic, or reactivity hazards which are likely to be encountered in the handling or utilization of a hazardous substance and will communicate this information to their affected employees, before any are permitted to work with it.
- Confirm that an MSDS is available for each hazardous substance used, or potentially encountered, in the work areas or on the projects that are under their supervision.
- Notify subcontractors (working for AECOM) of any hazardous substances that are used or stored by AECOM to which the subcontractor's employees may be exposed.
- Notify clients or property owner/operators of chemicals brought onto their property by AECOM or AECOM's subcontractors.
- Request MSDSs from all subcontractor organization for the relevant chemicals they bring onto an AECOM controlled site.

4.1.4 **Employees** will:

- Confirm that they have received appropriate hazard communication training prior to working with materials that fall under the standard.
- Only work with materials for which they have been instructed on how to find an MSDS and how to work with that material safely.
- Provide a copy of all MSDSs received to the MSDS Administrator at their facility.
- Verify that an MSDS is available in their work area for each hazardous substance that they use.
- Confirm that containers of hazardous substances that they use are properly labelled.

4.2 All employees have a right to, and should, know the properties and potential hazards of substances to which they may be exposed.

4.3 Should AECOM assign employees that do not read and speak English to tasks with chemical exposures, communications will be provided in the language understood by that employee.

#### 4.4 Hazardous Waste Exemption

4.4.1 In the U.S., hazardous wastes are excluded from the state and federal Hazard Communication standards. However, AECOM employees who handle or are otherwise exposed to hazardous wastes are covered by the requirements of the OSHA Hazardous Waste Operations and Emergency Response (HAZWOPER) standard at 29 CFR 1910.120 – Hazardous Waste Operations And Emergency Response. This standard requires that:

- Employees receive 40-hour initial and 8-hour annual SH&E training; and that
- Information on the hazards of hazardous wastes be documented in a site-specific Health and Safety Plan (HASP) and communicated to all employees in site-specific briefing on-site training required by the standard.

4.4.2 Therefore, AECOM HAZWOPER projects are not required to comply with the requirements of this SOP as they relate to the hazardous wastes that are present at those project sites.

4.4.3 AECOM's Health And Safety Plan (HASP) requirements are specified in *S3NA-509-PR Hazardous Waste Operations and Emergency Response*.

#### 4.5 Hazardous Substance Inventory

4.5.1 Establishment-Specific Hazardous Substance Inventory or WHMIS Log

- If an AECOM establishment uses or stores additional hazardous substances, an establishment-specific HSI must be maintained at that establishment.
- If it is determined that an office-specific HSI is needed, the AECOM **Office Manager** shall assure that one is developed and maintained by someone appointed as the establishment's MSDS Administrator.
- The content of the office-specific written inventory shall be updated as new hazardous substances are procured for, or removed from, the establishment and shall be verified by the **Region SH&E Manager** through regular inspections of the establishment.
- In order to meet the 30-years-after-employment-termination record retention requirement, the office-specific HSIs shall be treated as a permanent record.

#### 4.6 Material Safety Data Sheets

4.6.1 Establishment-Specific MSDS Inventory

- If it is determined that an AECOM establishment is required to maintain an establishment-specific inventory ,MSDSs for the specific hazardous substances must be maintained on file at that establishment.
- The **Region SH&E Manager** shall audit the local office program for MSDS request and maintenance and report deficiencies to the appropriate management level, as necessary, to assure compliance with this SOP.

4.6.2 Field Project Sites and Client Facilities

- The **Project Manager** and/or the **Site Safety Officer** shall access or obtain, and maintain copies of MSDS from:
  - All AECOM subcontractors bringing chemicals onto the project site; and
  - The client, for all of the client's chemicals to which AECOM or AECOM subcontract employees are potentially exposed.

4.6.3 Employee Access to MSDSs

- MSDSs should be maintained at the local establishment that uses that hazardous substance. Copies of the MSDS should be made available to the employee upon request to the office's MSDS Administrator.

**4.6.4 Field Access to MSDSs**

- When hazardous substances are brought into the field, the user must assure that a copy of the MSDS for that substance accompanies it and is available at the field location where it is to be used.

**4.6.5 MSDSs for AECOM Products**

- It is unlikely that AECOM activities would create a chemical for which a new MSDS were needed. If such a chemical were created, the Corporate SH&E Department shall work with the appropriate operations groups to draft, review, and publish the new MSDS.

**4.6.6 Content of the Material Safety Data Sheet**

- As a minimum, the MSDS must contain the following information:
  - The name, address, and telephone number of the source of the product or material, preferably those of the manufacturer
  - The trade name and synonyms of the product or material
  - Chemical names of hazardous ingredients, including, but not limited to, those in mixtures
  - An indication of the percentage, by weight or volume, which each ingredient of a mixture bears to the whole mixture
  - Physical data pertaining to the product or material, including boiling point (in °F); vapor pressure (in mm of mercury); vapour density of gas or vapour (air = 1); solubility in water (in percent by weight); specific gravity of material (water = 1); percentage volatile by volume (at 70 °F); evaporation rate for liquids (either butyl acetate or ether may be taken as 1); and appearance and odour
  - Fire and explosion hazard data pertaining to the product or material, including flash point (in °F); flammable limits (in percent by volume in air); suitable extinguishing media or agents; special fire fighting procedures; and unusual fire and explosion hazard information
  - Health hazard data pertaining to the product or material, including exposure limits, effects of overexposure and medical conditions aggravated by exposure, and emergency and first-aid procedures
  - Reactivity data, including stability, incompatibility, hazardous decomposition products, and hazardous polymerization
  - Procedures to be followed and precautions to be taken in cleaning up and disposing of materials leaked or spilled
  - Special protection information, including use of personal protective equipment, such as respirators, eye protection, and protective clothing, and ventilation or other control measures
  - Special precautionary information about handling and strong
  - Any other general precautionary information
- MSDSs that do not contain this information shall be returned to the distributor or manufacturer to be updated.

**4.6.7 Trade Secrets**

- Some hazardous substance suppliers may claim the information requested on MSDSs is proprietary and not provide the information to AECOM.
- When MSDSs supplied to the AECOM Regional SH&E Manager indicate that proprietary information has been withheld, the Regional SH&E Manager will either obtain the necessary information to make a hazard assessment or reject the material for use within AECOM.

**4.7 Labeling****4.7.1 Containers of hazardous substances used or stored in each AECOM establishment must be labeled, tagged or marked with the following information:**

- Identification of the hazardous substance(s)

Appropriate hazard warnings

- Name and address of the manufacturer, importer or other responsible parties
- Safe Handling Instructions
- Statement that an MSDS is available for the product

4.7.2 Labels on containers shall not be removed or defaced. Labels or other forms of warning shall be legible, in English and French (Canada), and prominently displayed on the container.

4.7.3 Any failure to have the appropriate labeling information on a container at any time will be cause to suspend use of the product until the container is properly labeled.

4.7.4 Carcinogen Labeling

- Chemicals which have been indicated as positive or suspect carcinogens by either OSHA, ACGIH, the International Agency for Research on Cancer (IARC) (World Health Organization), or the National Toxicology Program (NTP) will be considered to be carcinogenic for purpose of the HCS. Those chemicals identified as being "known to be carcinogenic" by NTP must have carcinogen warnings on the label and information on the MSDSs.

4.7.5 Stationary Process Containers

- If there is stationary process equipment within a work area, signs, placards, process sheets, batch tickets, operating procedures, or other such written materials may be used in lieu of fixed labels on the containers, as long as the alternative method conveys the appropriate hazard information. The written materials shall be readily accessible to the employees in the work area.

4.7.6 Portable Containers

- Portable containers of hazardous substances need not be labelled when the substance is transferred from labelled containers and is intended for immediate use of the employee who performs the transfer.
- Containers of hazardous substances transferred from labelled containers and not intended for the immediate use of the employee performing the transfer shall be labelled with the chemical name and a hazard warning label in accordance with the National Fire Protection Association's (NFPA) 704M Hazard Identification System shall be attached.

#### 4.8 Chemical Storage

4.8.1 Hazardous chemicals are to be stored in their original, labeled containers with the lids securely closed and taped if possible. Flammable and combustible materials must be stored in fire impervious cabinets in designated stockroom areas. Chemicals must be stored in compliance with instructions provided on their labels, MSDS, or the manufacturer's specifications.

4.8.2 All hazardous chemicals must be stored in a manner that prevents spillage and leakage from exposing people or the environment to the chemical.

4.8.3 Hazardous chemicals shall not be stored with foods or beverages. Food and beverages shall not be consumed in areas where hazardous chemicals are used or stored.

#### 4.9 Chemical Use in Offices

4.9.1 In general, hazardous substances should not be taken into office areas, conference rooms, or break areas. If this general requirement is infeasible, contact the SH&E Department for guidance.

4.9.2 General exceptions to this rule are the following:

- Liquid paper
- Toner
- Cleaners
- Isobutylene calibration gas
- pH calibration solutions for instruments

**4.10 Employee Information and Training**

4.10.1 Each AECOM **employee** who handles or is exposed to hazardous substances must be provided information and training on hazardous substances in their work area.

- At the time of their initial assignment
- Whenever a new hazard is introduced into their work area

4.10.2 As a minimum, the training requirements apply to AECOM personnel in the following job categories:

- All personnel who perform field work that involves the use of, or potential exposure to, hazardous substances
- Laboratory Employees

**4.11 Initial Training Content**

4.11.1 The Initial Training will provide instruction in the following:

- Methods and observations that may be used to detect the presence or release of a hazardous substance in the work area (such as personal monitoring, visual appearance or odor of hazardous substances being released, etc.);
- The physical and health hazards of substances in the work area and measures and procedures AECOM has implemented to protect employees; and
- The details of this hazard communication program (SOP), including an explanation of the labeling system and the MSDS, and how he/she can obtain and use appropriate hazard information.

4.11.2 The Initial Training will also inform the employee of the following:

- Any operations in their work area in which hazardous substances are present
- Location and availability of this written hazard communications program (SOP)
- Their right to personally receive information regarding hazardous substances to which they may be exposed
- Their right to have their physician receive information regarding hazardous substances to which they may be exposed
- Their right against discharge or other discrimination (in California) due to the employee's exercise of rights afforded pursuant to provisions of the California Hazardous Substances Information and Training Act

**4.12 Periodic Training and Training for Non-Routine Tasks**

4.12.1 Additional training will be provided to employees who have received initial training whenever:

- A new hazardous substance is introduced into their work area
- A new or revised MSDS is received, which indicates significantly increased risks to employee health as compared to those stated on the previous MSDS
- Non-routine tasks are performed, which will potentially result in exposure to hazardous substances, or exposure under circumstances, which were not addressed during initial training

4.12.2 Supervisors, in coordination with their **Region SH&E Manager**, shall provide such training through an explanation of the information on the contents of the MSDS for that substance.

4.12.3 When training their employees, supervisors shall explain:

- Any health hazards associated with use of the substance or mixture
- Proper precautions for handling
- Necessary personal protective equipment or other safety precautions to prevent or minimize exposure

Emergency procedures for spills, fire, disposal, and first aid

- 4.12.4 For most projects involving field work, this periodic training requirement will be facilitated through the implementation of the site specific HASP that has been developed for the project.

4.13 **Documentation of Initial and Periodic Training**

- 4.13.1 All training required by this SOP shall be documented at the time it is performed by having the employee sign a copy of a training attendance sheet.

4.14 **Chemical Usage**

- 4.14.1 Prior to using any chemical, a Task Hazard Analysis (THA) shall be completed by the employees assigned to use the chemical. The analysis will identify the hazards associated with the tasks to be performed and prescribe the Personal Protective Equipment (PPE) to be used.

4.15 **Office Specific Written Program**

- 4.15.1 Each office or location using or storing hazardous materials will develop a written office/ location-specific Hazard Communication/WHMIS Program. If the local office decides to implement the requirements of the standard in any way that differs from this procedure, they shall verify the changes with the SH&E department, document the changes, and communicate the differences to all affected employees.

- 4.15.2 For Canadian operations, all relevant MSDS must be current (no more than 3 years old) and readily available (in French and English) for all hazardous materials.

4.16 **Canada-specific**

- 4.16.1 Consumer products are exempt from supplier labels and MSDS requirements. Some cleaning solvents may be packaged as consumer products and these must be labeled in accordance with the Consumer Product Act requirements.

- 4.16.2 In addition to the labelling of storage containers in the workplace, the contents of process piping (including valves), process vessels and reaction vessels are required to be identified through the use of colour coding, labels, placards or other modes of identifications that must be communicated to workers through training programs. It is very important for employees to be aware of and understand Client labelling requirements for these types of process systems.

**5.0 Records**

- 5.1 None

**6.0 References**

- 6.1 None

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## **Attachment E**

### **Respiratory Protection Plan**



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## S3NA-519-PR Respiratory Protection Program

### 1.0 Purpose and Scope

- 1.1 This procedure establishes methods that AECOM will use to prevent employee exposure to hazardous concentrations of airborne contaminants or to supply breathing-quality air to employees working in oxygen-deficient atmospheres.
- 1.2 This procedure applies to all AECOM North America-based employees and operations.

### 2.0 Terms and Definitions

- 2.1 **Air-purifying respirator:** A respirator with an air-purifying filter, cartridge, or canister that removes specific air contaminants by passing ambient air through the air-purifying element.
- 2.2 **Approved:** Equipment tested and listed by the Bureau of Mines, jointly by the Mining Enforcement and Safety Administration (MESA), and the National Institute for Occupational Safety and Health (NIOSH), or jointly by the Mine Safety and Health Administration (MSHA) and NIOSH.
- 2.3 **Assigned protection factor (APF):** The ratio of the ambient concentration of an airborne substance (outside the respirator) to the concentration of the substance inside the respirator. NIOSH defines this as 10 for an approved half-face respirator and 50 for an approved full-face respirator.
- 2.4 **Atmosphere-supplying respirator:** A respirator that supplies the respirator user with breathing air from a source independent of the ambient atmosphere and includes supplied-air respirators (SARs) and self-contained breathing apparatus (SCBA) units.
- 2.5 **Breakthrough:** The first perception of an odor, taste or irritation experienced while wearing an air-purifying respirator. Breakthrough is generally an indication that the cartridges are saturated and are no longer filtering out the contaminant. Breakthrough can also be an indication of an improperly functioning respirator.
- 2.6 **Confined space:** An enclosure, such as a storage tank, process vessel, boiler, silo, tank car, pipeline, tube, duct, sewer, underground utility vault, tunnel, or pit, that has limited means of egress and poor natural ventilation and that may contain hazardous contaminants or be oxygen deficient.
- 2.7 **Canister or cartridge:** A container that has a filter, sorbent, or catalyst, or a combination of these items and that removes specific contaminants from the air passed through the container.
- 2.8 **Demand respirator:** An atmosphere-supplying respirator that admits breathing air to the facepiece only when a negative pressure is created inside the facepiece by inhalation.
- 2.9 **Emergency situation:** Any occurrence such as, but not limited to, equipment failure, rupture of containers, or failure of control equipment that may or does result in an uncontrolled significant release of an airborne contaminant.
- 2.10 **Employee exposure:** Exposure to a concentration of an airborne contaminant that would occur if the employee were not using respiratory protection.
- 2.11 **End-of-service-life indicator (ESLI):** A system that warns the respirator user of the approach of the end of adequate respiratory protection, for example, that the sorbent is approaching saturation or is no longer effective.
- 2.12 **Escape-only respirator:** A respirator intended to be used only for emergency exit.
- 2.13 **Filter or air purifying element:** A component used in respirators to remove solid or liquid aerosols from the inspired air.
- 2.14 **Filtering facepiece (dust mask):** A negative pressure particulate respirator with a filter as an integral part of the facepiece or with the entire facepiece composed of the filtering medium.
- 2.15 **Fit factor:** A quantitative estimate of the fit of a particular respirator to a specific individual, typically estimating the ratio of the concentration of a substance in ambient air to its concentration inside the respirator when worn.

- 2.16 **Fit test:** The use of a protocol to qualitatively or quantitatively evaluate the fit of a respirator on an individual. (See also Qualitative fit test QLFT and Quantitative fit test QNFT.)
- 2.17 **Helmet:** A rigid respiratory inlet covering that also provides head protection against impact and penetration.
- 2.18 **HASP:** Health and Safety Plan
- 2.19 **Hazardous atmosphere:** Any atmosphere, either immediately or not immediately dangerous to life or health, that is oxygen-deficient or that contains a toxic or disease-producing contaminant exceeding the legally established permissible exposure limit (PEL) or, where applicable, the Threshold Limit Value (TLV) established by the American Conference of Governmental Industrial Hygienists (ACGIH).
- 2.20 **High efficiency particulate air (HEPA) filter:** A filter that is at least 99.97% efficient in removing monodisperse particles of 0.3 micrometers in diameter. The equivalent NIOSH 42 CFR 84 particulate filters are the N100, R100, and P100 filters.
- 2.21 **Hood:** A respiratory inlet covering that completely covers the head and neck and may also cover portions of the shoulders and torso.
- 2.22 **Immediately dangerous to life or health (IDLH):** An atmosphere that poses an immediate threat to life, would cause irreversible adverse health effects, or would impair an individual's ability to escape from a dangerous atmosphere.
- 2.23 **Loose-fitting facepiece:** A respiratory inlet covering that is designed to form a partial seal with the face.
- 2.24 **Maximum use concentration (MUC):** The protection factor (PF) of an approved respirator assembly times the permissible exposure limit (PEL).  $MUC = PF \times PEL$
- 2.25 **Negative pressure respirator (tight fitting):** A respirator in which the air pressure inside the facepiece is negative during inhalation with respect to the ambient air pressure outside the respirator.
- 2.26 **Oxygen deficient atmosphere:** An atmosphere with oxygen content below 19.5% by volume.
- 2.27 **Powered air-purifying respirator (PAPR):** A respirator that contains a blower that passes ambient air through an air-purifying component. Air-purifying respirators may be half-face (covering the nose and mouth) or full-face (covering the eyes, nose, and mouth).
- 2.28 **Physician or other licensed health care professional (PLHCP):** An individual whose legally permitted scope of practice (i.e., license, registration, or certification) allows him or her to independently provide or be delegated the responsibility to provide some or all of the health care services required by paragraph (e) of this section.
- 2.29 **Positive pressure respirator:** A respirator in which the pressure inside the respiratory inlet covering exceeds the ambient air pressure outside the respirator.
- 2.30 **Powered air-purifying respirator (PAPR):** An air-purifying respirator that uses a blower to force the ambient air through air-purifying elements to the inlet covering.
- 2.31 **Program administrator:** The individual that has the responsibility to verify full compliance with this SOP and determines the need for medical evaluations or any other additional medical attention in regards to the use of a respirator.
- 2.32 **Pressure demand respirator:** A positive pressure atmosphere-supplying respirator that admits breathing air to the facepiece when the positive pressure is reduced inside the facepiece by inhalation.
- 2.33 **Qualitative fit test (QLFT):** A pass/fail fit test to assess the adequacy of respirator fit that relies on the individual's response to the test agent.
- 2.34 **Quantitative fit test (QNFT):** An assessment of the adequacy of respirator fit by numerically measuring the amount of leakage into the respirator.
- 2.35 **Respiratory inlet covering:** That portion of a respirator that forms the protective barrier between the user's respiratory tract and an air-purifying device or breathing air source, or both. It may be a facepiece, helmet, hood, suit, or a mouthpiece respirator with nose clamp.
- 2.36 **Self-contained breathing apparatus (SCBA):** An atmosphere-supplying respirator for which the breathing air source is designed to be carried by the user.

- 2.37 **Service life:** The period of time that a respirator, filter or sorbent, or other respiratory equipment provides adequate protection to the wearer.
- 2.38 **Supplied-air respirator (SAR) or airline respirator:** An atmosphere-supplying respirator for which the source of breathing air is not designed to be carried by the user.
- 2.39 **Tight-fitting facepiece:** A respiratory inlet covering that forms a complete seal with the face.
- 2.40 **User seal check:** An action conducted by the respirator user to determine if the respirator is properly sealed to the face.

### 3.0 Attachments

- 3.1 S3NA-519-FM1 Respiratory Equipment Fit Test
- 3.2 S3NA-519-FM2 Respiratory Equipment Maintenance Log
- 3.3 S3NA-519-FM3 Respiratory Equipment Inspection
- 3.4 S3NA-519-WI1 Fit Testing Protocol
- 3.5 S3NA-519-WI2 User Seal Check Procedures
- 3.6 S3NA-519-WI3 Respirator Cleaning Procedures

### 4.0 Procedure

#### 4.1 Roles and Responsibilities

- 4.1.1 **Program Administrator.** The AECOM Americas **SH&E Director** is the Respiratory Protection Program Administrator. The **Program Administrator** shall:
- Verify full compliance with this SOP.
  - Determine the need for medical evaluations or any other additional medical attention related to the use of a respirator.
  - Perform the program evaluations described in this SOP.
- 4.1.2 **District/office manager and project manager (including Operations Field Manager, supervisors, etc)** shall:
- Verify compliance with the respiratory protection program set forth in this procedure.
  - Verify that only those employees who are medically qualified, properly trained, and fit tested are assigned to respirator work.
  - Verify that respirators are provided, repaired, or replaced as may be required due to wear and deterioration.
- 4.1.3 **Region SH&E Manager** shall:
- Monitor compliance with the various aspects of this program.
  - Provide technical assistance regarding respirator selection and use, evaluate the effectiveness of this program, and support respirator training and fit testing.
  - Audit company compliance with this procedure.
- 4.1.4 **Employees** shall:
- Will use the provided respiratory protection in accordance with instructions and training received.
  - Will guard against damage to the respirator.
  - Will report immediately any malfunction of the respirator to the supervisor or other responsible person.

## 4.2 Medical Surveillance

No employee shall be assigned to a task that requires the use of a respirator unless it has been determined that he/she is physically able to perform the work while using the required respirator.

- 4.2.1 Prior to wearing a respirator, **employees** will complete an initial baseline medical surveillance examination performed by a PLHCP in accordance with the requirements of the Medical Surveillance Program (*S3NA-605- PR Medical Surveillance Program*).
- 4.2.2 **Employees** who continue to use respiratory protection will receive an annual medical surveillance examination.
- 4.2.3 Additional medical examinations will be provided to employees who wear respirators if/when:
- An **employee** reports medical signs or symptoms that are related to ability to use a respirator;
  - A PLHCP, supervisor, or the respirator program administrator determines that an employee needs to be reevaluated;
  - Information from the respiratory protection program, including observations made during fit testing and program evaluation, indicates a need for employee reevaluation; or
  - A change occurs in workplace conditions (e.g., physical work effort, protective clothing, temperature, etc.) that may result in a substantial increase in the physiological burden placed on an employee.
- 4.2.4 All medical surveillance examinations shall occur during normal working hours; shall be convenient, understandable, and confidential; and the employee will be given chance to discuss results with examining physician.
- ## 4.3 Training
- 4.3.1 Project staff that may be exposed to the hazard will be oriented to the hazard and the controls prior to beginning work.
- 4.3.2 Atmospheric testing will be carried out by someone trained in the use, calibration, and interpretation of the test equipment.
- 4.3.3 **Employees** who may be required to use a breathing apparatus shall be properly trained in the operation, maintenance, cleaning and storage of the apparatus.
- 4.3.4 All staff will receive an orientation to the hazards on the job site as well as initial Field Safety training which outlines appropriate PPE requirements.
- 4.3.5 **Employees** who wear respiratory protection must receive training before they are assigned to a task that requires the use of respiratory protection.
- 4.3.6 Retraining shall be administered annually, and when the following situations occur:
- Changes in the workplace or the type of respirator render previous training obsolete;
  - Inadequacies in the employee's knowledge or use of the respirator indicate that the employee has not retained the requisite understanding or skill; or
  - Any other situation arises in which retraining appears necessary to verify safe respirator use.
- 4.3.7 Frequency of Training
- All employees who may have the need to wear respiratory protection are required to participate in AECOM's internal SH&E training program.
  - In addition, AECOM's SH&E Department will conduct respirator training classes, as necessary, for those who may need to wear respiratory protection but did not participate in AECOM's HAZWOPER training classes.
- 4.3.8 Basic Respirator Training Program
- Respirator training classes will include, at a minimum, the following:
- Instruction in the nature of the respiratory hazards, whether acute, chronic, or both, and a description of potential health effects if the respirators are not used.

Why the respirator is necessary and how improper fit, usage, or maintenance can compromise the protective effect of the respirator.

- The limitations and capabilities of the respirator.
- Proper fitting, including demonstrations and practice in wearing, adjusting, determining the fit of, and performing a user seal check (in accordance with *S3NA-519-W11 Fit Testing Protocol*) each time respirator is donned.
- How to inspect, put on, use and remove the respirator.
- How to use the respirator effectively in emergency situations, including situations in which the respirator malfunctions.
- The procedures for maintenance and storage of the respirator.
- How to recognize medical signs and symptoms that may limit or prevent the effective use of respirators.
- The general requirements of the OSHA and OH&S Respiratory Protection Standard.

#### 4.4 **Respirator Selection**

4.4.1 AECOM will maintain air purifying respirators and cartridges from at least two providers (i.e. MSA and North).

4.4.2 Prior to fit testing, the employee shall be allowed to pick the most comfortable respirator from the brands offered.

4.4.3 The type of respirator most commonly used by AECOM staff is a cartridge type air purifying respirator (APR). Many different types of APRs exist, and field staff should always fit test an APR prior to use.

#### 4.5 **Fit Testing Procedures**

4.5.1 A respirator that doesn't fit properly will not provide adequate protection.

4.5.2 Four types of tests can be used:

- **Positive Pressure Sealing Check:** Close off the exhalation valve and exhale gently. The fit is satisfactory if a slight positive pressure can be built up inside the face piece for a full 10 seconds without detecting any outward leakage of air between the sealing surface of the face piece and the wearer's face.
- **Negative Pressure Sealing Check:** Close off the inlet opening of the cartridges by covering them with the palm of the hands. Inhale gently and hold breath for at least 10 seconds. The face piece should collapse slightly with no detection of inward leakage of air into the face piece.
- **Isoamyl Acetate Test (banana oil test):** A tube or bottle of banana oil is held in front of and around the mask. The fit is adequate if the wearer does not detect the odour of bananas. During the test, the wearer should be demonstrating movements that approximate a normal working situation, including deep breathing, side-to-side and up-and-down head movements, and talking.
- **Irritant Smoke Test (Stannic Chloride Test):** The procedure is similar to that of the banana oil test except that an irritant smoke is used. The wearer of the mask will cough (involuntary reaction) if he/she detects the irritant smoke in the mask.

4.5.3 **Fit Testing Frequency**

Additional fit tests will be performed:

- Whenever there is an indication that changes in the **employee's** physical condition might have an effect on respirator fit. (Such conditions include, but are not limited to, facial scarring, dental changes, cosmetic surgery, or an obvious change in body weight.)
- Whenever there is an indication that changes in the **employee's** physical condition might have an effect on respirator fit. (Such conditions include, but are not limited to, facial scarring, dental changes, cosmetic surgery, or an obvious change in body weight.)
- If the **employee** notifies his/her supervisor or Regional SH&E Manager that the fit of his/her respirator is unacceptable.

## 4.5.4 Fit Testing Records

A written record of each fit test performed must be maintained in the **employee's** health and safety records. *S3NA-519-FM1 Respiratory Equipment Fit Test* will be used to document each fit test.

## 4.6 Interference with Gas-Tight Seal

Respiratory protection can only be worn when it can be determined that there is no obstruction of contact between the wearer's skin and the sealing surfaces of the mask whatsoever. Such obstruction can include facial hair, head hair, and the temple bars of eye glasses.

4.6.1 Respirator wearers cannot be afforded protection from hazardous airborne contaminants when conditions prevent a complete gas-tight face seal.

4.6.2 Although eyeglass temple bars will interfere with the formation of a gas-tight face seal in the case of full-face respirators, this problem is correctable by use of internally mounted spectacle kits. Management and supervisors shall verify that **employees** under their supervision who regularly wear eyeglasses, and who will require the use of a full-face respirator, are provided with appropriate spectacle kits at company expense.

The use of contact lenses in hazardous atmospheres or in operations involving intense heat, molten metals or the potential for chemical splash shall be prohibited.

4.6.3 Because facial hair (even beard stubble) will interfere with a gas-tight seal, employees shall be required to be clean-shaven whenever the use of respiratory protection is specified.

4.6.4 Respiratory Protection will only be assigned to those **employees** without physical obstructions to a gas-tight face seal to jobs that may require the use of respiratory protection. Candidates for employment shall be made aware that their versatility may be limited if they cannot wear a respirator and that this can affect their job assignments.

## 4.7 Specification of Proper Level of Respiratory Protection

4.7.1 The **Region SH&E Manager** or his/her designated and qualified representative is responsible for specifying the proper selection and use of all respiratory protective devices, including half-face and full-face air purifying respirators, airline respirators, and self-contained breathing apparatus. This information is generally specified as part of the written site-specific Health and Safety Plan (HASP).

4.7.2 **Employees** engaged in activities not covered by a HASP must consult with the **Region SH&E Manager** or his/her designated representative to determine the proper equipment prior to use. Whenever appropriate, exposure levels will be measured to verify that the actual use conditions are within the limitations of the approvals specified by NIOSH/MSHA for the selected respirator.

## 4.7.3 Conditions Required for Air-Purifying Respirator (APR) Use

Air-purifying respirators (APR) shall only be specified for use when it can be determined that the following conditions exist:

- The oxygen concentration is greater than 19.5%.
- The contaminant is known and its concentration can be quantified.
- The airborne contaminant concentration is below its IDLH.
- A canister or cartridge is available which is approved for the contaminant.
- The contaminant concentration is below the concentration for which the canister is approved.
- The contaminant concentration is below the Maximum Use Concentration (MUC) of the respirator.

In all cases where OSHA has specified that a particular respirator be used (asbestos, formaldehyde, benzene, arsenic, lead, etc.), that respirator, or one providing equal or better protection, shall be specified.

## 4.7.4 APR Filter and Chemical Cartridges

An adequate supply of the following cartridges shall be maintained in stock at each office location where respiratory protective equipment:

- High efficiency particulate air (HEPA) filter cartridges;
- Organic vapor cartridges; and
- Combination HEPA/acid gas/organic vapor cartridges

#### 4.7.5 Change Out Schedule

Filter cartridges shall be changed out whenever an increase in breathing resistance is detected by the user.

When available, chemical cartridges that are equipped with end-of-service life indicators (ESLI) shall be utilized. In those cases, cartridges should be changed when indicated by the ESLI.

In the absence of cartridges equipped with an ESLI, employees shall change chemical cartridges on the following schedule:

- Immediately if breakthrough is perceived;
- In accordance with the change out schedule developed by the Regional SH&E Manager in the site-specific Health and Safety Plan (HASP); and
- After each day's use.

The change out schedule will be based upon the anticipated contaminant concentration, environmental conditions, employee work rate, and the specific data provided by manufacturer

When powered air-purifying respirators (PAPRs) are worn, the same rules apply with the exception that filter cartridges should be changed when airflow through the filter elements decreases to an unacceptable level, as indicated by the manufacturer's test device.

### 4.8 Air-Supplying Respirator Use

#### 4.8.1 Conditions Requiring Use of Air-Supplying Respirators

Air-supplying respirators will be specified for use when it has been determined that any of the following conditions exist:

- The oxygen concentration is less than 19.5%;
- The contaminant is unknown or its concentration cannot be quantified;
- The airborne contaminant concentration is above its IDLH;
- An air-purifying respirator canister or cartridge that removes the contaminant is not available;
- The contaminant concentration is above the concentration for which an air-purifying canister or cartridge is approved; or
- The contaminant concentration is above the Maximum Use Concentration (MUC) of a full-face air-purifying respirator.

No employee may engage in an operation requiring the use of an air-supplied respirator unless a representative of the SH&E Department has reviewed the operation and approved its use.

The determination of the type of air-supplying respirator (i.e., SCBA, air-line, demand, pressure demand, etc.) which is appropriate for the job, outside standby persons, communication, proper training and equipment, notification procedures, and necessary action all require planning. Mandatory equipment including SCBA or SAR with auxiliary air supply & emergency appropriate retrieval equipment or equivalent rescue means will be made by the **Region SH&E Manager** or his/her designated representative at the time of review. The need for any additional precautions (i.e.,



equipment specific training, on-site H&S support, etc.) will also be determined by the **Region SH&E Manager**.

#### 4.9 **Minimum Procedures for IDLH atmospheres**

- 4.9.1 One **employee** or, when needed, more than one employee shall be located outside the IDLH atmosphere. This employee shall be responsible for communicating with the **employees** in the IDLH atmosphere, alerting rescue services if needed, and restricting entrance to the IDLH area by untrained and unapproved persons.
- 4.9.2 Visual, voice, or signal line communication shall be maintained between the **employee(s)** in the IDLH atmosphere and the employee(s) located outside the IDLH atmosphere.
- 4.9.3 The **employee(s)** located outside the IDLH atmosphere shall be trained and equipped to provide effective emergency rescue or to initiate onsite rescue services.
- 4.9.4 If on-site rescue services are to be used, the **Site Safety Officer** shall confirm that the service is available to respond prior to any employees entering the IDLH area.
- 4.9.5 **Employee(s)** located outside the IDLH area and/or on-site rescue services shall be equipped with:
- Pressure demand or other positive pressure SCBAs, or a pressure demand or other positive pressure supplied-air respirator with auxiliary SCBA; and either
  - Appropriate retrieval equipment for removing the employee(s) who enter(s) these hazardous atmospheres where retrieval equipment would contribute to the rescue of the employee(s) and would not increase the overall risk resulting from entry; or
  - Equivalent means for rescue where retrieval equipment would create a hazard to the workers in the IDLH area.

#### 4.10 **Breathing Air Quality**

Compressed air used for respiration shall be of high purity and shall meet, as a minimum, the requirements of the specification for Grade D breathing air as described in Compressed Gas Association Specification G-7.1 (ANSI Z86.1).

Oxygen shall NOT be used as a source of breathing air at any time in open-circuit SCBAs or air-line respirators.

##### 4.10.1 **Compressor Supplied Breathing Air**

All compressors used for filling SCBA air cylinders or for supplying air-line respirators shall be equipped with the following safety and standby devices:

- The compressor intake shall be located to verify that only respirable (uncontaminated) air is admitted. This requires attention to the location of the compressor intake with respect to compressor engine exhaust, chemical storage or use areas, and suitable intake screening or filtration.
- Alarms to indicate compressor failure (such as low-pressure air horns, etc.) shall be installed in the system.
- A receiver of sufficient capacity to enable the respirator wearer to exit from a contaminated atmosphere shall be provided.

If an oil-lubricated compressor is used to supply breathing air, it shall be equipped with both of the following devices:

- A continuous reading carbon monoxide monitoring system set to alarm should the carbon monoxide concentration exceed 10 ppm; and,
- A high temperature alarm which will activate when the discharge air exceeds 110% of the normal operating temperature in degrees Fahrenheit.

An in-line purifying filter assembly to remove oil, condensed water, particulates, odors, and organic vapors shall be used in conjunction with the air compressor.

Routine inspection and maintenance of air compressor shall be performed.

#### 4.10.2 Compressed Air Cylinders

Breathing air cylinders shall be legibly identified with the word AIR by means of stenciling, stamping, or labeling as near to the valve end as practical.

Cylinders shall be stored and handled to prevent damage to the cylinder or valve.

Cylinders shall be stored upright with the protective valve cover in place and, in such a way (e.g. supported with substantial rope or chain in the upper one third of the cylinder, or in racks designed for this purpose) as to prevent the cylinder from falling.

Cylinders shall not be dropped, dragged, rolled, or allowed to strike each other or to be struck violently. Cylinders shall never be exposed to temperatures exceeding 125<sup>0</sup> F. Cylinders with visible external damage, evidence of corrosion damage, or exposure to fire shall not be accepted or used.

Only cylinders within current hydrostatic test periods shall be used. Steel cylinders must be hydrostatically tested every five years and fiberglass wrapped aluminum cylinders must be tested every three years.

#### 4.10.3 Compressed Air Cylinder Systems for Air-Line Respirators

Compressed air cylinder systems used to supply air-line respirators shall be equipped with low pressure warning bells (e.g., Scott Pak-Alarm) or similar warning devices to indicate air pressure in the manifold below 500 psi. When such systems are used, one employee shall be assigned as safety standby within audible range of the low pressure alarm.

Air-line hose couplings shall be incompatible with outlets for other gas systems to prevent inadvertently supplying air-line respirators with nonrespirable gases or oxygen.

The air pressure at the hose connection to air-line respiratory equipment shall be within the range specified in the approval of the equipment by the manufacturer.

#### 4.10.4 Compressed Air Cylinder Systems for Recharging SCBAs

When a cascade system is used to recharge SCBA air cylinders, it shall be equipped with a high-pressure supply hose and coupling rated at a capacity of at least 3000 psi.

#### 4.10.5 Escape/Egress Units

Escape/egress unit respirators are intended for use in areas where escape with a short-term (5 minutes) air supply is necessary.

They may be used as adjuncts to airline pressure demand respirators as a backup air supply or as independent emergency devices in areas where respiratory protection is not normally required.

Appropriate training shall be conducted and documented prior to assigning employees to tasks or locations subject to the use of these respirators.

Escape/egress units (5 minutes) shall never be used to enter a hazardous atmosphere or as primary standby respirators for confined space entry.

#### 4.10.6 Respirator Inspection, Cleaning, Maintenance, and Storage

When respirator use is required, only properly cleaned and maintained NIOSH/MSHA approved respirators shall be used.

#### 4.10.7 Inspection

- Respirators should be inspected before and after use. Those for emergency use should be inspected once per month.
- All connections, including gaskets, o-rings should be checked for damage and tightness.
- The face piece should be inspected for cracks and rubber or elastomer parts should be checked for deterioration and pliability.
- All respirators shall be inspected routinely by the user before, during, and after each use. Defects shall be reported to supervision. No defective respirator shall be issued or worn.

Routinely used respiratory equipment shall be inspected by an individual qualified by experience or training to do the work.

4.10.8 Cleaning and Maintenance

- Respirator facepiece assemblies shall be cleaned and sanitized minimally after each day of use in accordance with the requirements specified in *S3NA-519-WI3 Respirator Cleaning Procedures*.
- Respiratory equipment shall not be passed from one person to another until it has been cleaned and sanitized.
- Respiratory equipment shall be maintained according to manufacturer's instructions.
- Where respirators are assigned to individual employees, management shall verify compliance with cleaning and maintenance requirements by periodic inspection and field audits of respiratory equipment.
- Respirators must be cleaned after each use and then placed into a clean bag for storage.
- Prior to cleaning, the filters, cartridges, or canisters must be removed and discarded.
- The respirator should then be inspected for any damaged parts (repair should only be done by trained personnel with the proper tools) and cleaned with a hot water/mild detergent solution.
- In field situations, a premoistened towelette (e.g., baby wipes) can be used. The mask should then be rinsed with clean warm water and dried.
- Alcohol should never be used to clean masks as it can damage the face pieces and rubber parts.

4.10.9 Storage

- Store clean respirators so that they are protected from dust, excessive moisture, damaging chemicals, temperature extremes and direct sunlight. They should be placed in a sealed plastic bag and stored in the original box.

When not in use, respirator facepieces shall be placed in clean Ziploc-style bags and stored to protect against dust, sunlight, extreme temperatures, excessive moisture, and damaging chemicals.

4.11 Hygiene

Employees must leave the work area to wash, change cartridges, or if they detect breakthrough or resistance.

4.12 Program Evaluation

4.12.1 The **Region SH&E Manager** will conduct evaluations of the workplace as necessary to verify that the provisions of the current written program are being effectively implemented and that it continues to be effective.

4.12.2 The **Region SH&E Manager** will regularly (i.e., during annual training) consult employees required to use respirators to assess their views on program effectiveness and to identify any problems. Any problems that are identified during this assessment shall be corrected. Factors to be assessed include but are not limited to:

- Respirator fit (including the ability to use the respirator without interfering with effective workplace performance);
- Appropriate respirator selection for the hazards to which the employee is exposed;
- Proper respirator use under the workplace conditions the employee encounters; and
- Proper respirator maintenance.

#### 4.13 **Costs**

- 4.13.1 The costs for training, medical examinations, fit testing, respirators, and cleaning materials should be considered as operational costs for the respective AECOM business lines.

### 5.0 **Records**

#### 5.1 **Medical Records**

Medical records under this section will be maintained at a minimum in accordance with 29 CFR 1910.1020 – Access to Employee Exposure and Medical Records (*S3NA-604 Medical Records*).

#### 5.2 **Fit Test Records**

Fit test records will include the name of the employee tested; the type of fit test performed; the specific style, make, model, and size of the respirator tested; the date of the test; and the pass/fail results for QLFTs or QNFT test documentation (i.e., strip charts).

#### 5.3 **Training Records**

- Respiratory protection training records will be maintained by the employee with copies provided to their SH&E Coordinators or Administrators.
- On-site records of training and fit testing will be maintained as necessary.
- For situations where training is required by and provided by clients, copies of SH&E Records shall be maintained by AECOM.

### 6.0 **References**

- 6.1 The following standards apply to respiratory equipment:

Association	Standard
<b>Canadian Standards Association (CSA)</b>	Z180.1-00, Compressed Breathing Air and Systems Z94.4-02, Selection, Use and Care of Respirators
<b>Department of Labor - Occupational Safety and Health Administration</b>	29 Code of Federal Regulation 1910. 134 29 Code of Federal Regulation 1926.103

## S3NA-519-FM1 Respiratory Equipment Fit Test

Date of Testing:		Respirator Type(s):	
Employee Name:		Location:	
Method & Testing Agent:			
Test Exercise	Pass / Fail	Test Exercise	Pass / Fail
Sensitivity Check		Normal Breathing	
Deep Breathing		Turning Head (side to side)	
Moving Head (up/down)		Rainbow Passage*	
Bending Over		Normal Breathing	
<b>Successful Respirator Fit Determined:</b> <input type="checkbox"/> Yes <input type="checkbox"/> No			
I certify that I have been tested with the respirator(s) listed above. I have also had the opportunity to ask questions and those questions have been answered to my satisfaction. I also understand that the above fit test is voided if respirator limitations are not followed or the respirator is not worn or if conditions (e.g., facial hair) prevent a good face seal.			
Employee Signature:		Date:	
Signature of Tester:		Date:	

**\*Rainbow Passage.** "When the sunlight strikes raindrops in the air, they act like a prism and form a rainbow. The rainbow is a division of white light into many beautiful colors. These take the shape of a long round arch with its path high above and its two ends apparently beyond the horizon. There is, according to legend, a boiling pot of gold at one end. People look, but no one ever finds it. When a man looks for something beyond reach, his friends say he is looking for the pot of gold at the end of the rainbow."

Date: Tester:	MSA Comfo II HM S <input type="checkbox"/> M <input type="checkbox"/> L <input type="checkbox"/>	MSA Ultra Twin FM S <input type="checkbox"/> M <input type="checkbox"/> L <input type="checkbox"/>	North 7700 HM S <input type="checkbox"/> M <input type="checkbox"/> L <input type="checkbox"/>	North 7600 FM S <input type="checkbox"/> M/L <input type="checkbox"/>	HM S <input type="checkbox"/> M <input type="checkbox"/> L <input type="checkbox"/>	FM S <input type="checkbox"/> M <input type="checkbox"/> L <input type="checkbox"/>
Qualitative Test Agent(s): IAA <input type="checkbox"/> Smoke <input type="checkbox"/>	Pass <input type="checkbox"/> Fail <input type="checkbox"/>	Pass <input type="checkbox"/> Fail <input type="checkbox"/>	Pass <input type="checkbox"/> Fail <input type="checkbox"/>	Pass <input type="checkbox"/> Fail <input type="checkbox"/>	Pass <input type="checkbox"/> Fail <input type="checkbox"/>	Pass <input type="checkbox"/> Fail <input type="checkbox"/>
Quantitative Test Device	Overall Fit Factor	Overall Fit Factor	Overall Fit Factor	Overall Fit Factor	Overall Fit Factor	Overall Fit Factor
Date: Tester:	MSA Comfo II HM S <input type="checkbox"/> M <input type="checkbox"/> L <input type="checkbox"/>	MSA Ultra Twin FM S <input type="checkbox"/> M <input type="checkbox"/> L <input type="checkbox"/>	North 7700 HM S <input type="checkbox"/> M <input type="checkbox"/> L <input type="checkbox"/>	North 7600 FM S <input type="checkbox"/> M/L <input type="checkbox"/>	HM S <input type="checkbox"/> M <input type="checkbox"/> L <input type="checkbox"/>	FM S <input type="checkbox"/> M <input type="checkbox"/> L <input type="checkbox"/>
Qualitative Test Agent(s): IAA <input type="checkbox"/> Smoke <input type="checkbox"/>	Pass <input type="checkbox"/> Fail <input type="checkbox"/>	Pass <input type="checkbox"/> Fail <input type="checkbox"/>	Pass <input type="checkbox"/> Fail <input type="checkbox"/>	Pass <input type="checkbox"/> Fail <input type="checkbox"/>	Pass <input type="checkbox"/> Fail <input type="checkbox"/>	Pass <input type="checkbox"/> Fail <input type="checkbox"/>
Quantitative Test Device	Overall Fit Factor	Overall Fit Factor	Overall Fit Factor	Overall Fit Factor	Overall Fit Factor	Overall Fit Factor
Date: Tester:	MSA Comfo II HM S <input type="checkbox"/> M <input type="checkbox"/> L <input type="checkbox"/>	MSA Ultra Twin FM S <input type="checkbox"/> M <input type="checkbox"/> L <input type="checkbox"/>	North 7700 HM S <input type="checkbox"/> M <input type="checkbox"/> L <input type="checkbox"/>	North 7600 FM S <input type="checkbox"/> M/L <input type="checkbox"/>	HM S <input type="checkbox"/> M <input type="checkbox"/> L <input type="checkbox"/>	FM S <input type="checkbox"/> M <input type="checkbox"/> L <input type="checkbox"/>
Qualitative Test Agent(s): IAA <input type="checkbox"/> Smoke <input type="checkbox"/>	Pass <input type="checkbox"/> Fail <input type="checkbox"/>	Pass <input type="checkbox"/> Fail <input type="checkbox"/>	Pass <input type="checkbox"/> Fail <input type="checkbox"/>	Pass <input type="checkbox"/> Fail <input type="checkbox"/>	Pass <input type="checkbox"/> Fail <input type="checkbox"/>	Pass <input type="checkbox"/> Fail <input type="checkbox"/>
Quantitative Test Device	Overall Fit Factor	Overall Fit Factor	Overall Fit Factor	Overall Fit Factor	Overall Fit Factor	Overall Fit Factor
Instructions    1. Complete the employee information at the top of the record (one record per employee). 2. Enter the date of the test and the name of the person conducting the fit test. 3. Circle the brand and model of respirator tested (e.g., MSA Comfo II, North 7700, etc.) or enter another brand and model in one of the last two columns. 4. Circle the size of the respirator tested. 5. For qualitative fit tests, circle the test agent used - IAA = Isoamyl Acetate, Smoke = Irritant Smoke (Stannic Chloride) and the outcome of the test (i.e., Pass or Fail). 6. For quantitative fit tests, enter the name of the instrument used and the overall fit factor measured by the test. 7. Keep a copy in the employee's training files and enter subsequent (e.g., annual) tests until the record is filled.						

[illegible]

## S3NA-519-FM3 Respiratory Equipment Inspection

Date:		Inspected by:		
Air Purifier Unit #:				
		N/A	Pass	Fail
<b>Examine Face Piece for:</b>				
Excessive dirt		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Cracks, tears, holes, or distortion from improper storage		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Inflexibility (stretch and massage to restore flexibility)		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Cracked or badly scratched lenses in full face pieces		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Incorrectly mounted full-face piece lens or broken or missing mounting clips		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Lens sealed properly in receptacle, retaining clamp secured		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Cracked or broken air-purifying element holder(s), badly worn threads or missing gasket(s) (if appropriate)		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<b>Examine the Head Straps or Head Harness for:</b>				
Breaks		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Loss of elasticity		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Broken or malfunctioning buckles and attachments		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Excessively worn serrations on the head harness that might permit slippage (full face pieces only)		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Tears in headband at cradle attachment		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<b>Examine the Inhalation and Exhalation Valves for:</b>				
Foreign material, such as detergent residue, dust particles, or human hair under the valve seat		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Cracks, tears, or distortion in the valve material		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Improper insertion of the valve body in the face piece		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Cracks, breaks, or chips in the valve body, particularly in the sealing surface		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Missing or defective valve cover		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<b>Examine the Air Purifying Elements for:</b>				
Incorrect cartridge, canister, or filter for the hazard		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Incorrect installation, loose connection, missing or worn gaskets, or cross-threading in the holder		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Expired shelf life date on cartridge or canister		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Defects Noted:				
Unit Deemed Suitable for Use		<input type="checkbox"/> Yes		<input type="checkbox"/> No



## **S3NA-519-WI1 Fit Testing Protocol**

### **1.0 Selection**

- 1.1 The test subject shall be allowed to pick the most acceptable respirator from a sufficient number of respirator models and sizes so that the respirator is acceptable to, and correctly fits, the user.
- 1.2 Prior to the selection process, the test subject shall be shown how to put on a respirator, how it should be positioned on the face, how to set strap tension, and how to determine an acceptable fit. A mirror shall be available to assist the subject in evaluating the fit and positioning of the respirator. This instruction may not constitute the subject's formal training on respirator use, because it is only a review.
- 1.3 The test subject shall be informed that he/she is being asked to select the respirator that provides the most acceptable fit. Each respirator represents a different size and shape and if fitted and used properly will provide adequate protection.

### **2.0 Comfort**

- 2.1 The test subject shall be instructed to hold each chosen face piece up to the face and to eliminate those that obviously do not give an acceptable fit.
- 2.2 The more acceptable face pieces are noted in case the one selected proves unacceptable; the most comfortable mask is donned and worn at least five minutes to assess comfort.
- 2.3 If the test subject is not familiar with using a particular respirator, the test subject shall be directed to don the mask several times and to adjust the straps each time to become adept at setting proper tension on the straps.
- 2.4 Assessment of comfort shall include a review of the following points with the test subject and allowing the test subject adequate time to determine the comfort of the respirator:
  - Position of the mask on the nose
  - Room for eye protection
  - Room to talk
  - Position of mask on face and cheeks

### **3.0 Fit Test Criteria**

- 3.1 The following criteria shall be used to help determine the adequacy of the respirator fit:
  - Chin properly placed;
  - Adequate strap tension, not overly tightened;
  - Fit across nose bridge;
  - Respirator of proper size to span distance from nose to chin;
  - Tendency of respirator to slip;
  - Self-observation in mirror to evaluate fit and respirator position.
- 3.2 The test subject shall conduct a user seal check, either the negative and positive pressure seal checks described in *S3NA-519-WI2 User Seal Check Procedures* or those recommended by the respirator manufacturer that provide equivalent protection to the procedures in *S3NA-519-WI2 User Seal Check Procedures*.
- 3.3 Before conducting the negative and positive pressure checks, the subject shall be told to seat the mask on the face by moving the head from side to side and up and down slowly while taking in a few slow deep breaths. Another face piece shall be selected and retested if the test subject fails the user seal check tests.
- 3.4 The test shall not be conducted if there is any hair growth between the skin and the face piece sealing surface, such as stubble beard growth, beard, mustache, or sideburns that cross the

respirator sealing surface. Any type of apparel that interferes with a satisfactory fit shall be altered or removed.

- 3.5 If a test subject exhibits difficulty in breathing during the tests, she or he shall be referred to a physician or other licensed health care professional, as appropriate, to determine whether the test subject can wear a respirator while performing her or his duties.
- 3.6 If the employee finds the fit of the respirator unacceptable, the test subject shall be given the opportunity to select a different respirator and to be retested.

## 4.0 Exercise Regimen

- 4.1 Prior to the commencement of the fit test, the test subject shall be given a description of the fit test and the test subject's responsibilities during the test procedure. The description of the process shall include a description of the test exercises that the subject will be performing. The respirator to be tested shall be worn for at least 5 minutes before the start of the fit test.
- 4.2 The fit test shall be performed while the test subject is wearing any applicable safety equipment that may be worn during actual respirator use and that could interfere with respirator fit.

## 5.0 General Test Exercises

- 5.1 The following test exercises are to be performed for all fit testing methods prescribed in this appendix, except for the CNP method. A separate fit testing exercise regimen is contained in the CNP protocol. The test subject shall perform exercises, in the test environment, in the following manner:
  - 5.1.1 **Normal breathing.** In a normal standing position, without talking, the subject shall breathe normally.
  - 5.1.2 **Deep breathing.** In a normal standing position, the subject shall breathe slowly and deeply, taking caution so as not to hyperventilate.
  - 5.1.3 **Turning head side to side.** Standing in place, the subject shall slowly turn his/her head from side to side between the extreme positions on each side. The head shall be held at each extreme momentarily so the subject can inhale at each side.
  - 5.1.4 **Moving head up and down.** Standing in place, the subject shall slowly move his/her head up and down. The subject shall be instructed to inhale in the up position (i.e., when looking toward the ceiling).
  - 5.1.5 **Talking.** The subject shall talk out loud slowly and loud enough so as to be heard clearly by the test conductor. The subject can read from a prepared text such as the Rainbow Passage, count backward from 100, or recite a memorized poem or song.
  - 5.1.6 **Rainbow Passage.** "When the sunlight strikes raindrops in the air, they act like a prism and form a rainbow. The rainbow is a division of white light into many beautiful colors. These take the shape of a long round arch with its path high above and its two ends apparently beyond the horizon. There is, according to legend, a boiling pot of gold at one end. People look, but no one ever finds it. When a man looks for something beyond reach, his friends say he is looking for the pot of gold at the end of the rainbow."
  - 5.1.7 **Grimace.** The test subject shall grimace by smiling or frowning. (This applies only to QNFT testing; it is not performed for QLFT.)
  - 5.1.8 **Bending over.** The test subject shall bend at the waist as if he/she were to touch his/her toes. Jogging in place shall be substituted for this exercise in those test environments such as shroud type QNFT or QLFT units that do not permit bending over at the waist.
  - 5.1.9 **Normal breathing.** In a normal standing position, without talking, the subject shall breathe normally (this is the same as the first test).
- 5.2 Each test exercise shall be performed for one minute except for the grimace exercise, which shall be performed for 15 seconds.
- 5.3 The test subject shall be questioned by the test conductor regarding the comfort of the respirator upon completion of the protocol. If it has become unacceptable, another model of respirator shall be tried.
- 5.4 The respirator shall not be adjusted once the fit test exercises begin. Any adjustment voids the test and the fit test must be repeated.

## **6.0 Qualitative Fit Test (QLFT) Protocols**

### **6.1 General**

6.1.1 AECOM will ensure that persons administering QLFT are able to calibrate equipment and perform tests properly, recognize invalid tests, and ensure that test equipment is in proper working order.

6.1.2 AECOM will ensure that that QLFT equipment is kept clean and well maintained so as to operate within the parameters for which it was designed.

### **6.2 Irritant Smoke (Stannic Chloride) Protocol**

6.2.1 This qualitative fit test uses a person's response to the irritating chemicals released in the "smoke" produced by a stannic chloride ventilation smoke tube to detect leakage into the respirator.

#### **6.2.2 General Requirements and Precautions:**

- The respirator to be tested shall be equipped with high efficiency particulate air (HEPA) or P100 series filter(s).
- Only stannic chloride smoke tubes shall be used for this protocol.
- No form of test enclosure or hood for the test subject shall be used.
- The smoke can be irritating to the eyes, lungs, and nasal passages. The test conductor shall take precautions to minimize the test subject's exposure to irritant smoke. Sensitivity varies, and certain individuals may respond to a greater degree to irritant smoke. Care shall be taken when performing the sensitivity screening checks that determine whether the test subject can detect irritant smoke to use only the minimum amount of smoke necessary to elicit a response from the test subject.
- The fit test shall be performed in an area with adequate ventilation to prevent exposure of the person conducting the fit test or the build-up of irritant smoke in the general atmosphere.

#### **6.2.3 Sensitivity Screening Check**

The person to be tested must demonstrate his or her ability to detect a weak concentration of the irritant smoke.

- The test operator shall break both ends of a ventilation smoke tube containing stannic chloride and attach one end of the smoke tube to a low flow air pump set to deliver 200 milliliters per minute or to an aspirator squeeze bulb. The test operator shall cover the other end of the smoke tube with a short piece of tubing to prevent potential injury from the jagged end of the smoke tube.
- The test operator shall advise the test subject that the smoke can be irritating to the eyes, lungs, and nasal passages and instruct the subject to keep his/her eyes closed while the test is performed.
- The test subject shall be allowed to smell a weak concentration of the irritant smoke before the respirator is donned to become familiar with its irritating properties and to determine if he/she can detect the irritating properties of the smoke. The test operator shall carefully direct a small amount of the irritant smoke in the test subject's direction to determine that he/she can detect it.

#### **6.2.4 Irritant Smoke Fit Test Procedure**

- The person being fit tested shall don the respirator without assistance, and perform the required user seal check(s).
- The test subject shall be instructed to keep his/her eyes closed.
- The test operator shall direct the stream of irritant smoke from the smoke tube toward the face seal area of the test subject, using the low flow pump or the squeeze bulb. The test operator shall begin at least 12 inches from the face piece and move the smoke stream around the whole perimeter of the mask. The operator shall gradually make two more passes around the perimeter of the mask, moving to within six inches of the respirator.

If the person being tested has not had an involuntary response and/or has not detected the irritant smoke, proceed with the test exercises.

- The General Test Exercises (Section 5.0) shall be performed by the test subject while the respirator seal is being continually challenged by the smoke, directed around the perimeter of the respirator at a distance of six inches.
- If the person being fit tested reports detecting the irritant smoke at any time, the test is failed. The person being retested must repeat the entire sensitivity check and fit test procedure.
- Each test subject passing the irritant smoke test without evidence of a response (involuntary cough, irritation) shall be given a second sensitivity screening check, with the smoke from the same smoke tube used during the fit test, once the respirator has been removed, to determine whether he/she still reacts to the smoke. Failure to evoke a response shall void the fit test.
- If a response is produced during this second sensitivity check, then the fit test is passed.

## **7.0 Quantitative Fit Test (QNFT) Protocols**

### **7.1 General**

- AECOM will confirm that persons administering QNFT are able to calibrate equipment and perform tests properly, recognize invalid tests, calculate fit factors properly, and ensure that test equipment is in proper working order.
- AECOM will ensure that QNFT equipment is kept clean and is maintained and calibrated according to the manufacturer's instructions so as to operate at the parameters for which it was designed.

### **7.2 Ambient Aerosol Condensation Nuclei Counter (CNC) Quantitative Fit Testing Protocol**

7.2.1 The ambient aerosol condensation nuclei counter (CNC) quantitative fit testing (Portacount TM) protocol quantitatively fit tests respirators with the use of a probe. The probed respirator is only used for quantitative fit tests. A probed respirator has a special sampling device installed on the respirator to allow the probe to sample the air from inside the mask. A probed respirator is required for each make, style, model, and size that the employer uses and can be obtained from the respirator manufacturer or distributor. The CNC instrument manufacturer, TSI Inc., also provides probe attachments (TSI sampling adapters) that permit fit testing in an employee's own respirator. A minimum fit factor pass level of at least 100 is necessary for a half-mask respirator, and a minimum fit factor pass level of at least 500 is required for a full face piece negative pressure respirator. The entire screening and testing procedure shall be explained to the test subject prior to the conduct of the screening test.

#### **7.2.2 Portacount Fit Test Requirements**

- Check the respirator to make sure the sampling probe and line are properly attached to the face piece and that the respirator is fitted with a particulate filter capable of preventing significant penetration by the ambient particles used for the fit test (e.g., NIOSH 42 CFR 84 series 100, series 99, or series 95 particulate filter) according to the manufacturer's instructions.
- Instruct the person to be tested to don the respirator for five minutes before the fit test starts. This purges the ambient particles trapped inside the respirator and permits the wearer to make certain the respirator is comfortable. This individual shall already have been trained on how to wear the respirator properly.
- Check the following conditions for the adequacy of the respirator fit: chin properly placed; adequate strap tension, not overly tightened; fit across nose bridge; respirator of proper size to span distance from nose to chin; tendency of the respirator to slip; self-observation in a mirror to evaluate fit and respirator position.
- Have the person wearing the respirator do a user seal check. If leakage is detected, determine the cause. If leakage is from a poorly fitting face piece, try another size of the same model respirator, or another model of respirator.
- Follow the manufacturer's instructions for operating the Portacount and proceed with the test.
- The test subject shall be instructed to perform the exercises in General Test Exercises (Section 5.0).

- After the test exercises, the test subject shall be questioned by the test conductor regarding the comfort of the respirator upon completion of the protocol. If it has become unacceptable, another model of respirator shall be tried.

**7.2.3 Portacount Test Instrument**

- The Portacount will automatically stop and calculate the overall fit factor for the entire set of exercises. The overall fit factor is what counts. The Pass or Fail message will indicate whether or not the test was successful. If the test was a Pass, the fit test is over.
- Since the pass or fail criterion of the Portacount is user programmable, the test operator shall confirm that the pass or fail criterion meet the requirements for minimum respirator performance.
- A record of the test needs to be kept on file, assuming the fit test was successful. The record must contain the test subject's name; overall fit factor; make, model, style, and size of respirator used; and date tested.

## S3NA-519-WI2 User Seal Check Procedures

### 1.0 Requirements

- 1.1 The individual who uses a tight-fitting respirator is to perform a user seal check to confirm that an adequate seal is achieved each time the respirator is put on.
- 1.2 Either the positive and negative pressure checks listed here or the respirator manufacturer's recommended user seal check method shall be used.
- 1.3 User seal checks are not substitutes for qualitative or quantitative fit tests.

### 2.0 Facepiece Positive and/or Negative Pressure Checks

#### 2.1 Positive pressure check

- 2.1.1 Close off the exhalation valve and exhale gently into the facepiece.
- 2.1.2 The face fit is considered satisfactory if a slight positive pressure can be built up inside the facepiece without any evidence of outward leakage of air at the seal.
- 2.1.3 For most respirators, this method of leak testing requires the wearer to first remove the exhalation valve cover before closing off the exhalation valve and then carefully replacing it after the test.

#### 2.2 Negative pressure check

- 2.2.1 Close off the inlet opening of the canister or cartridge(s) by covering with the palm of the hand(s) or by replacing the filter seal(s), inhale gently so that the facepiece collapses slightly, and hold your breath for 10 seconds.
- 2.2.2 The design of the inlet opening of some cartridges cannot be effectively covered with the palm of the hand.
- 2.2.3 The test can be performed by covering the inlet opening of the cartridge with a thin latex or nitrile glove.
- 2.2.4 If the facepiece remains in its slightly collapsed condition and no inward leakage of air is detected, the tightness of the respirator is considered satisfactory.

### 3.0 Manufacturer's Recommended User Seal Check Procedures

- 3.1 The respirator manufacturer's recommended procedures for performing a user seal check may be used instead of the positive and/or negative pressure check procedures, provided that the employer demonstrates that the manufacturer's procedures are equally effective.

## **S3NA-519-WI3 Respirator Cleaning Procedures**

### **1.0 Requirements**

- 1.1 These procedures are general in nature. The cleaning recommendations provided by the manufacturer may be used for the respirators used by their employees, provided such procedures are as effective as those listed here.
- 1.2 Equivalent effectiveness simply means that the procedures used must accomplish the objectives set forth (i.e., confirm that the respirator is properly cleaned and disinfected in a manner that prevents damage to the respirator and does not cause harm to the user).

### **2.0 Procedures for Cleaning Respirators**

- 2.1 Remove filters, cartridges, or canisters. Disassemble facepieces by removing speaking diaphragms, demand and pressure-demand valve assemblies, hoses, or any components recommended by the manufacturer. Discard or repair any defective parts.
- 2.2 Wash components in warm (43°C [110°F] maximum) water with a mild detergent or with a cleaner recommended by the manufacturer. A stiff bristle (not wire) brush may be used to facilitate the removal of dirt.
- 2.3 Rinse components thoroughly in clean, warm (43°C [110°F] maximum), preferably running water. Drain.
- 2.4 When the cleaner used does not contain a disinfecting agent, respirator components should be immersed for two minutes in one of the following:
  - Hypochlorite solution (50 ppm of chlorine) made by adding approximately one milliliter of laundry bleach to one liter of water at 43°C (110°F); or,
  - Aqueous solution of iodine (50 ppm iodine) made by adding approximately 0.8 milliliters of tincture of iodine (6-8 grams ammonium and/or potassium iodide/100 cc of 45% alcohol) to one liter of water at 43°C (110°F); or,
  - Other commercially available cleansers of equivalent disinfectant quality when used as directed, if their use is recommended or approved by the respirator manufacturer.
- 2.5 Rinse components thoroughly in clean, warm (43°C [110°F] maximum), preferably running water. Drain. The importance of thorough rinsing cannot be overemphasized. Detergents or disinfectants that dry on facepieces may result in dermatitis. In addition, some disinfectants may cause deterioration of rubber or corrosion of metal parts if not completely removed.
- 2.6 Components should be hand dried with a clean, lint-free cloth or air-dried.
- 2.7 Reassemble facepiece, replacing filters, cartridges, and canisters where necessary.
- 2.8 Test the respirator to ensure that all components work properly.
- 2.9 After the fit test, wipe down the respirator with a sanitary swab.

## **Attachment F**

### **Sanitation Plan**



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## **SANITATION PLAN**

### **INTRODUCTION**

AECOM personnel will strive to maintain the workplace in sanitary condition to eliminate the health hazard posed by unsanitary conditions.

### **DRINKING WATER**

AECOM shall provide an adequate supply of potable drinking water for their personnel. Portable containers used to dispense drinking water shall be capable of being tightly closed and equipped with a drain faucet. Water shall not be dipped from containers. The water container shall be labeled "Drinking Water". A common drinking cup is prohibited. Where disposable cups are supplied, both a sanitary container for the unused cups and a receptacle for disposing of the used cups will be provided.

#### **Nonpotable Water**

Outlets dispensing nonpotable water will be conspicuously posted "CAUTION - WATER UNSAFE FOR DRINKING, WASHING, OR COOKING."

Cross-connection - open or potential - between a system furnishing potable water and a system furnishing nonpotable water is prohibited.

### **TOILETS**

AECOM shall provide toilet facilities for their personnel. The minimal number of toilets and urinals shall comply with EM 385-1-1 Section 2.E. AECOM will make arrangements to have the facilities pumped and cleaned weekly or more frequently based on usage. Toilet facility will be designated for both male and female personnel and label as such.

Enclosed temporary/ portable toilet facilities which contain a toilet seat and urinal will be provided on the project site. The facilities are constructed to protect personnel from the weather and falling objects and are equipped a self closing door capable of being latched.

Exceptions to this requirement will apply to mobile crews where work activities and locations permit transportation to nearby toilet facilities.

### **WASHING FACILITIES**

Hand washing facilities such as a portable sink or hand sanitizer will be provided at toilet facilities. Where hand washing facilities are provided they will be maintained in sanitary condition and provided with water, soap and means of drying. The washing facilities at nearby buildings will be used for persons to wash where harmful substances are used.

## **FOOD SERVICE OPERATIONS**

As part of the project no food service operations will be conducted. Personnel who obtain food from an off-site location (home) will be provided with a clean and safe place to consume their meal/take a break. No food or beverage will be consumed or stored in a toilet room or in any area where hazardous materials may be present.

## **WASTE DISPOSAL**

An adequate number of waste receptacles will be provided in the break area for food scrapes and litter. These receptacles will have a tight-fitting cover and emptied at least daily.

## **VERMIN CONTROL**

Vermin control on this project is the responsibility of the bases. If vermin control is need the facility will be contacted.

## **Attachment G**

### **Alcohol and Drug Abuse Policy**

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# AECOM Technology Corporation Employee Handbook

AECOM Core Value: Employees

Revision Date: October 2013



## Drug-Free Workplace

AECOM is committed to providing a safe and healthy workplace for all employees. Consistent with this commitment and in keeping with the federal Drug-Free Workplace Act of 1988, it is the policy of AECOM to maintain a drug-free workplace.

### Key provisions

AECOM policy prohibits employees from being under the influence of alcohol or drugs or improperly using medication in any way that could diminish, or raise questions concerning, an employee's ability to perform at his or her best while performing services for or on behalf of AECOM. Employees who are under the influence of alcohol or any controlled substance have the potential for interfering with their own and their coworkers' safe and efficient job performance. Compliance with this policy is considered a condition of employment.

This policy also prohibits the sale, possession, manufacturing and/or distribution of illegal drugs, and/or other controlled substances in the workplace or while on company business off premises. Violations of this policy will be considered to be gross and willful misconduct and will result in disciplinary action, up to and including termination. Any illegal substances discovered in the workplace will be turned over to the appropriate law enforcement agency and may result in criminal prosecution.

### Company-sponsored events

It is understood that employees may at times attend company-sponsored events where alcohol is served. While consuming alcohol on such occasions is not prohibited, employees are expected to exercise proper judgment and must observe professional, legal and common-sense guidelines at all times.

Prior approval from management and Human Resources is required for any on-site AECOM-sponsored event where alcohol is served. In addition, such events must comply with the following conditions:

- Employees should not be expected to return to work after attending the event.
- Transportation arrangements will be provided for employees who need such assistance.

### Testing for drugs and alcohol

Drug and/or alcohol screening may be required:

- Of any applicant to whom a job offer has been made.
- Of any employee where there is reason to believe that he or she may be using illegal or non-prescribed drugs or may be under the influence of drugs and alcohol. "Reason to believe" includes an injury or accident at work where there is reason to believe that employee impairment may have been a factor. "Reason to believe" may be based on objective symptoms such as the employee's appearance, behavior or speech.
- As part of occasional follow-up testing if the employee is found to have breached these policies but has been permitted to remain employed.
- As required by client contract, project, or if an employee is employed in a safety-sensitive position. Under these limited circumstances, employees may also be subjected to pre-employment and random drug screening.

An employee's cooperation with such drug or alcohol screening tests is required as a condition of employment. The employee's refusal to cooperate with such a request and to provide a specimen may result in termination where there is reason to believe that the employee has violated this policy and the employee's refusal to cooperate has prevented a medical determination of his or her condition. Any violation of this policy may result in immediate termination.

Employees who take the initiative of advising their supervisor or Human Resources in advance that they have a medical problem with regard to alcohol or drug use, and who demonstrate a commitment to take the necessary remedial action, may be eligible for a medical leave of absence for such purpose and may not be subjected to disciplinary action.

As part of the disciplinary process and, at its sole discretion, AECOM may require employees who violate this policy to successfully complete a drug abuse assistance or rehabilitation program as a condition of continued employment.

Persons whose positions with AECOM require driving as part of their work may be removed from such positions and/or subject to termination if found to have been driving under the influence of alcohol or controlled substances whether on or off-duty.

**Drug conviction**

An employee who has been convicted of a felony under a criminal drug statute for a violation occurring on company property or during the employee's working hours must notify Human Resources no later than five (5) calendar days after the felony conviction becomes final under the law.

[Return to Contents](#)



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## **Attachment H**

### **Cold Stress Prevention Plan and Heat Stress Prevention Plan**

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## S3NA-511-PR Heat Stress

### 1.0 Purpose and Scope

- 1.1 Establishes a heat stress prevention program to help ensure that employees know and recognize the symptoms of heat stress-related illnesses and are prepared to take appropriate corrective action.
- 1.2 This procedure applies to all AECOM North America-based employees and operations.

### 2.0 Terms and Definitions

- 2.1 **Acclimated:** Workers who have developed physiological adaptation to hot environments characterized by increased sweating efficiency, circulation stability, and tolerance of high temperatures without stress. Acclimatization occurs after 7 to 10 consecutive days of exposure to heat and much of its benefit may be lost if exposure to hot environments is discontinued for a week.
- 2.2 **Chemical Protective Clothing (CPC):** Apparel that is constructed of relatively impermeable materials intended to act as a barrier to physical contact of the worker with potentially hazardous materials in the workplace. Such materials include: Tyvek® coveralls (all types) and polyvinyl chloride (PVC) coveralls and rain suits.
- 2.3 **Unacclimated:** Workers who have not been exposed to hot work conditions for one week or more or who have become heat-intolerant due to illness or other reasons.
- 2.4 **Heat Cramps:** A form of heat stress brought on by profuse sweating and the resultant loss of salt from the body.
- 2.5 **Heat Exhaustion:** A form of heat stress brought about by the pooling of blood in the vessels of the skin and in the extremities.
- 2.6 **Heat Rash:** A heat-induced condition characterized by a red, bumpy rash with severe itching.
- 2.7 **Heat Stress:** The combination of environmental and physical work factors that constitute the total heat load imposed on the body.
- 2.8 **Heat Stroke:** The most serious form of heat stress, which involves a profound disturbance of the body's heat-regulating mechanism.
- 2.9 **Sunburn:** Is caused by unprotected exposure to ultraviolet light that is damaging to the skin. The injury is characterized by red painful skin, blisters, and/or peeling.

### 3.0 Attachments

- 3.1 S3NA-511-FM Heat Stress Monitoring Log
- 3.2 S3NA-511-WI1 Temperature Thresholds
- 3.3 S3NA-511-WI2 Symptoms and Treatment
- 3.4 S3NA-511-ST Heat Exposure

### 4.0 Procedures

#### 4.1 Restrictions

- 4.1.1 Staff working in extreme heat or sun for extended periods of time away from a shelter or vehicle must not work alone.
- 4.1.2 Staff shall not be exposed to levels that exceed those listed in the screening criteria for heat stress exposure in the heat stress and strain section of the ACGIH Standard.
- 4.1.3 Clothing corrections shall be applied in accordance with the heat stress and strain section of the ACGIH Standard.

## 4.2 Roles and Responsibilities

### 4.2.1 Project Managers'/field task managers' responsibilities:

- Evaluate the need for heat stress prevention measures and incorporate as appropriate into the Health and Safety Plan.
- Implement heat stress prevention measures, as applicable, at each work site.
- Develop/coordinate a work-rest schedule, as applicable.
- Ensure heat stress hazard assessments/evaluations were completed for the planned activities.
- Assign personnel physically capable of performing the assigned tasks.
- Ensure that personnel are properly trained in the recognition of heat stress-related symptoms.

### 4.2.2 Region SH&E Managers' responsibilities:

- Provide heat stress awareness training.
- Assist project teams develop appropriate work-rest schedules.
- Conduct/support incident investigations related to potential heat stress-related illnesses.

### 4.2.3 Site Supervisors' responsibilities:

- Identify those tasks that may be most impacted by heat stress and communicate the hazard to the assigned employees.
- Ensure that employees have been trained on the recognition of heat stress-related illness.
- Ensure that adequate supplies of appropriate fluids are readily available to employees.
- Ensure that a proper rest area is available.
- Conduct heat stress monitoring, as applicable.
- Implement the work-rest schedule.
- Ensure that first aid measures are implemented once heat stress symptoms are identified.
- Ensure personnel are physically capable of performing the assigned tasks and are not in a physically compromised condition.
- Report all suspected heat stress-related illnesses.

### 4.2.4 Employees' responsibilities:

- Observe each other for the early symptoms of heat stress-related illnesses.
- Maintain an adequate intake of available fluids.
- Be familiar with heat stress hazards, predisposing factors, and preventative measures.
- Report to work in a properly rested and hydrated condition.
- Report all suspected heat stress-related illnesses.

## 4.3 Controls

### 4.3.1 If staff are or may be exposed, the supervisor shall:

- Conduct a heat stress assessment to determine the potential for hazardous exposure of workers, and
- Develop and implement a heat stress exposure control plan.

### 4.3.2 If staff are or may be exposed, the supervisor shall implement engineering controls (e.g., shelters, cooling devices, etc.) to reduce the exposure of staff to levels below those listed in the screening criteria for heat stress exposure in the heat stress and strain section of the ACGIH Standard.

### 4.3.3 If engineering controls are not practicable, the supervisor shall reduce the exposure of workers to levels below those listed in the screening criteria for heat stress exposure in the heat stress and strain section of the ACGIH Standard by providing administrative controls, including a work-rest cycle or personal protective equipment, if the equipment provides protection equally effective as administrative controls.

### 4.3.4 If staff are or may be exposed, the supervisor shall provide and maintain an adequate supply of cool, potable water close to the work area for the use of a heat exposed worker.

### 4.3.5 If a staff person shows signs or reports symptoms of heat stress or strain, they shall be removed from the hot environment and treated by an appropriate first aid attendant, if available, or by a physician.

4.3.6 Heat stress can be a significant field site hazard, especially for workers wearing CPC. The workforce will gradually work up to a full workload under potentially stressful conditions to allow for proper acclimation.

4.3.7 Site personnel shall be instructed in the recognition of heat stress symptoms, the first aid treatment procedures for severe heat stress, and the prevention of heat stress injuries. Workers must be encouraged to immediately report any heat stress that they may experience or observe in fellow workers. Supervisors must use such information to adjust the work-rest schedule to accommodate such problems.

4.3.8 Wherever possible, a designated break area should be established in an air conditioned space, or in shaded areas where air conditioning is impractical. The break area should be equipped to allow workers to loosen or remove protective clothing, and sufficient seating should be available for all personnel. During breaks, workers must be encouraged to drink plenty of water or other liquids, even if not thirsty, to replace lost fluids and to help cool off. Cool water should be available at all times in the break area, and in the work area itself unless hygiene/chemical exposure issues prevent it.

#### 4.4 Symptoms and Treatment

4.4.1 Workers who exhibit ANY signs of significant heat stress (e.g., profuse sweating, confusion and irritability, pale, clammy skin), shall be relieved of all duties at once, made to rest in a cool location, and provided with large amounts of cool water.

4.4.2 Anyone exhibiting symptoms of heat stroke (red, dry skin, or unconsciousness) must be taken immediately to the nearest medical facility, taking steps to cool the person during transportation (clothing removal, wet the skin, air conditioning, etc.).

4.4.3 Severe heat stress (heat stroke) is a life-threatening condition that must be treated by a competent medical authority.

#### 4.5 Prevention

4.5.1 All staff working in extreme heat or sun should understand the following guidelines for preventing and detecting heat exhaustion and heat stroke.

- If you experience heat exhaustion or heat stroke you must immediately seek shelter and water.
- Take frequent short breaks in areas sheltered from direct sunlight; eat and drink small amounts frequently.
- Try to schedule work for the coolest part of the day, early morning and evening.

4.5.2 Prevention of heat-related illnesses:

- Avoid strenuous physical activity outdoors during the hottest part of the day.
- Wear a hat and light-colored, loose-fitting clothing to reflect the sun.
- Avoid sudden changes of temperature. Air out a hot vehicle before getting into it.
- If you take diuretics, ask your doctor about taking a lower dose during hot weather.
- Drink 8 to 10 glasses of water per day. Drink even more if you are working or exercising in hot weather.
- Avoid caffeine and alcohol as they increase dehydration.
- If you exercise strenuously in hot weather, drink more liquid than your thirst seems to require.

#### 4.6 Personal Protective Equipment

- Wear a hat and light-colored, loose-fitting clothing to reflect the sun.
- Apply sunscreen to exposed skin (SPF 30 or greater, follow directions on label).
- Wear sunglasses with UV protection.
- Pack extra water to avoid dehydration (try freezing water in bottles overnight to help keep the water cooler for longer during the day).

#### 4.7 Work-Rest Schedule Practices

- Intake of fluid will be increased beyond that which satisfies thirst, and it is important to avoid "fluid debt," which will not be made up as long as the individual is sweating.
- Two 8-ounce glasses of water should be taken prior to beginning work, then up to 32 oz. per hour during the work shift; fluid replacement at frequent intervals is most effective.

The best fluid to drink is water; liquids like coffee or soda do not provide efficient hydration and may increase loss of water.

- If commercial electrolyte drinks (e.g., Gatorade) are used, the drink should be diluted with water, or 8 ounces of water should be taken with each 8 ounces of electrolyte beverage.
- Additional salt is usually not needed and salt tablets should not be taken.
- Replacement fluids should be cool, but not cold.
- Breaks will be taken in a cool, shaded location, and any impermeable clothing should be opened or removed.
- Dry clothing or towels will be available to minimize chills when taking breaks.
- Manual labor will not be performed during breaks, other than paperwork or similar light tasks.
- Other controls that may be used include:
  - Scheduling work at night or during the cooler parts of the day (6 am–10 am, 3 pm–7 pm).
  - Erecting a cover or partition to shade the work area.
  - Wearing cooling devices such as vortex tubes or cooling vests beneath protective garments. If cooling devices are worn, only physiological monitoring will be used to determine work activity.

#### 4.8 **Evaluating the Work-Rest Schedule's Effectiveness**

4.8.1 Once a work-rest schedule is established, the work supervisor must continually evaluate its effectiveness through observation of workers for signs/symptoms of heart stress. Measurement of each worker's vitals (e.g., pulse, blood pressure, and temperature) can provide additional information in determining if the schedule is adequate, and is accomplished as follows:

4.8.2 At the start of the workday each worker's baseline pulse rate (in beats per minute – bpm) is determined by taking a pulse count for 15 seconds and multiplying the result by four or an automated pulse count device may be utilized. Worker pulse rates can then be measured at the beginning and end of each break period to determine if the rest period allows adequate cooling by applying the following criteria:

- Each worker's maximum heart rate at the start of any break should be less than [180 minus worker's age] bpm. If this value is exceeded for any worker, the duration of the following work period will be decreased by at least 10 minutes.
- At the end of each work period all workers' heart rates must have returned to within +10% of the baseline pulse rate. If any worker's pulse rate exceeds this value the break period will be extended for at least 5 minutes, at the end of which pulse rates will be remeasured and the end-of-break criteria again applied.

4.8.3 Use a clinical thermometer or similar device to measure the oral/ear temperature at the beginning (before drinking liquids) and end of each break period and apply the following criteria:

- If the oral temperature exceeds 99.6°F, shorten the next work cycle by one-third without changing the rest period.
- If the oral temperature still exceeds 99.6°F (36.6°C) at the beginning of the next rest period, shorten the following work cycle by one-third.

4.8.4 Use of an automated or similar blood pressure device will be used to assess each employee's blood pressure at the beginning and end of each break period to determine if the rest period allows adequate cooling by applying the following criteria:

- If the blood pressure of an employee is outside of 90/60 to 150/90, then the employee will not be allowed to begin or resume work; extend the break period by at least five minutes, at the end of which blood pressure rates will be remeasured and the end-of-break criteria again applied.

4.8.5 All physiological monitoring of heat stress will be documented using *S3NA-511-FM Heat/Cold Stress Monitoring Log*.

#### 4.9 **Training**

4.9.1 Project staff and their supervisors that may be exposed to the hazard will be oriented to the hazard and the controls prior to work commencing.

4.9.2 Those personnel potentially exposed to heat stress will receive training including, but not limited to

- Sources of heat stress, influence of protective clothing, and importance of acclimatization.

- How the body handles heat.
- Recognition of heat-related illness symptoms.
- Preventative/corrective measures.
  - Employees will be informed of the harmful effects of excessive alcohol consumption in the prevention of heat stress.
  - All employees will be informed of the importance of adequate rest and proper diet in the prevention of heat stress.
- First aid procedures for heat stress-related illnesses.

## **5.0 Records**

5.1 None

## **6.0 References**

- 6.1 S3NA-003-PR SH&E Training
- 6.2 S3NA-208-PR Personal Protective Equipment
- 6.3 S3NA-314-PR Working Alone and Remote Travel



## ■-511-FM Heat Stress Monitoring Log

The purpose of this form is to track entry into hot zones wearing chemically protective clothing and monitor employees for heat stress-related illness. It is the responsibility of the foreman or supervisor-in-charge to ensure that each person entering the hot zone completes the required information. Vital signs must be taken by a competent person.

Project Name:		Foreman/Supervisor:		Work/Rest Schedule <sup>1</sup> :											
Date:	Water Provided <sup>2</sup>	Acclimated <sup>3</sup>		Initial Vitals <sup>3</sup>	Vital Signs and Time In/Out <sup>4</sup>						IN (min)		OUT (min)		
		Yes	No		Vitals	In	Out	Vitals	In	Out	Vitals	In	Out		
Employee Name	Yes	No		Vitals	In	Out	Vitals	In	Out	Vitals	In	Out	Vitals	In	Out
				P			P			P			P		
				BP			BP			BP			BP		
				Temp			Temp			Temp			Temp		
				P			P			P			P		
				BP			BP			BP			BP		
				Temp			Temp			Temp			Temp		
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				BP			BP			BP			BP		
				Temp			Temp			Temp			Temp		

1. Please refer to S3NA-511-PR, Heat Stress. Section 6.3 provides specific details on how to develop a work-rest schedule.

2. Each employee should be provided a sufficient amount of water or sports drink before entering the hot zone. Drinks such as coffee and cola should be discouraged.

3. A worker is "acclimated" if he/she has worked in a hot environment for at least 7 to 10 consecutive days. If a worker is acclimated, check "Yes." If a worker is not acclimated, check "No" and reduce the "Min In" by 50 percent for that employee until the 7 - to 10-day period is reached.

4. "Vitals" refers to employee vital signs (e.g., pulse [P], blood pressure [BP], body temperature [Temp], etc.). Initial vitals must be taken and recorded before the start of work operations in the hot zone. Each time the employee exits the hot zone, vitals must be taken and evaluated for heat stress criteria. Section 6.4 of S3NA-511-PR, Heat Stress provides specific instructions for taking and evaluating employee vital signs.

5. Body temperature vital signs will be recorded in °F.

## S3NA-511-WI1 Temperature Thresholds

### 1.0 Work-Rest Schedule

The prevention of heat stress is best performed through supervisor observation of employees and routine heat stress awareness training activities. However, it is also necessary to implement a work routine that incorporates adequate rest periods to allow workers to remove protective clothing, drink fluids (vital when extreme sweating is occurring), rest and recover. The frequency and length of work breaks must be determined by the work supervisor based upon the ambient temperature, amount of sunshine, humidity, the amount of physical labor being performed, the physical condition of the workers (e.g., acclimated/not), and protective clothing being used.

#### 1.1 Establishing a Work-Rest Schedule

##### 1.1.1 AECOM permits the use of either of two techniques to initially determine an appropriate daily work-rest schedule. These methods are:

- Wet Bulb Globe Thermometer (WBGT) Method: This method is preferred, if a WBGT meter is available.
- Adjusted Temperature Method: This method should be used only if WBGT data is not available.

##### 1.1.2 Either procedure will provide the work supervisor with a recommended routine; however, adjustments to this routine may be required to accommodate the specific daily conditions at the work site.

#### 1.2 WBGT Work-Rest Schedule Guidelines

##### 1.2.1 Table 1, the Non-CPC Activities WBGT Chart, is intended for use where personnel are not utilizing CPC. Where workers are required to utilize CPC, Table 2, the CPC Activities WBGT Chart, will be used.

##### 1.2.2 WBGT readings are compared directly with the values the applicable WBGT Chart for the applicable work rate (where light work corresponds to minimal physical activity besides standing/watching; very heavy work corresponds to significant, continuous physical labor) to determine the work-rest frequency.

Table 1. Non-CPC Activities WBGT Chart

Work-Rest Regimen	WBGT			
	Light Work	Moderate Work	Heavy Work	Very Heavy Work
Continuous Work	85°F (29.4°C)	81°F (27.2°C)	78°F (25.6°C)	
75% Work – 25% Rest	86°F (30°C)	83°F (28.3°C)	81°F (27.2°C)	
50% Work – 50% Rest	88°F (31.1°C)	85°F (29.4°C)	83°F (28.3°C)	81°F (27.2°C)
25% Work – 75% Rest	90°F (32.2°C)	87°F (30.6°C)	86°F (30°C)	85°F (29.4°C)

Modified from ACGIH's 2002 *Threshold Limit Values for Chemical Substances and Physical Agents*, for acclimatized workers

Table 2. CPC Activities WBGT chart

Work-Rest Regimen	WBGT			
	Light Work	Moderate Work	Heavy Work	Very Heavy Work
Continuous Work	74°F (23.3°C)	70°F (21.1°C)	67°F (19.4°C)	
75% Work – 25% Rest	75°F (23.9°C)	72°F (22.2°C)	70°F (21.1°C)	

50% Work – 50% Rest	77°F (25°C)	74°F (23.3°C)	72°F (22.2°C)	70°F (21.1°C)
25% Work – 75% Rest	79°F (26.1°C)	76°F (24.4°C)	75°F (23.9°C)	74°F (23.3°C)

Modified from ACGIH's 2002 *Threshold Limit Values for Chemical Substances and Physical Agents*, for acclimatized workers

### 1.3 Adjusted Temperature Work-Rest Schedule Guidelines

This method can be utilized where WBGT data is not available, and requires only that the ambient temperature be known. Adjustment factors are applied to the ambient temperature to account for departures from ideal conditions (sunny conditions, light winds, moderate humidity and a fully acclimated work force). The adjustments will be made by addition or subtraction to the ambient temperature reading, or changes in table position, as indicated in Table 3. Adjustments are independent and cumulative, all applicable adjustments should be applied. The result is the Adjusted Temperature, which can be compared with the values in Table 4 for the applicable work rate (where light work corresponds to minimal physical activity besides standing/watching; very heavy work corresponds to significant, continuous physical labor) to determine the work-rest schedule.

**Table 3. Temperature Adjustment Factors**

Time of Day	
Before daily temperature peak <sup>1</sup>	+2°F (+1.11°C)
10 am – 2 pm (peak sunshine)	+2°F (+1.11°C)
Sunshine	
No clouds	+1°F (+0.56°C)
Partly Cloudy (3/8 – 5/8 cloud cover)	-3°F (-1.67°C)
Mostly Cloudy (5/8 – 7/8 cloud cover)	-5°F (-2.78°C)
Cloudy (>7/8 cloud cover)	-7°F (-3.89°C)
Indoor or nighttime work	-7°F (-3.89°C)
Wind (ignore if indoors or wearing CPC)	
Gusts greater than 5 miles per hour at least once per minute	-1°F (-0.56°C)
Gusts greater than 10 miles per hour at least once per minute	+2°F (+1.11°C)
Sustained greater than 5 miles per hour	-3°F (-1.67°C)
Sustained greater than 10 miles per hour	-5°F (-2.78°C)
Humidity (ignore if wearing CPC)	
Relative Humidity greater than 90%	+5°F (+2.78°C)
Relative Humidity greater than 80%	+2°F (+1.11°C)
Relative Humidity less than 50%	-4°F (-2.23°C)
Chemical Protective Clothing (CPC)	
Modified Level D (coveralls, no respirator)	+5°F (+2.78°C)
Level C (coveralls w/o hood, full-face respirator)	+8°F (+4.45°C)
Level C (coveralls with hood, full-face respirator)	+10°F (+5°C)
Level B with airline system	+9°F (+5.56°C)
Level B with SCBA	+9°F (+5.56°C) and right one column <sup>2</sup>
Level A	+14°F (+7.78°C) and right one column <sup>2</sup>
Other	Specified in the HASP
Miscellaneous	

<sup>1</sup> This adjustment accounts for temperature rise during the day. If the temperature has already reached its daytime peak it can be ignored.

<sup>2</sup> Locate the proper column based on work rate, then move one column to the right (next higher work rate) before locating the corresponding adjusted temperature.

Unacclimated work force	+5°F (+2.78°C)
Partially acclimated work force	+2°F (+1.11°C)
Working in shade	-3°F (-1.67°C)
Breaks taken in air conditioned space	-3°F (-1.67°C)

**Table 4. Work-Rest Schedule Based on Adjusted Temperature**

Work-Rest Regimen	Adjusted Temperature			
	Light Work	Moderate Work	Heavy Work	Very Heavy Work
No specified requirements	< 80°F (22.67°C)	< 75 (23.88°C)	< 70 (21.11°C)	< 65 (18.33°C)
15 minute break every 90 minutes of work	80°F – 90°F (22.67°C) - (32.22°C)	75 – 85 (23.88°C) - (29.44°C)	70 – 80 (21.11°C) - (22.67°C)	65 – 75 (37.77°C) - (23.88°C)
15 minute break every 60 minutes of work	>90 – 100 (32.22°C) - (37.77°C)	> 85 – 95 (23.88°C) - (35°C)	>80 – 85 (22.67°C) - (23.88°C)	>75 – 80 (23.88°C) - (22.67°C)
15 minute break every 45 minutes of work	>100 – 110 (37.77°C) - (43.33°C)	>95 – 100 (35°C) - (37.77°C)	>85 – 90 (23.88°C) - (32.22°C)	>80 – 85 (22.67°C) - (23.88°C)
15 minute break every 30 minutes of work	>110 – 115 (43.33°C) - (46.11°C)	>100 – 105 (37.77°C) - (40.55°C)	>90 – 95 (32.22°C) - (35°C)	>85 – 90 (23.88°C) - (32.22°C)
15 minute break every 15 minutes of work	>115 – 120 (46.11°C) - (48.88°C)	>105 – 110 (40.55°C) - (43.33°C)	>95 -100 (35°C) - (37.77°C)	>90 – 95 (32.22°C) - (35°C)
<b>Stop Work</b>	<b>&gt;120</b> (48.88°C)	<b>&gt;110</b> (43.33°C)	<b>&gt;100</b> (37.77°C)	<b>&gt;95</b> (35°C)

Note: Time spent performing decontamination or donning/doffing CPC should not be included in calculating work or break time lengths.

## **S3NA-511-WI2 Symptoms and Treatment**

### **1.0 Heat Stress-related Illness Symptoms**

1.1 There are three stages of heat-related illness:

1.1.1 Heat Cramps

- Heat cramps are painful muscle cramps caused by over-exertion in extreme heat.
  - Muscle spasms, and
  - Pain in the hands, feet, and abdomen

1.1.2 Heat Exhaustion

- Heat exhaustion is the next stage. Symptoms include:
  - Cool, moist, pale, flushed or red skin
  - Heavy sweating
  - Headache
  - Nausea or vomiting
  - Dizziness, and
  - Exhaustion.
- Mood changes (irritable, or confused/can't think straight)
- Pale, cool, moist skin
- Heavy sweating
- Dizziness
- Nausea
- Fainting

1.1.3 Heat Stroke

- Heat stroke. Heat exhaustion can sometimes lead to heat stroke, which can be fatal and requires emergency treatment. Heat stroke happens when you stop sweating and your body temperature continues to rise, often to 105° F (40.5° C) or higher. Symptoms of heat stroke:
  - Vomiting
  - Decreased alertness level or complete loss of consciousness
  - High body temperature (sometimes as high as 105° F (40.5° C) )
  - Skin may still be moist or the victim may stop sweating and the skin may be red, hot, and dry
  - Rapid, weak pulse, and
  - Rapid, shallow breathing.
- Red, hot, usually dry skin
- Lack of or reduced perspiration
- Nausea
- Dizziness and confusion
- Strong rapid pulse
- Coma

### **2.0 Recommended Treatment for Heat Stress-related Illnesses**

2.1 Heat Cramps

2.1.1 Treatment:

- Gently stretch the cramped muscle and hold the stretch for about 20 seconds, then gently massage the muscle. Repeat these steps if necessary.
- Take more frequent breaks and drink more water.
- Move victim to a cool place.
- Administer drinks of cool water.

Apply manual pressure to cramped muscles.

- Seek medical attention if symptoms are not alleviated or if more serious problems are indicated.

#### 2.1.2 Heat Exhaustion

- Treatment of heat exhaustion:
  - Get out of the sun to a cool location and drink lots of water, a little at a time.
  - Remove or loosen tight clothing.
  - If you are nauseated or dizzy, lie down.
- Move the victim to a cool place.
- Remove as much clothing as possible and elevate the feet.
- Administer drinks of cool water and fan to cool.
- Seek medical attention immediately.

#### 2.1.3 Heat Stroke

- Treatment of heat stroke, or if a person's temperature exceeds 102° F (38.9 ° C) :
- Call for immediate medical help and then try to lower the temperature as quickly as possible:
  - Apply cool (not cold) water the person's whole body, then fan the person.
  - Stop cooling once the person's temperature appears to be down; be careful not to overcool.
  - Do not give aspirin or acetaminophen to reduce the temperature.
- Treat as a true medical emergency. Seek medical help immediately
- Reduce body temperature quickly
- Douse with cool water (not cold water)
- Wrap in wet sheet
- If available, use cold packs under arms, neck, and ankles
- Protect from injury during convulsion
- Ensure that the person's airway is open.
- Transfer to a medical facility immediately.

## S3NA-511-ST Heat Exposure

The following Occupational Health and Safety regulations apply directly to heat stress hazards:

Jurisdiction		Regulation
<b>United States</b>		
<b>OSHA</b>		1910.132
<b>Canada</b>		
<b>Alberta</b>		n/a
<b>British Columbia</b>		OHS Regulation (1997) Sect 7.28 – 7.32, 8.21, 12.72, 12.73
<b>Manitoba</b>		Workplace Health and Safety Regulation (217/2006) Sect 4.12, 4.13
<b>New Brunswick</b>		OHS Regulation (91-191) Sect 44
<b>Newfoundland/Labrador</b>		OHS Regulation (C.N.L.R. 1165/96) Sect 10
<b>Nova Scotia</b>		n/a
<b>NWT/NU Territories</b>		n/a
<b>Ontario</b>		O. Reg. 213/91 Sect 112 O. Reg. 851 Sect 129 Heat Stress (Health and Safety Guidelines) (April 2003)
<b>Prince Edward Island</b>		OHS Regulations (EC180/87) Sect 42.1
<b>Quebec</b>		OHS Regulation (R.R.Q., c. S-2.1, r.19.01 O.C. 885-2001) Sect 121 – 124, Schedule 4, Schedule 5
<b>Saskatchewan</b>		OHS Regulation (R.R.S., c. O-1, r. 1) Sect 70
<b>Yukon Territory</b>		Occupational Health Regulations (O.I.C. 1986/164) Sect 9, 12

## S3NA-505-PR Cold Stress Prevention

### 1.0 Purpose and Scope

- 1.1 To protect workers from the severest effects of cold stress (hypothermia) and cold injury and to identify exposures to cold working conditions under which it is believed nearly all workers can be repeatedly exposed without adverse health effects.
- 1.2 This procedure applies to all AECOM North America-based employees and operations.

### 2.0 Terms and Definitions

- 2.1 **Cold Stress:** The production of physiological effects due to cold temperatures and/or wind chill.
- 2.2 **Equivalent Chill Temperature (ECT):** Also known as Wind Chill (see below)
- 2.3 **Frostnip:** Superficial cooling of tissues without cellular destruction.
- 2.4 **Frostbite:** Freezing of tissue, resulting in tissue destruction.
- 2.5 **Hypothermia:** Condition of reduced core body temperature to 95°F (35°C) resulting in loss of dexterity, loss of mental alertness, collapse, and possible death.
- 2.6 **Wind Chill:** The combined effect of air temperature and wind. Also expressed as "equivalent chill temperature" (ECT), wind chill is defined as heat loss resulting from the effects of air temperature and wind velocity upon exposed skin.

### 3.0 Attachments

- 3.1 S3NA-505-WI1 Temperature Thresholds
- 3.2 S3NA-505-WI2 Symptoms and Treatment
- 3.3 S3NA-505-ST Cold Exposure

### 4.0 Procedure

#### 4.1 Restrictions

- 4.1.1 Staff working in extreme cold (wind chill or ECT below 10°F or -12°C) shall not work alone.
- 4.1.2 All staff working in extreme cold or snow conditions should understand the following guidelines for preventing and detecting hypothermia and frost bite.
  - If you experience frost bite or hypothermia, find shelter and warmth and contact a medical practitioner if symptoms persist.
  - Take frequent short breaks in warm dry shelters to allow your body to warm up. Limit time of exposure.
  - Schedule work for the warmest part of the day or when the wind is most calm.
  - Avoid exhaustion or fatigue because energy is needed to keep muscles warm.
  - Because prolonged exposure to cold air or to immersion in cold water at temperatures even well above freezing can lead to dangerous hypothermia, whole-body protection shall be used.

#### 4.2 Roles and Responsibilities

##### 4.2.1 Project Managers/field task managers

- Implement cold stress prevention measures as applicable at each work site.
- Develop/coordinate a work-warning regimen, as applicable.
- Confirm cold stress hazard assessments/evaluations were completed for the planned activities.
- Assign personnel physically capable of performing the assigned tasks. Consider acclimation to cold weather when evaluating worker capability.
- Confirm personnel are properly trained to recognize the symptoms of cold stress.



**4.2.2 Region SH&E Managers**

- Conduct/support cold stress assessments/evaluations.
- Conduct/support incident investigations related to potential cold stress-related illnesses.
- Assist project teams develop appropriate work-warming regimens.
- Provide cold stress awareness training.

**4.2.3 Supervisors**

- Identify the tasks that may be most impacted by cold stress and communicate the hazard to the assigned employees.
- Confirm that employees have been trained on the recognition of cold stress-related illnesses.
- Confirm that adequate supplies of warm fluids/drinks are readily available to employees.
- Confirm that a warm/sheltered rest area is available, as applicable.
- Conduct cold stress monitoring, as applicable.
- Implement the work-warming regimen.
- Confirm that first aid measures are implemented once cold stress symptoms are identified.
- Confirm that personnel are physically capable of performing the assigned tasks and are not in a physically compromised condition.

**4.2.4 Employees**

- Observe each other for the early symptoms of cold stress-related illnesses.
- Maintain an adequate intake of available fluids.
- Report to work in a properly vested condition.
- Report all suspected cold stress-related illnesses.

**4.3 Training**

4.3.1 Before they begin work in a cold environment, project staff who might be exposed to cold stress will be informed of the potential for cold stress and how to prevent cold stress. Workers that have not had the training within the twelve prior months shall repeat the training before exposure to cold stress.

4.3.2 Personnel potentially exposed to cold stress will receive training including, but not limited to:

- Sources of cold stress, the influence of protective clothing, and the importance of acclimatization
- How the body loses heat.
- Recognition of cold-related illness symptoms
- Cold stress preventative/corrective measures
- The harmful effects of excessive alcohol consumption in a cold stress environment
- The hazards associated with unstable snow or ice build ups
- First aid procedures for symptoms related to cold stress

**4.4 Personal Protective Equipment**

4.4.1 Wear multiple layers of loose fitting clothing to maintain immobile layers of warm air next to the body.

4.4.2 Avoid cotton, especially blue jeans.

4.4.3 Wear proper clothing, including head coverings and gloves or mittens for cold, wet, and windy conditions.

4.4.4 Use insulated footwear with adequate traction to prevent slips and falls.

4.4.5 Confirm extra blankets or sleeping bags are on-site.

4.4.6 Sunglasses and sunscreen should be used when there is a persistent combination of snow and direct sun.

4.4.7 If shelter is not readily available, consider supplying temporary shelters

4.4.8 Confirm that staff carry fire starter materials if working in remote areas..

4.4.9 Pack warm, sweet drinks, and high calorie food for snacks.

#### 4.5 General Cold Stress Prevention Measures

##### 4.5.1 In order to prevent hypothermia:

- Wear multiple layers of clothing to maintain immobile layers of warm air next to the body. Avoid cotton, especially blue jeans.
- When active, ventilate excess heat by opening or removing outer layers of clothing to avoid sweating.
  - Start with the mitten or gloves, unless protection from ice, snow, or cold metal surfaces is needed.
  - Next remove head gear and neck wrappings.
  - Then coats/parkas should be opened at the waist and sleeves.
  - Finally, layers of clothing should be taken off.
  - When resting or tired, or colder conditions are encountered, add additional layers of clothing/ close outer layers in the reverse of the above order, or get out of the cold. Have a sweet drink but do not indulge in heavy eating.
- Garments worn to keep out rain and spray should also allow water vapor to escape.
- Take advantage of heat from the sun and stay out of the wind as much as possible.
- Have available emergency shelter providing protection from wind and rain and insulation from the ground.
- Replace wet clothing. If wet clothing cannot be replaced, then cover it with a layer of non-breathing material to prevent evaporation. Place an insulation layer over this non-breathing material.
- Get adequate rest; conserve energy.
- Get adequate nutrition to replenish energy stores; rest after meals.
- Drink adequate fluids to avoid dehydration.
- If any project staff member shows signs of hypothermia, stop and treat him/her.

##### 4.5.2 In order to prevent frost bite:

- Dress to prevent hypothermia and protect the feet and hands.
- Avoid obstruction of circulation by, for example, tight boots or tightly fitting clothing.
- Avoid nicotine, particularly cigarettes, and alcohol.
- Keep ears and nose covered and out of the wind.
- Frostbite of the corneas of the eyes can be prevented by protective goggles.
- Adopt a "buddy system" of constantly watching the faces of others in the party for white skin tissue, which is evidence of frostbite (frostnip).
- Practice constant personal vigilance for signs of trouble in one's own fingers and toes; when in doubt, investigate thoroughly before it is too late.

4.5.3 Adequate, insulating dry clothing that will help maintain core temperatures above 96.8°F (37°C) shall be provided to workers if work is performed in air temperatures below 40°F (5°C). Wind chill cooling rate and the cooling power of air are critical factors. The higher the wind speed and the lower the temperature in the work area, the greater the insulation value of the protective clothing required.

4.5.4 An Equivalent Chill Temperature (ECT) chart relating the actual dry bulb air temperature and the wind velocity is presented in *S3NA-505-W11 Temperature Thresholds*. Unless unusual or extenuating circumstances exist, cold injury to other than hands, feet, and head is not likely to occur without the development of the initial signs of hypothermia. Superficial or deep local tissue freezing will occur only at temperatures below 32°F (0°C) regardless of wind speed. However, older workers or workers with circulatory problems require special precautionary protection against cold injury. The use of extra insulating clothing and/or a reduction in the duration of the exposure period are among the special precautions that should be considered.

4.5.5 Continuous exposure of skin should not be permitted when the air speed and temperature results in an ECT of -25°F (-32°C) or below.

4.5.6 At air temperatures of 40°F (5°C) or less, it is imperative that workers who become immersed in water or whose clothing becomes wet be immediately removed from the cold environment, provided a change of clothing, and be treated for hypothermia.

- 4.5.7 If the air velocity at the job site is increased by wind, draft, or artificial ventilating equipment, the cooling effect of the wind should be reduced by shielding the work area or by wearing an easily removable windbreak garment.
- 4.5.8 Adequate protection, such as general ventilation, shall be incorporated into any warming shelter design to prevent carbon monoxide poisoning.
- 4.5.9 Operation of internal combustion or similar devices within warming shelters is prohibited.
- 4.5.10 If the available clothing does not give adequate protection to prevent hypothermia or frostbite, work should be modified or suspended until adequate clothing is made available or until weather conditions improve.
- 4.5.11 Walking and working surfaces shall be cleared of ice and snow to prevent slips and falls.
- 4.5.12 Supplies such as PPE, fuels, enclosures, de-icing, traction aids, warm drinks, and batteries will be specified by the SH&E Manager and/or the Project Manager. These supplies will be inspected at least weekly during cold weather projects and replaced when necessary.
- 4.6 **Cold Stress Prevention Measures for the Hands**
- 4.6.1 Special protection of the hands is required to maintain manual dexterity for the prevention of accidents including, but not limited to the following:
- If fine work is to be performed with bare hands for more than 10 to 20 minutes in an environment below 60°F (15° C), special provisions should be established for keeping the workers' hands warm. For this purpose, warm air jets, radiant heaters (fuel burner or electric radiator), or contact warm plates may be utilized. Metal handles of tools and control bars should be covered by thermal insulating material at temperatures below 30°F (-1° C).
  - If the air temperature falls below 60°F (15° C) for sedentary work, 40°F (5° C) for light work, or 20°F (-6° C) for moderate work, and fine manual dexterity is not required, workers should use gloves.
- 4.6.2 To prevent contact frostbite, workers should wear anti-contact gloves:
- When cold surfaces below 20°F (-6° C) are within reach, each worker should be warned to prevent inadvertent contact by bare skin.
  - If the air temperature is 0°F (-18° C) or less, workers should protect their hands with mittens. Machine controls and tools for use in cold conditions should be designed so that they can be handled without removing the mittens.
- 4.6.3 Provisions for additional total body protection are required if work is performed in an environment at or below 40°F (5° C). The workers should wear cold protective clothing appropriate for the level of cold and physical activity.
- 4.6.4 Additional Cold Stress Prevention Measures For work practices at or below 10°F (-12° C) ECT, the following will apply:
- The worker should be under constant protective observation (buddy system or supervision).
  - The work rate should not be so high as to cause heavy sweating that will result in wet clothing. If heavy work is being performed, rest periods should be taken in heated shelters and opportunities to change into dry clothing should be provided.
  - New employees should not be required to work full time in the cold during the first days of employment until they become acclimated to the working conditions and required protective clothing.
  - The weight and bulkiness of clothing should be included in estimating the required work performance and weights to be lifted by the worker.
  - The work should be arranged in such a way that sitting still or standing still for long periods is minimized. Unprotected metal chair seats should not be used. The worker should be protected from drafts to the greatest extent possible.
  - Workers should be instructed in safety and health procedures, which should address:
    - Proper rewarming procedures and appropriate first aid treatment.
    - Proper clothing practices.
    - Proper eating and drinking habits.
    - Recognition of impending frostbite.

- Recognition of signs and symptoms of impending hypothermia or excessive cooling of the body even when shivering does not occur.
  - Safe work practices.
- 4.6.5 Eye protection for workers employed outdoors in a snow and/or ice-covered terrain should be supplied. Special safety goggles to protect against blowing ice crystals and ultraviolet light and glare (which can produce temporary conjunctivitis and/or temporary loss of vision) should be required when there is an expanse of snow coverage causing a potential eye exposure hazard.
- 4.6.6 Workers handling evaporative liquid (gasoline, alcohol, or cleaning fluids) at air temperatures below 40°F should take special precautions to avoid soaking of clothing or gloves with the liquids because of the added danger of cold injury due to evaporative cooling. Special note should be taken of the particularly acute effects of splashes of “cryogenic fluids” or those liquids with a boiling point that is just above ambient temperature.
- 4.6.7 Trauma sustained in freezing or subzero conditions requires special attention, because an injured worker is predisposed to cold injury. Special provisions should be made to prevent hypothermia and freezing of damaged tissue in addition to providing for first aid treatment.
- 4.7 **Work-Warming Regimen**
- 4.7.1 If work is performed continuously in the cold at an equivalent chill temperature (ECT) at or below -15°F (-26°C), heated warming shelters (tents, cabins, rest rooms, etc.) should be made available nearby. The workers should be encouraged to use these shelters at regular intervals; the frequency will depend on the severity of the environmental exposure.
- 4.7.2 The onset of heavy shivering, minor frostbite (frostnip), the feeling of excessive fatigue, drowsiness, irritability, or euphoria are indications for immediate return to the shelter.
- 4.7.3 When entering the heated shelter, the outer layer of clothing should be removed and the remainder of the clothing should be loosened to permit sweat evaporation or a change of dry work clothing provided.
- 4.7.4 A change of dry work clothing should be provided as necessary to prevent workers from returning to the cold environment with wet clothing.

## 5.0 Records

- 5.1 Training records will be maintained by the SH&E Department
- 5.2 Exposure assessments will be documented in the project files.

## 6.0 References

- 6.1 See attachment S3NA-505-WI1 Temperature Thresholds.

## S3NA-505-WI1 Temperature Thresholds

### 1.0 Purpose and Scope

- 1.1 The following table gives apparent temperatures (wind chill) for various combinations of wind and air temperature, as well as guidelines to the danger of skin exposure.

Table 1. Wind Chill Chart (C)

Actual Temp (°C)	Wind Speed in km/hour									
	8	16	24	32	40	48	56	64	72	80
	Ambient Temperature (°C)									
0	-2	-8	-11	-14	-16	-17	-18	-19	-19	-20
-5	-7	-14	-18	-21	-23	-25	-26	-27	-28	-28
-10	-12	-20	-25	-28	-31	-33	-34	-35	-36	-36
-15	-18	-26	-32	-35	-38	-40	-42	-43	-43	-44
-20	-23	-32	-38	-43	-46	-48	-50	-51	-52	-52
-25	-28	-38	-45	-50	-53	-56	-57	-59	-59	-60
-30	-33	-45	-52	-57	-61	-63	-65	-67	-67	-68
-35	-39	-51	-59	-64	-68	-71	-73	-75	-75	-76
-40	-44	-57	-65	-71	-75	-79	-81	-83	-83	-84
-45	-49	-63	-72	-78	-83	-86	-89	-90	-91	-92
-50	-54	-69	-79	-85	-90	-94	-96	-98	-99	-100

Note: A. Little Danger: if less than one hour of exposure to dry skin.

B. Danger: Exposed flesh freezes within one minute.

C. Great Danger: Flesh may freeze with in 30 seconds.

Source: \*Threshold Limit Values (TLV™) and Biological Exposure Indices (BEI™) booklet; published by ACGIH, Cincinnati, Ohio.

Table 2. Equivalent Chill Temperature Chart (F)

Estimated Wind Speed (mph)	Actual Temperature Reading (°F)									
	50	40	30	20	10	0	-10	-20	-30	-40
	Equivalent Chill Temperature (°F)									
Calm	50	40	30	20	10	0	-10	-20	-30	-20
5	48	37	27	16	6	-5	-15	-26	-36	-47
10	40	28	16	4	-9	-24	-33	-46	-58	-70
15	36	22	9	-5	18	-32	-45	-58	-72	-85
20	32	18	4	-10	-25	-39	-53	-67	-82	-96
25	30	16	0	-15	-29	-44	-59	-75	-88	-104
30	28	13	-2	-18	-33	-48	-63	-79	-94	-109
35	27	11	-4	-20	35	-51	-67	-82	-98	-113
40	26	10	-6	-21	-37	-53	-69	-85	-100	-116
Wind speeds >40 mph have little additional effect	LITTLE DANGER				INCREASING DANGER			GREAT DANGER		
	Trenchfoot and immersion foot may occur at any point on this chart.									

**Table 3. Work-Warming Schedule Guidelines**

Air Temp. (Sunny Sky) °F	No Noticeable Wind		5 mph Wind		10 mph Wind		15 mph Wind		20 mph Wind		25 mph Wind		Air Temp. (Sunny Sky) °C																				
	Max. Work Period	Breaks	Max. Work Period	Breaks	Max. Work Period	Breaks	Max. Work Period	Breaks	Max. Work Period	Breaks	Max. Work Period	Breaks																					
above 5°	Normal Work Schedule		Normal Work Schedule		Normal Work Schedule		Normal Work Schedule		Normal Work Schedule		Normal Work Schedule		above -15°																				
5° to -1°											100 min	2	-15° to -17°																				
0° to -4°									100 min	2	-18° to -20°																						
-5° to -9°							100 min	2	-21° to -22°																								
-10° to -14°					100 min	2	75 min	2	55 min	3	40 min	4	-23° to -25°																				
-15° to -19°	100 min 2		100 min	2	75 min	2	55 min	3	40 min	4	30 min	5	-26° to -28°																				
-20° to -24°			75 min	2	55 min	3	40 min	4	30 min	5	Cease Work		-29° to -31°																				
-25° to -29°			55 min	3	40 min	4	30 min	5	Cease Work				-32° to -34°																				
-30° to -34°			40 min	4	30 min	5	Cease Work						-35° to -37°																				
-35° to -39°			30 min	5	Cease Work								-38° to -39°																				
-40° to -44°	30 min 5		Cease Work										-40° to -42°																				
-44° & below													-43° & below																				

Modified from ACGIH 2002 Threshold Limit Values for Chemical Substances and Physical Agents.

Note 1: Schedule describes the maximum continuous duration of work and number of 10-15 minute breaks to be observed during any 4-hour work period and assumes that period will be followed by an extended warm-up period (e.g., lunch). Allowed breaks should be taken in a warm environment.

Note 2: Schedule applies to moderate to heavy work performed by acclimated workers wearing appropriate layered clothing. For light to moderate work apply the schedule for conditions one step lower. For unacclimated workers apply the schedule for conditions two steps lower. These modifications are additive.

Note 3: For work under 25%–50% overcast/clouds, apply the schedule for conditions one step lower. For work at night or under greater than 50% overcast/clouds, apply the schedule for conditions two steps lower. These modifications are additive with any applicable modifications from Note 2.

Note 4: For wind speeds in excess of 25 mph, cease all nonemergency work when temperatures fall below 5°F.

## **S3NA-505-WI2 Symptoms and Treatment**

### **1.0 Cold Stress-related Illnesses**

#### **1.1 Frostbite**

1.1.1 Frostbite is a localized cold injury characterized by freezing of the tissues with ice crystal formation.

1.1.2 This injury is almost always limited to the upper and lower extremities or to such appendages as the ears or nose.

1.1.3 Conditions conducive to frostbite include sub-zero temperatures, hypothermia (most important predisposing factor), dehydration, obstruction of the blood supply to the extremities (by constricting clothing, especially on the feet or at the wrists or ankles), contact with cold metal, contact with organic liquids (such as gasoline or solvents that have been left outdoors in sub-zero temperatures), use of substances that cause vasoconstriction (such as smoking tobacco), or other injury or shock.

1.1.4 Symptoms of frostbite include:

- Pain in the involved tissue is the earliest symptom.
- Sudden and complete cessation of cold or discomfort in affected fingers or toes, often followed by a pleasant feeling of warmth.
- Subsequently the only symptom may be the absence of any sensation in the frozen part.
- Paleness in the affected tissues.
- Firm or hard tissues.
- Purple tissue, if a large area, such as an entire hand or foot, is frostbitten.

1.1.5 If exposure occurs in temperatures that are below freezing (32°F or below), frostbite or trench foot (immersion foot) may accompany or complicate the symptoms of hypothermia. Frostbite is the freezing of living tissues with a resultant breakdown of cell structure. Symptoms due to frostbite may include, but is not limited to:

- Superficial redness of the skin
- Slight numbness
- Blisters
- Obstruction of blood flow (ischemia)
- Blood clots (thrombosis)
- Skin discoloration due to insufficient oxygen in the blood (cyanosis)

1.1.6 Frostbite may occur if the skin comes into contact with objects with a surface temperature below freezing, such as metal tool handles. Trench foot is caused by continuous exposure to cold combined with persistent dampness or immersion in water. Injuries in this case include permanent tissue damage due to oxygen deficiency, damage to capillary walls, severe pain, blistering, tissue death, and ulceration.

1.1.7 Additionally, cold exposures may either induce or intensify vascular abnormalities. These include chilblain (a swelling or sore), Raynaud's disease, acrocyanosis (blueness of hands and feet) and thromboangiitis (inflammation of the innermost walls of blood vessels with accompanying clot formation). Workers suffering from these ailments should take particular precautions to avoid chilling.

#### **1.2 Hypothermia**

1.2.1 Hypothermia is a lower than normal body temperature that occurs when outer cold cools the body faster than the body can produce heat to stay warm.

1.2.2 Hypothermia can be caused by exposure to wind, cold, and/or moisture. The combination of wind, cold, and moisture can be deadly.

1.2.3 Early warning signs of hypothermia:

- Feeling of being cold and tired.
- Heavier breathing and increased pulse rate.
- Tendency to keep moving (e.g., stamping feet, rubbing hands, continued walking/pacing).
- Goose bumps, holding arms tightly wrapped around the body, hunching of shoulders.

Shivering.

1.2.4 Hypothermia damages both the body's internal temperature mechanisms (hypothalamus) and the peripheral mechanisms to prevent heat loss (vasoconstriction and perspiration.) These effects may last up to three years after the initial hypothermia episode. Symptoms of hypothermia may include, but are not limited to:

- Pain in the extremities.
- Severe shivering and numbness.
- Low core body temperature.
- Drowsiness and muscular weakness.
- Apathy.
- Mental confusion.
- Loss of consciousness.
- Shock.
- Decreasing pulse and breathing rate.

## **2.0 Recommended Treatment for Cold Stress-related Illnesses**

### **2.1 Frostbite**

- 2.1.1 Wrap the victim in woolen blanket and keep dry until he or she can be brought inside.
- 2.1.2 Remove the victim from the cold environment.
- 2.1.3 Do not rub, chafe, or manipulate frozen parts.
- 2.1.4 Place the victim in warm water (102°F to 105°F) and make sure the water remains warm. Test the water by pouring it on the inner surface of your forearm. Never thaw affected body parts if the victim has to go back out into the cold; refreezing can cause significant tissue damage.
- 2.1.5 Do not use hot water bottles or a heat lamp, and do not place the victim near a hot stove.
- 2.1.6 Do not allow the victim to walk if his or her feet are affected.
- 2.1.7 Have the victim gently exercise the affected parts once they are thawed.
- 2.1.8 Seek immediate medical attention for thawing of serious frostbite.

### **2.2 Hypothermia**

- 2.2.1 Bring the victim into a warm room or shelter as quickly as possible.
- 2.2.2 Give artificial respiration and stop any bleeding, if necessary.
- 2.2.3 If the victim cannot be moved (spinal injury, etc.), carefully place newspapers, blankets, or some other insulation between the victim and the ground.
- 2.2.4 Remove all wet clothing.
- 2.2.5 Provide an external heat source, because the body cannot generate its own heat. Wrap the victim in prewarmed blankets, place him or her in the liner of a portable hypothermia treatment unit, put the torso (not the extremities) into a tub of warm water, or use body-to-body contact to rewarm the body core. These measures will slowly reopen the peripheral circulation, minimizing the possibility of after-shock or after-drop (the flowing of cooled, stagnated blood from the limbs to the heart), which may cause ventricular fibrillation, cardiac arrest, or death.
- 2.2.6 Do not allow the victim to sleep.
- 2.2.7 Give warm, sweet drinks. Do not give alcohol or pain relievers.
- 2.2.8 Keep the victim still. Do not try to walk.
- 2.2.9 Do not rub numb skin.
- 2.2.10 Get medical attention as soon as possible.



## S3NA-505-ST Cold Exposure

The following Occupational Health and Safety regulations apply directly to cold and snow hazards:

Jurisdiction	Regulation
<b>United States</b>	
<b>OSHA</b>	Title 29, Code of Federal Regulations, Sections 1910.1027 and 1926.1127
<b>Canada</b>	
<b>Alberta</b>	n/a
<b>British Columbia</b>	OHS Regulation (1997) Sect 7.33 – 7.38
<b>Manitoba</b>	Workplace Health and Safety Regulation (217/2006) Sect 4.12, 4.14
<b>New Brunswick</b>	OHS Regulation (91-191) Sect 44
<b>Newfoundland/Labrador</b>	OHS Regulation (C.N.L.R. 1165/96) Sect 10
<b>Nova Scotia</b>	n/a
<b>NWT/NU Territories</b>	n/a
<b>Ontario</b>	O. Reg. 851 Sect 39, 129
<b>Prince Edward Island</b>	OHS Regulations (EC180/87) Sect 42.1
<b>Quebec</b>	OHS Regulation (R.R.Q., c. S-2.1, r.19.01 O.C. 885-2001) Schedule 4
<b>Saskatchewan</b>	OHS Regulation (R.R.S., c. O-1, r. 1) Sect 70 Cold Conditions Guidelines for Outside Workers
<b>Yukon Territory</b>	Occupational Health Regulations (O.I.C. 1986/164) Sect 9

## **Attachment I**

### **Site Safety and Health Plan**

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# **SITE SAFETY AND HEALTH PLAN**

Regional Compliance Restoration Program  
Preliminary Assessment/Site Investigation  
at Multiple Air National Guard Installations  
Northeast

Schenectady Air National Guard Base  
Scotia, New York

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# Table of Contents

1	INTRODUCTION .....	1-1
2	SITE DESCRIPTION AND CONTAMINATION CHARACTERIZATION .....	2-1
2.1	Site Information.....	2-1
2.1.1	General Description .....	2-1
2.1.2	Site Background/History .....	2-1
2.1.3	Suspected Contamination at PA/SI Sites .....	2-1
2.1.4	Previous Investigations .....	2-1
2.2	Site Assessment Program .....	2-1
2.2.1	Mobilization/Demobilization .....	2-2
2.2.2	Site Preparation .....	2-2
2.2.3	Soil Borings and Soil Sample Collection .....	2-2
2.2.4	Groundwater Sampling .....	2-2
2.2.5	Investigative-Derived Waste Management .....	2-3
2.2.6	Equipment Decontamination.....	2-3
2.2.7	Site Restoration .....	2-3
2.2.8	Additional Work Operations .....	2-3
3	HAZARD / RISK ANALYSIS .....	3-1
3.1	Physical Hazard Recognition and Controls .....	3-2
3.1.1	Slips, Trips, Falls, and Protruding Objects .....	3-2
3.1.2	Housekeeping.....	3-2
3.1.3	Electrical Hazards.....	3-2
3.1.3.1	Extension Cords.....	3-3
3.1.3.2	Portable Electrical Equipment.....	3-3
3.1.4	Lock-Out/Tag-Out Procedures.....	3-4
3.1.5	Hand Tool Usage.....	3-4
3.1.6	Power Tool Usage .....	3-5
3.1.7	Motor Vehicle Operation .....	3-7
3.1.7.1	Motor Vehicle Operating Rules .....	3-7
3.1.7.2	Transportation of Personnel.....	3-8
3.1.7.3	Motor Vehicle Equipment .....	3-8
3.1.7.4	Inspections, Tests, Maintenance, and Repairs .....	3-8
3.1.8	Machinery and Mechanized Equipment .....	3-9
3.1.8.1	Preparation for Use .....	3-9
3.1.8.2	Daily/Shift Inspections and Tests .....	3-10
3.1.8.3	Equipment Operation .....	3-10
3.1.8.4	Equipment Requirements.....	3-11
3.1.8.5	Maintenance and Repairs .....	3-11
3.1.8.6	Parking .....	3-12
3.1.8.7	Towing.....	3-12
3.1.9	Manual Lifting.....	3-12
3.1.10	Drilling Operations .....	3-12
3.1.11	Traffic Exposure/Control .....	3-12
3.2	Environmental Hazards and Controls.....	3-13
3.2.1	Hazardous Noise Levels.....	3-13
3.2.1.1	Hearing Protection for Noise .....	3-13
3.3	Non-ionizing Radiation .....	3-13
3.4	Ionizing Radiation .....	3-13
3.5	Biological Hazards.....	3-13
3.5.1	Microorganisms.....	3-14
3.5.2	Ticks.....	3-14

3.5.3	Chiggers.....	3-14
3.5.4	Spiders.....	3-14
3.5.5	Mosquitoes.....	3-15
3.5.6	Bees and Hornets .....	3-15
3.5.7	Small Mammals .....	3-16
3.5.8	Snakes .....	3-16
3.5.9	Poisonous Plants .....	3-17
3.5.10	Personal Precautions and Protective Measures for Biological Hazards .....	3-19
3.5.11	PPE for Poisonous Plants.....	3-19
3.5.12	Chemical Treatment of Field Clothing .....	3-20
3.5.12.1	Pretreatment of Field Clothing .....	3-20
3.5.12.2	Lemon Eucalyptus.....	3-20
3.5.12.3	Personal Hygiene and Body Checks .....	3-20
3.6	Assessment of chemical Exposure Hazards by Task .....	3-21
3.6.1	Mobilization .....	3-21
3.6.2	Soil Boring and Sample Collection .....	3-21
3.6.3	Groundwater Sampling .....	3-21
3.6.4	Additional Work Operations .....	3-21
4	STAFF ORGANIZATION, QUALIFICATIONS, AND RESPONSIBILITIES .....	4-1
5	TRAINING.....	5-1
5.1	General Training .....	5-1
5.2	Project-Specific Training.....	5-1
5.2.1	Competent Person Training Requirements .....	5-2
6	PERSONNEL PROTECTIVE EQUIPMENT .....	6-1
6.1	Personal Protective Equipment .....	6-1
6.2	PPE Doffing and Donning Information.....	6-2
7	MEDICAL SURVEILLANCE .....	7-1
7.1	Exemptions/Exceptions to Medical Surveillance and Training.....	7-1
8	EXPOSURE MONITORING / AIR SAMPLING PROGRAM .....	8-1
8.1	Real-Time Exposure Measurement.....	8-1
8.1.1	Health and Safety Action Levels.....	8-1
8.1.2	Monitoring Procedures.....	8-2
8.1.3	Monitoring Equipment Calibration.....	8-3
8.1.4	Personal Sampling.....	8-3
9	HEAT AND COLD STRESS .....	9-1
10	STANDARD OPERATING SAFETY PROCEDURES, ENGINEERING CONTROLS, AND WORK PRACTICES.....	10-1
10.1	Safe Work Practices .....	10-1
10.2	Personal Standards .....	10-1
10.3	General Safety Rules .....	10-2
10.3.1	Housekeeping .....	10-3
10.3.2	Smoking, Eating, or Drinking .....	10-3
10.3.3	Personal Hygiene.....	10-3
10.3.4	Buddy System.....	10-4
10.4	Safety Equipment Rules .....	10-4
10.5	Work Ergonomic Rules .....	10-4
10.6	Tailgate Meetings .....	10-5
10.7	Hazard Communication .....	10-5
10.8	Hazardous, Solid, or Municipal Waste .....	10-5
10.9	Stop Work Authority.....	10-5
10.10	Client Specific Safety Requirements .....	10-5
11	SITE CONTROL MEASURES .....	11-1

11.1	General .....	11-1
11.2	Controlled Work Areas .....	11-1
11.2.1	Exclusion Zone .....	11-1
11.2.2	Contamination Reduction Zone .....	11-5
11.2.3	Support Zone .....	11-5
11.3	Site Access Documentation .....	11-5
11.3.1	Visitor Access .....	11-5
11.4	Site Security .....	11-5
12	PERSONAL HYGIENE AND DECONTAMINATION .....	12-1
12.1	Personal Hygiene .....	12-1
12.2	Decontamination Requirements .....	12-1
12.2.1	General Requirements.....	12-1
12.2.2	Decontamination Equipment.....	12-1
12.2.3	Personal and Equipment Decontamination .....	12-2
13	EMERGENCY EQUIPMENT AND FIRST AID .....	13-1
13.1	Emergency Supplies.....	13-1
13.2	Accident Prevention Signs, Tags and Labels.....	13-1
14	EMERGENCY RESPONSE AND CONTINGENCY PROCEDURES .....	14-1
14.1	Emergency Response Plan .....	14-1
14.2	Emergency Coordinator .....	14-1
14.3	Site-Specific Emergency Procedures.....	14-1
15	PERSONNEL ACKNOWLEDGEMENT .....	15-1
16	REFERENCES.....	16-1

## List of Attachments

Attachment A Activity Hazard Analysis  
Attachment B Material Safety Data Sheets  
Attachment C Equipment Safety Cards



## List of Figures

Figure 11-1	Example Drilling Site Control Layout .....	11-3
Figure 14-1	Emergency Hospital Route/Detail Map .....	14-3

## List of Tables

Table 3-1 Hazards Table.....	3-1
Table 3-3 Poisonous Spider Identification Guide.....	3-14
Table 3-4 Venomous Snake Identification Guide .....	3-16
Table 3-5 Hazardous Plant Identification Guide .....	3-17
Table 3-5 Hazardous Plant Identification Guide (Continued) .....	3-19
Table 6-1 Personal Protective Equipment .....	6-1
Table 8-1 Monitoring Parameters and Equipment .....	8-1
Table 8-2 Monitoring Procedures and Action Levels .....	8-3
Table 14-1 Emergency Planning.....	14-1
Table 14-2 Emergency Contacts .....	14-2

## List of Acronyms and Abbreviations

ACGIH	American Conference of Governmental Industrial Hygienists
AHA	Activity Hazard Analysis
ANSI	American National Standards Institute
APP	Accident Prevention Plan
BCT	BRAC Cleanup Team
BRAC	Base Realignment and Closure
CDC	Centers for Disease Control
cDCE	cis-1,2-dichloroethene
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CIH	Certified Industrial Hygienist
CO	Contracting Officer
COC	Contaminant of Concern
COPT	Corporate Office Properties Trust
CPR	Cardiopulmonary Resuscitation
CRZ	Contamination Reduction Zone
DCE	Dichloroethene
DIUF	Deionized Ultra-Filtered
EC	Emergency Coordinator
EEE	Eastern Equine Encephalitis
EM	Engineering Manual
EZ	Exclusion Zone
FFRAG	Former Fort Ritchie Army Garrison
FOST	Finding of Suitability to Transfer
GPS	Global Positioning System
HSA	Hollow-Stem Auger
IAW	In Accordance With
ICP	Inductively Coupled Plasma
ICS	Interference Check Sample
IDW	Investigation-Derived Waste
ISCO	In Situ Chemical Oxidation
LCS	Laboratory Control Sample
LOC	Level of Concern
LOD	Limit of Detection
LTGM	Long-Term Groundwater Monitoring
LTGMP	Long-Term Groundwater Monitoring Plan
LTM	Long-Term Monitoring
LUC	Land Use Control
LUCRD	Land Use Control Remedial Design

MCL	Maximum Contaminant Level
MDE	Maryland Department of the Environment
MDL	Method Detection Limit
mg/L	milligrams per liter
MRL	Method Reporting Limit
MS	Matrix Spike
MSD	Matrix Spike Duplicate
MSDS	Material Safety Data Sheets
NEC	National Electric Code
NIOSH	National Institute of Occupational Safety and Health
OPS	Operating Properly and Successfully
OSHA	Occupational Safety and Health Administration
OU4	Operable Unit 4
PCE	Tetrachloroethene
PEL	Permissible Exposure Limit
PM	Project Manager
POV	Privately Owned Vehicle
PPE	Personal Protective Equipment
QC	Quality Control
RBC	Risk-Based Concentration
RI	Remedial Investigation
ROD	Record of Decision
SH&E	Safety, Health & Environmental
SI	Site Investigation
SOPs	Standard Operating Procedures
SOW	Statement of Work
SSHO	Site Safety and Health Officer
SSHP	Site Safety and Health Plan
SZ	Support Zone
TCE	Trichloroethene
TCL	Target Compound List
TLV	Threshold Limit Value
U.S.	United States
USACE	United States Army Corps of Engineers
USEPA	United States Environmental Protection Agency
VC	Vinyl Chloride
VOC(s)	Volatile Organic Compound(s)
WP	Work Plan
µg/L	micrograms per liter

# 1 Introduction

AECOM is collecting data to support PA/SI reports at multiple Air National Guard Installations. The Installations included in this task order include:

Camp Pendleton ANGB, VA	Pease ANGB, NH
Martin State ANGB, MD	Bangor IAP, ME
Fort Indiantown Gap, PA	South Portland, ME
Harrisburg ANGB, PA	Gabreski ANGB, NY
Pittsburg ANGB, PA	Hancock Field ANGB, NY
Martinsburg ANGB, WV	Niagara Falls ANGB, NY
Charleston-Yeager ANGB, WV	Schenectady ANGB, NY
Barnes ANGB, MA	Stewart ANGB, NY
Quonset ANGB, RI	Burlington ANGB, VT
Bradley IAP, CT	

ANG2013NEASTCRP PA/SI activities are being performed under the Comprehensive Environmental Response Compensation and Liability Act (CERCLA). The state and regional federal environmental agencies in which the respective site resides is the regulatory lead for this project. The field investigation tasks planned as part of the field operations at the various installations include:

- Mobilization/Demobilization;
- Geophysical Survey
- Concrete Coring;
- Soil Borings and Soil Sample Collection; and
- Monitoring Well Installation
- Groundwater Measurement and Sampling

AHAs for the above investigation tasks are included in this SSHP. Work will be conducted in accordance with the following documents:

- United States Army Corps of Engineers (USACE) Scope of Work;
- Engineering Manual (EM) 385-1-1 [United States Army Corps of Engineers, (USACE), 2008];
- Air National Guard Investigation Guidance, 2009;
- ANG2013NEASTCRP Quality Assurance and Safety Plan;

This SSHP identifies and addresses all occupational safety and health hazards known to be associated with planned investigations at the project sites. All work completed by AECOM and its subcontractors will be performed in compliance with the Accident Prevention Plan (APP) and this SSHP.

The provisions of this SSHP are mandatory for all AECOM personnel engaged in fieldwork associated with the PA/SI activities for all sites. A copy of this SSHP, any applicable SSHP supplements, the APP, and the AECOM U.S. Operations Safety, Health, and Environmental (SH&E) Manual shall be maintained on site and available for review at all times. Record keeping will be maintained in accordance with this SSHP and the applicable Standard Operating Procedures (SOPs). In the event of a conflict between this SSHP, the SOPs, and federal, state, and local regulations, workers shall follow the most stringent/protective requirements.

This SSHP conforms to the regulatory requirements and guidelines established in the following documents:

- Title 29, Part 1910 of the Code of Federal Regulations(CFR) (29 CFR 1910), *Occupational Safety and Health Standards* (with special attention to Section 120, *Hazardous Waste Operations and Emergency Response*);
- Title 29, Part 1926 of the Code of Federal Regulations (29 CFR 1926), *Safety and Health Regulations for Construction*;
- National Institute for Occupational Safety and Health (NIOSH)/Occupational Safety and Health Administration (OSHA)/United States Coast Guard/U.S. Environmental Protection Agency (USEPA), *Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities*, Publication No. 85-115, 1985;
- Department of the Army, United States Army Corps of Engineers EM 385-1-1, *Safety and Health Requirements Manual* (15 September 2008); and
- AECOM's Corporate SH&E Program requirements as specified in the U.S. Operations SH&E Manual, a copy of which will be maintained onsite at all times.

SSHP changes and modifications will be generated as necessary to address any additional activities or changes in site conditions, which may occur during field operations.

All proposed changes/modifications to this SSHP will be in writing and will be reviewed and approved by the Regional SH&E Manager and USACE before such modifications are implemented in the field.

## 2 Site Description and Contamination Characterization

AECOM will conduct environmental services at multiple ANG facilities under ANG2013NEASTCRP. The work will be performed in accordance with the applicable Statement of Work (SOW) and associated Work Plan developed for project site. Deviations from the listed SOW will require that a Safety Professional review and changes made to this SSHP, to ensure adequate protection of personnel and other property. The following is a summary of relevant data concerning the project site, and the work procedures to be performed.

### 2.1 Site Information

This section provides a general description and historical information associated with the sites.

#### 2.1.1 General Description

See the AECOM Work Plan for a description of each of the ANG installations.

#### 2.1.2 Site Background/History

See the AECOM Work Plan for a description of the site background for each of the ANG installations

#### 2.1.3 Suspected Contamination at PA/SI Sites

See the AECOM Work Plan for a description of the site background and suspected contamination for each of the ANG installations.

#### 2.1.4 Previous Investigations

See the AECOM Work Plan for a description of previous investigations for each of the ANG installations.

### 2.2 Site Assessment Program

The primary objective of the Task Order is to collect data at each installation to support a PA/SI. The site assessment activities will be completed in two Phases:

PA: The PA will include review of existing information about each respective site; reconnaissance of the site and environs; information about potential receptors; and recommended sample locations and analyses for the SI.

SI: The SI objective is to gather information to support a site decision regarding the need for further CERCLA action. SI sample locations will be focused to determine whether hazardous substances are or have been released to the environment, impacted media, and whether receptors may have been impacted from a release. The tasks required to complete this objective may include:

- Mobilization/Demobilization;
- Geophysical Survey
- Concrete Coring;
- Soil Borings and Soil Sample Collection; and
- Monitoring Well Installation
- Groundwater Measurement and Sampling

AHAs for the above investigation tasks are included in this SSHP.

### **2.2.1 Mobilization/Demobilization**

Mobilization and demobilization represent limited pre- and post-task activities. These activities include driving personnel to and from the site, and transporting or shipping equipment to and from the site. This activity does not include any site preparation or intrusive activities.

### **2.2.2 Site Preparation**

Site preparation includes site orientation and training of the field team, utility mark-out and clearance, testing and cleaning of equipment as needed, and the set-up of other work support-related items. It is assumed that the Government will provide applicable maps for on-site utility locations, if available. The public utility marking service (i.e. Miss Utility) will be contacted prior to drilling to perform utility mark-outs. The utilities at ANG Installations in areas with proposed soil borings will also be located and cleared by the ANGB installation or private utility location services. Concrete coring of paved surfaces will be required at some installations. Soft digging techniques using a hand auger for the clearing of unknown utilities to a depth of three feet below ground surface (ft bgs), will be conducted, if possible. Additional information on locating underground power lines can be found in SH&E SOP 417, *Underground Utilities*.

### **2.2.3 Soil Borings and Soil Sample Collection**

A geologist will perform oversight of the soil borings installed by the drilling subcontractor. Drilling and sampling equipment will be utilized to collect soil samples. Tables presented in the Site Work Plans detail the boring depth and samples to be collected at each installation. Soil samples collected will be logged with lithologic descriptions and screened with a photo-ionization detector (PID). The PID screening results and visual observations will be used to select samples for analytical testing. If elevated levels are detected during the intrusive activities, the work area will be ventilated before other protective measures are employed.

During sampling activities, appropriate air monitoring will be conducted and the appropriate chemical resistant personal protective equipment (PPE) will be worn to protect against exposure. The major activities involved with the soil borings are as follows:

- Monitor air quality in the workers breathing zone;
- Drill soil cores;
- Log soils and screen with a PID;
- Laboratory sample collection;
- Decontamination of equipment; and
- Sample prep and shipping.

### **2.2.4 Groundwater Sampling**

The field sampling team will collect groundwater samples from temporary DPT points and/or monitoring wells. Groundwater samples will be collected using low-flow sampling techniques. During sampling activities, appropriate air monitoring will be conducted and the appropriate chemical resistant PPE will be worn to protect against exposure. The major activities involved with groundwater sampling are as follows:

- Pre-sampling event notifications and approval;
- Setup for sampling activities;
- Purge and sample monitoring wells;

- Monitor air quality in the workers breathing zone;
- Decontamination of equipment; and
- Sample prep and shipping.

#### **2.2.5 Investigative-Derived Waste Management**

Investigation-derived waste (IDW) will be collected and categorized as non-hazardous or hazardous. IDW including purge water, decontamination fluids, and soil cuttings will be tested and disposed of within 90 calendar days of completing the field activities in accordance with federal, state, and local regulations.

#### **2.2.6 Equipment Decontamination**

Field personnel will perform decontamination of equipment used to conduct environmental investigation and sampling activities. Before any drilling has begun and at the completion of drilling, the drilling subcontractor shall decontaminate the drill rig, casing, samplers, and all other drilling equipment that will be used on site. The drilling subcontractor shall provide a high-pressure steam cleaner for decontamination of all downhole tooling. Soil sampling equipment will be decontaminated between each use using a phosphate-free detergent and potable water. The drilling subcontractor shall construct a temporary decontamination pad to contain all decontamination water generated during decontamination of drill rigs and tools.

#### **2.2.7 Site Restoration**

Site restoration will involve the backfill of borings with a bentonite-grout slurry, repair/replacement of surface cover (concrete), removal of temporary materials, and the disposal of IDW.

#### **2.2.8 Additional Work Operations**

Operations at an installation may require additional tasks not identified in this section or addressed in Attachment A, Activity Hazard Analyses (AHAs). Before performing any task not covered in this SSHP, a modification to the SSHP must be prepared, and approved by the Regional SH&E Manager or designee.



### 3 Hazard / Risk Analysis

Hazards that cannot be eliminated by project design during hazard identification or the hazard assessment processes will be considered residual hazards. If unable to eliminate the hazard through design change, risk will be reduced through engineering controls or administrative controls.

Each distinct task or operation will have an AHA developed to define the activity to be performed. The AHA will identify the work sequences, site conditions, anticipated hazards (classic safety, chemical, physical, biological, ionizing radiation), control methods, equipment requirements, and training to be implemented to eliminate or reduce the hazards.

Table 3-1 identifies the hazards that are anticipated to be encountered during this project.

**Table 3-1  
Hazards Table**

Type of Hazard	Hazard	Yes	No
<b>Physical</b>	Confined space entry		✓
	Drowning		✓
	Electrical Shock	✓	
	Equipment and Machinery	✓	
	Trench entry		✓
	Lacerations and skin punctures	✓	
	Lifting and Moving (excess of 25 lbs individual and 50 lbs 2 person lift)	✓	
	Slips, trips and falls	✓	
	Heavy Equipment Operations	✓	
	Traffic/Vehicle Exposure	✓	
	Hand & Power Tool Usage	✓	
	Hazardous Noise Levels	✓	
<b>Chemical</b>	VOC, SVOC, TPH, PAHs, Metals	✓	
<b>Environmental</b>	Heat and Cold Stress	✓	
	Hazardous Noise Levels	✓	
<b>Radiological</b>	Non-Ionizing Radiation	✓	
	Ionization Radiation		✓
<b>Biological</b>	Spiders	✓	
	Ticks	✓	
	Hazardous Plants	✓	
	Animals	✓	
	Poisonous Snakes	✓	

Operations at the site may require additional tasks not identified in Section 2.3 or addressed in Attachment A, AHA. Before performing any task not covered in this SSHP, an AHA must be prepared and approved by the Regional SH&E Manager or designee.

### 3.1 Physical Hazard Recognition and Controls

The following physical safety hazards may be encountered during this project:

- Slips, Trips, Falls and Protruding Objects;
- Electrical hazards;
- Hand and Power Tool Usage;
- Motor Vehicle Operation;
- Mechanized Machinery;
- Manual Lifting;
- Drilling Operations; and
- Traffic Exposure/Control.

#### 3.1.1 Slips, Trips, Falls, and Protruding Objects

A variety of conditions may exist that may result in injury from slips, trips, falls, and protruding objects. Slips and trips may occur as a result of wet, slippery, or uneven walking surfaces. To prevent injuries from slips and trips, always keep work areas clean; keep walkways free of objects and debris; and report/clean up liquid spills. Serious injuries may occur as a result of falls from elevated heights. Always wear fall protection while working at heights of 6 feet or greater above the next lower level. Protruding objects are any object that extends into the path of travel or working area that may cause injury when contacted by personnel. Always be aware of protruding objects and when feasible remove or label the protruding object with an appropriate warning.

#### 3.1.2 Housekeeping

During site activities, work areas will be continuously policed for identification of excess trash and unnecessary debris. Excess debris and trash will be collected and stored in an appropriate container (e.g., plastic trash bags, garbage can, roll-off bin) prior to disposal. At no time will debris or trash be intermingled with waste PPE or contaminated materials. Additional information on the requirements of housekeeping can be found in SH&E SOP 307, *Worksite Housekeeping*.

#### 3.1.3 Electrical Hazards

The following guidance is provided to ensure electricity safety at the site:

- Personnel may set up temporary circuits up to 220 volts. Maintenance or installation of circuits over 220 volts will require qualified and trained personnel.
- Lockout devices will be used to prevent the operation/energizing of equipment or circuits during maintenance or other work. Tag-out devices will be used only where it is not feasible to use a lockout device. Insulated tools and electrical handling equipment shall be inspected prior to use to ensure the protective properties are not damaged. Damaged equipment will be tagged and removed from service.
- Extension cords and electrical connections on hand-held and other power tools will be inspected prior to use for cuts, kinks, frayed wires, etc. If any deficiency is noted, the equipment will be tagged "DAMAGED" and removed from service. Manufacturer-installed insulated electrical cords will not be repaired or spliced.
- Extension cords are to be kept clean, free of kinks, and protected from oil, hot or sharp surfaces, and chemicals. Extension cords are not to be placed across aisles, through doors, through holes

in a wall, or in areas where the cord may be damaged or create a tripping hazard. Extension cords will be appropriate for the specific task and environment.

- Ground Fault Circuit Interrupter (GFCI) devices will be in place between the equipment and power source for all temporary circuits.

#### **3.1.3.1 Extension Cords**

The following applies when extension cords are used during field operations:

- Extension cords for portable electric tools shall be of a 3-wire type;
- Use of extension cords is allowed only for temporary installations not to exceed 90 days;
- Extension cords shall be provided with a plug cap, which is either molded to the cord or equipped with a cord clamp to prevent strain on the terminal screws;
- Extension cords shall not be fastened with staples, or otherwise hung in a manner that could damage the outer jacket or insulation;
- Extension cords shall be inspected prior to each use to ensure that there is no damage or defects. Defective cords shall not be used;
- Extension cords used with grounding-type equipment (e.g., three-prong plug) shall contain a grounding-type conductor (have three prongs to accept the ground plug);
- GFCIs shall be used for all non-permanent wiring needed for construction purposes, or when working in wet or moist areas;
- Extension cords used in highly conductive work locations (e.g., wet areas) shall be of the type approved for such locations;
- Grounding-type equipment (e.g., three-prong plugs) shall not be modified to mate to incompatible outlets (e.g., cut off grounding prong to fit two-prong outlets);
- A temporary light shall not be suspended by the cord, unless the cord and light are designed for suspension;
- Temporary lights shall be equipped with bulb protectors, unless they are installed at least 7 or more feet overhead; and
- Electric lines crossing work areas, personnel, or vehicular traffic areas, shall be either fastened securely overhead (at a height that provides safe clearance for work operations), or protected by a cover capable of withstanding the imposed loads without creating a trip hazard.

#### **3.1.3.2 Portable Electrical Equipment**

Double-insulated, portable, industrial-type electrical tools meeting the requirements of the National Electrical Code (NEC) are authorized for use (ground wire not required). Where this type of tool is used, the equipment must be distinctly marked.

Portable electrical tools not provided with special insulating or grounding protection are not for use in damp, wet, or conductive locations (e.g., by persons standing on the ground or on metal floors).

All portable electrical appliances and equipment where the non-current-carrying metal parts are exposed to contact by personnel shall be grounded by a continuous conductor of adequate capacity from the device to a grounded receptacle. The Site Safety Health Officer (SSHO) shall resolve any question of whether or not a particular appliance should be grounded.

Manufacturer-installed guards shall not be tampered with, modified, or removed. These guards will be in place and utilized during operation of equipment.

The dimension of the working space in the direction of access to energized parts in switchboards, control panels, fused switches, circuit breakers, panel boards, motor controllers, and similar equipment that requires examination, adjustment, servicing, or maintenance while energized, shall not be less than 36 inches deep and 30 inches wide or the width of the equipment, whichever is greater.

Energized parts of electrical equipment operating at 50 volts or more shall be guarded against accidental contact by the use of approved cabinets or enclosures. Warning sign(s) shall be conspicuously placed on the enclosure.

Grounding of receptacles shall be accomplished in one of two ways:

- A built-in, green-colored ground wire may be attached to the ground pole of the receptacle; or
- The conduit system, if installed in an approved manner, may be relied upon for grounding of a receptacle serving single-phase appliances with ratings up to 230 volts. At outside construction sites, all single-phase 15- and 20-ampere receptacle outlets operating at 230 volts or less, which are not a part of the permanent wiring of the building or structure, must have GFCIs for personnel protection.

The outlet box for portable extension cords for outdoor use shall be weatherproofed and maintained in good condition.

### **3.1.4 Lock-Out/Tag-Out Procedures**

Use lockout/tagout procedures when performing maintenance or repairs on equipment.

It is the responsibility of AECOM employees to verify that all remediation equipment is locked out before AECOM employees perform any maintenance or repair work on the system. The source must be locked out; it is not enough to push the power switch to off and disconnect the breaker. Anyone can re-engage power under these circumstances. Locking out the power source is the only way to guarantee that the power will not be inadvertently reactivated.

A lock-out/tag-out kit will be located in the treatment shed for the duration of the project. The kit includes standard locks, keys, and lockout notices.

The site-specific lock-out/tag-out information must be completed for both the groundwater containment system and the SSD system. These forms will then be placed within the remediation trailer so all field technicians performing operations and maintenance work on the system are familiar with how to lockout the system when necessary. Refer to SH&E SOP 410, *Hazardous Energy Control*, for additional information and requirements.

### **3.1.5 Hand Tool Usage**

All manually operated hand tools and equipment shall be used in accordance with the following requirements:

- Use each tool only for the job it was designed to do.
- Discard damaged or abused tools promptly.
- Inspect for distortion, cracks, chips, wear, or mushrooming.
- Keep all tools clean and in working order.
- Be sure handles are fixed firmly to a tool's working end.
- Be sure tools and work mate properly to avoid slippage.
- Handles are made for the tool. Never use extensions.

- Confine impact forces to striking and struck tools.
- Hold work in a clamp or vise, not in your hand.
- Start off slowly when engaging the tool and the work.
- Shut current off before using a tool near electricity.
- Make sure the handle sits securely in your hand.
- Keep moving parts lightly lubed. Avoid lube leakage.
- Wear approved safety goggles when using hand tools.
- Keep hands away from sharp edges.
- Pull, don't push, a wrench handle for more leverage.
- Position your body securely while working with the tool.
- Keep jaw teeth, cutters, and blades sharp for better results.
- Keep tool's moving parts properly cleaned and tightened.
- Use steady pressure on jaws and cutters. Don't rock the tool.
- Support long, overhanging work in a vise at the far end.
- Use pads in the jaws to protect soft or crushable work.
- Use a tool close to the vise or clamp.
- Hold work in a clamp or vise with sufficient pressure.
- Keep clamped assemblies away from vibration and bumping.
- Discard a tool instead of repairing it by welding or brazing.
- Keep tools from excessive heat.
- For continuous work, use comfort grips or gloves.
- Follow instructions on the tool and/or package.
- Only non-sparking tools shall be used in locations where sources of ignition may cause a fire or explosion.
- Tools requiring heat treating or redressing shall be tempered, formed, dressed, and sharpened by personnel who are experienced in these operations.

### **3.1.6 Power Tool Usage**

The following safety precautions will be followed by project personnel using power tools in accordance with the following requirements:

- Wear appropriate eye protection such as safety glasses or face shield.
- Switch off the tools before connecting them to a power supply.
- If a power cord feels more than comfortably warm, or if a tool is sparking excessively, have it checked by an electrician or other qualified person.
- Disconnect the power supply before making adjustments or changing accessories.
- Remove any wrenches and adjusting tools before turning on a tool.

- Inspect the cord for fraying or damage before each use. Tag defective tools clearly with an Out of Service tag and replace immediately with a tool in good running order.
- During use, keep power cords clear of tools and the path that the tool will take.
- Use clamps, a vice, or other devices to hold and support the piece being worked on when practical to do so. This will allow you to use both hands for better control of the tool and will help prevent injuries if a tool jams or binds in a work piece.
- Use only approved extension cords that have the proper wire size for the length of cord and power requirements of the electric tool that you are using. This will prevent the cord from overheating.
- For outdoor work, use outdoor extension cords marked "W-A" or "W".
- Suspend power cords over aisles or work areas to eliminate stumbling or tripping hazards.
- Eliminate octopus connections: if more than one receptacle plug is needed, use a power bar or power distribution strip that has an integral power cord and a built-in over-current protection.
- Pull the plug, not the cord when unplugging a tool. Pulling the cord causes wear and may adversely affect the wiring to the plug. An electrical shock to the operator may result.
- Keep power cords away from heat, water, oil, sharp edges, and moving parts. They can damage the insulation and cause a shock.
- Avoid accidental starting by ensuring the tool is turned off before you plug it in. Also, do not walk around with a plugged-in tool with your finger touching the switch.
- Do not bypass the ON/OFF switch and operate the tools by connecting and disconnecting the power cord.
- Do not disconnect the power supply of the tool by pulling or jerking the cord from the outlet.
- Do not leave a running tool unattended. Do not leave it until it has been turned off, has stopped running completely, and has been unplugged.
- Do not use electric tools in wet conditions or damp locations unless tool is connected to a GFCI.
- Do not expose electric power tools to rain or wet conditions. Wet tools increase the likelihood for getting an electric shock.
- Avoid body contact with grounded surfaces like refrigerators, pipes, and radiators when using electric powered tools. This will reduce the likelihood of shock if the operator's body is grounded.
- Do not plug several power cords into one outlet by using single-to-multiple outlet adapters or converters ("cube taps").
- Do not use light duty power cords.
- Do not connect or splice extension cords together to make a longer connection. The resulting extension cord may not be able to provide sufficient current or power safely.
- Do not carry electrical tools by the power cord.
- Do not tie power cords in knots. Knots can cause short circuits and shocks. Loop the cords or use a twist lock plug.
- Never break off the third prong on a plug: replace broken three-prong plugs and make sure the third prong is properly grounded.
- Never use extension cords as permanent wiring. Use extension cords only as a temporary power supply to an area that does not have a power outlet.

- Do not walk on or allow vehicles or other moving equipment to pass over unprotected power cords. Cords should be put in conduits or protected by placing planks on each side of them.
- Do not brush away sawdust, shavings, or turnings while the tool is running. Never use compressed air for cleaning surfaces or removing sawdust, metal turnings, etc.
- Do not operate tools in an area containing explosive vapors or gases.
- Do not clean tools with flammable or toxic solvents.
- Do not surprise or touch anyone who is operating a tool. Startling a tool operator could end up causing an accident or injury.

### **3.1.7 Motor Vehicle Operation**

Operators of any equipment or vehicle shall be able to read and understand the signs, signals, and operating instructions in use.

Operators of motor vehicles, while on duty, shall not operate vehicles for a continuous period of more than ten hours in any 24-hour period; moreover, no employee, while on duty, may operate a motor vehicle after being in a duty status for more than twelve hours during any 24-hour period. A minimum of eight consecutive hours shall be provided for rest in each 24-hour period.

#### **3.1.7.1 Motor Vehicle Operating Rules**

The following guidelines are provided to ensure safe operation of privately owned vehicles (POV) or rental vehicles being used on the job site:

- Operators of motor vehicles being used on projects may only use cellular telephones with hands-free devices while the vehicle is in motion. Prior to using a hand-held cellular phone, drivers shall find a safe place to bring their vehicle to a stop.
- Text messaging is strictly prohibited while operating motor vehicles.
- The use of any other portable headphones, earphones, or other listening devices (except for hands-free cellular phones) while operating motor vehicles is prohibited.
- Operators of motor vehicles will not eat, drink, or smoke while the vehicle is in motion. Seat belts shall be installed and worn.
- GPS systems shall be mounted within the vehicle so that they do not create sight hazards for the operator and programming of dashboard GPS systems while driving is prohibited. The use of non-mounted GPS systems may only be used by the vehicle operator while the vehicle is stopped.
- The principles of defensive driving shall be practiced. At all times, the operator must have the vehicle under control and be able to bring it to a complete stop within a safe stopping distance.
- Vehicles may not be driven at speeds greater than the posted speed limit, with due regard for weather, traffic, intersections, width and character of the roadway, type of motor vehicle, and any other existing condition.
- Headlights shall be lighted from sunset to sunrise, during fog, smoke, rain, or other unfavorable atmospheric conditions, and at any other time when there is not sufficient light for the vehicle to be seen or the operator to see on the highway at a distance of 500 feet (150.4 meters), unless local regulations prohibit.
- Vehicles shall not be stopped, parked, or left standing on any road, or adjacent thereto, or in any area in a manner as to endanger the vehicle, other vehicles, or personnel using or passing that road or area.

- Vehicles shall not be left unattended until the motor has been shut off, the key removed (unless local regulations prohibit), parking brake set, and gear engaged in low, reverse, or park. If stopped on a hill or grade, front wheels shall be turned or hooked into the curb or the wheels securely chocked.
- When backing or maneuvering, operators will take the applicable precautions. If a signal person or spotter is not used, operators will walk behind their vehicle to view the area for possible hazards before backing their vehicle.
- All motor vehicles shall be shut down prior to and during fueling operations.

#### **3.1.7.2 Transportation of Personnel**

The number of passengers in passenger-type vehicles shall not exceed the number that can be seated. No person will be permitted to ride with arms or legs outside of a vehicle body, in a standing position on the body, on running boards, seated on side fenders, cabs, cab shields, bed of the truck, or on the load.

Vehicles transporting personnel shall not be moved until the driver has ascertained that all persons are seated and the guardrails and rear end gates are in place or doors closed. Getting on or off any vehicle while it is in motion is prohibited.

Explosives, flammable materials (excepting normal fuel supply), or toxic substances may not be transported in vehicles carrying personnel and all tools and equipment shall be guarded, stowed, and secured when transported with personnel.

#### **3.1.7.3 Motor Vehicle Equipment**

Every motor vehicle shall have:

- An operable speedometer;
- An operable fuel gage;
- An operable audible warning device (horn);
- An adequate rearview mirror or mirrors;
- A power-operated starting device;
- A windshield equipped with an adequate windshield wiper;
- An operable defrosting and defogging device;
- Non-slip surfaces on steps; and
- Cabs, cab shields, and other protection to protect the driver from the elements and falling or shifting materials.

Every person operating a motor vehicle shall possess, at all times while operating such vehicle, a license/permit valid for the equipment being operated. Licensing requirements will be as per State regulations for personnel. The operator must present the license/permit upon request. Failure to do so will result in the immediate prohibition of the operator to operate motor vehicles.

#### **3.1.7.4 Inspections, Tests, Maintenance, and Repairs**

Vehicle inspections, tests, maintenance, and repairs shall be conducted by a qualified person in accordance with the manufacturer's recommendations. Before initial use, vehicles not otherwise inspected by State or local authorities, shall be inspected by a qualified mechanic and found in safe operating condition and in compliance with all required published vehicle safety standards during this one-time inspection. The inspection shall be documented and available for inspection on the work site.



Vehicles shall be inspected on a scheduled maintenance program. Prior to each use, motor vehicles shall be checked by the operator to assure that the following parts, equipment, and accessories are in safe operating condition and free of apparent damage that could cause failure while in use:

- Service brakes, including trailer brake connections;
- Parking system (hand brake);
- Emergency stopping system (brakes);
- Tires;
- Horns;
- Steering mechanism;
- Coupling devices;
- Seat belts;
- Operating controls;
- Safety devices (e.g., backup alarms and lights, fire extinguishers, first-aid kits, etc.); and
- Accessories including lights, reflectors, windshield wipers, and defrosters where such equipment is necessary.

Inspection, test, repair, and maintenance records shall be maintained at the site available upon request.

Vehicles not meeting safe operating conditions shall be immediately removed from service, its use prohibited until unsafe conditions have been corrected, and re-inspected before being placed in service again.

Whenever visibility conditions warrant additional light, all vehicles, or combinations of vehicles, in use shall be equipped with the following:

- Two headlights, one on each side in the front;
- At least two red taillights and one red or amber stoplight on each side of the rear;
- Directional signal lights (both front and back); and
- Three emergency flares, reflective markers, or equivalent portable warning device.

### **3.1.8 Machinery and Mechanized Equipment**

#### **3.1.8.1 Preparation for Use**

Before any machinery or mechanized equipment is placed into use, it shall be inspected and tested in accordance with the manufacturer's recommendations and requirements of this manual and shall be certified in writing by a competent person to meet the manufacturer's recommendations and requirements of this manual.

The company will keep records of tests and inspections. These records shall be made available in a timely manner upon request by USACE and, when submitted, shall become part of the official project file.

All safety deficiencies noted during the inspection shall be corrected prior to the equipment being placed in service at the project.

Subsequent re-inspections will be conducted at least annually thereafter. Anytime the machinery or mechanized equipment is removed and subsequently returned to the project (other than equipment

removed for routine off-site operations as part of the project), it shall be re-inspected and recertified prior to use.

No modifications or additions that affect the capacity or safe operation of machinery or equipment shall be made without the manufacturer's written approval. If such modifications or changes are made, the capacity, operation, and maintenance instruction plates, tags, or decals shall be changed accordingly.

In no case shall the original safety factor of the equipment be reduced.

### **3.1.8.2 Daily/Shift Inspections and Tests**

All machinery and equipment shall be inspected daily (when in use) to ensure safe operating conditions. The employer shall designate competent persons to conduct the daily inspections and tests.

Tests shall be made at the beginning of each shift during which the equipment is to be used to determine that the brakes and operating systems are in proper working condition and that all required safety devices are in place and functional.

Whenever any machinery or equipment is found to be unsafe, or whenever a deficiency that affects the safe operation of equipment is observed, the equipment shall be immediately taken out of service and its use prohibited until unsafe conditions have been corrected.

A tag indicating that the equipment shall not be operated, and that the tag shall not be removed, shall be placed in a conspicuous location on the equipment. Where required, lockout procedures shall be used. The tag shall remain in its attached location until it is demonstrated to the individual deadlining the equipment that it is safe to operate.

When corrections are complete, the machinery or equipment shall be retested and re-inspected before being returned to service.

### **3.1.8.3 Equipment Operation**

Machinery and mechanized equipment shall be operated only by designated qualified personnel.

Machinery or equipment shall not be operated in a manner that will endanger persons or property nor shall the safe operating speeds or loads be exceeded.

Getting off or on any equipment while it is in motion is prohibited.

Machinery and equipment shall be operated in accordance with the manufacturer's instructions and recommendations.

The use of headphones for entertainment purposes while operating equipment is prohibited.

Inspections or determinations of road and shoulder conditions and structures shall be made in advance to assure that clearances and load capacities are safe for the passage or placing of any machinery or equipment.

Mechanized equipment shall be shut down before and during fueling operations.

Bulldozer and scraper blades, end-loader buckets, dump bodies, and similar equipment shall be either fully lowered or blocked when being repaired or when not in use. All controls shall be in a neutral position, with the engines stopped and brakes set, unless work being performed on the machine requires otherwise.

Equipment powered by an internal combustion engine will not be operated in or near an enclosed area unless adequate ventilation is provided to ensure the equipment does not generate a hazardous atmosphere.

No one shall be permitted in the truck cab during loading operations except the driver, and then only if the truck has a cab protector.

Safeguards, i.e., bumpers, railings, tracks, etc., shall be provided to prevent machinery and equipment operating on a floating plant or dock from going into the water.

Personnel shall not work in, pass under, or ride in the buckets or booms of loaders in operation.

Each bulldozer, scraper, dragline, crane, motor grader, front-end loader, mechanical shovel, backhoe, and other similar equipment shall be equipped with at least one dry chemical or CO<sub>2</sub> fire extinguisher with a minimum rating of 10-B:C.

#### **3.1.8.4 Equipment Requirements**

The following are guidelines relating to accessories will be present and operable:

- An operable fuel gage;
- An operable audible warning device (horn);
- Adequate rearview mirror or mirrors;
- Non-slip surfaces on steps;
- A power-operated starting device;
- Seats or equal protection must be provided for each person required to ride on equipment;
- Whenever visibility conditions warrant additional light, all vehicles, or combinations of vehicles, in use shall be equipped with at least two headlights and two taillights in operable condition;
- All equipment with windshields shall be equipped with powered wipers. Vehicles that operate under conditions that cause fogging or frosting of windshields shall be equipped with operable defogging or defrosting devices. Glass in windshields, windows, and doors shall be safety glass. Cracked or broken glass shall be replaced; and
- Mobile equipment, operating within an off-highway job site not open to public traffic, shall have a service brake system and a parking brake system capable of stopping and holding the equipment while fully loaded on the grade of operation. In addition, it is recommended that heavy-duty hauling equipment have an emergency brake system that will automatically stop the equipment upon failure of the service brake system. This emergency brake system should be manually operable from the driver's position.

#### **3.1.8.5 Maintenance and Repairs**

Maintenance, including preventive maintenance and repairs shall be in accordance with the manufacturer's recommendations and shall be documented. Records of maintenance and repairs conducted during the life of a contract shall be made available upon request.

All machinery or equipment shall be shut down and positive means taken to prevent its operation while repairs or manual lubrications are being done. Equipment designed to be serviced while running are exempt from this requirement.

Heavy machinery, equipment, or parts thereof that are suspended or held apart by slings, hoist, or jacks also shall be substantially blocked or cribbed before personnel are permitted to work underneath or between them.

#### **3.1.8.6 Parking**

Whenever equipment is parked, the parking brake shall be set.

Equipment parked on an incline shall have the wheels chocked or track mechanisms blocked and the parking brake set.

All equipment left unattended at night, adjacent to a highway in normal use or adjacent to construction areas where work is in progress, shall have lights or reflectors, or barricades equipped with lights or reflectors, to identify the location of the equipment.

#### **3.1.8.7 Towing**

All towing devices used on any combination of equipment shall be structurally adequate for the weight drawn and securely mounted.

Persons shall not be permitted to get between a towing vehicle and the piece of towed equipment until both have been completely stopped with all brakes set and wheels chocked on both vehicle and equipment.

#### **3.1.9 Manual Lifting**

Most materials associated with investigation and remedial activities are moved by hand. The human body is subject to severe damage in the forms of back injury, muscle strains, and hernia if caution is not observed in the handling process. Whenever possible, use at least two people to lift, or roll/lift with your arms as close to the body as possible. Under no circumstances should any one person lift more than 49 pounds unassisted. For additional requirements, refer to SH&E SOP 308, *Field Manual Lifting*.

#### **3.1.10 Drilling Operations**

Drilling operations, including hollow-stem, rotary and/or direct push drilling, present their own set of hazards. Several basic precautions that should be taken include, but are not limited to, confirming locations of underground and overhead utilities, wearing of appropriate PPE and the avoidance of loose clothing or jewelry, staying clear of moving parts, knowing the locations of emergency shut-off switches. Other operational safety precautions regarding moving the drilling equipment, raising and lowering the derrick (mast), and drilling can be found in SH&E SOP 405, *Drilling, Boring, and Direct-Push Probing*.

#### **3.1.11 Traffic Exposure/Control**

During certain work tasks, the establishment of traffic control to adequately protect workers and the public may be required on-site. Site-specific requirements will be determined by the Site Supervisor/SSO on a case-by-case basis. Only approved traffic control devices per accordance with the Manual of Uniform Traffic Control Devices will be used on public roadways in accordance with the applicable State regulatory guidance.

General traffic control precautions include placing a work vehicle between your worksite and oncoming traffic whenever possible. Not only is it a large, visible warning sign, but also if an oncoming car should fail to yield or deviate, the parked vehicle rather than your body would absorb the first impact of a crash. Turn the vehicle wheels so that if it was struck, it would swing away from the worksite. When using cones or other devices to modify traffic flow, ensure use of the proper taper length and device spacing to provide adequate warning distance to on-coming motor vehicles. In addition, proper PPE is to be worn during

traffic operations, to include hardhat and high-visibility vests. Refer to SH&E SOP 306, *Highway and Road Work*, for additional requirements.

### **3.2 Environmental Hazards and Controls**

#### **3.2.1 Hazardous Noise Levels**

Occupational noise is the most significant health hazard present in the modern industrial workplace. AECOM's Hearing Conservation Program (SH&E SOP 510 *Hearing Conservation Program*) complies with OSHA Occupational Noise Exposure Standards (CFR, Title 29, Part 1010.95). In addressing industrial noise, the following components are identified:

- Recognition;
- Evaluation;
- Control; and
- Training.

##### **3.2.1.1 Hearing Protection for Noise**

Certain operations can cause personnel to receive excessive exposure to noise. The Site Assessment investigation activity which has the most potential for causing over exposure to noise is drilling. When the drill rig is in operation, hearing protection will be donned by the field sampling team, including the drilling subcontractor. Hearing protection will be accomplished using earplugs, earmuffs, or a combination thereof.

### **3.3 Non-ionizing Radiation**

To protect against exposure to ultraviolet (UV) radiation, workers will observe the following requirements:

- All workers will wear sunglass-type safety glasses at all times when working outdoors during daylight hours;
- Workers will utilize a commercial sunblock with a minimum solar protection factor (SPF) of 30 or higher; and
- Wide-brim hard hats are recommended as they provide additional UV protection.

### **3.4 Ionizing Radiation**

Ionizing Radiation hazards are not anticipated for this project.

### **3.5 Biological Hazards**

It should be assumed that biological hazards exist whenever working on undeveloped property. This can include insect activity any time that local temperatures exceed 40°F for a period of more than 24 hours. The stubble and roots of poisonous plants can be a hazard any time of year, including when some plants are dormant or mown.

Employees in the field where biological hazards exist will not enter the hazard areas unless they are wearing the appropriate protective clothing, repellants, and barrier creams specified below. If the hazard is recognized in the field but was not adequately assessed during the AHA, the affected employees shall stop work and not proceed until the AHA has been amended and protective measures implemented.

### 3.5.1 Microorganisms

Natural and artificial bodies of water (e.g., lakes, rivers, ponds, lagoons, etc.) may contain a variety of microorganisms. Microorganisms, in particular, present a significant hazard to personnel who may come into contact with water bodies. Contact with microorganisms in water may result in dermatitis, infection (i.e., in cuts/lacerations), digestive distress, and other diseases. Always be aware of areas that may contain excessive amounts of microorganisms. Such areas may include areas of standing water, areas of warm water (i.e., cooling tower effluents, etc.), and areas downstream of municipal wastewater treatment. To prevent exposure to microorganisms in water, always adhere to the following:

- Wear protective gloves (i.e., nitrile, etc.) and other appropriate PPE to prevent skin contact with water.
- Never drink from natural or artificial bodies of water. Such water is considered non-potable and is not safe for drinking.

### 3.5.2 Ticks

Data from the CDC indicates that tick-borne diseases have become increasingly prevalent. At the same time, tick repellents have become both safe and effective so it is possible to prevent the vast majority of bites and therefore most related illnesses. The most common and severe tick-borne illnesses in the U.S. are Lyme disease, Ehrlichiosis, and Rocky Mountain spotted fever.

### 3.5.3 Chiggers

Chiggers are mite larvae, approximately  $\frac{1}{2}$  mm in size, and typically invisible to the naked eye. While chiggers are not known to carry infectious diseases, their bites and resulting rashes and itching can lead to dermatitis and a secondary infection. Chiggers are typically active from the last hard freeze in the winter or spring to the first hard freeze.

### 3.5.4 Spiders

Spiders can be found in derelict buildings, sheltered areas, basements, storage areas, well heads and even on open ground. Spiders can be found year round in sheltered areas and are often present in well heads and valve boxes. The black widow is present in northeast states and known to be dangerous to people. The black widow prefers moist, dark conditions. Black widow bites feel like a minor pinprick, but dull pains will soon develop in the area of the bite. The affected area will generally begin to cramp and other symptoms such as sweating, nausea and vomiting may occur. Other spiders native to the area possess venom but they are not harmful to humans.

**Table 3-3**  
**Poisonous Spider Identification Guide**

<p><b>Black widows</b> <b>(Latrodectus)</b></p> <ul style="list-style-type: none"> <li>• Females: shiny black with red hourglass on the bottom of abdomen</li> <li>• Males: more vibrant pattern on abdomen consisting of many red and white spots</li> <li>• Males are rarely encountered and are not known to bite humans</li> <li>• Cobweb spiders; spend most of</li> </ul>	
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### 3.5.5 Mosquitoes

When a mosquito bites, it injects an enzyme that breaks down blood capillaries and acts as an anticoagulant. The enzymes induce an immune response in the host that results in itching and local inflammation. The tendency to scratch the bite sites can lead to secondary infections.

CDC data indicates that mosquito-borne illnesses, including the strains of encephalitis, are a health risk to employees working in outdoor environments. At least one of the Encephalitis strains listed below is known to exist in every area of the U.S. and in many other countries as well:

- Eastern Equine encephalitis (EEE);
- Western Equine encephalitis (WEE);
- West Nile Virus;
- St. Louis encephalitis (SLE); and
- La Crosse (LAC) encephalitis.

Other diseases including Dengue Fever and Malaria are spread by mosquitoes in the sub-tropic and tropical parts of the world.

### 3.5.6 Bees and Hornets

Bees, hornets, and wasps may be found in derelict buildings, sheltered areas, and even on open ground. The flying/stinging insects are not specifically included in the scope of this procedure and the PPE and other protective measures are not normally effective against aggressive, flying insects. Avoid reaching into areas where visibility is limited. If stung by a wasp, bee or hornet, notify a co-worker or someone who can help should you have an allergic reaction. Stay calm and treat the area with ice or cold water. Seek medical attention if you have any reactions to the sting such as developing a rash, excessive swelling, or pain at the site of the bite or sting or any swelling or numbness beyond the site of the bite or sting.

Employees with known allergies to insect stings should consult their personal physician for advice on any immediate medications that they should carry with them. It is recommended that employees with known allergies inform their co-workers of the allergy and the location of the medications they might carry for the allergy.

### 3.5.7 Small Mammals

Working in the field either directly or indirectly with small mammals has inherent risks of injury or exposure to zoonotic diseases (infectious diseases that can be transmitted from animals to humans) against which all field staff should protect themselves. The risks are usually higher when there is direct contact with a wild animal, either through a break in the skin (blood), saliva, or excrement; however, there are also risks through air-borne diseases (e.g., Hantavirus). Avoid animals whenever possible, and if bitten, go to the nearest medical facility.

### 3.5.8 Snakes

Snakes are rarely aggressive towards humans. If a snake encounter occurs, the worker should simply maintain a safe distance and move away from it, or allow it to move away. Only two species of venomous snakes are found in northeast areas of U.S., the copperhead and the timber rattlesnake. The best snakebite treatment is to avoid getting bitten. The following suggestions will help workers stay clear of venomous snakes.

- Learn to identify, by sight, the copperhead and timber rattlesnake.
- When working in areas where snakes might be found, watch where you put your hands and feet. Watch where you sit and where you place supplies.
- Wear suitable clothing, and when working in or around tall grass or heavy brush, wear long pants and heavy boots.
- Avoid rock piles, stacks of old boards and brush in wooded areas, as snakes use such areas frequently.
- Never handle "dead" venomous snakes; they may not be completely dead.
- Leave live snakes alone. DO NOT attempt to capture or kill them.

If bitten by any venomous animal, special care should be taken to treat the wound as it may lead to complications due to the toxin. A bite from a venomous snake, which may inject varying degrees of toxic venom, is rarely fatal but should always be considered a medical emergency. Bites from a black widow should be treated as medical emergencies. All other bites should be reported, proper first aid implemented, and the wound progression tracked.

**Table 3-4**  
**Venomous Snake Identification Guide**

#### **Northern Copperhead**

##### **(*Agkistrodon contortrix mokas*)**

- Color is a rich, reddish, brown with a series of darker hourglass markings down back
- Head is usually a bright copper color; belly is pinkish
- Seldom exceeds three feet in length
- Dark dorsal markings which are narrow on the back and broad on the sides
- Found in remote rocky, wooded areas





**Timber Rattlesnake  
(*Crotalus horridus horridus*)**

- Only species of snake in region with a segmented rattle at the end of its tail
- Brown or black chevron-shaped markings on a yellow background, down its back
- Background color may vary from a bright yellow to a dull gray; Entirely black specimens also occur
- Rarely exceeds six feet in length
- Found in the remote rocky, mountainous areas



### 3.5.9 Poisonous Plants

Poisonous Plants including poison ivy, oak, and sumac, which contain the oil urushiol that produces a rash, can lead to dermatitis and infections. Exposure to urushiol produces a rash that can be irritating and cause the exposed employee to scratch the affected area, increasing susceptibility for an infection. It should be noted that each time an employee is exposed to urushiol the severity of the reaction increases. In cases that involve severe rashes, medical treatment may be necessary to control the rash.


Employees who develop a rash as a result of exposure to poisonous plants shall report the exposure immediately to the Site Supervisor or PM who will then forward the report to the Regional SH&E Manager.

**Table 3-5  
Hazardous Plant Identification Guide**


**Poison Ivy**

- Grows in West, Midwest, Texas, East
- Several forms – vine, trailing shrub, or shrub
- Three leaflets (can vary 3-9)
- Leaves green in summer, red in fall
- Yellow or green flowers
- White berries



<p><b>Poison Oak</b></p> <ul style="list-style-type: none"><li>• Grows in the East (NJ to Texas), Pacific Coast</li><li>• 6-foot tall shrubs or long vines</li><li>• Oak-like leaves, clusters of three</li><li>• Yellow berries</li></ul>	
<p><b>Poison Sumac</b></p> <ul style="list-style-type: none"><li>• Grows in boggy areas, especially in the Southwest and Northern states</li><li>• Shrub up to 15 feet tall</li><li>• Seven to 13 smooth-edged leaflets</li><li>• Glossy pale yellow or cream-colored berries</li></ul>	

**Table 3-5  
Hazardous Plant Identification Guide (Continued)**

<p><b>Giant Hogweed</b></p> <ul style="list-style-type: none"> <li>• Grows from MI to VA, found in western NY</li> <li>• 8- to 14-feet tall</li> <li>• Small, white flowers form a large flat-topped umbel</li> <li>• Leaves up to 5-feet across, lobed and deeply incised</li> </ul>	
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### 3.5.10 Personal Precautions and Protective Measures for Biological Hazards

The following precautions and protective measures will be implemented by employees conducting fieldwork where biological hazards exist:

- Chemically-treated field clothing, full length clothing, or Tyvek coveralls;
- Application of insect repellent to clothing and/or exposed skin; and
- Routine personal checks.

Disposable gloves may be cotton, leather, or synthetic materials and must not be reused after removing.

Exercise care and avoid reaching into areas where visibility is limited. If stung by an insect or bitten by a spider or tick, attempt to identify the attacker and notify a co-worker or someone who can help should the bite site become painful, discolored, or swollen. Stay calm and treat the area with ice or cold water. Seek medical attention if you have any reactions to the sting such as developing a rash, excessive swelling, or pain at the site of the bite, or any swelling or numbness beyond the site of the bite.

Oil of lemon eucalyptus, DEET and Permethrin, have been recommended by the Centers for Disease Control and Prevention (CDC) for effective protection against mosquitoes that may carry the West Nile virus and related diseases.

### 3.5.11 PPE for Poisonous Plants

Employees working in areas where poisonous plants exist shall wear either long sleeve clothing or Tyvek coveralls, and disposable cotton, leather or synthetic gloves. Employees must not touch exposed skin (neck and face) with potentially contaminated gloves. Tyvek and gloves worn to protect from exposure to poisonous plants will be treated as contaminated, removed from the body in a manner that the contamination is not spread, and placed in plastic bags for disposal.

Personal clothing that has been exposed to poisonous plants shall be decontaminated with a poisonous plant cleanser such as Tecnu or removed in a careful manner, bagged and washed separately from other clothing to remove urushiol. Work boots will be decontaminated with either soap and water or a cleansing agent such as Tecnu cleanser.

In the fall and winter, the hazard still exists in the form of stubble and roots. Employees who develop a rash as a result of exposure to poisonous plants shall report the exposure immediately to the Site Supervisor or PM who will forward the report to the Regional SH&E Manager.

### **3.5.12 Chemical Treatment of Field Clothing**

Oil of lemon eucalyptus, DEET, and Permethrin have been recommended by the CDC for effective protection against mosquitoes that may carry the West Nile virus and related diseases.

When selected as part of project's PPE requirements, the PM will ensure that field teams wear clothing treated with the chemical Permethrin, which is an insecticide with repellent properties registered with the USEPA, and recommended by the CDC. Permethrin is highly effective in preventing tick bites when applied to clothing, but is not effective when applied directly to the skin. Two options are available for Permethrin treatment of clothing worn during fieldwork:

- Pre-treatment of fabric by the clothing manufacturer; or
- Employee treatment of their personal clothing using 0.5% Permethrin spray.

#### **3.5.12.1 Pretreatment of Field Clothing**

The Permethrin pretreatment is odorless and retains its effectiveness for approximately 25 washings. After 25 washings, the pretreated clothing will be considered no longer effective and removed from service. Clothing that has been manually treated by employees will be considered effective for five wash cycles.

Use of clothing that has been pretreated with Permethrin offers a reduction in the use and application of other insect repellants that must be applied directly to the skin.

If an employee opts not to utilize chemically pretreated clothing while potentially exposed to insects, spiders, and/or ticks, they must either wear Tyvek coveralls taped to the boots or clothing consisting of long legged pants and long sleeved shirts treated with an insect repellant containing Permethrin DEET or an organic alternative to their work clothing.

#### **3.5.12.2 Lemon Eucalyptus**

Lemon Eucalyptus is a plant-based insect repellent on the market as Repel Lemon Eucalyptus. The products have been proven to be effective against mosquitoes, deer ticks, and no-see-ums for up to 6 hours. Derived from Oil of Lemon Eucalyptus, this non-greasy lotion or spray have a pleasant scent and are not known to be toxic to humans. The spray or lotions will be effective for approximately two to six hours and should be reapplied each two hours to sustain protection. Lemon Eucalyptus products cannot be applied to fire retardant clothing.

#### **3.5.12.3 Personal Hygiene and Body Checks**

Tick borne diseases typically require that the tick be imbedded for four hours to begin disease transfer. The oils from poisonous plants can take up to 4 hours after exposure to penetrate the skin and react with the live proteins under the skin.

It is recommended that exposed skin be checked frequently for the presence of ticks, insects, rashes, or discolorations. External clothing should also be checked for the presence of ticks and insects; these should be retained for identification and to determine if medical treatment is needed.

Employees will shower as soon as practical after working in the field and examine their bodies for the presence of ticks, insect bites, rashes, or swollen areas. If imbedded ticks are found they should be

removed; the tick should be preserved with the date and location of the bite noted, and retained for identification if medical treatment is needed.

The presence of an imbedded tick, rash, or abnormal reactions will be reported as an SH&E Incident to the PM or Site Supervisor who will forward the report to the Regional SH&E Manager for follow up.

### **3.6 Assessment of chemical Exposure Hazards by Task**

The tasks outlined in this document have been further analyzed for potential for chemical exposure in the following subsections.

#### **3.6.1 Mobilization**

Mobilization does not involve contact with contaminated groundwater and/or soil. Chemical exposure is not anticipated for this task.

#### **3.6.2 Soil Boring and Sample Collection**

The anticipated PPE level for this activity is Level D.

Inhalation – An inhalation hazard exists during well installation activities. The monitoring procedures and action levels established in Section 8 will be followed to avoid potential exposure.

Skin Contact – A contact hazard exists during well installation activities. Employees will don the prescribed PPE to avoid contact with impacted soils.

Ingestion – Protection against exposure via ingestion can be accomplished by performance of proper decontamination procedures when exiting contaminated work areas (see Section 12).

#### **3.6.3 Groundwater Sampling**

The anticipated PPE level for this activity is Level D. The monitoring procedures shown below will be followed during all groundwater sampling activities.

Any well which has been sealed for longer than 6 hours will be allowed to ventilate for a minimum of 5 minutes upon opening, then monitored for VOC concentration using a PID. A reading in excess of 50 ppm will require additional ventilation, followed by re-monitoring. If an acceptable VOC concentration cannot be reached within 30 minutes of opening a well, reseal it and contact the Safety Professional for guidance.

Inhalation – An inhalation hazard exists during groundwater sampling activities. The monitoring procedures and action levels established in Section 8 will be followed to avoid potential exposure.

Skin Contact – A contact hazard exists during groundwater sampling activities from coming into contact with impacted groundwater. Employees will don the prescribed PPE to avoid contact with impacted groundwater.

Ingestion – Protection against exposure via ingestion can be accomplished by performance of proper decontamination procedures when exiting contaminated work areas (see Section 12).

#### **3.6.4 Additional Work Operations**

If additional work operations become necessary, the anticipated level of PPE and hazard controls will be detailed in the applicable AHA developed for the task.

## 4 Staff organization, Qualifications, and responsibilities

All personnel are responsible for continuous adherence to the APP and SSHP procedures during the performance of their work. Staff Organization, Qualifications, Responsibilities, and lines of authority are presented in Section 4.0 of the APP.

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## 5 Training

### 5.1 General Training

Personnel performing work at the job site must be qualified as HAZWOPER workers (unless otherwise noted in specific AHAs or by the SSHO), and must meet the medical monitoring and training requirements specified in the following safety procedures:

- SH&E SOP 003, *SH&E Training*;
- SH&E SOP 507, *Hazardous Materials Communication*;
- SH&E SOP 210, *Project Safety Meetings*; and
- SH&E SOP 509, *Hazardous Waste Operations and Emergency Response (HAZWOPER) Activities*.

Personnel who participate in field activities associated with this project are subject to the training requirements presented in Section 6.0 of the APP.

### 5.2 Project-Specific Training

All personnel performing field activities at the site will be trained in accordance with SH&E SOP 003, *SH&E Training*. For this project, training will include the requirements specified in the following:

- SH&E SOP 507, *Hazardous Materials Communication*;
- SH&E SOP 210, *Project Safety Meetings*; and
- SH&E SOP 509, *Hazardous Waste Operations and Emergency Response (HAZWOPER) Activities*.

In addition to the general health and safety training programs, personnel will be:

- Instructed on the contents of applicable portions of this SSHP and any supplemental health and safety information developed for the tasks to be performed;
- Workers will be instructed on the proper ultraviolet radiation protection measures per SH&E SOP 517, *Non-Ionizing Radiation*;
- Informed about the potential routes of exposure, protective clothing, precautionary measures, and symptoms or signs of chemical exposure and heat stress;
- Made aware of task-specific physical hazards and other hazards that may be encountered during site work. This includes any client-specific required training for health and safety; and
- Made aware of fire prevention measures, fire extinguishing methods, and evacuation procedures.

The site-specific training will be performed prior to the worker performing the subject task or handling the impacted materials and on an as-needed basis thereafter. Training will be conducted by the SSHO (or his/her designee) and will be documented on the form attached to SH&E SOP 210, *Project Safety Meetings*.



### **5.2.1 Competent Person Training Requirements**

In order to complete the planned scope of work, an OSHA-designated competent person must be onsite to perform the required daily inspections of equipment and/or operations. The competent person may be an AECOM or subcontractor employee and is defined as:

*One who is capable of identifying existing and predictable hazards in the surroundings or working conditions which are unsanitary, hazardous, or dangerous to employees, and who has authorization to take prompt corrective measures to eliminate them.*

AECOM personnel must be designated by the SH&E Department per accordance with SH&E SOP 202 *Competent Person Designation*.

## 6 Personnel Protective Equipment

### 6.1 Personal Protective Equipment

The purpose of PPE is to provide a barrier, which will shield or isolate individuals from the chemical and/or physical hazards that may be encountered during work activities. SH&E SOP 208, *Personal Protective Equipment Program*, lists the general requirements for selection and usage of PPE. All Site Assessment field activities will be conducted in Level D PPE. Table 6-1 lists the minimum PPE required during Level D site operations. The specific PPE requirements for each work task are specified in the individual AHAs found in Attachment A.

Prior to the start of field operations, the SSHO will ensure that all personnel have been trained on when and what PPE is necessary; how to properly don, doff, adjust and wear PPE; limitations of PPE; and proper care, inspection, testing, and maintenance; useful life; and storage and disposal of PPE.

By signing Section 15 (Personnel Acknowledgement) of this SSHP, you are agreeing that you have been properly trained in the use, limitations, care, and maintenance of the protective equipment you will use at this project. If you have not received training on the proper use, care, and, limitations of the PPE required for this project, please see the Project Manager or SSHO for the proper training prior to signing this SSHP.

**Table 6-1**  
**Personal Protective Equipment**

Type	Material	Additional Information
<b>Minimum PPE</b>		
Safety Vest	ANSI Type II high-visibility	Must have reflective tape/be visible from all sides
Boots	Leather	ANSI approved safety toe
Safety Glasses		ANSI Approved; ≥98% UV protection
Hard Hat		If overhead hazard is present. ANSI Approved; recommended wide-brim.
Work Uniform		No shorts/cutoff jeans or sleeveless shirts
<b>Additional PPE</b>		
Hearing Protection	Ear plugs and/ or muffs	In hazardous noise areas
Leather Gloves		If working with sharp objects or powered equipment.
Protective Chemical Gloves	Nitrile	
Sunscreen	SPF 30 or higher	
Cold Weather Gear	Hard hat liner, hand warmers, insulated gloves, and thick, warm socks	

## 6.2 PPE Doffing and Donning Information

The following information is to provide field personnel with helpful hints that, when applied, make donning and doffing of PPE a more safe and manageable task:

- Never cut disposable booties from your feet with basic utility knives. This has resulted in workers cutting through the bootie and the underlying sturdy leather work boot, resulting in significant cuts to the legs/ankles. Recommend using a pair of scissors or a package/letter opener (cut above and parallel with the work boot) to start a cut in the edge of the bootie, then proceed by manually tearing the material down to the sole of the bootie for easy removal;
- When applying duct tape to PPE interfaces (wrist, lower leg, around respirator, etc.) and zippers, leave approximately one inch at the end of the tape to fold over onto itself. This will make it much easier to remove the tape by providing a small handle to grab while still wearing gloves. Without this fold, trying to pull up the tape end with multiple gloves on may be difficult and result in premature tearing of the PPE;
- Have a “buddy” check your ensemble to ensure proper donning before entering controlled work areas. Without mirrors, the most obvious discrepancies can go unnoticed and may result in a potential exposure situation; and
- Never perform personal decontamination with a pressure washer.

## 7 Medical Surveillance

All on-site personnel must participate in a medical surveillance program that complies with OSHA 1910.120 where the evaluation includes a judgment of the employee's ability to use respiratory protective equipment and to participate in hazardous waste site activities. Additionally, personnel trained and certified in First Aid and Cardiopulmonary Resuscitation (CPR) will be onsite at all times when work is being performed.

All current certifications and training records for site personnel will be maintained on-site for the duration of the project. Individuals without proper training records will not be permitted on-site. All training and certification records will be made available upon request.

### 7.1 Exemptions/Exceptions to Medical Surveillance and Training

The support zone (SZ) is defined as the work zone where no contamination is present and no potential for exposure exists. AECOM personnel who remain in the SZ and never enter the exclusion zone (EZ) or contamination reduction zone (CRZ) will not be subject to exposure potential. Therefore, they are exempt from all provisions of the standard, including medical surveillance and training, as per the preamble and 29 CFR 1910.120(a)(i). This exemption to the standard holds true for all personnel working in situations where lack of exposure potential can be demonstrated.

Client and/or regulators will be responsible for the compliance parameters prescribed for their representatives, employees, visitors, subcontractors, and affiliates, as these personnel do not fall under AECOM's Health and Safety Program, the APP/SSHP, and/or AECOM authority. However, if client and/or regulatory personnel enter the AECOM exclusion zone, they will be required to wear the prescribed PPE worn by AECOM employees. Additionally, they are responsible for having documentation that they are medically capable and trained to be in the work area and/or wear the PPE. Client and/or regulatory personnel will be responsible for ensuring compliance with this requirement and are required to attend a site-specific training session given by their safety representative.

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## 8 Exposure Monitoring / Air Sampling Program

Monitoring procedures will be employed during site characterization activities to assess employee exposure to chemical and physical hazards. Monitoring will consist primarily of on-site determination of various parameters (e.g., airborne contaminant concentrations and heat stress effects), but may be supplemented by more sophisticated monitoring techniques, if necessary. The suspected contaminants of concern (COC), identified by the historical site use data, may include VOCs, SVOCs, TPH, PAH, and Metals.

### 8.1 Real-Time Exposure Measurement

Monitoring will be performed within the work area in order to detect the presence and relative levels of toxic substances. The data collected throughout monitoring will be used to determine the appropriate levels of PPE. Monitoring will be conducted as specified in each AHA (Attachment A) as work is performed.

Table 8-1 specifies the real-time monitoring equipment, which will be used for this project.

**Table 8-1**  
**Monitoring Parameters and Equipment**

Instrument	Manufacturer/Model*	Substances Detected
Photoionization Detector (PID)	RAE Systems Mini-RAE Photovac Microtip HNu Model Hnu (10.6 eV bulb)	VOCs, SVOCs, TPH, PAH

It is not anticipated that groundwater sampling will result in a sufficient dispersal of contaminants to pose an inhalation risk. While no historical data is available for heavy metal concentrations in soil, any dispersal of dust will be controlled through the utilization of DPT to advance the soil borings. Risk due to ingestion and dermal exposure will be controlled through the use of PPE and worksite housekeeping to reduce handling or dispersal of contaminated media.

#### 8.1.1 Health and Safety Action Levels

An action level is a point at which increased protection is required due to the concentration of contaminants in the work area or other environmental conditions. The concentration level (above background level) and the ability of the PPE to protect against that specific contaminant determine each action level. The action levels are based on concentrations in the breathing zone.

All field activities will be conducted in Level D PPE. If ambient levels are measured which exceed the action level (see Table 8-2), all investigations at that location will be shut down.

Personnel should also be able to upgrade or downgrade their level of protection with the concurrence of SSO or the Safety Professional.

Reasons to upgrade:

- Known or suspected presence of dermal hazards;
- Occurrence or likely occurrence of gas, vapor, or dust emission; or
- Change in work task that will increase the exposure or potential exposure to hazardous materials.

Reasons to downgrade:

- New information indicating that the situation is less hazardous than was originally suspected;
- Change in site conditions that decrease the potential hazard; or
- Change in work task that will reduce exposure to hazardous materials.

### **8.1.2 Monitoring Procedures**

A summary of the monitoring procedures and action levels are presented in Table 8-2. Any well which has been sealed for longer than six hours will be allowed to ventilate for a minimum of five minutes upon opening, then monitored at the well head for VOC concentrations using a PID. A reading in excess of 2.5 ppm will require additional ventilation, followed by re-monitoring. If an acceptable VOC concentration (below 2.5 ppm) cannot be reached within 30 minutes of opening a well, reseal it and contact the Regional Health and Safety Manager for guidance. The procedures summarized in Table 8-2 will be followed during drilling operations.

During drilling and advancement of soil borings and handling of IDW, the breathing zone will be monitored for VOC concentrations. If ambient levels are measured that exceed the action levels, on-site workers must be implement the mitigative actions and control measures prior to commencing or continuing activities at the specific work area.

The lower alarm limit of the PID should be set at 2.5 ppm and the upper alarm limit should be set at 15 ppm. A lower level alarm sustained for 5 minutes requires additional analysis with VC Drager tubes. An upper level alarm sustained for 5 minutes requires stop work. The provisions below provide for the appropriate action level and action to afford respiratory protection to on-site workers during this scope of services.

**Table 8-2  
Monitoring Procedures and Action Levels**

<b>VOCs measured by PID (10.6 eV bulb) calibrated to Isobutylene</b>		
<b>Zone Location and Monitoring Interval</b>	<b>Response Level (sustained in BZ for <math>\geq 5</math> minutes)</b>	<b>Response Activity</b>
Worker Breathing Zone, continuous during all activities	0 - 2.5 ppm	Continue work in required PPE, station personnel up-wind, and continue monitoring.
	> 2.5 - 15 ppm	Continue work in required PPE, continue monitoring. Implement engineering controls (dilution ventilation).
	> 15 - 25 ppm	STOP WORK. Contact the SSHO, implement mitigation measures and prepare for upgrade to Level C. Contact HSM and PM.
	> 25 ppm	STOP WORK, shut down all equipment, exit, and contact the HSM and PM.

### 8.1.3 Monitoring Equipment Calibration

All instruments used will be calibrated at the beginning and end of each work shift, in accordance with the manufacturer's recommendations. If the owner's manual is not available, the personnel operating the equipment will contact the applicable office representative, rental agency, or manufacturer for technical guidance for proper calibration. If equipment cannot be pre-calibrated to specifications, site operations requiring monitoring for worker exposure or off-site migration of contaminants will be postponed or temporarily ceased until this requirement is completed.

### 8.1.4 Personal Sampling

Should site activities warrant performing personal sampling to better assess chemical exposures experienced by employees, the SSHO, under the direction of a Certified Industrial Hygienist (CIH), will be responsible for specifying the monitoring required. Within five working days after the receipt of monitoring results, the CIH will notify each employee, in writing, of the results that represent that employee's exposure. Copies of air sampling results will be maintained in the project files.

If the site activities warrant, the subcontractor will ensure its employees' exposures are quantified via the use of appropriate sampling techniques. The subcontractor shall notify the employees sampled in accordance with health and safety regulations, and provide the results to the SSHO for use in determining the potential for other employees' exposure.



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## 9 Heat and Cold Stress

Heat and cold stress may vary based upon work activities, PPE/clothing selection, the season of the year, and weather conditions. To reduce the potential of developing heat/cold stress, be aware of the signs and symptoms of heat/cold stress and watch fellow employees for signs of heat/cold stress. For additional requirements, see Section 9.14 of the APP, Heat/Cold Stress Monitoring Plan.

Heat stress can be a significant field site hazard, particularly for non-acclimated personnel operating in a hot, humid setting. Site personnel will be instructed in the identification of a heat stress victim, the first-aid treatment procedures for the victim and the prevention of heat stress casualties as specified in the APP.

Heat Stress monitoring and work-rest regiments will be implemented using the Adjusted Temperature Method outlined in SH&E 511, *Heat Stress*. All temperature monitoring results, physiological monitoring results, and temperature stress controls will be documented in field records using the Heat Stress Monitoring form attached to the SOP.

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## 10 Standard Operating Safety Procedures, Engineering controls, and work practices

### 10.1 Safe Work Practices

Personnel are charged with performing all job duties in a responsible manner, following and complying with regulatory standards, company safety policies, industry standards, work practices, guidelines, and project-specific requirements governing the scope of work.

Personnel must be aware of the job site conditions, work environments, client operations, contractor activities, and general public (if applicable) that may impact an employee or be impacted by or affected by one's work by observing the following guidelines:

- Work in a manner that will not put oneself, other personnel or equipment or facilities at risk;
- Identify hazardous conditions and activities in the work environment consistent with the job and training;
- If one can't remove a hazard, it should be reported to the PM promptly;
- Implement established control methods consistent with project procedures and/or training.
- Unsafe employee actions or behavior are prohibited;
- Employees performing inspections, construction observations, investigations, reviews, surveys or visits to remote sites shall work in teams of a minimum of two persons present (buddy system), or an alternate communication plan must be provided;
- Work involving the removal, handling, storage or disposal of hazardous materials or wastes requires the approval of the Regional SH&E Manager;
- Immediately report all potentially dangerous conditions and injuries, regardless of severity, to the SSHO; and
- Report all accidents that result in medical treatment, equipment damage or near miss incidents to supervision immediately.

### 10.2 Personal Standards

Any employee who willfully disregards company or client safety standards, rules, or requirements is subject to disciplinary action, including removal from the project and dismissal. The following guidelines are provided:

- Carrying firearms or other weapons on company or a client's property is prohibited.
- Fighting and gambling are not permitted.
- Be considerate of the safety and welfare of others. Distracting other's attention or engaging in practical jokes and horseplay is prohibited.
- Employees are not permitted to use, sell or distribute, be under the influence, or have in their possession any controlled substances, drugs, or alcohol. The only exception is if an employee is taking prescription medication(s) under the direction of a physician. It is then the responsibility of the employee to notify one's Project Manager if the medication may impair their ability to perform their job function in a safe manner, in which case they shall be removed from that task.

- Smoking is prohibited in any area specifically designated as “NO SMOKING” and in all company facilities.
- Be alert at all times. Obey safety signs, heed warning signs and instructions.
- Report unsafe equipment, conditions, and actions or behavior to one’s task leader or supervisor promptly.
- Avoid back injuries by knowing one’s capabilities, using proper lifting techniques, and seeking assistance when needed.
- Employees should operate vehicles in a safe and conscientious manner.
- Use only designated project entrances, parking areas and facilities.
- Show or produce evidence of identification or required training if requested to gain entry to or while on a project.
- Personal cameras, video recorders, and other photographic equipment shall not be permitted on site without the PM and client’s approval.
- All employees shall direct any questions or concerns they may have about the project APP/SSHP, job tasks, instructions or conditions to the SSHO, PM or Regional SH&E Manager.

### 10.3 General Safety Rules

All site personnel shall conduct themselves in a safe manner and maintain a working environment that is free of additional hazards, in adherence to SH&E SOP 001 *Safe Work Standards and Rules* and SH&E SOP 307 *Worksite Housekeeping*.

Employees are required to practice “good housekeeping” when performing job tasks at all company locations and offices. Such practices include:

- Overseeing that work areas are kept clean and organized by using approved cleaning materials for tools and equipment; proper packaging and disposal of waste materials including hazardous materials; and leaving a work area clean and orderly. This includes office workstations and occupancies.
- One should plan work tasks before beginning work and consider any hazards that may exist and how to avoid them through proper work practices.
- One should keep an eye out for and take care of one’s “buddy” in the field.
- Obey all warning signs (e.g., “Do Not Enter,” “No Smoking,” “Eye, Hearing or Respiratory Protection Required,” “Permit Required Confined Space,” “Authorized Personnel Only”).
- Do not jump from any elevated surface or platform, including truck beds, equipment, and scaffolding.
- Taking shortcuts leads to injury. Use appropriate ladders, platforms, and stairs. Do not block, deface or remove any signage, barricade or fencing without approval.
- Keep passageways clean and clear of debris, materials, hoses, cords, and tripping obstructions. Items should be moved to low activity areas or overhead.
- Permits may be required when performing non-routine tasks and work involving hazards. Seek advice from the PM.
- Use only designated sanitary facilities.
- Be alert to work going on, around or above you including contractor activities and motoring public vehicles.

- Be familiar with project emergency procedures. Report all emergency situations to the PM immediately.
- Hand tools, electronic devices, and equipment may not be used for any purpose other than their intended use. Damaged equipment and tools with worn part(s) shall be reported to the Site Supervisor for repair or replacement.
- Electric power tools must be properly grounded or double insulated. Electric power tools shall be Ground Fault Circuit Interrupter-protected when use in wet and exterior conditions.
- Defective tools and equipment, frayed and ungrounded electrical cords and unguarded tools and machinery shall not be used. Report same to the Project Manager.
- Employees shall not remove floor covering, guardrails, or other working surfaces from any floor or perimeter side opening without approval by the PM.
- Defective or unsecured ladders shall not be used.
- Employees shall not ascend or descend a ladder without free use of both hands while facing the ladder.

#### **10.3.1 Housekeeping**

During site activities, work areas will be continuously policed for identification of excess trash and unnecessary debris. Excess debris and trash will be collected and stored in an appropriate container (e.g., plastic trash bags, garbage can, roll-off bin) prior to disposal. At no time will debris or trash be intermingled with waste PPE or contaminated materials.

#### **10.3.2 Smoking, Eating, or Drinking**

Smoking, eating and drinking will not be permitted inside any controlled work area at any time. Field workers will first wash hands and face immediately after leaving controlled work areas (and always prior to eating or drinking). Consumption of alcoholic beverages is prohibited at any AECOM site. Smoking, eating or drinking must be in an approved area.

#### **10.3.3 Personal Hygiene**

The following personal hygiene requirements will be observed:

Water Supply: A water supply meeting the following requirements will be utilized:

*Potable Water* - An adequate supply of potable water will be available for field personnel consumption. Potable water can be provided in the form of water bottles, canteens, water coolers, or drinking fountains. Where drinking fountains are not available, individual-use cups will be provided as well as adequate disposal containers. Potable water containers will be properly identified in order to distinguish them from non-potable water sources.

*Non-Potable Water* - Non-potable water may be used for hand washing and cleaning activities. Non-potable water will not be used for drinking purposes. All containers of non-potable water will be marked with a label stating:

***Non-Potable Water  
Not Intended for Drinking Water Consumption***

Toilet Facilities: A minimum of one toilet will be provided for every 20 personnel on site, with separate toilets maintained for each sex except where there are less than five total personnel on site. For mobile crews where work activities and locations permit transportation to nearby toilet facilities on-site facilities are not required.

Washing Facilities: Employees will be provided washing facilities (e.g., buckets with water and Alconox) at each work location. The use of water and hand soap (or similar substance) will be required by all employees following exit from the Exclusion Zone, prior to breaks, and at the end of daily work activities.

#### **10.3.4 Buddy System**

All field personnel will use the buddy system when working within any controlled work area. Personnel belonging to another organization on site can serve as "buddies" for AECOM personnel. Under no circumstances will any employee be present alone in a controlled work area. For areas not in controlled work areas, the procedures outlined in SH&E SOP 314 *Working Alone and Remote Travel* will be followed at all times.

#### **10.4 Safety Equipment Rules**

The following guidelines are provided that relate to safety equipment:

- Always wear assigned safety equipment and PPE.
- Always use protective equipment in accordance with manufacturer's instructions and company training and procedures.
- All employees, subcontractors, subconsultants, visitors, and vendors shall wear a hard hat, high visibility vest, sturdy work boots, and eye protection on projects. Other PPE may be required based on the nature of the work.
- Wear clothing suitable for the work being performed. Minimum attire consists of long pants and shirt with a minimum 4-inch sleeve, tank tops are not permitted unless otherwise specified.
- Hearing protection devices shall be used when conducting drilling operations.
- Fall protection equipment is required for all work with a fall exposure greater than 6 feet on any elevated structure or aerial platform including structural steel, incomplete work platforms, scaffolding, open surface work, and aerial lifts.
- Modification or alteration of any safety equipment is prohibited as it changes the equipment's design strength and manufacturer's certifications.
- PPE use shall be consistently enforced in accordance with rules established for the project and federal and state safety regulations.

#### **10.5 Work Ergonomic Rules**

The following guidelines are provided that address ergonomic issues:

- Use proper methods to perform all job functions so as to minimize the risk of physical injury.
- Take reasonable precautions when lifting heavy or large objects that could cause back injury or hernia.
- Do not exceed one's capability and strength. Seek assistance.
- Make suitable adjustments to one's workstation including office furniture, chair, keyboard platform, computer monitor for comfort, equipment, and work.
- Avoid routine, repetitive motion hand activities. Integrate varying motions and body parts.
- Change work routines e.g., phones, typing, files. Stretch and take mini-breaks.

## **10.6 Tailgate Meetings**

Prior to the commencement of daily project activities, a tailgate meeting will be conducted by the SSHO to review the specific requirements of this HASP and applicable AHA. Attendance at the daily tailgate meeting is mandatory for all employees at the site covered by this HASP and must be documented on the attendance form. All safety training documentation is to be maintained in the project file by the SSHO.

## **10.7 Hazard Communication**

Hazardous materials that may be encountered as existing on-site environmental or physical/health contaminants during the work activities are addressed in this SSHP and their properties, hazards, and associated required controls will be communicated to all affected staff and subcontractors.

In addition, any employee or organization (contractor or subcontractor) intending to bring any hazardous material onto this AECOM-controlled work site must first provide a copy of the item's Material Safety Data Sheet (MSDS) to the SSHO for review and filing (the SSHO will maintain copies of all MSDS on site). MSDS may not be available for locally-obtained products, in which case some alternate form of product hazard documentation will be acceptable in accordance with the requirements of S3NA-507-PR Hazardous Materials Communication/WHMIS.

All personnel shall be briefed on the hazards of any chemical product they use, and shall be aware of and have access to all MSDS.

All containers on site shall be properly labeled to indicate their contents. Labeling on any containers not intended for single-day, individual use shall contain additional information indicating potential health and safety hazards (flammability, reactivity, etc.).

## **10.8 Hazardous, Solid, or Municipal Waste**

If hazardous, solid, and/or municipal wastes are generated during any phase of the project, the waste shall be accumulated, labeled, and disposed of in accordance with applicable Federal, State, Provincial, Territorial and/or local regulations. Consult the Regional SH&E Manager for further guidance.

## **10.9 Stop Work Authority**

All employees have the right and duty to stop work when conditions are unsafe, and to assist in correcting these conditions as outlined in SH&E SOP 002, *Stop Work Authority for Unsafe Work*. Whenever the SSO determines that workplace conditions present an uncontrolled risk of injury or illness to employees, immediate resolution with the appropriate supervisor shall be sought. Should the supervisor be unable or unwilling to correct the unsafe conditions, the SSHO is authorized and required to stop work, which shall be immediately binding on all affected AECOM employees and subcontractors.

Upon issuing the stop work order, the SSHO shall implement corrective actions so that operations may be safely resumed. Resumption of safe operations is the primary objective; however, operations shall not resume until the Safety Professional has concurred that workplace conditions meet acceptable safety standards.

## **10.10 Client Specific Safety Requirements**

The client has specified no additional health and safety requirements.



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## 11 Site Control Measures

### 11.1 General

The purpose of site control is to minimize potential contamination of workers, protect the public from site hazards, and prevent vandalism. The degree of site control necessary depends on the site characteristics, site size, and the surrounding community.

Controlled work areas will be established at each work location, and if required, will be established directly prior to the work being conducted. Diagrams designating specific controlled work areas will be drawn on site maps, posted in the support vehicle or trailer, and discussed during the daily safety meetings. If the site layout changes, the new areas and their potential hazards will be discussed immediately after the changes are made. General examples of zone layouts have been developed for drilling activities and are attached to this section.

### 11.2 Controlled Work Areas

Each HAZWOPER controlled work area will consist of the following three zones:

- **Exclusion Zone (EZ):** Contaminated work area.
- **Contamination Reduction Zone (CRZ):** Decontamination area.
- **Support Zone (SZ):** Uncontaminated or “clean area” where personnel should not be exposed to hazardous conditions.

Each zone will be periodically monitored in accordance with the air monitoring requirements established in this SSHP. The EZ and the CRZ are considered work areas. The SZ is accessible to the public (e.g., vendors, inspectors). Example layouts of the work zones for drilling operation is presented in Figures 11-1.

#### 11.2.1 Exclusion Zone

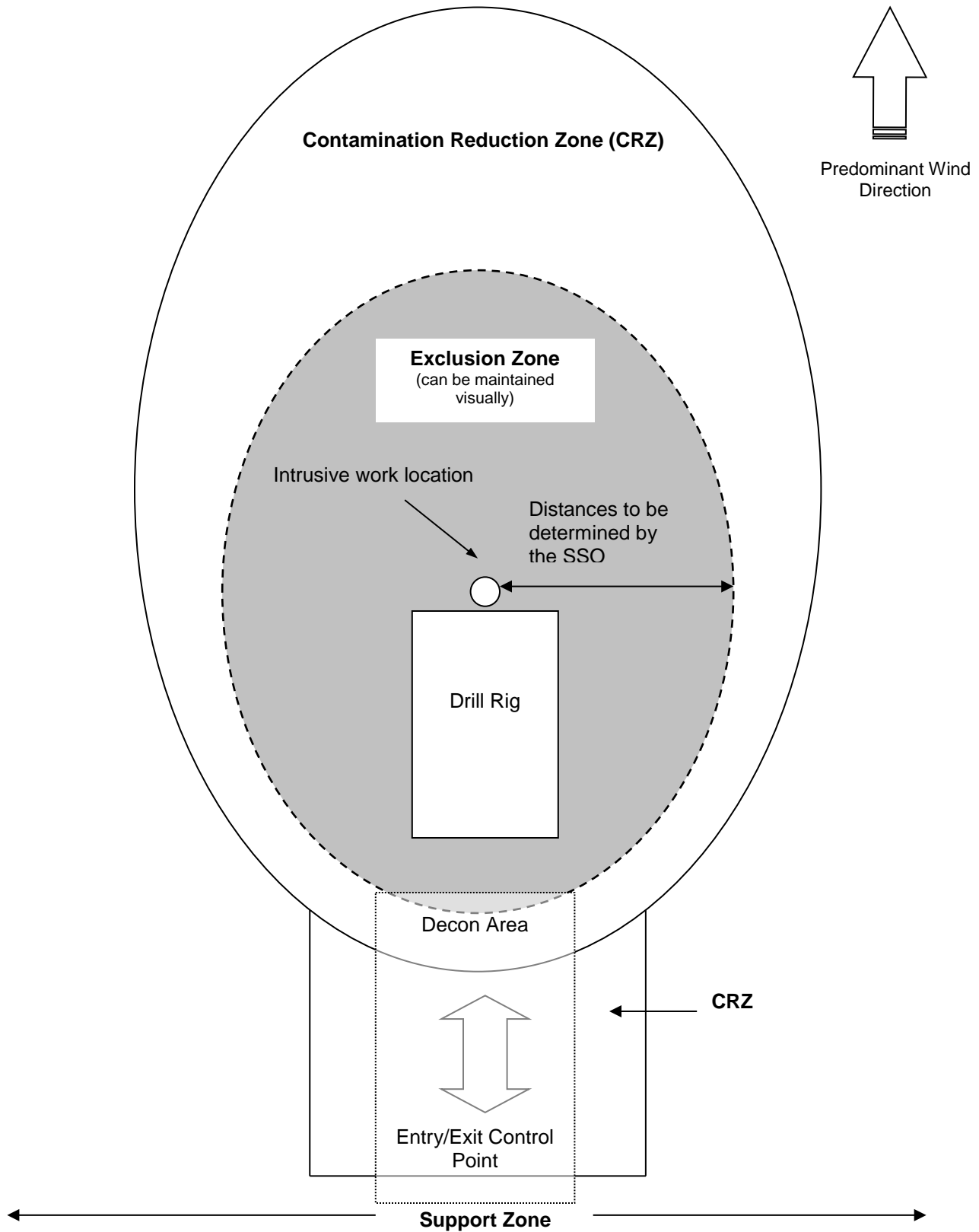
The EZ is the area where primary activities occur, such as sampling, remediation operations, installation of wells, cleanup work, etc. This area must be clearly marked with hazard tape, barricades or cones, or enclosed by fences or ropes. Only personnel involved in work activities, and meeting the requirements specified in the applicable AHA and Sections 4 and 5 will be allowed in an EZ.

The extent of each area will be sufficient to ensure that personnel located at/beyond its boundaries will not be affected in any substantial way by hazards associated with sample collection activities. To meet this requirement, the following minimum distances will be used:

- **Drilling and Soil Sampling:** Determine the mast height of the drill rig. This height will be cleared, if practical, in all directions from the borehole location and designated as the exclusion zone. The cleared area will be sufficient to accommodate movement of necessary equipment and the stockpiling of spoils piles.
- **Groundwater Sampling:** A distance of 10 feet will be cleared in all directions from the monitoring well. The cleared area will be sufficient to accommodate sampling equipment and supplies.

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**Figure 11-1**  
**Example Drilling Site Control Layout**



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All personnel should be alert to prevent unauthorized, accidental entrance into controlled-access areas (the EZ and CRZ). If such an entry should occur, the trespasser should be immediately escorted outside the area, or all HAZWOPER-related work must cease. All personnel, equipment, and supplies that enter controlled-access areas must be decontaminated or containerized as waste prior to leaving (through the CRZ only).

#### **11.2.2 Contamination Reduction Zone**

The CRZ is the transition area between the contaminated area and the clean area. Decontamination is the main focus in this area. The decontamination of workers and equipment limits the physical transfer of hazardous substances into the clean area. This area must also be clearly marked with hazard tape and access limited to personnel involved in decontamination. Decontamination procedures are further explained in Section 12.

#### **11.2.3 Support Zone**

The SZ is an uncontaminated zone where administrative and other support functions, such as first aid, equipment supply, emergency information, etc., are located. The SZ shall have minimal potential for significant exposure to contaminants (i.e., background levels).

Employees will establish a SZ (if necessary) at the site before the commencement of site activities. The SZ would also serve as the entry point for controlling site access.

### **11.3 Site Access Documentation**

If implemented by the PM, all personnel entering the site shall complete the "Site Entry/Exit Log" located at the site trailer or primary site support vehicle.

#### **11.3.1 Visitor Access**

Visitors to any HAZWOPER controlled-work area must comply with the health and safety requirements of this SSHP and demonstrate an acceptable need for entry into the work area. All visitors desiring to enter any controlled work area must observe the following procedures:

- A written confirmation must be received by AECOM documenting that each of the visitors has received the proper training and medical monitoring required by this SSHP. Verbal confirmation can be considered acceptable provided such confirmation is made by an officer or other authorized representative of the visitor's organization.
- Each visitor will be briefed on the hazards associated with the site activities being performed and acknowledge receipt of this briefing by signing the appropriate tailgate safety briefing form.
- All visitors must be escorted by an AECOM employee.

If the site visitor requires entry to any EZ, but does not comply with the above requirements, all work activities within the EZ must be suspended. Until these requirements have been met, entry will not be permitted.

### **11.4 Site Security**

Site security is necessary to:

- Prevent the exposure of unauthorized, unprotected people to site hazards;
- Avoid the increased hazards from vandals or persons seeking to abandon other wastes on the site;

- Prevent theft; and
- Avoid interference with safe working procedures.

To maintain site security during working hours:

- Maintain security in the SZ and at access control points.
- Establish an identification system to identify authorized persons and limitations to their approved activities.
- Assign responsibility for enforcing authority for entry and exit requirements.
- When feasible, install fencing or other physical barrier around the site.
- If the site is not fenced, post signs around the perimeter and whenever possible, use guards to patrol the perimeter. Guards must be fully apprised of the hazards involved and trained in emergency procedures.
- Have the PM approve all visitors to the site. Make sure they have valid purpose for entering the site. Have trained site personnel accompany visitors at all times and provide them with the appropriate protective equipment.

To maintain site security during off-duty hours:

- If possible, assign trained, in-house technicians for site surveillance. They will be familiar with the site, the nature of the work, the site's hazards, and respiratory protection techniques.
- If necessary, use security guards to patrol the site boundary. Such personnel may be less expensive than trained technicians, but will be more difficult to train in safety procedures and will be less confident in reacting to problems around hazardous substances.
- Enlist public enforcement agencies, such as the local police department, if the site presents a significant risk to local health and safety.
- Secure the equipment.

## 12 Personal Hygiene and Decontamination

### 12.1 Personal Hygiene

Section 9.4 of the APP contains the site sanitation plan for the project.

### 12.2 Decontamination Requirements

All possible and necessary steps shall be taken to reduce or minimize contact with chemicals and contaminated/impacted materials while performing field activities (e.g., avoid sitting or leaning on, walking through, dragging equipment through or over, tracking, or splashing potential or known contaminated/impacted materials, etc).

All personal decontamination activities shall be performed with an attendant (buddy) to provide assistance to personnel that are performing decontamination activities. Depending on specific site hazards, attendants may be required to wear a level of protection that is equal to the required level in the EZ.

All persons and equipment entering the EZ shall be considered contaminated, and thus, must be properly decontaminated in the CRZ prior to entering the SZ.

Decontamination procedures may vary based on site conditions and nature of the contaminant(s). If chemicals or decontamination solutions are used, care should be taken to minimize reactions between the solutions and contaminated materials. In addition, personnel must assess the potential exposures created by the decontamination chemical(s) or solutions. The applicable MSDS must be reviewed, implemented, and filed by personnel contacting the chemicals/solutions.

All contaminated PPE and decontamination materials shall be contained, stored, and disposed of in accordance with site-specific requirements determined by site management.

#### 12.2.1 General Requirements

All possible and necessary steps shall be taken to reduce or minimize contact with chemicals and contaminated/impacted materials while performing field activities (e.g., avoid sitting or leaning on, walking through, dragging equipment through or over, tracking, or splashing potential or known contaminated/impacted materials, etc).

All personal decontamination activities shall be performed with an attendant (buddy) to provide assistance to personnel that are performing decontamination activities. Decontamination procedures may vary based on site conditions and nature of the contaminant(s). If chemicals or decontamination solutions are used, care should be taken to minimize reactions between the solutions and contaminated materials. In addition, personnel must assess the potential exposures created by the decontamination chemical(s) or solutions. The applicable MSDS must be reviewed, implemented, and filed by personnel contacting the chemicals/solutions.

All contaminated PPE and decontamination materials shall be contained, stored, and disposed of in accordance with site-specific requirements determined by site management.

#### 12.2.2 Decontamination Equipment

The equipment required to perform decontamination may vary based on site-specific conditions and the nature of the contaminant(s). The following equipment is commonly used for decontamination purposes:

- Soft-bristle scrub brushes or long-handled brushes to remove contaminants;



- Hoses, buckets of water or garden sprayers for rinsing;
- Large plastic/galvanized wash tubs or children's wading pools for washing and rinsing solutions;
- Large plastic garbage cans or similar containers lined with plastic bags for the storage of contaminated clothing and equipment;
- Metal or plastic cans or drums for the temporary storage of contaminated liquids; and
- Paper or cloth towels for drying protective clothing and equipment.

### **12.2.3 Personal and Equipment Decontamination**

All equipment leaving the EZ shall be considered contaminated and must be properly decontaminated to minimize the potential for exposure and off-site migration of impacted materials. Such equipment may include, but is not limited to: sampling tools, heavy equipment, vehicles, PPE, support devices (e.g., hoses, cylinders, etc.), and various handheld tools.

All employees performing equipment decontamination shall wear the appropriate PPE to protect against exposure to contaminated materials. The level of PPE may be equivalent to the level of PPE required in the EZ. Other PPE may include splash protection, such as face-shields and splash suits, and knee protectors. Following equipment decontamination, employees may be required to follow the proper personal decontamination procedures above.

Personnel decontamination should consist of the following glove removal procedure:

- Grasp the cuff of the dominant hand and pull glove over the bulk of the hand, leaving the fingers inside the glove;
- Use the dominant hand to grasp the cuff of the non-dominant hand and pull the glove completely off (inside-out) and place inside of the dominant hand glove;
- Once removed, employee should only touch the inside material of the dominant hand glove; and
- Thoroughly wash hands.

For equipment, a high-pressure washer may need to be used. Some contaminants require the use of a detergent or chemical solution and scrub brushes to ensure proper decontamination. Before heavy equipment and trucks are taken offsite, the Site Supervisor and/or SSHO will visually inspect them for signs of contamination. If contamination is present, the equipment must be decontaminated.

For smaller equipment, use the following steps for decontamination:

- Remove majority of visible gross contamination in EZ;
- Wash equipment in decontamination solution with a scrub brush and/or power wash heavy equipment;
- Rinse equipment;
- Visually inspect for remaining contamination; and
- Follow appropriate personal decontamination steps outlined above.

All decontaminated equipment shall be visually inspected for contamination prior to leaving the CRZ. Signs of visible contamination may include an oily sheen, residue or contaminated soils left on the equipment. All equipment with visible signs of contamination shall be discarded or re-decontaminated until clean. Depending on the nature of the contaminant, equipment may have to be analyzed using a wipe method or other means.

## 13 Emergency Equipment and First Aid

A complete first aid kit, Type III, 16 unit or larger in a waterproof container, and containing at a minimum, a one pocket mouthpiece for CPR, absorbent compresses, adhesive bandages, adhesive tape, antiseptic swabs, burn gel, sterile pads, and a triangular bandage will be readily available on-site. Its contents will be evaluated and possibly modified for this specific project. It will be located in the SZ.

The contents will be checked prior to their utilization for sterility and to replace expended items. The SSHO or other designated individual will inventory the kit weekly.

Prior to the start of work, the SSHO will discuss with site personnel the prevention steps, symptoms and medical persons available to assist with injuries or questions on diseases, plants or animals that could be encountered while working on this project.

A working cell phone and radio with adequate signal in this area will be maintained on-site and fully charged at the start of each work day.

A fire extinguisher will be readily available on-site. It will be located in the SZ, not more than 25 feet from the SZ activities. A minimum of a 5-lb. B: C fire extinguisher will be maintained in each vehicle as well. Personnel will be instructed on the proper use of fire extinguishers.

### 13.1 Emergency Supplies

At a minimum, the following supplies will be immediately available for on-site use:

- First aid equipment and supplies;
- Emergency eyewash station as per American National Standards Institute (ANSI) Z-358.1 if exposure to corrosive materials is present;
- Spill control material and equipment;
- Radio and cell phone;
- A minimum of two Type 10 A:B:C fire extinguishers;
- A vehicle parked at an exit point; and
- Each field team will have a first aid kit, eye wash, fire extinguisher, air horn, and communications equipment. Additional emergency response equipment will be located at the field office.

### 13.2 Accident Prevention Signs, Tags and Labels

Standard accident prevention signs, tags, and labels will be used to communicate hazards and precautions in accordance with Section 8 of EM 385-1-1. Examples that may be used include:

- Danger, Warning and Caution signs;
- Work zone signs;
- PPE requirement signs;
- Lockout/ tag out tags;

- Inspection and Do Not Use tags;
- NFPA or HMIS hazardous material signs and labels; and
- Specific items and quantities will be determined by SSHO.

## 14 Emergency Response and Contingency Procedures

AECOM personnel will follow the emergency response procedures established in Section 9.0 of the APP.

### 14.1 Emergency Response Plan

Although the potential for an emergency to occur is remote, an emergency response plan (ERP) has been prepared in accordance with SH&E SOP 203, *Emergency Response Planning* for this project should such critical situations arise. The only significant type of onsite emergency that may occur is physical injury or illness to a member of the AECOM team. The ERP will be reviewed by all personnel prior to the start of field activities.

Three major categories of emergencies could occur during site operations:

- Illnesses and physical injuries (including injury-causing chemical exposure);
- Catastrophic events (fire, explosion, earthquake, or chemical); and
- Safety equipment problems.

### 14.2 Emergency Coordinator

The duties of the Emergency Coordinator (EC) include:

- Implement the ERP based on the identified emergency condition;
- Notify the appropriate project and SH&E Department personnel of the emergency (Table 14-2);
- Verify emergency evacuation routes and muster points are accessible; and
- Conduct routine ERP drills and evaluate compliance with the ERP.

### 14.3 Site-Specific Emergency Procedures

Prior to the start of site operations, the EC will complete Table 14-1 with any site-specific information regarding evacuations, muster points, communication, and other site-specific emergency procedures. The emergency hospital route/detail map will also be included as Figure 14-1.

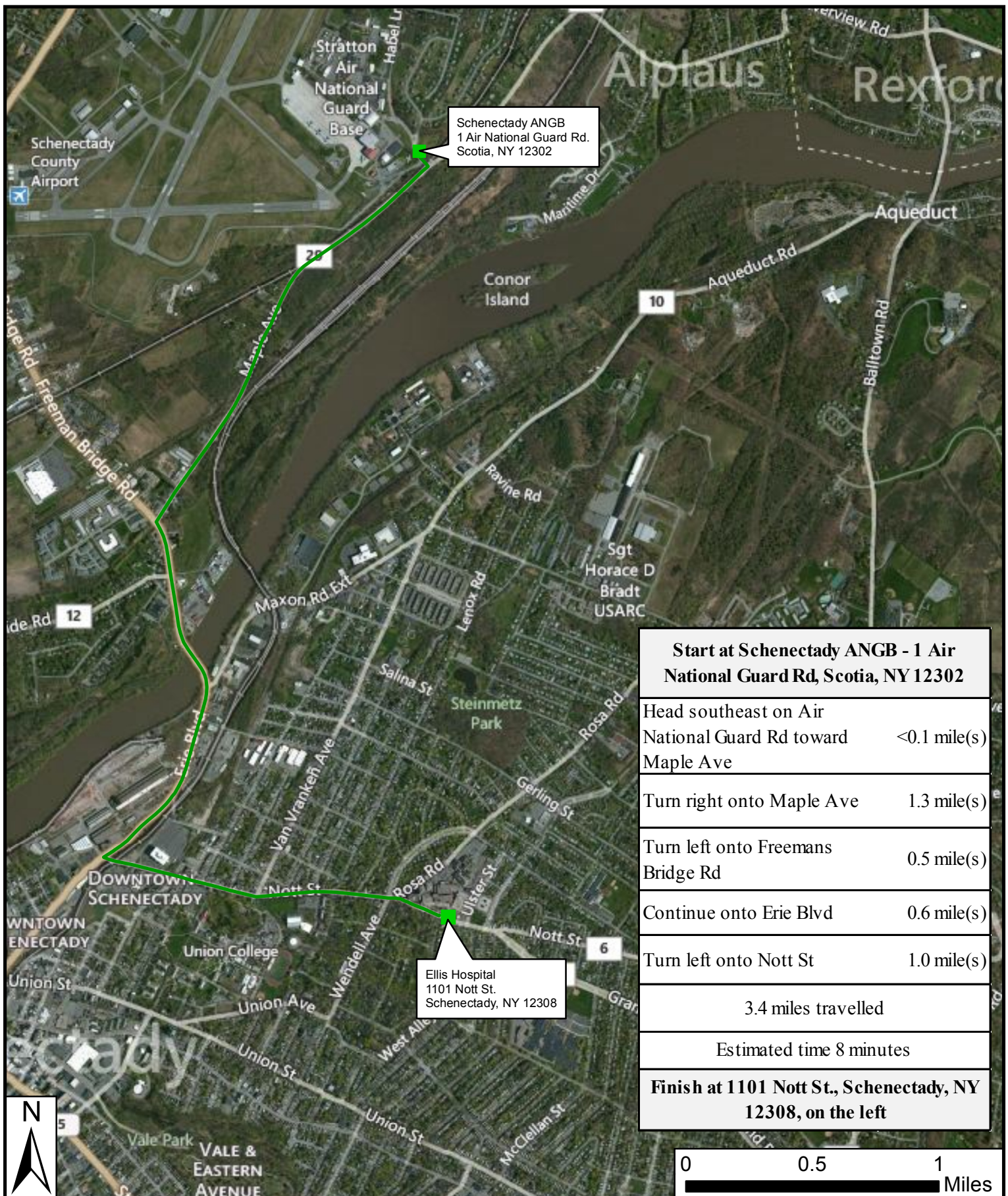
**Table 14-1  
Emergency Planning**

Emergency	Evacuation Route	Muster Location
Chemical Spill	Upwind	TBD
Fire/Explosion	Upwind	TBD
Severe Weather	Closest available shelter	TBD
Lightning	Closest available shelter	TBD
Additional Information		
Communication Procedures	Cell Phones	
CPR/First Aid Trained Personnel	TBD	
Site-Specific Spill Response Procedures	Use absorbents and spill kit for any incidental fuel spills from equipment	

**Table 14-2  
Emergency Contacts**

Emergency Coordinators / Key Personnel			
Name	Title/Workstation	Telephone Number	Mobile Phone
Mark MacEwan	Project Manager	(703) 739-4736	(202) 375-9353
TBD	SSHO	TBD	TBD
TBD	Site Supervisor	TBD	TBD
Mike Grasso, CIH	Regional SH&E Manager	TBD	TBD
Incident Reporting	Incident Reporting Line	(800) 348-5046	N/A
Ann-Alyssa Hill	DOT/IATA Shipping Expert	(804) 515-8506	(804) 640-4815
Organization / Agency			
Name			Telephone Number
Police Department (local)			911
Fire Department (local)			911
State Police			911
Ambulance Service (EMT will determine appropriate hospital for treatment)			911
Emergency Hospital (Use by site personnel is only for emergency cases)			(518) 243-4000
Hospital Information Ellis Hospital 1101 Nott St. Schenectady, NY 12308			
WorkCare: 24-hr On-Call Occupational Nurse ( <i>minor First Aid assistance only</i> )			(800) 455-6155
Poison Control Center			(800) 222-1222
Pollution Emergency			(800) 292-4706
National Response Center			(800) 424-8802
Info-Trac: 24-hr Response Services– Account # 74984			(800) 535-5053
Title 3 Hotline			(800) 424-9346
Public Utilities			
Call Before You Dig			





CONTRACT NO 60308608		Schenectady Air National Guard Base	  675 N. Washington Street, Suite 300, Alexandria VA 22314 Phone 703.549.8728 Fax 703.549.9134 aecom.com
CARTOGRAPHY BY A. Weber			
CHECKED BY B. McGuinness	DATE October 2013		
SCALE 1 in = 0.5 mi	SHEET 1 of 1		
Schenectady_ANGB_Route.mxd			

Driving Directions From Schenectady Air National Guard Base to Ellis Hospital	
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## 15 Personnel Acknowledgement

By signing below, the undersigned acknowledges that he/she has read and reviewed the AECOM APP and SSHP for Fort Ritchie OU4. The undersigned also acknowledges that he/she has been instructed in the contents of this document and understands the information pertaining to the specified work, and will comply with the provisions contained therein.

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## 16 References

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U.S. Army Corps of Engineers (USACE), Baltimore District. 2012. Long-Term Monitoring Event #6 June 2012 for Operable Unit 4 – Motor Pool Building 700. Final. June 2013.

## **Attachment A**

### **Activity Hazard Analysis**

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# ACTIVITY HAZARDS ANALYSIS

Overall Risk Assessment Code (RAC)  
(Use highest code)

M

Date: TBD Project: ANGB PA/SI

Activity: Soil Boring and Sample Collection

Activity Location: ANGB

Prepared By: Brendan McGuinness

## Risk Assessment Code Matrix

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

E = Extremely High Risk H = High Risk M = Moderate Risk L = Low Risk		Probability				
		Frequent	Likely	Occasional	Seldom	Unlikely
Severity	Catastrophic	E	E	H	H	M
	Critical	E	H	H	M	L
	Marginal	H	M	M	L	L
	Negligible	M	L	L	L	L

Add Identified Hazards

	JOB STEPS	HAZARDS	ACTIONS TO ELIMINATE OR MINIMIZE HAZARDS	RAC
X	Establish EZ and Air Monitoring in Work Area	-Slips, trips, and uneven surfaces -Cuts/lacerations from sharp objects and hand tool usage -Biological Hazards -Traffic in roads and parking lots	Keep work area clear of surface encumbrances Use proper hand protection (leather work gloves) and approved cutting devices (tubing cutter) -Use proper PPE and repellents -Use combination of vehicle and cones, traffic barriers and/or caution tape	L
X	Conduct DPT drilling of borehole	-Heat Stress and UV sunlight -Slips, trips, and uneven surfaces -Underground and overhead utilities -Potential contaminant exposure -Heavy equipment operations -Cuts/lacerations from sharp objects and hand tool usage -Traffic in roads, parking lots, and garage	-Monitor for heat stress and use UV protection -Work in areas clear of surface encumbrances -Conduct utility locates, maintain appropriate distances -Use proper PPE and follow air monitoring procedures -Use hand signals, keep clear of moving equipment, ensure eye contact with operator. Do not wear loose clothing or jewelry. Use hearing protection. -Use proper cutting devices and wear leather work gloves. -Use combination of vehicles and cones, traffic barriers and/or caution tape	M
X	Collect Soil Samples	-Heat Stress and UV sunlight -Slips, trips, and uneven surfaces -Potential contaminant exposure	-Monitor for heat stress and use UV protection -Work in areas clear of surface encumbrances -Use proper PPE and follow air monitoring procedures	L
X	Backfill boring hole	-Heat Stress and UV sunlight -Slips, trips, and uneven surfaces -Potential contaminant exposure -Traffic in roads, parking lots, and garage	-Monitor for heat stress and use UV projection -Work in areas clear of surface encumbrances -Use proper PPE and follow air monitoring procedures -Use combination of vehicles and cones, traffic barriers and/or caution tape	L

# ACTIVITY HAZARDS ANALYSIS

EQUIPMENT	TRAINING	INSPECTION
Add Items		

	EQUIPMENT	TRAINING	INSPECTION
X	EPA Level D	Knowledge of the components of the Level "D" ensemble	Daily Serviceability Checks
X	Communications Equipment	Familiarity with the equipment.	Daily communications Checks
X	Fire Extinguishers	Knowledge of Emergency Response Procedures. Limitations and placement of the extinguishers. Techniques for the use of the extinguishers	Initial and Monthly Serviceability Checks
X	First Aid Kits	First Aid/CPR training current. Universal safety precautions for blood borne pathogens.	Weekly Inspection/Inventory
X	Hand Tools	Use hand tools for their intended purposes. Familiarity with the equipment.	Inspect hand tools for serviceability
X	Drill rig	Operator Training Complete Verified by SSHO. Familiarity with the vehicle being operated. Personnel working adjacent to have awareness level type training.	Daily Preventative Maintenance Checks Ensure all equipment is equipped with necessary fire extinguishers (min 5 lbs BC). Ensure back-up alarms are working properly and follow equipment inspection procedures.
X	Sampling equipment & supplies	Familiarity with sample collection process and equipment	Inspect sampling equipment before going into field to ensure all parts are present. Use approved cutting devices (no FBOK) to cut tubing Watch for broken glass and acid preservatives.

Involved Personnel:

Competent Persons:

Drill Rig Operator: TBD

SSHO: TBD

Inspections will be conducted by driller for heavy equipment and technicians for hand tools.

SSHO will verify training documentation and ensure all personnel work safely.

Acceptance Authority (digital signature): \_\_\_\_\_

# ACTIVITY HAZARDS ANALYSIS

Overall Risk Assessment Code (RAC)  
(Use highest code)

L

Date: TBD Project: ANGB

Activity: Groundwater Sampling

Activity Location: ANGB

Prepared By: Brendan McGuinness

## Risk Assessment Code Matrix

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

E = Extremely High Risk H = High Risk M = Moderate Risk L = Low Risk		Probability				
		Frequent	Likely	Occasional	Seldom	Unlikely
s e v e r i t y	Catastrophic	E	E	H	H	M
	Critical	E	H	H	M	L
	Marginal	H	M	M	L	L
	Negligible	M	L	L	L	L

Add Identified Hazards

	JOB STEPS	HAZARDS	ACTIONS TO ELIMINATE OR MINIMIZE HAZARDS	RAC
X	Establish EZ and Air Monitoring in Work Area	<ul style="list-style-type: none"> <li>-Slips, trips, and uneven surfaces</li> <li>-Cuts/lacerations from sharp objects and hand tool usage</li> <li>-Biological Hazards</li> <li>-Traffic in roads and parking lots</li> <li>-Heat Stress</li> </ul>	<ul style="list-style-type: none"> <li>Keep work area clear of surface encumbrances</li> <li>Use proper hand protection (leather work gloves) and approved cutting devices (tubing cutter)</li> <li>-Use proper PPE and repellents</li> <li>-Use combination of vehicle and cones, traffic barriers and/or caution tape</li> <li>-Follow heat stress monitoring procedures. Drink fluids and take breaks in AC or shaded areas.</li> </ul>	L
X	Sample collection via low-flow submersible pumps	<ul style="list-style-type: none"> <li>-Slips, trips, and uneven surfaces</li> <li>-Underground and overhead utilities</li> <li>-Potential contaminant exposure</li> <li>-Cuts/lacerations from sharp objects and hand tool usage</li> <li>-Splashing water. Eye/contact hazards</li> </ul>	<ul style="list-style-type: none"> <li>-Work in areas clear of surface encumbrances</li> <li>-Conduct utility locates, maintain appropriate distances</li> <li>-Use proper PPE and follow air monitoring procedures</li> <li>-Ensure workers familiar with tool usage. Watch hand placement on stake while driving with hammer. Wear leather work gloves to avoid burrs and splinters.</li> <li>-Use proper cutting devices and wear leather work gloves.</li> <li>-Ensure safety glasses are being worn. Avoid contact with purge water.</li> </ul>	L
X	Package and ship samples	<ul style="list-style-type: none"> <li>- Slips, trips, and uneven surfaces</li> <li>-Potential contaminant exposure</li> <li>-Sprains/Strains from lifting equipment/supplies</li> <li>-Broken glass and spilled preservatives</li> </ul>	<ul style="list-style-type: none"> <li>-Work in areas clear of surface encumbrances</li> <li>-Use proper PPE and follow air monitoring procedures</li> <li>-Use proper lifting techniques and get assistance when lifting heavy objects (sample coolers).</li> <li>-inspect coolers for broken glass. Use leather work gloves with nitrile to clean up to protect from cuts and acid preservative. Wipe down remaining sample jars and inside of cooler with water and flush.</li> </ul>	L

Add Items



# ACTIVITY HAZARDS ANALYSIS

	EQUIPMENT	TRAINING	INSPECTION
X	EPA Level D	Knowledge of the components of the Level "D" ensemble. May include use of face shield.	Daily Serviceability Checks
X	Communications Equipment	Familiarity with the equipment.	Daily communications Checks
X	Fire Extinguishers	Knowledge of Emergency Response Procedures. Limitations and placement of the extinguishers. Techniques for the use of the extinguishers	Initial and Monthly Serviceability Checks
X	First Aid Kits	First Aid/CPR training current. Universal safety precautions for blood borne pathogens.	Weekly Inspection/Inventory
X	Hand Tools	Use hand tools for their intended purposes. Familiarity with the equipment.	Inspect hand tools for serviceability
X	Sample Equipment/Supplies	Familiarity with sample collection process and equipment.	Inspect sampling equipment before going into field to ensure all parts are present. Use approved cutting devices (no FBOK) to cut tubing Watch for broken glass and acid preservatives.

Involved Personnel:

Competent Persons: N/A

SSHO: TBD

Inspections will be conducted by technicians for hand tools.

SSHO will verify training documentation and ensure all personnel work safely.

Acceptance Authority (digital signature): \_\_\_\_\_

# ACTIVITY HAZARDS ANALYSIS

Overall Risk Assessment Code (RAC)  
(Use highest code)

L

Date: TBD Project: ANG PA/SI

Activity: Mobilization/Demobilization

Activity Location: TBD

Prepared By: Brendan McGuinness

## Risk Assessment Code Matrix

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

		Probability				
		Frequent	Likely	Occasional	Seldom	Unlikely
s e v e r i t y	Catastrophic	E	E	H	H	M
	Critical	E	H	H	M	L
	Marginal	H	M	M	L	L
	Negligible	M	L	L	L	L

Add Identified Hazards

	JOB STEPS	HAZARDS	ACTIONS TO ELIMINATE OR MINIMIZE HAZARDS	RAC
X	Check the weather.	-Unexpected storm – lightning, rain, snow (slip hazard), wind. -Heat and cold stress.	-Check local weather forecast, have a weather radio for remote sites, observation and communication among team members. Discuss weather issues during tailgate safety meeting. At the first sign of lightning, thunder or strong winds, immediately move away and take shelter. Do not resume work until 30 minutes have passed without signs of storm. -Know the symptoms of heat and/or cold stress, and the potential for their occurrence based on expected weather conditions. Take precautions to avoid them. Refer to the SSHP or ask your supervisor if you have questions.	L
X	Mobilize with equipment and supplies.	Vehicle accident. Accidents caused by use of improper equipment/tools. Injuries caused by improper lifting techniques. Damage to equipment/tools and/or accidents with loose objects.	-Follow safe driving procedures. Always use the buddy system when moving vehicles. Plan your travel path ahead of time. Use maps and known construction zones to make your selection. Consult with the other team members before making any changes to travel path. -Use an equipment checklist to verify you have the appropriate equipment/tools for your tasks. -Use proper bending/lifting techniques by bending and lifting with legs and not with back. -Stow all materials in vehicle properly, use appropriate cases and bags. Secure equipment in bed of truck with netting or straps. Do not leave any equipment loose in the cab or bed or the truck. It can cause property damage or serious injuries to others or yourself by falling-off from vehicle.	L

# ACTIVITY HAZARDS ANALYSIS

	JOB STEPS	HAZARDS	ACTIONS TO ELIMINATE OR MINIMIZE HAZARDS	RAC
X	Perform perimeter walk around of vehicle for damage or unusual conditions.	-Low air pressure, flat tire, blowout, impaired vision, collision, injury.	-Complete Vehicle Inspection checklist. Assure tires are properly inflated and there is sufficient tread (including spare). Assure there are no cuts or bulges in the sidewalls, all wheels/rims are in good condition. Assure windshield and window glass is clean and free from obstructions. Lift wiper arms and check wiper blades for damage or deterioration. Check to see that all lights work. Check for fluid leaks under vehicle. Check oil, radiator, brake, transmission and washer fluid levels. Check behind vehicle for obstructions.	L
X	Slowly pull out of parking space.	Collision with other vehicles, pedestrians, or stationary objects.	Release parking brake. Check mirrors and over shoulder in all directions prior to slowly pulling out of parking space. Signal if parallel parked along a street. Use a spotter if available.	L
X	DURING TRIP - Keep your eyes moving. Aim high in steering.	Collision, injury or death to occupants or other parties.	DRIVE DEFENSIVELY. Move eyes at least every 2 seconds. Scan major and minor intersections before entry (left-right-left). Check mirrors when slowing or stopping vehicle. Scan mirrors frequently, at least one mirror every 5-8 seconds. Avoid staring while evaluating road conditions. Do not use cell phones or perform other distraction activities while car is in motion. If necessary, pull off the roadway and park prior to performing other activities. Be cautious about the use of cruise control if available on vehicle - never use in inclement weather, within cities and towns, or during hours without daylight. Maintain 12 second eye lead time (1 1/2 blocks in city traffic, 1/4 mile in highway traffic). Assess information from distant objects (i.e., flashers on?). Adjust eye lead distance to speed.	L
X	Driving and/or walking to sample locations.	Damage to equipment or vehicles due to surface/subsurface obstructions. Fixed facilities Biologic hazards such as insects, poison ivy, spiders, and snakes.	Inspect area before driving and/or walking. Identify possible hazards such as holes, obstructions protruding from the ground, or debris that may be scattered on the ground. Contact site manager immediately and do not proceed if any conditions are observed that could make driving/walk in the area unsafe and that cannot be fixed with the equipment or personnel onsite. When parked near a fixed facility (building, monitoring well, bollards, etc...) use the buddy system when backing-up vehicle. Check immediate area for potential hazards such as poison ivy, spiders, wasps, snakes, etc. Use bug repellent and sunscreen as necessary. Use a bar to clear out objects and/or vegetation from spiders and/or snakes (don't use your hands or feet).	L

Add Items

	EQUIPMENT	TRAINING	INSPECTION
X	Level D PPE	Knowledge of the components of the Level "D" ensemble. May include use of face shield.	Daily Serviceability Checks
X	Communications Equipment	Familiarity with the equipment. Knowledge of Emergency Response Procedures.	Daily communications Checks
X	Fire Extinguishers	Limitations and placement of the extinguishers. Techniques for the use of the extinguishers	Initial and Monthly Serviceability Checks

# ACTIVITY HAZARDS ANALYSIS

	EQUIPMENT	TRAINING	INSPECTION
X	First Aid Kits	First Aid/CPR training current. Universal safety precautions for blood borne pathogens.	Weekly Inspection/Inventory
X	Hand Tools	Use hand tools for their intended purposes. Familiarity with the equipment.	Inspect hand tools for serviceability
X	Sample Equipment/Supplies	Familiarity with sample collection process and equipment.	Inspect sampling equipment before going into field to ensure all parts are present. Use approved cutting devices (no FBOK) to cut tubing Watch for broken glass and acid preservatives.

Involved Personnel:

Competent Persons: N/A

SSHO: TBD

Inspections will be conducted by technicians for hand tools.

SSHO will verify training documentation and ensure all personnel work safely.

Acceptance Authority (digital signature):

---

# ACTIVITY HAZARDS ANALYSIS

Overall Risk Assessment Code (RAC)  
(Use highest code)

M

Date: TBD

Project: ANGB PA/SI

Activity: Concrete Coring

Activity Location: ANGB

Prepared By: Brendan McGuinness

## Risk Assessment Code Matrix

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

E = Extremely High Risk H = High Risk M = Moderate Risk L = Low Risk		Probability				
		Frequent	Likely	Occasional	Seldom	Unlikely
s e v e r i t y	Catastrophic	E	E	H	H	M
	Critical	E	H	H	M	L
	Marginal	H	M	M	L	L
	Negligible	M	L	L	L	L

Add Identified Hazards				
	JOB STEPS	HAZARDS	ACTIONS TO ELIMINATE OR MINIMIZE HAZARDS	RAC
X	Set up coring equipment, water supply, and electrical supply	-Slips, trips, and uneven surfaces -Cuts/lacerations from sharp objects and hand tool usage -Traffic in roads, parking lots, and garage -Electrical usage -Flying objects	Keep work area clear of surface encumbrances Use proper hand protection (leather work gloves), boots, and eye protection -Use combination of vehicle and cones, traffic barriers and/or caution tape -Inspect electrical supply, GFCI, and extension cords	L
X	Conduct concrete coring	-Slips, trips, and uneven surfaces -Cuts/lacerations from sharp objects and hand tool usage -Traffic in roads, parking lots, and garage -Electrical usage -Flying objects	Keep work area clear of surface encumbrances Use proper hand protection (leather work gloves), boots, and eye protection -Use combination of vehicle and cones, traffic barriers and/or caution tape -Maintain electrical cords and water hoses free and clear and protect from tripping	M

Add Items			
	EQUIPMENT	TRAINING	INSPECTION
X	EPA Level D	Knowledge of the components of the Level “D” ensemble	Daily Serviceability Checks
X	Communications Equipment	Familiarity with the equipment. Knowledge of Emergency Response Procedures.	Daily communications Checks
X	Fire Extinguishers	Limitations and placement of the extinguishers. Techniques for the use of the extinguishers	Initial and Monthly Serviceability Checks

# ACTIVITY HAZARDS ANALYSIS

	EQUIPMENT	TRAINING	INSPECTION
X	First Aid Kits	First Aid/CPR training current. Universal safety precautions for blood borne pathogens.	Weekly Inspection/Inventory
X	Hand Tools	Use hand tools for their intended purposes. Familiarity with the equipment.	Inspect hand tools for serviceability
X	Concrete coring rig	Operator Training Complete Verified by SSHO. Familiarity with the vehicle being operated. Personnel working adjacent to have awareness level type training.	Daily Preventative Maintenance Checks

Involved Personnel:

Competent Persons:

Coring Rig Operator: TBD

SSHO: TBD

Inspections will be conducted for coring equipment and technicians for hand tools.

SSHO will verify training documentation and ensure all personnel work safely.

Acceptance Authority (digital signature):

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## **Attachment B**

### **Material Safety Data Sheets (To Be Updated Prior to Operations)**



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CITGO PETROLEUM CORP -- NO 2 FUEL OILS, DIESEL FUELS-ALL GRADES, 1763 --  
9150-00N060728

===== Product Identification =====

Product ID:NO 2 FUEL OILS, DIESEL FUELS-ALL GRADES, 1763

MSDS Date:11/11/1994

FSC:9150

NIIN:00N060728

MSDS Number: BXWZC

=== Responsible Party ===

Company Name:CITGO PETROLEUM CORP

Box:3758

City:TULSA

State:OK

ZIP:74102

Country:US

Info Phone Num:918-495-5933

Emergency Phone Num:800-424-9300 (CHEMTREC)

CAGE:1JW40

=== Contractor Identification ===

Company Name:CITGO PETROLEUM CORP

Address:OFF HWY 108

Box:3758

City:LAKE CHARLES

State:LA

ZIP:70602

Country:US

Phone:918-561-5165

CAGE:1JW40

Company Name:CITIES SERVICE CO

Address:110 W 7TH

Box:300

City:TULSA

State:OK

ZIP:74102

Country:US

CAGE:12518

===== Composition/Information on Ingredients =====

Ingred Name:NO INGREDIENT FOR THIS FORMULATION\_INGREDIENT

===== Hazards Identification =====

LD50 LC50 Mixture:SEE INGREDIENTS

Routes of Entry: Inhalation:YES Skin:YES Ingestion:YES

Reports of Carcinogenicity:NTP:NO IARC:NO OSHA:NO

Health Hazards Acute and Chronic:LOW HAZ UNDER AMBIENT CNDTNS. VAPS,  
MISTS & FUMES HAZ. NORMALLY OF LOW TOX EXCEPT ON INGEST, IF MISTING  
OCCURS/DERM ABSORP. ACUTE:INHAL:MISTS/FUMES ABOVE TLV MAY CAUSE  
TRANSIENT EUPHORIA, RESP & GI IRRIT, HDCH, DIZZ, CNS & GENERALIZED  
DEPRESS, COMA, PARTICULARLY IN OXYG-DEFICIENT ATM. PULM IRRIT.  
SKIN:(EFTS OF OVEREXP)

Explanation of Carcinogenicity:NOT RELEVANT

Effects of Overexposure:HLTH HAZS:MILD TEMP IRRIT. EYES:MILD TO MOD  
IRRIT. INGEST:TOX DOSE:1 OZ TO 1 PINT FOR HUMAN ADULT. SYMPS

INCLUDE BURNING OF MOUTH & UPPER GI TRACT, VOMIT & DIARR. LESS THAN  
1 OZ W/RETENTION MAY PRDCE GEN DEPRESS, SEDATION, RESP & CARDIAC  
INSUFFICIENCY & COMA. INJECTION:IRRIT, ERYTHEMA, EDEMA.  
CHRONIC:PRLNGD, (ING 10)

Medical Cond Aggravated by Exposure:PRE-EXISTING DERMATOSIS.

===== First Aid Measures =====

First Aid:INHAL:REMOVE FROM EXPOS, SEEK IMMED MED AID. SKIN:WASH W/SOAP  
& WATER. DO NOT WEAR HEAVILY CONTAM CLTHG BEFORE CLEANING.  
EYES:FLUSH W/LG VOLS OF TEPID WATER FOR @ LST 15 MIN. INGEST:DO NOT  
INDUCE VOMI T. SEEK MED AID. INJECTION:SEEK IMMED MED AID. NOTE TO  
MD:THIS IS LOW VISCOSITY MATL, W/SAYBOLT VISCOSITY @ 100F OF  
32.6-40 SUS. IF INGEST & VOMIT OCCURS, THERE EXISTS HIGH PULM ASPIR  
HAZ, (SUP DAT)

===== Fire Fighting Measures =====

Flash Point Method:CC  
Flash Point:>126F,>52C  
Extinguishing Media:CO\*2, DRY CHEMICAL, FOAM, WATER FOG.  
Fire Fighting Procedures:WEAR NIOSH/MSHA APPROVED SCBA & FULL  
PROTECTIVE EQUIPMENT .  
Unusual Fire/Explosion Hazard:MATERIAL IS HIGHLY VOLATILE AND EMITS  
VAPORS WHICH MAY BE IGNITED BY OTHER IGNITION SOURCES.

===== Accidental Release Measures =====

Spill Release Procedures:REMOVE SOURCES OF IGNIT, VENT AREA. SM  
SPILLS:TAKE UP W/NONCOMBUST ABOSRB SUCH AS FULLERS EARTH/SAND.  
PLACE INTO CNTNRS FOR LATER DISP. LG SPILLS:CNTN SPILL IN EARTHEN  
DIKES FOR LATER RECOVERY. CTL IG NIT SOURCES AROUND SPILL AREA.  
FIRE-FIGHT (ING 4)  
Neutralizing Agent:NONE SPECIFIED BY MANUFACTURER.

===== Handling and Storage =====

Handling and Storage Precautions:KEEP CNTNR TIGHTLY CLSD & AWAY FROM  
HEAT & FLAME. DO NOT STORE W/STRONG OXIDIZERS. CAUTN:COMBUST LIQ.  
DO NOT INHALE VAPS, FUMES/MISTS. PVNT DERM CONT.  
Other Precautions:CAUTN:EMPTY CNTNRS MAY CNTN PROD RESIDUE WHICH COULD  
INCLUDE FLAM/EXPLO VAPS. CONSULT FED, STATE & LOC AUTHS BEFORE  
REUSING, RECNDTNING, RECLAIMING, RECYCLING/DISP OF EMPTY CNTNRS  
&/OR WASTE RESIDUES OF PROD. PROT MEASURES DURING (ING 7)

===== Exposure Controls/Personal Protection =====

Respiratory Protection:NIOSH/MSHA APPROVED ORGANIC RESPIRATOR ABOVE THE  
TLV'S.  
Ventilation:USE IN WELL VENT AREA. IN CONFINED SPACES, MECH VENT MAY BE  
REQ TO KEEP LEVELS OF CERTAIN COMPONENTS BELOW (ING 9)  
Protective Gloves:OIL IMPERVIOUS GLOVES.  
Eye Protection:ANSI APPRVD CHEM WORKERS GOGGS &(SUPDAT)  
Other Protective Equipment:ANSI APPRVD EMER EYE WASH & DELUGE SHOWER .  
WEAR BODY-COVERING WORK CLTHS TO AVOID PRLNGD/RPTD EXPOS.  
Work Hygienic Practices:WASH EXPOSED SKIN THOROUGHLY WITH SOAP AND  
WATER. LAUNDER SOILED WORK CLOTHES BEFORE REUSE.

Supplemental Safety and Health

APPEAR & ODOR:OIL/DIESEL FUEL:WATER WHITE TO LEMON LIQ, PETROL ODOR.

FIRST AID PROC:POSS INDUCING LIPOID PNEUM. FOR QTYS >FEW DROPS, USE

CAREFUL GASTRIC LAVAGE W/TIGHT FITTING, CUFFED ENDOTRACHEAL TUB E.

EYE PROT:FULL LENGTH FACE SHIELD

===== Physical/Chemical Properties =====

Boiling Pt:B.P. Text:>342F,>172C

Vapor Density:>1

Spec Gravity:0.87 (H\*20=1)

Evaporation Rate & Reference:<1 (BUTYL ACETATE=1)

Solubility in Water:NEGLIGIBLE

Appearance and Odor:HIGH SULFUR FUEL OIL/DIESEL FUEL:RED LIQ, PETROL

ODOR. LOW SULFUR FUEL (SUP DAT

===== Stability and Reactivity Data =====

Stability Indicator/Materials to Avoid:YES

CAUSTICS, OXIDIZING AGENTS AND STRONG ACIDS.

Stability Condition to Avoid:HEAT, FLAME.

Hazardous Decomposition Products:CO\*2, (CO UNDER INCOMPLETE  
COMBUSTION).

===== Disposal Considerations =====

Waste Disposal Methods:DISP MUST BE I/A/W FED, STATE & LOC REGS IT IS  
RESPONSIBILITY OF USER TO DETERM IF MATL IS HAZ WASTE AT TIME OF  
DISP. CHECK BEFORE DISPOSING TO BE SURE YOU ARE IN COMPLIANCE W/ALL  
APPLIC LAWS & REGS. RCRA EMER HOTLINE #:800-424-9346.

Disclaimer (provided with this information by the compiling agencies):  
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of Defense. The United States of America in no manner whatsoever,  
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document should seek competent professional advice to verify and  
assume responsibility for the suitability of this information to their  
particular situation.

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CITGO PETROLEUM CORP -- GASOLINES-ALL GRADES UNLEADED, 1600 -- 9140-00N060727

===== Product Identification =====

Product ID:GASOLINES-ALL GRADES UNLEADED, 1600

MSDS Date:10/21/1994

FSC:9140

NIIN:00N060727

MSDS Number: BXWZB

=== Responsible Party ===

Company Name:CITGO PETROLEUM CORP

Box:3758

City:TULSA

State:OK

ZIP:74102

Country:US

Info Phone Num:918-495-5933

Emergency Phone Num:800-424-9300 (CHEMTREC)

CAGE:1JW40

=== Contractor Identification ===

Company Name:CITGO PETROLEUM CORP

Address:OFF HWY 108

Box:3758

City:LAKE CHARLES

State:LA

ZIP:70602

Country:US

Phone:918-561-5165

CAGE:1JW40

Company Name:CITIES SERVICE CO

Address:110 W 7TH

Box:300

City:TULSA

State:OK

ZIP:74102

Country:US

CAGE:12518

===== Composition/Information on Ingredients =====

Ingred Name:PETROLEUM DISTILLATES; (PETROLEUM DISTILLATES MFR CAS  
#:MIXTURE)

Fraction by Wt: 85-98%

OSHA PEL:N/K

ACGIH TLV:N/K

Ingred Name:BENZENE (SARA 313) (CERCLA); LD50 (ORAL,RAT):>5.0 G/KG  
CAS:71-43-2

RTECS #:CY1400000

Fraction by Wt: <5%

OSHA PEL:SEE 1910.1028

ACGIH TLV:10 PPM; A2

EPA Rpt Qty:10 LBS

DOT Rpt Qty:10 LBS

Ingred Name:LOWER ALIPHATIC ALCOHOLS; LD50 (ORAL,RAT):>5.0 G/KG

Fraction by Wt: 0-11%  
OSHA PEL:N/K  
ACGIH TLV:N/K

Ingred Name:LOWER ALIPHATIC ETHERS; LD50 (ORAL,RAT):4 ML/KG  
Fraction by Wt: 0-15%  
OSHA PEL:N/K  
ACGIH TLV:N/K

Ingred Name:TERT-BUTYL ALCOHOL; (TERTIARY BUTYL ALCOHOL) (SARA 313)  
CAS:75-65-0  
RTECS #:EO1925000  
Fraction by Wt: 0-10%  
OSHA PEL:100 PPM  
ACGIH TLV:100 PPM

Ingred Name:BENZENE ETHYL-; (ETHYL BENZENE) (SARA 313)  
CAS:100-41-4  
RTECS #:DA0700000  
Fraction by Wt: 0-5%  
OSHA PEL:100 PPM  
ACGIH TLV:100 PPM  
EPA Rpt Qty:1000 LBS  
DOT Rpt Qty:1000 LBS

Ingred Name:ETHER, TERT-BUTYL METHYL; (METHYL-T-BUTYL ETHER) (SARA 313)  
(CERCLA)  
CAS:1634-04-4  
RTECS #:KN5250000  
Fraction by Wt: 0-15%  
OSHA PEL:N/K  
ACGIH TLV:N/K  
EPA Rpt Qty:1 LB  
DOT Rpt Qty:1 LB

Ingred Name:TOLUENE (SARA 313) (CERCLA)  
CAS:108-88-3  
RTECS #:XS5250000  
Fraction by Wt: 0-25%  
OSHA PEL:200 PPM  
ACGIH TLV:S, 50 PPM  
EPA Rpt Qty:1000 LBS  
DOT Rpt Qty:1000 LBS

Ingred Name:BENZENE, 1,2,4-TRIMETHYL-; (1,2,4-TRIMETHYLBENZENE) (SARA 313)  
CAS:95-63-6  
RTECS #:DC3325000  
Fraction by Wt: 0-5%  
OSHA PEL:25 PPM  
ACGIH TLV:25 PPM

Ingred Name:XYLENE; (XYLENE (MIXED ISOMERS)) (SAR  
CAS:1330-20-7  
RTECS #:ZE2100000  
EPA Rpt Qty:1000 LBS  
DOT Rpt Qty:1000 LBS

===== Hazards Identification =====

LD50 LC50 Mixture:SEE INGREDIENTS

Routes of Entry: Inhalation:YES Skin:YES Ingestion:NO

Reports of Carcinogenicity:NTP:YES IARC:YES OSHA:YES

Health Hazards Acute and Chronic:ACUTE:INHAL:MOD RISK OF VAP INTOX.

MAJOR RISK IN ENCLSD SPACES W/POOR VENT:EUPHORIA, LUNG IRRIT &  
EDEMA, HDCH, DIZZ, DROW, CONVLS, COMA, CYANOSIS, GENERALIZED  
DEPRESSION. SKIN:DEFATTING W/DRYING. EYE: IRRIT. INGEST:BURNING OF  
MOUTH & UPPER GI TRACT, VOMIT & DIARR. ABOVE 1 OZ/< 1 OZ  
W/RETENTION:GENERAL (EFTS OF OVEREXP)

Explanation of Carcinogenicity:BENZENE:IARC MONOGRAPHS, SUPP, VOL 7, PG  
20, 1987:GROUP 1. NTP 7TH ANNUAL RPT ON CARCINS, 1994:KNOWN TO BE  
(SUP DATA)

Effects of Overexposure:HLTH HAZS:DEPRESS, SEDATION, RESP DEPRESS,  
COMA. CHRONIC:SKIN:DRYING (DERM). INHAL:BENZENE HAS BEEN CLASSIFIED  
AS LEUKEMOGEN, & MAY PRDCE ANEMIA, LEUKEMIA FROM RPTD/PRLNGD EXPOS  
TO HIGH CONCS. AMERICA N PETROL INSTITUTE SPONSORED CHRONIC INHAL  
STUDIES OF UNLEADED GASOLINE VAPS INDICATING UNLEADED GASOLINE IS  
(ING 12)

Medical Cond Aggravated by Exposure:PRE-EXISTING DERMATOSES.

===== First Aid Measures =====

First Aid:INHAL:REMOVE TO FRESH AIR. RESP SUPPORT, IF NEC. SEEK MED  
AID. SKIN:WASH W/SOAP & WATER. DO NOT WEAR HEAVILY CONTAM CLTHG  
BEFORE CLEANING. EYES:FLUSH W/LG VOLS OF WATER FOR AT LST 15 MIN.  
SEEK MED AID . INGEST:DO NOT INDUCE VOMIT. SEEK MED AID. NOTE TO  
MD:THIS IS LOW VISCOSITY MATL W/SAYBOLT VISCOSITY @ 100F OF <40  
SUS. PULM HIGH ASPIR HAZ, POSS PRDCING LIPOID PNEUM IF SWALLOWED &  
VOMIT (ING 14)

===== Fire Fighting Measures =====

Flash Point Method:COC

Flash Point:-45F,-43C

Lower Limits:1.4%

Upper Limits:7.6%

Extinguishing Media:CO\*2, DRY CHEMICAL, FOAM, WATER FOG.

Fire Fighting Procedures:WEAR NIOSH/MSHA APPROVED SCBA & FULL  
PROTECTIVE EQUIPMENT .

Unusual Fire/Explosion Hazard:MATERIAL IS HIGHLY VOLATILE AND EMITS  
VAPORS WHICH MAY BE IGNITED BY OTHER IGNITION SOURCES.

===== Accidental Release Measures =====

Spill Release Procedures:REMOVE SOURCES OF IGNIT, VENT AREA. SM  
SPILLS:TAKE UP W/NON-COMBUST ABSORB SUCH AS FULLERS EARTH/SAND.  
PLACE INTO CNTNRS FOR LATER DISP. LG SPILL:CNTN IN EARTHEN DIKES  
FOR LATER RECOVERY. CTL IGNIT SO URCES AROUND SPILL AREA.  
FIRE-FIGHTING (ING 15)

Neutralizing Agent:NONE SPECIFIED BY MANUFACTURER.

===== Handling and Storage =====

Handling and Storage Precautions:KEEP CNTNR TIGHTLY CLSD & AWAY FROM



HEAT & FLAME & STRONG OXIDIZERS (NFPA CLASS 1A FLAM). DO NOT STORE W/STRONG OXIDIZERS.

Other Precautions:CAUTN:EMPTY CNTNRS MAY CNTN PROD RESIDUE WHICH COULD PRDCE FLAM & EXPLO VAPS. CONSULT APPROP FED, STATE & LOC AUTHS BEFORE REUSING, RECNDNTING, RECLAIMING, RECYCLING/DISP OF EMPTY CNTNRS &/OR WASTE RE SIDUES OF PROD. PROT MEASURES (ING 22)

===== Exposure Controls/Personal Protection =====

Respiratory Protection:IF HIGH VAPOR CONCENTRATION IS EXPECTED, USE NIOSH/MSHA APPROVED ORGANIC RESPIRATOR. TLV:TWA: 300 PPM (900 MG/M3) STEL:500 PPM (1500 MG/M3) ACGIH-1987-88.

Ventilation:USE IN WELL VENT AREA. IN CONFINED SPACE, MECH VENT MAY BE REQ TO KEEP LEVELS OF CERTAIN COMPONENTS BELOW (ING 20)

Protective Gloves:OIL IMPERVIOUS GLOVES, SUCH AS (ING 21)

Eye Protection:ANSI APPROVED CHEM WORKERS GOGGS .

Other Protective Equipment:ANSI APPRVD EMER EYE WASH & DELUGE SHOWER . WEAR BODY-COVERING GARMENTS TO PVNT PRLNGD/RPTD DIRECT DERM EXPOS.

Work Hygienic Practices:WASH EXPOSED SKIN THORO WITH SOAP AND WATER. LAUNDRER GASOLINE SOAKED CLOTHING BEFORE REUSE.

Supplemental Safety and Health

BP:>79F,>26C (SUBJECT TO SEASONAL CHANGE). VP:7-15 (MEETS SEASONAL RVP REQS SPECIFIED BY EPA). APPEAR & ODOR:LIQ, GASOLINE ODOR. MIDGRADE:LIGHT YELLOW, TO PINK, TO LIGHT RED, GASOLINE ODOR. EXPLAN OF CARCIN:CARCIN. FED REGISTER, VOL 52, PG34460, 1987:OSHA-CANCER HAZ HUMAN:MYELOID LEUKEMIA, HODGKINS DISEASE, LYMPHOMA.

===== Physical/Chemical Properties =====

Boiling Pt:B.P. Text:SUPP DATA

Vapor Pres:SUPP DATA

Vapor Density:3-4

Spec Gravity:0.75 (H\*20=1)

Evaporation Rate & Reference:>1 (BUTYL ACETATE=1)

Solubility in Water:NEGLIGIBLE

Appearance and Odor:UNLEADED:LIGHT YELLOW OR CLEAR LIQ, GASOLINE ODOR. PREMIUM:RED CLEAR (SUPP DATA

Percent Volatiles by Volume:HIGH

===== Stability and Reactivity Data =====

Stability Indicator/Materials to Avoid:YES

STRONG OXIDANTS, STRONG ACIDS, CAUSTICS.

Stability Condition to Avoid:HIGH TEMPERATURE, FLAME.

Hazardous Decomposition Products:CO\*2, (CO UNDER INCOMPLETE COMBUSTION).

===== Disposal Considerations =====

Waste Disposal Methods:DISP MUST BE I/A/W FED, STATE & LOC REGS IT IS RESPONSIBILITY OF USER TO DETERM IF MATL IS HAZ WASTE AT TIME OF DISP. CHECK BEFORE DISP TO BE SURE YOU ARE IN COMPLIANCE W/ALL APPLIC LAWS & REGS. RCRA EMER HOTLINE #:800-424-9346.

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SHERWIN-WILLIAMS COMPANY SPRAYON PRODUCTS GROUP -- S03700  
QUICKMARK WATERBASED MARKING PAINT(OTHER INFORMATION) -- -

===== Product Identification =====

Product ID:S03700 QUICKMARK WATERBASED MARKING PAINT(OTHER INFORMATION)

MSDS Date:06/28/1999

FSC:NIIN:Submitter:N EN

Status Code:A

MSDS Number: CKWSX

=== Responsible Party ===

Company Name:SHERWIN-WILLIAMS COMPANY SPRAYON PRODUCTS GROUP

Address:101 PROSPECT AVENUE N.W.

City:CLEVELAND

State:OH

ZIP:44115

Country:US

Info Phone Num:800-777-2966

Emergency Phone Num:216-566-2917

CAGE:54646

=== Contractor Identification ===

Company Name:SHERWIN-WILLIAMS COMPANY SPRAYON PRODUCTS GROUP

Address:101 PROSPECT AVENUE N.W.

Box:City:CLEVELAND

State:OH

ZIP:44115

Country:US

Phone:800-777-2966

CAGE:54646

===== Composition/Information on Ingredients =====

Ingred Name:PROPANE: VP: 760.00.

CAS:74-98-6

RTECS #:TX2275000

= Wt:16.

OSHA PEL:1000 PPM

ACGIH STEL:2500 PPM

Ingred Name:LIGHT ALIPHATIC HYDROCARBON SOLVENT. (MFR CAS #68410-97-9).

VP: 100.00

= Wt:18.

Ingred Name:MINERAL SPIRITS. (MFR CAS # 64742-88-7). VP: 2.00.

CAS:64475-85-0

RTECS #:PY8240000

= Wt:6.

OSHA PEL:100 PPM

ACGIH TLV:100 PPM

Ingred Name:ETHYLBENZENE. VP: 7.10.

CAS:100-41-4

RTECS #:DA0700000

= Wt:2.

OSHA PEL:100 PPM

OSHA STEL:125 PPM

ACGIH TLV:100 PPM

ACGIH STEL:125 PPM  
EPA Rpt Qty:1000 LBS  
DOT Rpt Qty:1000 LBS

Ingred Name:XYLENE. VP: 5.90  
CAS:1330-20-7  
RTECS #:ZE2100000  
= Wt:9.  
OSHA PEL:100 PPM  
OSHA STEL:150 PPM  
ACGIH TLV:100 PPM  
ACGIH STEL:150 PPM  
EPA Rpt Qty:1000 LBS  
DOT Rpt Qty:1000 LBS

===== Hazards Identification =====

Routes of Entry: Inhalation:YES Skin:YES Ingestion:YES  
Reports of Carcinogenicity:NTP:NO IARC:NO OSHA:NO  
Health Hazards Acute and Chronic:ACUTE: EFFECTS OF OVEREXPOSURE:  
IRRITATION OF EYES, SKIN AND RESPIRATORY SYSTEM. MAY CAUSE NERVOUS  
SYSTEM DEPRESSION. EXTREME OVEREXPOSURE MAY RESULT IN  
UNCONSCIOUSNESS AND POSSIBLY DEATH. CHRONIC: PROLONGED  
OVEREXPOSURE TO SOLVENT INGREDIENTS MAY CAUSE ADVERSE EFFECTS TO  
LIVER, URINARY AND REPRODUCTIVE SYSTEMS. REPORTS HAVE ASSOCIATED  
REPEATED OR PROLONGED OVER EXPOSURE TO SOLVENTS WITH PERMANENT  
BRAIN AND NERVOUS SYSTEM DAMAGE.  
Explanation of Carcinogenicity:NO INGREDIENT IN THIS PRODUCT IS AN  
IARC, NTP OR OSHA LISTED CARCINOGEN (MFR).  
Effects of Overexposure:HEADACHE, DIZZINESS, NAUSEA, AND LOSS OF  
COORDINATION ARE INDICATIONS OF EXCESSIVE EXPOSURE TO VAPORS OR  
SPRAY MISTS. REDNESS AND ITCHING OR BURNING SENSATION MAY INDICATE  
EYE OR EXCESSIVE SKIN EXPOSURE.  
Medical Condition Aggravated by Exposure:NONE GENERALLY RECOGNIZED.

===== First Aid Measures =====

First Aid:IF INHALED: IF AFFECTED, REMOVE FROM EXPOSURE. RESTORE  
BREATHING. KEEP WARM & QUIET. IF ON SKIN: WASH AFFECTED AREA  
THOROUGHLY WITH SOAP & WATER. REMOVE CONTAMINATED CLOTHING &  
LAUNDRY BEFORE RE-USE. IF IN EYES: FLUSH EYES WITH LARGE AMOUNTS  
OF WATER FOR 15 MINUTES. GET MEDICAL ATTENTION. IF SWALLOWED: NEVER  
GIVE ANYTHING BY MOUTH TO AN UNCONSCIOUS PERSON. DO NOT INDUCE  
VOMITING. GIVE CONSCIOUS PATIENT SEVERAL GLASSES OF WATER. SEEK  
MEDICAL ATTENTION.

===== Fire Fighting Measures =====

Flash Point:<-17.6C, 0.F  
PROPELLANT <0F  
Lower Limits:1.0  
Upper Limits:9.5  
Extinguishing Media:CARBON DIOXIDE, DRY CHEMICAL, ALCOHOL FOAM.  
Fire Fighting Procedures:FULL PROTECTIVE EQUIPMENT INCLUDING  
NIOSH-APPROVED SELF-CONTAINED BREATHING APPARATUS SHOULD BE USED.  
WATER SPRAY MAY BE INEFFECTIVE. IF WATER USED, FOG NOZZLES  
PREFERABLE. WATER MAY BE USED TO COOL CLOSED CONTAINERS TO PREVENT

PRESSURE BUILD-UP & POSSIBLE AUTOIGNITION OR EXPLOSION WHEN EXPOSED TO EXTREME HEAT.

Unusual Fire/Explosion Hazard:CLOSED CONTAINERS MAY EXPLODE (DUE TO BUILD-UP OF PRESSURE) WHEN EXPOSED TO EXTREME HEAT.

===== Accidental Release Measures =====

Spill Release Procedures:REMOVE ALL SOURCES OF IGNITION. VENTILATE AND REMOVE WITH INERT ABSORBENT.

===== Handling and Storage =====

Handling and Storage Precautions:KEEP AWAY FROM HEAT, SPARKS & OPEN FLAME. VAPORS WILL ACCUMULATE READILY & MAY IGNITE EXPLOSIVELY. DURING USE & UNTIL ALL VAPORS ARE GONE: KEEP AREA VENTILATED-DO NOT SMOKE-EXTINGUISH ALL FLAMES, PILO T LIGHTS & HEATERS. TURN OFF STOVES, ELECTRIC TOOLS & APPLIANCES & ANY (OTHER PRECAUTIONS)

Other Precautions:(HANDLING/STORAGE)-OTHER SOURCES OF IGNITION. CONSULT NFPA CODE. USE APPROVED BONDING & GROUNDING PROCEDURES. CONTENTS UNDER PRESSURE. DO NOT PUNCTURE, INCINERATE OR EXPOSE TO TEMP ABOVE 120F. HEAT FR OM SUNLIGHT, RADIATORS, STOVES, HOT WATER & OTHER HEAT SOURCES COULD CAUSE CONTAINER (STATE REG)

===== Exposure Controls/Personal Protection =====

Respiratory Protection:IF PERSONAL EXPOSURE CANNOT BE CONTROLLED BELOW APPLICABLE LIMITS BY VENTILATION, WEAR A PROPERLY FITTED ORGANIC VAPOR/PARTICULATE RESPIRATOR APPROVED BY NIOSH FOR PROTECTION AGAINST MATERIALS LISTED IN HAZARDOUS INGREDIENTS SECTION. WHEN SANDING OR ABRADING DRIED FILM, WEAR A NIOSH APPROVED DUST/MIST RESPIRATOR FOR DUST WHICH MAY BE GENERATED FROM PRODUCT.

Ventilation:LOCAL EXHAUST PREFERABLE. GENERAL EXHAUST ACCEPTABLE IF EXPOSURE TO MATLS IS MAINTAINED BELOW APPLICABLE EXPOSURE LIMITS. REFER TO OSHA STD (SUP DATA)

Protective Gloves:CHEMICAL-RESISTANT GLOVES FOR LONG/REPEATED CONTACT. NONE REQUIRED (SUP DATA)

Eye Protection:ANSI APPROVED CHEMICAL SAFETY GOGGLES AND FULL FACE SHIELD . (SUP DATA)

Other Protective Equipment:EYEWASH AND DELUGE SHOWER MEETING ANSI DESIGN CRITERIA .

Work Hygienic Practices:WASH HANDS AFTER USING.

Supplemental Safety and Health

GLOVES (CONT'D): FOR NORMAL APPLIC OF AEROSOL PRODUCTS WHERE MINIMAL SKIN CONTACT IS EXPECTED. EYE PROTECTION (CONT'D): WEAR SAFETY SPECTACLES WITH UNPERFORATED SIDESHIELD (MFR). VENT (CONT'D): 1910.9 4, 1910.107, 1910.108.

===== Physical/Chemical Properties =====

Boiling Pt:<-237.2C, -395.F

B.P. Text:<0 -395F

Melt/Freeze Pt:M.P/F.P Text:N.A.

Vapor Pres:SEE OTHER INFO.

Vapor Density:HEAV AIR

Spec Gravity:0.81

pH:7.0

VOC Grams/Liter:6.75

Evaporation Rate & Reference:FASTER THAN ETHER  
Solubility in Water:N.A.  
Appearance and Odor:NO APPEARANCE OR ODOR SPECIFIED BY MANUFACTURER .  
Percent Volatiles by Volume:90%

===== Stability and Reactivity Data =====

Stability Indicator/Materials to Avoid:YES  
NONE KNOWN.  
Stability Condition to Avoid:NONE KNOWN.  
Hazardous Decomposition Products:BY FIRE: CARBON DIOXIDE, CARBON  
MONOXIDE.  
Conditions to Avoid Polymerization:WILL NOT OCCUR.

===== Disposal Considerations =====

Waste Disposal Methods:WASTE FROM THIS PRODUCT MAY BE HAZARDOUS AS  
DEFINED UNDER RCRA 40 CFR 261. WASTE MUST BE TESTED FOR  
IGNITABILITY TO DETERMINE APPLICABLE EPA HAZARDOUS WASTE NUMBERS.  
DO NOT INCINERATE. DEPRESSURIZE CONTAINER. DISPOSE OF IN  
ACCORDANCE WITH FEDERAL, STATE & LOCAL REGULATIONS REGARDING  
POLLUTION.

===== Regulatory Information =====

SARA Title III Information:SARA 313 (40 CFR 372.65C) SUPPLIER  
NOTIFICATION: CAS #100-41-4: ETHYLBENZENE, 2% BY WT. CAS  
#1330-20-7: XYLENE, 9% BY WT.  
Federal Regulatory Information:TSCA CERTIFICATION: ALL CHEMICALS IN  
THIS PRODUCT ARE LISTED, OR ARE EXEMPT FROM LISTING, ON THE TSCA  
INVENTORY.  
State Regulatory Information:CALIFORNIA PROPOSITION 65: WARNING:  
PRODUCT CONTAINS CHEMICALS KNOWN TO STATE OF CA TO CAUSE CANCER &  
BIRTH DEFECTS OR OTHER REPRODUCTIVE HARM--ETHYLBENZENE & XYLENE.  
OTHER PRECAUTIONS (CONT'D):TO BUY. DO NOT TAKE INTERNALLY. KEEP  
OUT OF REACH OF CHILDREN. INTENTIONAL MISUSE BY DELIBERATELY  
CONCENTRATING & INHALING CONTENTS CAN BE HARMFUL OR FATAL. USE ONLY  
WITH ADEQUATE VENTILATION. AVOID BREATHING VAPOR & SPRAY MIST. AVOID  
CONTACT WITH SKIN & EYES. WASH HANDS AFTER USING. THIS COATING MAY  
CONTAIN MATERIALS CLASSIFIED AS NUISANCE PARTICULATES WHICH MAY BE  
PRESENT AT HAZARDOUS LEVELS ONLY DURING SANDING/ABRADING (OTHER  
INFORMATION)

===== Other Information =====

Disclaimer (provided with this information by the compiling agencies):  
This information is formulated for use by elements of the Department  
of Defense. The United States of America in no manner whatsoever,  
expressly or implied, warrants this information to be accurate and  
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document should seek competent professional advice to verify and  
assume responsibility for the suitability of this information to their  
particular situation.

## **Attachment C**

### **Equipment Safety Cards (To Be Updated Prior to Operations)**



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## SAFETY CARD

# CORE DRILLING MACHINE

**Objective / Overview:**

Core drilling machines are used on all types of jobs. They can be electrical or gas powered and come with a stand or can be hand held. Caution should be used when operating such a machine. It may look harmless and easy to run, but drilling machines have many hazards.

**Safe Operating Guidelines:**

Clean the flanges before mounting the blade. Make sure the blade is correct for the material being cut and the arrow on the blade corresponds with the direction of rotation of the machine spindle. Avoid tilting the blade when cutting. Use only the machines that have an approved safety guard. Remove the diamond blade from the machine during transit to prevent accidental damage. Inspect the blades frequently to detect cracks or undercutting of the steel center. Don't let excessive heat be generated at the cutting edge of the blade. Use adequate water supply to both sides of the blade. Follow the manufacturers recommended pulley sizes and operating speeds for specific blade diameters. Make sure to tighten drive belts to ensure full available power. Don't force the blade on the blade shaft or mount blade on an undersized spindle.

**Potential Hazards:**

- Electrical shock
- Flying debris
- Severe cuts
- Hearing loss
- Breathing fumes or dust

**Training Requirements:**

- Review of Applicable SOPs (SH&E 610, *Hand and Power Tools* & SH&E 611, *Electrical Safety-Portable Electrical Equipment*)
- Demonstrated knowledge on the use of a coring machine
- Review and follow manufacturers operating guidelines

**Personal Protective Equipment (Level D PPE) and:**

- Leather gloves
- Face shield
- Hearing protection
- Respirator or dust mask

**Other Safety Tips:**

- Keep fingers and hands away from the cutting edge.
- Hold handle firmly when operating.
- A subsurface utility clearance should be performed prior to initiating drilling operations.

## SAFETY CARD

# POWER DRILL

### **Objective / Overview:**

Available in a variety of types and capacities, portable power drills are undoubtedly the most used power tools. Because of their handiness and application to a wide range of jobs, drills often receive heavy use. For this reason, you'll need to carefully check your drill's capacity limitations and accessory recommendations.

### **Safe Operating Guidelines:**

Check carefully for loose power cord connections and frays or damage to the cord. Replace damaged tool and extension cords immediately. Be sure the chuck is tightly secured to the spindle. This is especially important on reversible type drills. Tighten the bit securely as prescribed by the owner / operator's manual. The chuck key must be removed from the chuck before starting the drill. A flying key can be an injury-inflicting missile. Check auxiliary handles, if part of the tool. Be sure they are securely installed. Always use the auxiliary drill handle when provided. It gives you more control of the drill, especially if stalled conditions occur. Grasp the drill firmly by insulated surfaces. Always hold or brace the tool securely. Brace against stationary objects for maximum control. If drilling in a clockwise -- forward -- direction, brace the drill to prevent a counter-clockwise reaction. Don't force a drill. Apply enough pressure to keep the drill bit cutting smoothly. If the drill slows down, relieve the pressure. Forcing the drill can cause the motor to overheat, damage the bit and reduce operator control.

### **Potential Hazards:**

- Electrical shock
- Leaving chuck wrench in tool
- Puncture wounds
- Flying debris
- Severe cuts
- Fire
- Burns (hot bits)
- Sprains/strains (wrist)



### **Training Requirements:**

- Review of Applicable SOPs (SH&E 610, *Hand and Power Tools & SH&E 611, Electrical Safety-Portable Electrical Equipment*)
- Demonstrated knowledge on the use of a power drill
- Review and follow manufacturers operating guidelines

### **Personal Protective Equipment (Level D PPE ) and:**

- Leather Gloves

### **Other Safety Tips:**

- Electric drills must be double-insulated or plugged into a GFCI outlet.
- Never carry tool by cord or yank it to disconnect from receptacle.
- Keep cord away from sharp edges.

## SAFETY CARD

# PRESSURE WASHERS

### Objective / Overview:

High pressure washers can operate up to pressures of 5,000 psi and come in a variety of types ranging from gas operated to electrical. If not used correctly and safely, pressure washers can be a dangerous piece of work equipment. Earth Tech only allows trained, authorized personnel to operate the high pressure washers. Along with training, other safety measures include: reviewing the manufacturers instructional booklet, proper maintenance of equipment, and personal protective equipment.

### Safe Operating Guidelines:

The gun valve must always be pointed at the work area, NEVER point the gun valve at yourself or another person. High pressure washers shall be used to clean or decontaminate equipment, surfaces or structures only. High pressure washers WILL NOT be used to clean or decontaminate workers or personal protective equipment while it is being worn. Always set the tripper safety lock when the gun valve is not in use.

### Potential Hazards:

- Kickback – Sudden and violent reverse movement of the gun
- Flying debris
- Slips and trips on wet surfaces and hoses
- Exhaust fumes/carbon monoxide (CO) in enclosed spaces
- Severe cuts

### Training Requirements:

- Review of Applicable SOPs (SH&E 613, *Pressure Washers*)
- Demonstrated knowledge on the use of a pressure washer
- Review of manufacturers operating guidelines

### Personal Protective Equipment (Level D PPE ) and:

- Hard hat with faceshield
- Heavy gloves
- Hearing protection
- PVC (or equivalent) rain suit



### Other Safety Tips:

- Never fill a pressure washer fuel tank with fuel while the engine is running or if the engine is still hot
  - Non-operators must remain a minimum of 25 feet from the operator
  - High pressure washing equipment should be cleaned often to avoid dirt buildup, especially around the trigger and guard area
  - Always set the trigger safety lock when the gun valve is not in use
- Relieve the pressure in the system before coupling and uncoupling hoses
- Visually inspect the full length of high pressure discharge hose and inspect other high pressure fluid-handling components for abrasions or cuts, damage caused by exposure to chemicals and for damage caused by kinks in the hose

## SAFETY CARD

# UTILITY KNIVES / RAZORS

### Objective / Overview:

Utility knives serve a variety of purposes at worksites, and can be a useful tool, when used safely and correctly. Learning proper positioning and correctly using a utility knife will drastically reduce the potential of cut related injuries.

### Safe Operating Guidelines:

Always be sure that knives are sharp and not dull. A dull blade will require more force to cut, increasing the likelihood of slipping. Be sure the blade is seated in the frame of the knife correctly, closed, and fastened together properly. Always keep body parts away from the cut line, (e.g., fingers), and ensure that the material being cut is on firm ground and not against a body part (cutting rope against your leg). Always pull the knife, never push the knife (the blade may break, and momentum could cause the body to come into contact with broken blade). Always retract the blade when not in use.

### Potential Hazards:

- Lacerations from direct contact with the blade
- Lacerations from blade breaking or shattering
- Ergonomics



### Training Requirements:

- Review of Applicable SOPs (SH&E 610, *Hand and Power Tools*)
- Demonstrated knowledge on the safe use of a utility knives
- Review and follow manufacturers operating guidelines for specialized or unusual knives.

### Personal Protective Equipment (Level D PPE) and:

Cut resistant gloves (Kevlar, thick leather, etc.).

### Other Safety Tips:

- Purchase safety equipped utility knives with guarding or automatically retracting blades
- Replace dull blades – When knife begins to tear rather than cut, it is a good indicator the blade is dull.
- Always wear a cut resistant glove on your free hand.
- Always use the right tool for the job – NEVER use the blade as a screwdriver or prying tool.
- When using a knife to cut thicker materials, use several passes. Increased force on the blade can cause it to stray from the intended cut path, or break the blade.
- When changing blades, always handle from the non-sharp side. Cover blade with duct tape and dispose.
- Use an alternate tool when possible (scissors, wire cutters, etc.)



Utility Knives with Guarding

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## **Appendix D**

### **Supporting Documentation**

# PRECISION

## Industrial Maintenance, Inc

January 25, 2010

Kim Kotkoskie  
109<sup>th</sup> Civil Engineer Squadron  
Stratton Air National Guard Base  
1 Air National Guard Road  
Scotia, New York 12303-9752

Re: Tank Closure Report for Tank # 293

Dear Kim,

On 10/20/10 Precision Industrial Maintenance, Inc. (PIM) was contracted by Stratton ANG Base under contract number W912PQ-10-C-0033 to provide all materials, equipment and labor to properly remove and close one 1,000 gallon UST located at the Jet Fuels Facility near the east wall of the POL Pump House Building 29, Stratton Air National Guard Base Scotia, NY. This tank is listed as # 293 under PBS Registration Number 4-388602 (attached as a reference).

On 11/4/10 PIM removed remaining product from tank, excavated tank, cut/cleaned tank, removed and cleaned all associated piping and ancillary equipment. The tank was strapped to a reinforced concrete hold-down pad which was cast in-place into the previously excavated shale walls. PIM cut straps to remove tank and left pad in place as requested by Stratton. Tank was removed and placed on double layered 6 mil poly for further cleaning. Liquids removed from tank along with contaminated sorbents and PPE generated from cleaning were placed in a 55 gallon drum for disposal (see attached disposal paperwork for water and jet fuel mixture).

Tank and piping were in excellent condition with so signs of leakage. The cleaned tank along with associated piping was loaded onto a flatbed for disposal as C&D to Albany Landfill (see attached weigh slip for .69 tons of C&D). Attached are photos of tank along with excavation. Excavation was approximately 32 feet x 16 feet x 9 feet deep at groundwater level and bedrock. Groundwater within the excavation appeared to have a very slight sheen. There was not enough of a sheen on the groundwater to pad off. PIM sampled groundwater (see attached results from Phoenix dated November 12, 2010).

Excavation was monitored with a PID (calibration logs available upon request). PIM staged all soil removed from excavation on double layered 6mil poly (two piles). No soil removed from excavation was placed back into excavation. Approximately 30 cubic yards of soil with PID readings greater than 25 ppm and less than 30 ppm was staged nearby and a second pile approximately 25 cubic yards with readings from 0 ppm to 5

*Providing Quality Industrial and Environmental Services*

1710 Erie Blvd, Schenectady, NY 12308 • (518) 346-5800 • (Fax) 346-6077

P.O. Box 674, Barre, VT 05641 • (802) 479-0046 fax (802) 479-0048

Toll Free 888-888-PIMI (7464) • [www.precisionindustrial.info](http://www.precisionindustrial.info)



ppm was also staged. An estimated total of 55 cubic yards of soil was staged on site for future off site disposal to Albany Landfill or ESMI.

PID readings were taken throughout the removal process. All readings within the excavation were at 0 ppm except for bottom layer of contamination that consisted of approximately an 8 inch band of contaminated soil. Based on the isolated location of this band, it was determined that the contamination in this area was from one of two historic Spills (#0411903 and #0704613), one of which is currently open and under remediation. Dan Lightsey, of NYSDEC Region IV was notified prior to backfilling the excavation and was provided with a description, PID readings and GW information. He agreed with the determination regarding the historic contamination and provided approval to backfill and proceed with the closure sampling.

A total of 5 soil samples were taken from excavation (four walls and bottom of excavation) and 1 groundwater sample. Laboratory analyses and chain of custody are attached (see Phoenix report dated November 12, 2010). Excavation was backfilled with 48 tons of pea stone and 23.19 tons of #2 round stone (see attached weigh tickets).

The soil piles were sampled for Gasoline Range Organics in preparation for final disposal at ESMI on December 27, 2010. Both of the samples had results less than the reporting level of 20 mg/kg. See results in attached Phoenix report dated January 4, 2011. Soil piles were transported and disposed of at ESMI on Thursday January 20, 2011. A total of 70.03 tons were disposed of (see attached weigh slips).

If you have any questions or would like additional information please feel free to contact me at (518) 346-5800.

Sincerely,



Lynne H. Farrell  
Project Manager

**New York State Department of Environmental Conservation  
Office of Environmental Quality, Region 4**

1130 North Westcott Road, Schenectady, New York 12306-2014

Phone: (518) 357-2045 • Fax: (518) 357-2398

Website: [www.dec.ny.gov](http://www.dec.ny.gov)



Joe Martens  
Commissioner

January 23, 2013

109<sup>th</sup> Airlift Wing, NYANG  
Attn: Col. Walter Wintsch  
1 Air National Guard Rd.  
Scotia, NY 12302

**Re: Spill # 0704613  
109<sup>th</sup> Airlift Wing, NYANG  
1 Air National Guard Rd.  
Scotia, Schenectady Co.**

Dear Colonel Wintsch:

The Department has reviewed the file pertaining to this spill. Be advised that this spill will be listed as "closed – does not meet standards" in our files. This does not limit your liability should future unforeseen problems as a result of this spill. I would also recommend that you properly close the wells associated with this spill.

Feel free to contact me if you have any questions regarding this matter.

Sincerely,

Matt Franklin  
Region 4 Spill Response

1021 River Rd. Cedar Hill  
SELKIRK, NEW YORK 12158  
Phone 767-3608 Fax 767-0998

[illegible]

LOCO

**THANK YOU**

**Asking** To Reorder:  
800-225-6380 or nabs.com

All claims and returned goods **MUST** be accompanied by this bill.

**THANK YOU**

**CEDAR MILL TRUCKING, INC.**

1021 River Rd. Cedar Hill  
SELKIRK, NEW YORK 12158  
Phone 767-9508 Fax 767-0900

[illegible]

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**THANK YOU**

**AWARDS** To Reader:  
800-225-8380 or nubs.com

**All claims and returned goods MUST be accompanied by this bill.**



CEDAR HILL TRUCKING INC.

1021 River Road Cedar Hill  
Selkirk, New York 12158  
Phone 767-9608 • 767-2862

Nº

NON-HAZARDOUS WASTE MANIFEST

Generator Name Schectdy Air Guard Shipping Location \_\_\_\_\_

Address Schectdy N.Y. Address SAME

Phone No. Precision Environmental Phone No. Fiberglass Tank

Approval  
Number

Description of Material

Non-Regulated Petroleum  
Contaminated Soil  
Non DOT/RCRA Regulated

Codes

GROSS

TARE

NET

TONNAGE

I hereby certify that the above named material does not contain free liquid as defined by 40 CFR Part 260.10 or any applicable state law, is not a hazardous waste as defined by 40 CFR Part 261 or any applicable state law, has been properly described, classified and packaged, and is in proper condition for transportation according to applicable regulations.

Generator Authorized Agent Name \_\_\_\_\_ Signature \_\_\_\_\_ Shipment Date \_\_\_\_\_

TRANSPORTER

Transporter Name \_\_\_\_\_ Driver Name (Print) Shawn Coates

Address SEE HEADING Vehicle License No./State \_\_\_\_\_

Truck Number 56

I hereby certify that the above named material was picked up at the generator site listed above.

I hereby certify that the above named material was delivered without incident to the destination listed below.

Driver Signature Shawn Coates Shipment Date 11-4-10 Driver Signature Shawn Coates Delivery Date 11-4-10

DESTINATION

Site Name Albany Landfill Phone No. \_\_\_\_\_

Address Rapp Rd Albany N.Y.

I hereby certify that the above named material has been accepted and to the best of my knowledge the foregoing is true and accurate.

Name of Authorized Agent \_\_\_\_\_ Signature \_\_\_\_\_ Receipt Date \_\_\_\_\_



CITY OF ALBANY  
DEPARTMENT OF GENERAL SERVICES  
Rapp Road Waste Management Facility  
525 Rapp Rd • Albany, N.Y. 12205  
(518) 869-3651

006019 Precision Industrial Maint.  
1710 Erie Blvd.  
Schenectady NY 12308

SH#	TICKET	GRID		WEIGHMASTER	
02	424342	NON SHRED		BRENDA	
DATE IN	DATE OUT	TIME IN	TIME OUT	VEHICLE	ROLL OFF
11/04/10	11/04/10	14:05	14:12	7001	
REFERENCE			ORIGIN		
0000			SCHENECTADY		

Manual Gross Wt. 48180 LB  
Scale 2 Tare Wt. 46800 LB  
Net Weight 1380 LB

Inbound - Charge ticket

QTY.	UNIT	DESCRIPTION	RATE	EXTENSION	FEE	TOTAL
0.69	TONS	Construction & Demo	54.00	37.26	0.00	37.26

Operating hours: 7 am to 3 pm, Monday - Friday

THIS IS TO CERTIFY THAT THIS LOAD DOES NOT CONTAIN ANY  
NON ACCEPTABLE MATERIALS AS DEFINED BY LANDFILL PERMIT  
AGREEMENT

LOT # 0000

SIGNATURE \_\_\_\_\_

NET AMOUNT
37.26
TENDERED
CHANGE
CHECK NO.

# ENVIRONMENTAL SOIL MANAGEMENT of New York Generator Waste Profile

BSMI Customer:

Precision Industrial Maint, Inc.

Customer Address:

1710 Erie Blvd

City:

Schenectady

State:

NYZip: 12308

Contact:

Lynne Farrell

Telephone:

(518) 346-5800

Fax:

(518) 346-6072

Site Contact:

Lynne Farrell

Telephone/Cell:

(518) 527-7136

Pager: ( )

Loading Contractor (optional)

Phone: ( )

Site Name:

Stratton ANGB

Property Owner(s) Phone: ( )

Site Address:

1 Air National Guard Rd.

City:

Schoharie

State:

NYZip: 12308

History of Site Use:

☐ Residential☐ Commercial☐ Industrial☒ OtherGovernment

If commercial, Industrial or other, please describe history of site:

Air Base

Event/process generating waste:

☐ Leaking UST☐ Leaking AST☒ Surface Spill☐ Other (describe):Jet Fuel Tank Removal

Waste Material Description:

Soil/Media contaminated with: the below described material is (initial one)☒

NON-HAZARDOUS VIRGIN PETROLEUM CONTAMINATED SOIL

☐ #2, ☐ #4, ☐ #6 Fuel oil☐ Diesel Fuel☒ Gas/Jet Fuel☐ Animal/vegetable/tall oils☐ White oil☐ Kerosene☐ Mixed Fuels (gas/fuel oil)☐ Petroleum Solvent

NON-HAZARDOUS NON-VIRGIN PETROLEUM CONTAMINATED SOIL

☐ Used oils☐ Grease/Lubes☐ Used Animal/Vegetable/tall oils☐ Waxes☐ Petrolatum☐ Lubricating oils☐ Metal Working oils☐ Industrial oils☐ Used Petroleum Solvent

NON-HAZARDOUS COAL TAR/PCB's CONTAMINATED SOIL / URBAN FILL

☐ Coal Tar☐ PCB's <1 ppm☐ Electrical oil☐ Transformer oil (non-pcb)☐ Urban Fill

Approximate Tonnage:

100

Physical Characteristics

% Gravel

60

% Sand

40

% Clay/Silt

\_\_\_\_\_ % H<sub>2</sub>O

% Debris

\_\_\_\_\_ % = (100%)

Describe Debris

Are there any known or suspected past releases of contaminants other than the above listed? NO ☒ YES

If YES, Specify

I hereby certify, to the best of my knowledge,

- a.) I am a responsible official of the generator of the material being disposed of and, b.) That the transport, treatment and recycling of the contaminated materials do not violate any laws or regulations of the state of origin and, c.) That the information within is complete and accurate.

Signature:

Lynne Farrell

Date:

11/7/11

Typed/Printed Name:

Lynne Farrell

Company:

Precision IndustrialMaintenance, Inc.

Check One: Owner

Generator ☒

Contractor

Consultant

Other (explain)

Acceptance of all projects are predicated on the review of this form and the analytical results of the material to be received.

304 Towpath Road, Fort Edward, New York 12828 (518) 747-5500 fax (518) 747-1181

122A Naubuc Ave, Glastonbury, Connecticut, 06033 (860) 633-7872 fax (860) 633-7884

# Summary Guide To Lab Requirements For ESMI of New York

Contaminant	TPH	Total VOC's	Total SVOC's	Total PCB's	Total Metals(8)*	Total Cyanide	Percent Sulfur
SW-846 Method	GC/FID	8260	8270	8082	6010B	9070	EPA D129-84
<b>Virgin</b>							
<input checked="" type="checkbox"/> Gas/Jet Fuel	X 8015 GRO						
<input type="checkbox"/> Fuel Oil 2,4,6,Diesel	X 8015 DRO						
<input type="checkbox"/> Mixed Fuels (fuel oil /gas)	X 8015 GRO / 8015 GRO						
<input type="checkbox"/> Animal, Vegetable, Tall oils	X 8100						
<input type="checkbox"/> Petroleum Solvents	X 8100	X	X				
<input type="checkbox"/> Waxes and Petrolatum	X 8100	X	X				
<input type="checkbox"/> Certified Residential Sites less than 150 tons require in-house TPH testing only.							
<input type="checkbox"/> NYSDEC Directed Virgin Spill Clean-ups require in-house TPH when certified virgin and characterization is waived by a NYSDEC Spills Representative							
<b>Non-Virgin</b>							
<input type="checkbox"/> Used Oils, Greases, Lubricants	X 8100	X		X	X		
<input type="checkbox"/> Used Animal, Vegetable, Tall oils	X 8100						
<input type="checkbox"/> Petroleum Solvents (used)	X 8100	X	X	X	X		
<b>Coal Tars/PCBs/Urban Fill</b>							
<input type="checkbox"/> Transformer Oil (non-pcb)	X 8100			X			
<input type="checkbox"/> Electrical Oils	X 8100			X			
<input type="checkbox"/> Coal Tars	X 8100	X	X	X	X	X	X
<input type="checkbox"/> Urban Fill	X 8100	X	X	X	X		
<b>Frequency</b>							
<b>Each composite to be made up of 3-5 grabs</b>							
<input type="checkbox"/> 1 composite sample for up to 150 Tons							
<input type="checkbox"/> 2 composite samples for 150-300 Tons							
<input type="checkbox"/> 3 composite samples for 300-750 Tons							
<input type="checkbox"/> 1 additional composite sample per 750 over							
<b>ANALYSIS MUST BE RUN BY NEW YORK ELAP CERTIFIED LABORATORY</b>							
* 8 Total Metals List (Arsenic, Barium, Cadmium, (Chromium, total) Lead, Mercury, Selenium, Silver)							
Acceptance of all projects are subject to the approval of a completed "PROFILE SHEET" and "ANALYTICAL RESULTS" of material to be received.							
At the discretion of the facility, specific knowledge of the waste and/or site may be substituted for certain lab analysis.							
At the discretion of the facility, additional lab analysis may be required for project acceptance.							
Certified Residential Sites, less than 150 tons require in-house TPH only							
NYSDEC Directed Virgin Spill Clean-up, require in-house TPH when certified virgin and characterization is waived by a NYSDEC Spills Representative.							
Listed Organic Hazardous Wastes, may be accepted when accompanied by NYSDEC "contained-out" decision.							





Tuesday, January 04, 2011

Attn: Mr. ~~Chris Kilburn~~ *Lynne Farrell*  
Precision Industrial Maint.  
1710 Erie Blvd  
Schenectady, NY 12308

Project ID: STRATTON ANGB TANK #293  
Sample ID#s: AZ91256 - AZ91257

This laboratory is in compliance with the QA/QC procedures outlined in EPA 600/4-79-019, Handbook for Analytical Quality in Water and Waste Water, March 1979, SW846 QA/QC and NELAC requirements of procedures used.

This report contains results for the parameters tested, under the sampling conditions described on the Chain Of Custody, as received by the laboratory.

A scanned version of the COC form accompanies the analytical report and is an exact duplicate of the original.

If you have any questions concerning this testing, please do not hesitate to contact Phoenix Client Services at ext. 200.

Sincerely yours,

A handwritten signature in cursive script, reading "Phyllis Shiller".

Phyllis Shiller  
Laboratory Director

NELAC - #NY11301  
CT Lab Registration #PH-0618  
MA Lab Registration #MA-CT-007  
ME Lab Registration #CT-007  
NH Lab Registration #213693-A,B  
NJ Lab Registration #CT-003  
NY Lab Registration #11301  
PA Lab Registration #68-03530  
RI Lab Registration #63  
VT Lab Registration #VT11301



Environmental Laboratories, Inc.  
587 East Middle Turnpike, P.O.Box 370, Manchester, CT 06045  
Tel. (860) 645-1102 Fax (860) 645-0823



## Analysis Report

January 04, 2011

FOR: Attn: Mr. Chris Kilburn  
Precision Industrial Maint.  
1710 Erie Blvd  
Schenectady, NY 12308

### Sample Information

Matrix: SOIL  
Location Code: PREINDST  
Rush Request:  
P.O.#: 10-0156

### Custody Information

Collected by:  
Received by: LDF  
Analyzed by: see "By" below

<u>Date</u>	<u>Time</u>
12/27/10	8:45
12/29/10	10:15

### Laboratory Data

SDG ID: GAZ91256  
Phoenix ID: AZ91256

Project ID: STRATTON ANGB TANK #293

Client ID: 1

Parameter	Result	RL	Units	Date	Time	By	Reference
Percent Solid	88		%	12/29/10		JL	E160.3
Gasoline Range Organics	< 20	20	mg/Kg	01/03/11		JRB	8015GRO

### Comments:

If there are any questions regarding this data, please call Phoenix Client Services at extension 200.

ND=Not detected BDL=Below Detection Level RL=Reporting Level

This report must not be reproduced except in full as defined by the attached chain of custody.

Phyllis Shiller, Laboratory Director  
January 05, 2011



Environmental Laboratories, Inc.  
587 East Middle Turnpike, P.O.Box 370, Manchester, CT 06045  
Tel. (860) 645-1102 Fax (860) 645-0823



## Analysis Report

January 04, 2011

FOR: Attn: Mr. Chris Kilburn  
Precision Industrial Maint.  
1710 Erie Blvd  
Schenectady, NY 12308

### Sample Information

Matrix: SOIL  
Location Code: PREINDST  
Rush Request:  
P.O.#: 10-0156

### Custody Information

Collected by:  
Received by: LDF  
Analyzed by: see "By" below

Date	Time
12/27/10	8:48
12/29/10	10:15

### Laboratory Data

SDG ID: GAZ91256  
Phoenix ID: AZ91257

Project ID: STRATTON ANGB TANK #293

Client ID: 2

Parameter	Result	RL	Units	Date	Time	By	Reference
Percent Solid	94		%	12/29/10		JL	E160.3
Gasoline Range Organics	< 20	20	mg/Kg	01/03/11		JRB	8015GRO

### Comments:

If there are any questions regarding this data, please call Phoenix Client Services at extension 200.

ND=Not detected BDL=Below Detection Level RL=Reporting Level

This report must not be reproduced except in full as defined by the attached chain of custody.

Phyllis Shiller, Laboratory Director  
January 05, 2011



**Environmental Laboratories, Inc.**  
587 East Middle Turnpike, P.O.Box 370, Manchester, CT 06045  
Tel. (860) 645-1102 Fax (860) 645-0823



## **NY Temperature Narration**

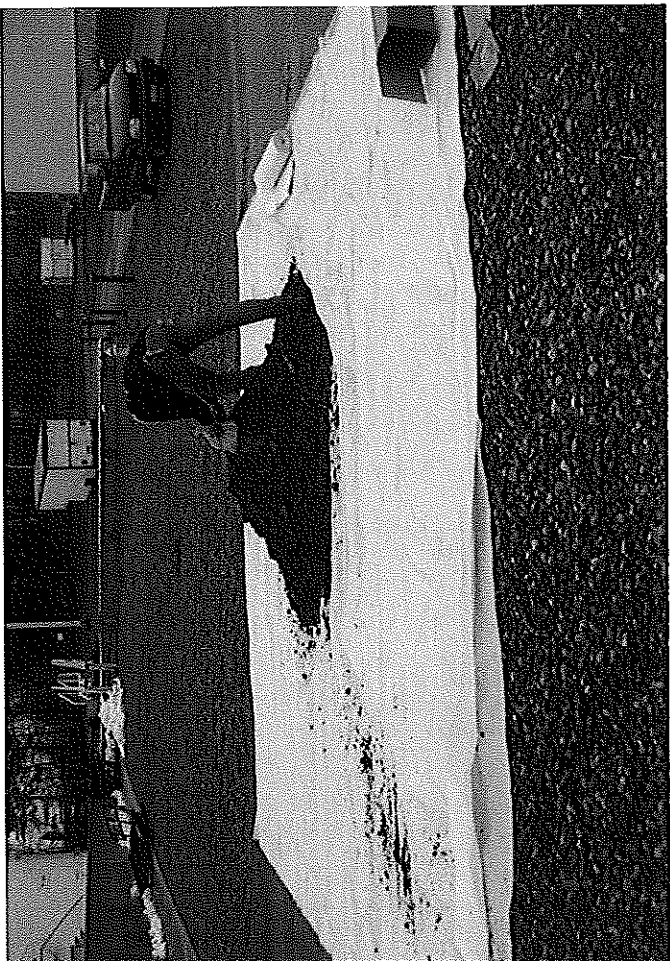
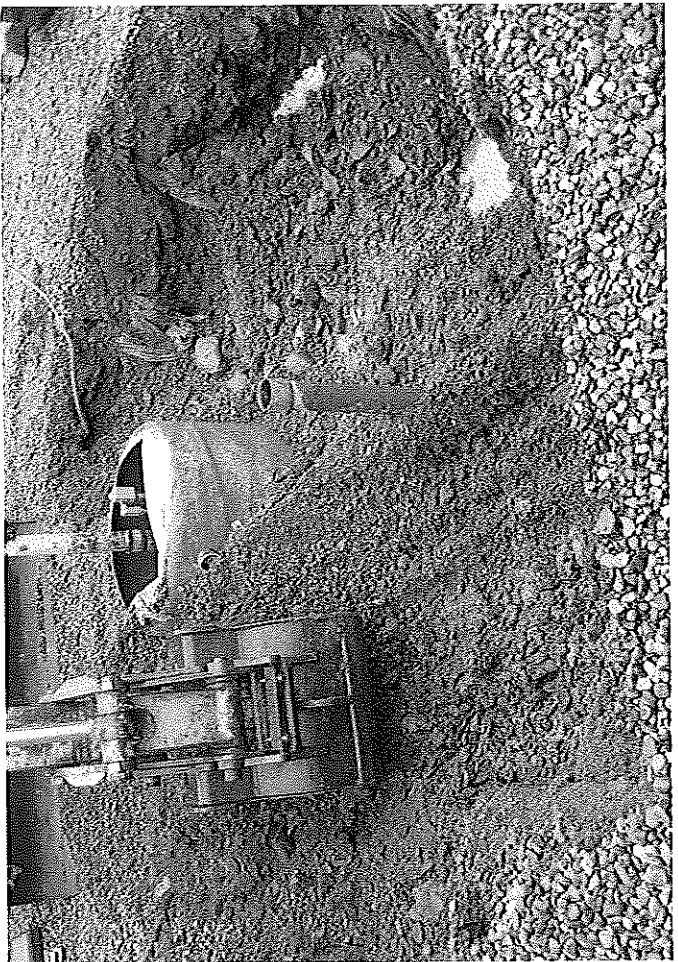
**January 05, 2011**

**SDG I.D.: GAZ91256**

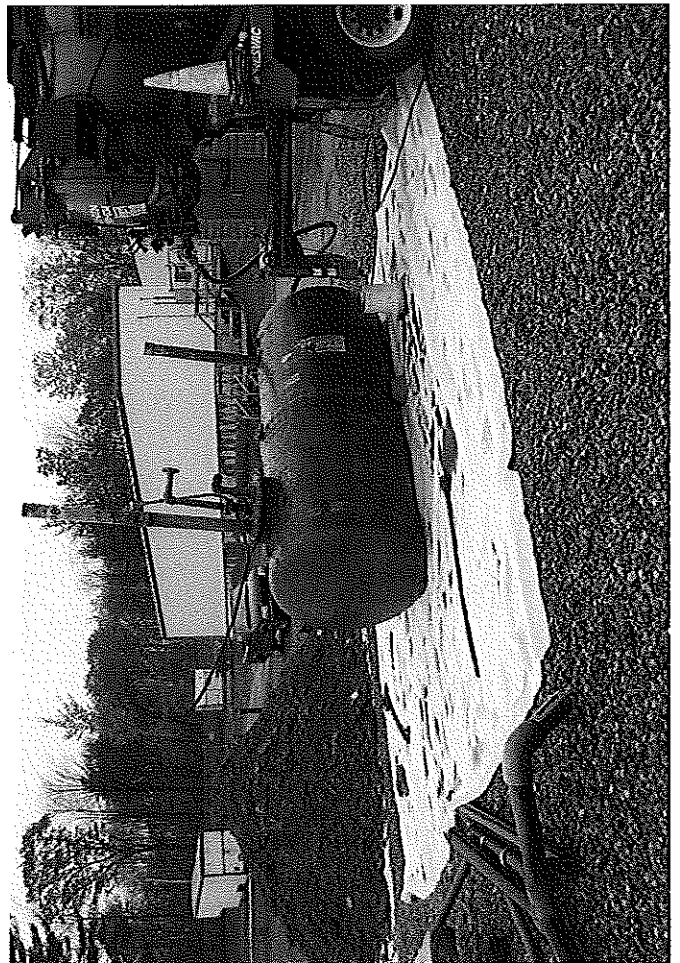
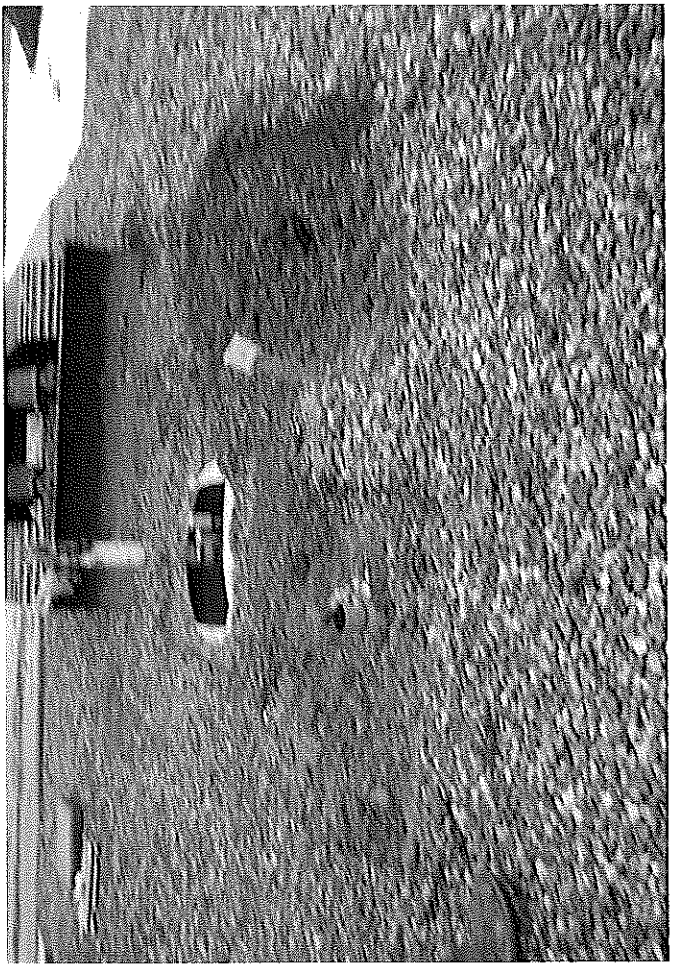
---

The samples in this delivery group were received at 6C.  
(Note acceptance criteria is above freezing up to 6C)











PBS Number  
**4-388602**

New York State Department of Environmental Conservation  
**PETROLEUM BULK STORAGE CERTIFICATE**  
625 Broadway, 11th Floor, Albany, NY 12233-7020 Phone: 518-402-9553

Region 4 NYSDEC - PBS Unit  
1130 North Westcott Road  
Schenectady, NY 12306  
(518) 357-2045

TANK NUMBER	TANK LOCATION	DATE INSTALLED	TANK TYPE	PRODUCT STORED	CAPACITY (GALLONS)	DATE LAST TESTED	TESTING DUE DATE
291	Aboveground - in contact with soil	08/01/1989	Steel/Carbon Steel/Iron	Jet Fuel	108,000		*
292	Aboveground - in contact with soil	08/01/1989	Steel/Carbon Steel/Iron	Jet Fuel	108,000		*
293	Underground	08/01/1989	Fiberglass Reinforced Plastic (FRP)	Jet Fuel	1,000		*
296	Aboveground - in contact with impervious barrier	03/11/2010	Steel/Carbon Steel/Iron	Jet Fuel	300		*
3201	Aboveground - No Contact (on saddles, legs, rack, cradle, etc.)	10/01/1997	Steel/Carbon Steel/Iron	Jet Fuel	2,500		*
351	Underground	04/01/1992	Steel/Carbon Steel/Iron	Diesel	8,000		*
352	Underground	04/01/1992	Steel/Carbon Steel/Iron	Gasoline	8,000		*
354	Aboveground - No Contact (on saddles, legs, rack, cradle, etc.)	09/01/1998	Steel/Carbon Steel/Iron	Used Oil (Heating)	250		*
371	Aboveground - No Contact (on saddles, legs, rack, cradle, etc.)	10/01/1996	Steel/Carbon Steel/Iron	Diesel	125		*
414	Aboveground - No Contact (on saddles, legs, rack, cradle, etc.)	09/01/1996	Steel Tank Encased in Concrete	Waste Oil/Used Oil	500		*
415	Aboveground - No Contact (on saddles, legs, rack, cradle, etc.)	09/01/1996	Steel Tank Encased in Concrete	Waste Oil/Used Oil	250		*

OWNER:  
109 AW/CE, NYANG  
1 AIR NATIONAL GUARD RD  
SCOTIA, NY 12302-9752

ON-SITE  
TY RANDALL, MAJOR  
OPERATOR: (518) 344-2568  
PRIMARY  
OPERATOR:  
EMERGENCY JAMES ACORS, CMSGT  
CONTACT: (518) 344-2405

ISSUED BY: Commissioner  
Alexander B. Grannis  
PBS NUMBER: 4-388602  
DATE ISSUED: 02/13/2008  
EXPIRATION DATE: 03/28/2013  
FEE PAID: \$500.00

SITE:

STRATTON AIR NATIONAL GUARD  
1 AIR NATIONAL GUARD RD  
SCOTIA, NY 12302-9752

MAILING CORRESPONDENCE:

LT COL RONALD LEADLEY  
109 AW/CE, NYANG  
1 AIR NATIONAL GUARD RD  
STRATTON AIR NATIONAL GUARD BASE  
SCOTIA, NY 12302-9752

As an authorized representative of the above named facility, I affirm under penalty of perjury that the information displayed on this form is correct to the best of my knowledge. Additionally, I recognize that I am responsible for assuring that this facility is in compliance with all sections of 6 NYCRR Parts 612, 613 and 614, and applicable sections of 6 NYCRR Subpart 374-2 (used oil tanks only), not just those cited below:

- The facility must be re-registered if there is a transfer of ownership.
- The Department must be notified within 30 days prior to adding, replacing, reconditioning, or permanently closing a stationary tank.
- The facility must be operated in accordance with the code for storing petroleum, 6 NYCRR Part 613.
- Any new facility or substantially modified facility must comply with 6 NYCRR Part 614.
- This certificate must be signed and posted on the premises at all times.
- Posting must be at the tank, at the entrance of the facility, or the main office where the storage tanks are located.
- Any person with knowledge of a spill, leak or discharge must report the incident to DEC within two hours (1-800-457-7362).

*Ronald E. Leadley* 31 Mar 2010  
Signature of Representative/Owner Date  
*Ronald E. Leadley* Engr Manager  
Name and Title of Authorized Representative/Owner (Please Print)





PBS Number  
**4-388602**

New York State Department of Environmental Conservation  
**PETROLEUM BULK STORAGE CERTIFICATE**  
625 Broadway, 11th Floor, Albany, NY 12233-7020 Phone: 518-402-9553

1130 North Westcott Road  
Schenectady, NY 12306  
(518) 357-2045

TANK NUMBER	TANK LOCATION	DATE INSTALLED	TANK TYPE	PRODUCT STORED	CAPACITY (GALLONS)	DATE LAST TESTED	TESTING DUE DATE

saddles, legs, rack, cradle, etc.)  
Aboveground - No Contact (on  
saddles, legs, rack, cradle, etc.)

Waste Oil/Used Oil

250

09/01/1996 Steel Tank Encased in Concrete

416

\* Aboveground tanks require monthly visual inspections and may need documented internal inspections as described in 6 NYCRR Part 613

**OWNER:**

109 AW/CE, NYANG  
1 AIR NATIONAL GUARD RD  
SCOTIA, NY 12302-9752

**ON-SITE** TY RANDALL, MAJOR

**OPERATOR:** (518) 344-2568

**PRIMARY**

**OPERATOR:**

EMERGENCY JAMES ACORS, CMSGT

**CONTACT:** (518) 344-2405

**ISSUED BY:** Commissioner

Alexander B. Grannis

**PBS NUMBER:** 4-388602

**DATE ISSUED:** 02/13/2008

**EXPIRATION DATE:** 03/28/2013

**FEE PAID:** \$500.00

**SITE:**

STRATTON AIR NATIONAL GUARD  
1 AIR NATIONAL GUARD RD  
SCOTIA, NY 12302-9752

**MAILING CORRESPONDENCE:**

LT COL RONALD LEADLEY  
109 AW/CE, NYANG  
1 AIR NATIONAL GUARD RD  
STRATTON AIR NATIONAL GUARD BASE  
SCOTIA, NY 12302-9752

As an authorized representative of the above named facility, I affirm under penalty of perjury that the information displayed on this form is correct to the best of my knowledge. Additionally, I recognize that I am responsible for assuring that this facility is in compliance with all sections of 6 NYCRR Parts 612, 613 and 614, and applicable sections of 6 NYCRR Subpart 374-2 (used oil tanks only), not just those cited below:

- The facility must be re-registered if there is a transfer of ownership.
- The Department must be notified within 30 days prior to adding, replacing, reconditioning, or permanently closing a stationary tank.
- The facility must be operated in accordance with the code for storing petroleum, 6 NYCRR Part 613.
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This certificate must be signed and posted on the premises at all times. Posting must be at the tank, at the entrance of the facility, or the main office where the storage tanks are located.

- Any person with knowledge of a spill, leak or discharge must report the incident to DEC within two hours (1-800-457-7367).

Ronald E. Leadley 31 Mar 2010  
Signature of Representative/Owner Date

Ronald E. Leadley Env'r Manager  
Name and Title of Authorized Representative/Owner (Please Print)

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## **Appendix E**

### **Laboratory Accreditation Certificate**



# CERTIFICATE OF ACCREDITATION

**ANSI-ASQ National Accreditation Board/AClass**  
500 Montgomery Street, Suite 625, Alexandria, VA 22314, 877-344-3044

This is to certify that

**TriMatrix Laboratories, Inc.**  
**5560 Corporate Exchange Court, SE**  
**Grand Rapids, MI 49512**

has been assessed by AClass  
and meets the requirements of

**ISO/IEC 17025:2005 and DoD-ELAP**

while demonstrating technical competence in the field(s) of

**TESTING**

Refer to the accompanying Scope(s) of Accreditation for information regarding the types of tests to which this accreditation applies.

ADE-1542

Certificate Number

AClass Approval

Certificate Valid: 4/30/2013-04/30/2015  
Version No. 003 Issued: 05/30/2013



This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2005. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (*refer to joint ISO-ILAC-IAF Communiqué dated January 2009*).



SCOPE OF ACCREDITATION TO ISO/IEC 17025:2005 & DoD-ELAP

**TriMatrix Laboratories, Inc**

5560 Corporate Exchange Court, SE, Grand Rapids, MI 49512

Rick Wilburn Phone: 616-975-4500

**TESTING**

Valid to: April 30, 2015

Certificate Number: ADE - 1542

**I. Environmental**

MATRIX	SPECIFIC TEST or ANALYTE GROUP**	SPECIFICATION OR STANDARD METHOD (all EPA unless specified)	* KEY EQUIPMENT OR TECHNOLOGY
Water	Metals Digestion	200.2	Block Digestion
Water	Metals Digestion	3010A	Block Digestion
Water	Metals Digestion	3020A	Block Digestion
Solid	Metals Digestion	3050B	Block Digestion
Water	Metals	200.7 / 6010C	ICP
Water	Calcium Hardness (as CaCO <sub>3</sub> )	SM 2340B	ICP
Solid	Metals	6010C	ICP
Water	Total Hardness (as CaCO <sub>3</sub> )	SM 2340B	ICP
Water	Metals	200.8 / 6020A	ICP MS
Solid	Metals	6020A	ICP MS
Water	Mercury	245.1 / 7470A	CVAA
Solid	Mercury	7471B	CVAA



<b>MATRIX</b>	<b>SPECIFIC TEST or ANALYTE GROUP**</b>	<b>SPECIFICATION OR STANDARD METHOD (all EPA unless specified)</b>	<b>* KEY EQUIPMENT OR TECHNOLOGY</b>
Water	Mercury, Low-Level	1631E	CVAF
Water	1,2-Dibromo-3- Chloropropane & 1,2-Dibromoethane	8011	GC-ECD
Water / Solid	Carbonyl Compounds	8315A	HPLC-UV
Water / Solid	Nitroaromatics and Nitramines	8330A	HPLC-UV
Water / Solid	Nitroglycerine and PETN	8332	HPLC-UV
Water / Solid	Chlorinated Herbicides	8151A	GC-ECD
Water	Methoxychlor	608.2	GC-ECD
Water	Organochlorine Pesticides	608 / 8081B	GC-ECD
Solid	Organochlorine Pesticides	8081B	GC-ECD
Water	PCBs	608 / 8082A	GC-ECD
Solid	PCBs	8082A	GC-ECD
Water / Solid	Diesel Range Organics (DRO)	Wisconsin DRO / 8015C	GC-FID
Water / Solid	Oil Range Organics	8015C	GC-FID
Water	Dissolved Gas Analysis	RSK-175	GC-FID
Water / Solid	Nonhalogenated Organics	8015C	GC-FID
Water	Semivolatile Organic Compounds	625 / 8270C	GCMS
Solid	Semivolatile Organic Compounds	8270C	GCMS
Water / Solid	Semivolatile Organic Compounds	8270C SIM	GCMS



<b>MATRIX</b>	<b>SPECIFIC TEST or ANALYTE GROUP**</b>	<b>SPECIFICATION OR STANDARD METHOD (all EPA unless specified)</b>	<b>* KEY EQUIPMENT OR TECHNOLOGY</b>
Solid	Semivolatile Extraction	3545A	Pressurized Fluid Ext
Water	Semivolatile Extraction	3510C	Separatory Funnel Ext
Solid	Semivolatile Extraction	3550C	Ultrasonic Extraction
Water / Solid	Chlorinated Hydrocarbons	8121 / 612	GC-ECD
Water / Solid	Gasoline Range Organics (GRO)	Wisconsin GRO / 8015C	GC-FID
Solid	Volatile Organics	8021B	GC-PID; HECD
Water	Volatiles Organics	601 / 602 / 8021B	GC-PID; HECD
Water	Volatile Organics	524.2 / 624 / 8260B	GCMS
Solid	Volatile Organics	8260B	GCMS
Solid	Volatiles Extraction	5035A	Purge & Trap
Water	Volatiles Extraction	5030B	Purge & Trap/Water
Water / Solid	SPLP	1312	Acetic Acid Leaching
Water / Solid	TCLP	1311	Acetic Acid Leaching
Solid	Ignitability	1020A	Closed-Cup
Solid	Acid Volatile Sulfide and Selected Simultaneously Extractable Metals	821-R-91-100	Distillation/ Spectrophotometric
Solid	Paint Filter Test	9095B	Filtration
Water	HEM Oil and Grease / SGT-HEM Non-Polar Material	1664A / 9070A	Gravimetric



<b>MATRIX</b>	<b>SPECIFIC TEST or ANALYTE GROUP**</b>	<b>SPECIFICATION OR STANDARD METHOD (all EPA unless specified)</b>	<b>* KEY EQUIPMENT OR TECHNOLOGY</b>
Solid	HEM Oil and Grease / SGT-HEM Non-Polar Material	9071B	Gravimetric
Water	Filterable Residue (TDS)	SM 2540C	Gravimetric
Water	Non-Filterable Residue (TSS)	SM 2540D	Gravimetric
Water	Total Residue / Solids (TS)	SM 2540B	Gravimetric
Solid	Total Residue / Solids (TS)	SM 3550C	Gravimetric
Water	Volatile Residue (VS)	SM 2540E	Gravimetric
Solid	Volatile Residue (VS)	SM 2540G	Gravimetric
Water	Settleable Residue / Solids	SM 2540 F	Imhoff cone
Water	Anions	300.0/9056A	Ion Chromatographic
Solid	Anions	9056A	Ion Chromatographic
Water	Bromide	ASTM D1246	ISE
Water / Solid	Fluoride	SM 4500-F C	ISE
Water	BOD and CBOD	SM 5210B	Luminescence
Water	Turbidity	SM 2130B	Nephelometric
Water	Color	SM 2120B	Platinum-Cobalt Color
Water	pH and Corrosivity	SM 4500-H <sup>+</sup> B / 9040C	Potentiometric
Solid	pH and Corrosivity	9045D	Potentiometric
Water	Conductivity	SM 2510B / 9050A	Specific Conductance





<b>MATRIX</b>	<b>SPECIFIC TEST or ANALYTE GROUP**</b>	<b>SPECIFICATION OR STANDARD METHOD (all EPA unless specified)</b>	<b>* KEY EQUIPMENT OR TECHNOLOGY</b>
Water / Solid	Ammonia-N	SM 4500-NH <sub>3</sub> B	Distillation
Water / Solid	Ammonia-N	SM 4500-NH <sub>3</sub> G	Spectrophotometric
Water	Chloride	SM 4500-Cl E / 9251	Spectrophotometric
Solid	Chromium (VI) Cr <sup>+6</sup>	3060A	Digestion
Water	Chromium (VI) Cr <sup>+6</sup>	SM 3500-Cr B / 7196A	Spectrophotometric
Solid	Chromium (VI) Cr <sup>+6</sup>	7196A	Spectrophotometric
Water	COD	SM 5220D	Spectrophotometric
Water / Solid	Cyanide Available	OIA-1677	Amperometry
Solid	Cyanide	9010C	Distillation
Water	Cyanide	SM 4500-CN C / 9010C	Distillation
Solid	Cyanide Extraction	9013A	Extraction
Solid	Cyanide Amenable	9014	Spectrophotometric
Water	Cyanide Amenable	SM 4500-CN G / 9014	Spectrophotometric
Solid	Cyanide, Total	9014	Spectrophotometric
Water	Cyanide, Total	SM 4500-CN E / 9014	Spectrophotometric
Water	Ferrous Iron	SM 3500-Fe B	Spectrophotometric
Water / Solid	Nitrate-N	SM 4500-NO <sub>3</sub> F	Spectrophotometric
Water	Nitrate+Nitrite-N	SM 4500-NO <sub>3</sub> F	Spectrophotometric



<b>MATRIX</b>	<b>SPECIFIC TEST or ANALYTE GROUP**</b>	<b>SPECIFICATION OR STANDARD METHOD (all EPA unless specified)</b>	<b>* KEY EQUIPMENT OR TECHNOLOGY</b>
Water	Nitrite-N	SM 4500-NO <sub>2</sub> B / NO <sub>3</sub> F	Spectrophotometric
Water	o-Phosphate	SM 4500-P E	Spectrophotometric
Water / Solid	Phosphorus Total	SM 4500-P E	Spectrophotometric
Water	Silica as SiO <sub>2</sub>	SM 4500-SiO <sub>2</sub> D	Spectrophotometric
Water	Surfactants (MBAS)	SM 5540C	Spectrophotometric
Water / Solid	TKN	SM 4500-N <sub>org</sub> D	Spectrophotometric
Solid	Total Phenolics	9065	Spectrophotometric
Water	Total Phenolics	420.4 / 9065	Spectrophotometric
Water	Acidity	SM 2310B	Titrimetric
Water	Calcium Hardness (as CaCO <sub>3</sub> )	SM 2340 C	Titrimetric
Water / Solid	Sulfide	9030B	Distillation
Water	Sulfide	SM 4500-S <sub>2</sub> D	Spectrophotometric
Water	Sulfide	SM 4500-S <sub>2</sub> F	Titrimetric
Water / Solid	Sulfide	9034	Titrimetric
Water / Solid	Reactive Sulfide	7.3.4.2	Titrimetric
Water	Sulfite	SM 4500-SO <sub>3</sub> <sup>2-</sup> B	Titrimetric
Water	Total Alkalinity (as CaCO <sub>3</sub> )	SM 2320B	Titrimetric
Water	Total Hardness (as CaCO <sub>3</sub> )	SM 2340C	Titrimetric



<b>MATRIX</b>	<b>SPECIFIC TEST or ANALYTE GROUP**</b>	<b>SPECIFICATION OR STANDARD METHOD (all EPA unless specified)</b>	<b>* KEY EQUIPMENT OR TECHNOLOGY</b>
Water	Sulfate	ASTM D516 / 9038	Turbidimetric
Solid	Total Organic Carbon (TOC)	Lloyd Kahn	Infrared
Water	Total Organic Carbon (TOC)	SM 5310C / 9060A	Oxidation/CO <sub>2</sub> Det
Solid	Total Organic Carbon (TOC)	WALKLEY BLACK	Titrimetric
Solid	Extractable Organic Halides	9023	Coulometric Titration
Water	Dissolved Organic Carbon	SM 5310C	Titrimetric
Solid	Fractional Organic Carbon	ASTM D2974	Gravimetric
Solid	Grain Size	ASTM D422	Size Exclusion
Water	Total Organic Halides (TOX)	9020B	Coulometric Titration
Solid	% Moisture in Soil and Rock	ASTM D2216	Gravimetric
Solid	Shake Extraction	ASTM D3987	Water Leaching

## II. Microbiological

<b>MATRIX</b>	<b>SPECIFIC TEST or ANALYTE GROUP**</b>	<b>SPECIFICATION OR STANDARD METHOD (all EPA unless specified)</b>	<b>* KEY EQUIPMENT OR TECHNOLOGY</b>
Water	Fecal Coliform	SM 9222D	Microbiological
Water	Heterotrophic Bacteria (Std Plate)	SM 9215B	Microbiological
Water	Total Coliform / <i>E. coli</i>	SM 9223B	Microbiological



**Notes:**

1. \* = As Applicable
2. \*\* = Refer to Accredited Analyte Listing for specific analytes in which the laboratory is accredited.
3. This scope is part of and must be included with the Certificate of Accreditation No. ADE-1542



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Vice President



**Accredited Analytes/Methods (by matrix)**

**TriMatrix Laboratoires, Inc.**

**Grand Rapids, MI**

Analyte	Matrix								
	Aqueous						Solid		
<b>Trace Metals</b>									
Aluminum	200.7	200.8	6010C	6020A			6010C		
Antimony	200.7	200.8	6010C	6020A			6010C	6020A	
Arsenic	200.7	200.8	6010C	6020A			6010C	6020A	
Barium	200.7	200.8	6010C	6020A			6010C	6020A	
Beryllium	200.7	200.8	6010C	6020A			6010C	6020A	
Boron	200.7	200.8	6010C	6020A			6010C	6020A	
Cadmium	200.7	200.8	6010C	6020A			6010C	6020A	
Calcium	200.7		6010C				6010C		
Chromium, total	200.7	200.8	6010C	6020A			6010C	6020A	
Chromium VI	SM3500Cr B				7196A				7196A
Cobalt	200.7	200.8	6010C	6020A			6010C	6020A	
Copper	200.7	200.8	6010C	6020A			6010C	6020A	
Iron	200.7		6010C				6010C		
Lead	200.7	200.8	6010C	6020A			6010C	6020A	
Lithium	200.7		6010C				6010C		
Magnesium	200.7		6010C				6010C		
Manganese	200.7	200.8	6010C	6020A			6010C	6020A	
Mercury	245.1				7470A				7471B
Mercury (Low Level)					1631E				
Molybdenum	200.7	200.8	6010C	6020A			6010C	6020A	
Nickel	200.7	200.8	6010C	6020A			6010C	6020A	
Potassium	200.7		6010C				6010C		
Selenium	200.7	200.8	6010C	6020A			6010C	6020A	
Silver	200.7	200.8	6010C	6020A			6010C	6020A	
Sodium	200.7		6010C				6010C		
Strontium	200.7	200.8	6010C	6020A			6010C		
Thallium	200.7	200.8	6010C	6020A			6010C	6020A	
Tin	200.7	200.8	6010C	6020A			6010C	6020A	
Titanium	200.7		6010C				6010C		
Vanadium	200.7	200.8	6010C	6020A			6010C	6020A	
Zinc	200.7	200.8	6010C	6020A			6010C	6020A	
<b>Demands</b>									
TOC	SM5310C	9060A					Walkley Black	Lloyd Kahn	
COD			SM5220D						
DOC-Dissolved Organic Carbon							SM5310C		

**Accredited Analytes/Methods (by matrix)**

**TriMatrix Laboratoires, Inc.**

**Grand Rapids, MI**

Analyte	Matrix								
	Aqueous						Solid		
BOD and CBOD	SM5210B								
<b>Misc Analytes</b>									
Total Alkalinity (as CaCO <sub>3</sub> )	SM2320B								
Calcium Hardness as CaCO <sub>3</sub>	SM2340B								
Total Hardness as CaCO <sub>3</sub>	SM2340B	SM2340C							
% Moisture in Soil and Rock							ASTM D2216		
Total Residue/Solids (TS)	SM2540B						3550C		
Filterable Residue (TDS)		SM2540C							
Ignitability							1020A		
Non-Filterable Residue (TSS)	SM2540D								
Volatile Residue (VS)		SM2540E					SM2540G		
Settleable Residue	SM2540F								
pH			9040C	SM4500H <sup>+</sup> B			9045D		
Sulfide	SM4500S <sup>2-</sup> D	SM4500S <sup>2-</sup> F	9034				9034		
Total Cyanide	SM4500CN E	9014					9014		
Cyanide, Amenable	SM4500CN G	9014					9014		
Ammonia	SM4500NH <sub>3</sub> G						SM4500NH <sub>3</sub> G		
Conductivity	SM2510B	9050A							
Nitrogen, Total Kjeldahl (TKN)	SM4500N <sub>org</sub> D						SM4500N <sub>org</sub> D		
Total Phenolics	420.4	9065					9065		
Total Organic Halides (TOX)	9020B								
Bromide	ASTM D1246		300.0	9056A					
Chloride	SM4500Cl E	9251	300.0	9056A			9056A		
Fluoride	SM4500F C		300.0	9056A			9056A		
Nitrate as N	SM4500NO <sub>3</sub> F		300.0	9056A			9056A	SM4500NO <sub>3</sub> F	
Nitrite as N	SM4500NO <sub>2</sub> B	SM4500NO <sub>3</sub> F	300.0	9056A			9056A		
Nitrate + Nitrite as N	SM4500NO <sub>3</sub> F		300.0	9056A			9056A		
ortho-phosphate	SM4500P E								
Total Phosphorus	SM4500P E						SM4500P E		
Silica as SiO <sub>2</sub>	SM4500SiO <sub>2</sub> D								
Sulfate	ASTM D516	9038	300.0	9056A			9056A		
Surfactants - MBAS	SM5540C								
Fecal Coliform	SM9222D								
Heterotrophic Bacteria (Std Plate)	SM9215B								
Total Coliform, E. Coli	SM9223B								

**Accredited Analytes/Methods (by matrix)**

**TriMatrix Laboratoires, Inc.**

**Grand Rapids, MI**

Analyte	Matrix								
	Aqueous						Solid		
Turbidity		SM2130B							
EOX-Extractable Organic Halides							9023		
FOC-Fractional Organic Carbon							ASTM D2974		
<b>Petroleum Hydrocarbons</b>									
SGT-HEM; Non-Polar Material	1664A	9070A					9071B		
HEM; Oil and Grease	1664A	9070A					9071B		
Gasoline Range Organics (GRO)	8015C	Wisconsin GRO					8015C	Wisconsin GRO	
Diesel Range Organics (DRO)	8015C	Wisconsin DRO					8015C	Wisconsin DRO	
Oil Range Organics (ORO)	8015C						8015C		
<b>VOCs</b>									
Acetone		624	8260B					8260B	
Acetonitrile		624	8260B					8260B	
Acrolein		624	8260B					8260B	
Acrylonitrile		624	8260B					8260B	
Benzene	524.2	624	8260B		602	8021B	8021B	8260B	
Bromobenzene	524.2		8260B					8260B	
Bromochloromethane	524.2		8260B					8260B	
Bromodichloromethane	524.2	624	8260B	601		8021B	8021B	8260B	
Bromoform	524.2	624	8260B	601		8021B	8021B	8260B	
Bromomethane	524.2	624	8260B	601		8021B	8021B	8260B	
2-Butanone (MEK)		624	8260B					8260B	
n-Butylbenzene	524.2		8260B					8260B	
sec-Butylbenzene	524.2		8260B					8260B	
tert-Butylbenzene	524.2		8260B					8260B	
Carbon disulfide		624	8260B					8260B	
Carbon Tetrachloride	524.2	624	8260B	601		8021B	8021B	8260B	
Chlorobenzene	524.2	624	8260B	601	602	8021B	8021B	8260B	
Chlorodibromomethane	524.2	624	8260B	601		8021B	8021B	8260B	
Chloroethane	524.2	624	8260B	601		8021B	8021B	8260B	
2-Chloroethylvinylether		624	8260B	601		8021B	8021B	8260B	
Chloroform	524.2	624	8260B	601		8021B	8021B	8260B	
Chloromethane	524.2	624	8260B	601		8021B	8021B	8260B	
2-Chlorotoluene	524.2		8260B					8260B	
4-Chlorotoluene	524.2		8260B					8260B	
1,2-Dibromo-3-chloropropane (DBCP)		624	8260B					8260B	

**Accredited Analytes/Methods (by matrix)**

**TriMatrix Laboratoires, Inc.**

**Grand Rapids, MI**

Analyte	Matrix								
	Aqueous						Solid		
1,2-Dibromoethane (EDB)		624	8260B					8260B	
Dibromomethane	524.2	624	8260B					8260B	
1,2-Dichlorobenzene	524.2	624	8260B	601	602	8021B	8021B	8260B	
1,3-Dichlorobenzene	524.2	624	8260B	601	602	8021B	8021B	8260B	
1,4-Dichlorobenzene	524.2	624	8260B	601	602	8021B	8021B	8260B	
Dichlorodifluoromethane	524.2	624	8260B	601		8021B	8021B	8260B	
1,1-Dichloroethane	524.2	624	8260B	601		8021B	8021B	8260B	
1,2-Dichloroethane	524.2	624	8260B	601		8021B	8021B	8260B	
1,1-Dichloroethene	524.2	624	8260B	601		8021B	8021B	8260B	
<i>cis</i> -1,2-Dichloroethene	524.2	624	8260B	601		8021B	8021B	8260B	
<i>trans</i> -1,2-Dichloroethene	524.2	624	8260B	601		8021B	8021B	8260B	
Dichloromethane (Methylene Chloride)	524.2	624	8260B	601		8021B	8021B	8260B	
1,2-Dichloropropane	524.2	624	8260B	601		8021B	8021B	8260B	
1,3-Dichloropropane	524.2		8260B					8260B	
2,2-Dichloropropane	524.2		8260B					8260B	
1,1-Dichloropropene	524.2		8260B					8260B	
<i>cis</i> -1,3-Dichloropropene	524.2	624	8260B	601		8021B	8021B	8260B	
<i>trans</i> -1,3-Dichloropropene	524.2	624	8260B	601		8021B	8021B	8260B	
Di-isopropylether (DIPE)			8260B					8260B	
Ethylbenzene	524.2	624	8260B		602	8021B	8021B	8260B	
Ethanol			8260B			8015C	8015C	8260B	
1,1,2-trichloro-1,2,2-trifluoroethane (Freon 113)			8260B					8260B	
Hexachlorobutadiene	524.2	624	8260B					8260B	
2-Hexanone		624	8260B					8260B	
Isopropylbenzene	524.2	624	8260B					8260B	
4-Isopropyltoluene	524.2		8260B					8260B	
4-Methyl-2-pentanone (MIBK)		624	8260B					8260B	
Methyl-tert-butylether (MTBE)	524.2	624	8260B					8260B	
Naphthalene	524.2	624	8260B					8260B	
n-Propylbenzene	524.2		8260B					8260B	
Styrene	524.2	624	8260B					8260B	
tert-amylmethylether (TAME)			8260B					8260B	
1,1,1,2-Tetrachloroethane	524.2	624	8260B					8260B	
1,1,2,2-Tetrachloroethane	524.2	624	8260B	601		8021B	8021B	8260B	
Tetrachloroethene	524.2	624	8260B	601		8021B	8021B	8260B	
Toluene	524.2	624	8260B		602	8021B	8021B	8260B	
1,2,3-Trichlorobenzene	524.2		8260B					8260B	



**Accredited Analytes/Methods (by matrix)**

**TriMatrix Laboratoires, Inc.**

**Grand Rapids, MI**

Analyte	Matrix								
	Aqueous						Solid		
1,2,4-Trichlorobenzene	524.2	624	8260B					8260B	
1,1,1-Trichloroethane	524.2	624	8260B	601		8021B	8021B	8260B	
1,1,2-Trichloroethane	524.2	624	8260B	601		8021B	8021B	8260B	
Trichloroethene	524.2	624	8260B	601		8021B	8021B	8260B	
Trichlorofluoromethane (Freon 11)	524.2	624	8260B	601		8021B	8021B	8260B	
1,2,3-Trichloropropane	524.2	624	8260B					8260B	
1,2,4-Trimethylbenzene	524.2		8260B					8260B	
1,3,5-Trimethylbenzene	524.2		8260B					8260B	
Vinyl acetate		624	8260B					8260B	
Vinyl chloride	524.2	624	8260B	601		8021B	8021B	8260B	
o-Xylene		624	8260B		602			8260B	
m+p-Xylene		624	8260B		602			8260B	
Xylenes, total	524.2	624	8260B		602	8021B	8021B	8260B	
<b>SVOCs - Base/Neutrals/Acids</b>									
Acenaphthene	8270C SIM	625	8270C				8270C	8270C SIM	
Acenaphthylene	8270C SIM	625	8270C				8270C	8270C SIM	
Aniline		625	8270C				8270C		
Anthracene	8270C SIM	625	8270C				8270C	8270C SIM	
Benzo(a)anthracene	8270C SIM	625	8270C				8270C	8270C SIM	
Benzo(b)fluoranthene	8270C SIM	625	8270C				8270C	8270C SIM	
Benzo(k)fluoranthene	8270C SIM	625	8270C				8270C	8270C SIM	
Benzo(g,h,i)perylene	8270C SIM	625	8270C				8270C	8270C SIM	
Benzo(a)pyrene	8270C SIM	625	8270C				8270C	8270C SIM	
Benzidine		625	8270C				8270C		
Benzoic acid		625	8270C				8270C		
Benzyl alcohol		625	8270C				8270C		
4-Bromophenyl-phenylether		625	8270C				8270C		
Butyl benzyl phthalate		625	8270C				8270C		
Carbazole			8270C				8270C		
4-Chloroaniline		625	8270C				8270C		
bis(2-Chloroethoxy)methane		625	8270C				8270C		
bis(2-Chloroethyl)ether		625	8270C				8270C		
bis(2-Chloroisopropyl) ether		625	8270C				8270C		
4-Chloro-3-methylphenol		625	8270C				8270C		
2-Chloronaphthalene		625	8270C	612		8121	8270C	8121	
4-Chlorophenyl-phenylether		625	8270C				8270C		

**Accredited Analytes/Methods (by matrix)**

**TriMatrix Laboratoires, Inc.**

**Grand Rapids, MI**

Analyte	Matrix								
	Aqueous						Solid		
2-Chlorophenol		625	8270C				8270C		
Chrysene	8270C SIM	625	8270C				8270C	8270C SIM	
Dibenzo(a,h)anthracene	8270C SIM	625	8270C				8270C	8270C SIM	
Dibenzofuran		625	8270C				8270C		
Di-n-butylphthalate		625	8270C				8270C		
1,2-Dichlorobenzene		625	8270C	612		8121	8270C	8121	
1,3-Dichlorobenzene		625	8270C	612		8121	8270C	8121	
1,4-Dichlorobenzene		625	8270C	612		8121	8270C	8121	
3,3'-Dichlorobenzidine		625	8270C				8270C		
2,4-Dichlorophenol		625	8270C				8270C		
2,6-Dichlorophenol		625	8270C				8270C		
Diethyl phthalate		625	8270C				8270C		
2,4-Dimethylphenol		625	8270C				8270C		
Dimethylphthalate		625	8270C				8270C		
Diphenylamine			8270C				8270C		
2,4-Dinitrophenol		625	8270C				8270C		
2,4-Dinitrotoluene		625	8270C				8270C		
2,6-Dinitrotoluene		625	8270C				8270C		
Di-n-octylphthalate		625	8270C				8270C		
Dinoseb			8270C				8270C		
1,4-Dioxane			8270C						
bis(2-ethylhexyl) phthalate		625	8270C				8270C		
Fluoranthene	8270C SIM	625	8270C				8270C	8270C SIM	
Fluorene	8270C SIM	625	8270C				8270C	8270C SIM	
Hexachlorobenzene		625	8270C	612		8121	8270C	8121	
Hexachlorobutadiene		625	8270C	612		8121	8270C	8121	
Hexachlorocyclopentadiene		625	8270C	612		8121	8270C	8121	
Hexachloroethane		625	8270C	612		8121	8270C	8121	
Indeno(1,2,3, cd)pyrene	8270C SIM	625	8270C				8270C	8270C SIM	
Isophorone		625	8270C				8270C		
2-Methyl-4,6-Dinitrophenol		625	8270C				8270C		
2-Methylphenol		625	8270C				8270C		
4-Methylphenol (and/or 3-Methylphenol)		625	8270C				8270C		
2-Methylnaphthalene	8270C SIM	625	8270C				8270C	8270C SIM	
Naphthalene	8270C SIM	625	8270C				8270C	8270C SIM	
2-Nitroaniline		625	8270C				8270C		
3-Nitroaniline		625	8270C				8270C		

Accredited Analytes/Methods (by matrix)

TriMatrix Laboratoires, Inc.

Grand Rapids, MI

Analyte	Matrix								
	Aqueous						Solid		
4-Nitroaniline		625	8270C				8270C		
Nitrobenzene		625	8270C				8270C		
2-Nitrophenol		625	8270C				8270C		
4-Nitrophenol		625	8270C				8270C		
4-nitroquinoline-1-oxide			8270C				8270C		
N-Nitrosodiethylamine		625	8270C				8270C		
N-Nitrosodimethylamine		625	8270C				8270C		
N-Nitrosodiphenylamine		625	8270C				8270C		
N-Nitroso-di-n-propylamine		625	8270C				8270C		
Pentachlorobenzene		625	8270C				8270C		
Pentachlorophenol		625	8270C				8270C		
Phenanthrene	8270C SIM	625	8270C				8270C	8270C SIM	
Phenol		625	8270C				8270C		
Pyrene	8270C SIM	625	8270C				8270C	8270C SIM	
Pyridine		625	8270C				8270C		
1,2,4,5-Tetrachlorobenzene		625	8270C				8270C		
2,3,4,6-Tetrachlorophenol		625	8270C				8270C		
o-Toluidine		625	8270C				8270C		
1,2,4-Trichlorobenzene		625	8270C	612		8121	8270C	8121	
2,4,5-Trichlorophenol		625	8270C				8270C		
2,4,6-Trichlorophenol		625	8270C				8270C		
<b>Nitroaromatic and Nitramines</b>									
4-Amino-2,6-dinitrotoluene	8330A						8330A		
2-Amino-4,6-dinitrotoluene	8330A						8330A		
1,3-Dinitrobenzene	8330A						8330A		
2,4-Dinitrotoluene	8330A						8330A		
2,6-Dinitrotoluene	8330A						8330A		
HMX (Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine)	8330A						8330A		
Nitrobenzene	8330A						8330A		
Nitroglycerin	8330A	8332					8330A	8332	
2-Nitrotoluene	8330A						8330A		
3-Nitrotoluene	8330A						8330A		
4-Nitrotoluene	8330A						8330A		
Pentaerythritoltetranitrate	8330A	8332					8330A	8332	
RDX (hexahydro-1,3,5-trinitro-1,3,5-triazine)	8330A						8330A		
Tetryl (methyl-2,4,6-trinitrophenylnitramine)	8330A						8330A		

Accredited Analytes/Methods (by matrix)

TriMatrix Laboratoires, Inc.

Grand Rapids, MI

Analyte	Matrix								
	Aqueous						Solid		
1,3,5-Trinitrobenzene	8330A						8330A		
2,4,6-Trinitrotoluene	8330A						8330A		
<b>Pesticides</b>									
Aldrin	608	8081B					8081B		
alpha-BHC	608	8081B					8081B		
beta-BHC	608	8081B					8081B		
delta-BHC	608	8081B					8081B		
gamma-BHC (Lindane)	608	8081B					8081B		
alpha-Chlordane	608	8081B					8081B		
gamma-Chlordane	608	8081B					8081B		
Chlordane (technical)	608	8081B					8081B		
DDD (4,4)	608	8081B					8081B		
DDE (4,4)	608	8081B					8081B		
DDT (4,4)	608	8081B					8081B		
Dieldrin	608	8081B					8081B		
Endosulfan I	608	8081B					8081B		
Endosulfan II	608	8081B					8081B		
Endosulfan sulfate	608	8081B					8081B		
Endrin	608	8081B					8081B		
Endrin aldehyde	608	8081B					8081B		
Endrin ketone	608	8081B					8081B		
Heptachlor	608	8081B					8081B		
Heptachlor Epoxide (beta)	608	8081B					8081B		
Methoxychlor	608.2	8081B					8081B		
Toxaphene (total)	608	8081B					8081B		
<b>Organophosphorus Pesticides</b>									
Dimethoate		8270C					8270C		
Dichlorvos		8270C					8270C		
Disulfoton		8270C					8270C		
Parathion, ethyl		8270C					8270C		
Parathion, methyl		8270C					8270C		
Phorate		8270C					8270C		
Sulfotepp		8270C					8270C		
<b>Herbicides</b>									

**Accredited Analytes/Methods (by matrix)**

**TriMatrix Laboratoires, Inc.**

**Grand Rapids, MI**

Analyte	Matrix								
	Aqueous						Solid		
2,4,5-T	8151A						8151A		
2,4,5-TP (Silvex)	8151A						8151A		
2,4-D	8151A						8151A		
2,4-DB	8151A						8151A		
Dalapon	8151A						8151A		
Dicamba	8151A						8151A		
Dichloroprop	8151A						8151A		
Dinoseb	8151A						8151A		
MCPA	8151A						8151A		
MCPP	8151A						8151A		
Pentachlorophenol	8151A						8151A		
Picloram	8151A						8151A		
<b>PCBs</b>									
Aroclor 1016	608	8082A					8082A		
Aroclor 1221	608	8082A					8082A		
Aroclor 1232	608	8082A					8082A		
Aroclor 1242	608	8082A					8082A		
Aroclor 1248	608	8082A					8082A		
Aroclor 1254	608	8082A					8082A		
Aroclor 1260	608	8082A					8082A		
<b>Misc. Analytes -Additional</b>									
Iron, Ferrous	SM 3500Fe B								
Cyanide, Available	OIA-1677						OIA-1677		
Acidity	SM 2310 B								
Sulfite	SM 4500SO <sub>3</sub> <sup>2-</sup> B								
Paint Filter Liquids Test							9095B		
Color	SM 2120 B								
Acid Volatile Sulfides (AVS/SEM)							EPA-821-R-91-100		
Grain Size							ASTM D422-63		
Reactive Sulfide	7.3.4.2						7.4.3.2		
<b>PCBs - Additional Aroclors</b>									
Aroclor 1262	608	8082A					8082A		
Aroclor 1268	608	8082A					8082A		

Accredited Analytes/Methods (by matrix)

TriMatrix Laboratoires, Inc.

Grand Rapids, MI

Analyte	Matrix								
	Aqueous						Solid		
<b>Misc. Organics</b>									
Ethane	RSK-175								
Ethylene	RSK-175								
Methane	RSK-175								
<b>Additional Compounds</b>									
<b>Volatiles</b>									
1,2-dibromo-3-chloropropane	8011								
1,2-dibromoethane	8011								
1,2,3-Trimethylbenzene			8260B				8260B		
1,4-dioxane			8260B				8260B		
1-chlorohexane			8260B				8260B		
sec-butanol		8015C	8260B				8015C	8260B	
2-chloro-1,3-butadiene (Chloroprene)			8260B				8260B		
2-methylnaphthalene			8260B				8260B		
2-nitropropane			8260B				8260B		
allyl chloride			8260B				8260B		
cyclohexane			8260B				8260B		
ETBE			8260B				8260B		
ethanol		8015C					8015C		
ethyl acetate			8260B				8260B		
ethyl ether			8260B				8260B		
ethyl methacrylate			8260B				8260B		
hexachloroethane			8260B				8260B		
hexane			8260B				8260B		
iodomethane			8260B				8260B		
isobutanol		8015C	8260B				8015C	8260B	
isopropanol		8015C	8260B				8015C	8260B	
methacrylonitrile			8260B				8260B		
methanol		8015C					8015C		
methyl acetate			8260B				8260B		
methyl methacrylate			8260B				8260B		
methylcyclohexane			8260B				8260B		
n-butanol		8015C	8260B				8015C	8260B	
n-butyl acetate			8260B				8260B		
n-propanol		8015C	8260B				8015C	8260B	

Accredited Analytes/Methods (by matrix)

TriMatrix Laboratoires, Inc.

Grand Rapids, MI

Analyte	Matrix								
	Aqueous						Solid		
propionitrile			8260B					8260B	
t-butanol		8015C	8260B				8015C	8260B	
tetrahydrofuran			8260B					8260B	
<i>trans</i> -1,4,dichloro-2-butene			8260B					8260B	
trichlorotrifluoromethane			8260B					8260B	
<b>SVOCs - Base/Neutrals/Acids</b>									
1,1'-Biphenyl			8270C				8270C		
1,2-Bis(2-chloroethoxy)ethane			8270C				8270C		
1,2-Diphenylhydrazine			8270C				8270C		
1,3 Dinitrobenzene			8270C				8270C		
1,4-Naphthoquinone			8270C				8270C		
1,4-Phenylenediamine			8270C				8270C		
1-Methylnaphthalene			8270C				8270C		
1-Naphthylamine			8270C				8270C		
1-Nitrosopyrrolidine			8270C				8270C		
2-Acetylaminofluorene			8270C				8270C		
2-Chloroaniline			8270C				8270C		
2-Naphthylamine			8270C				8270C		
2-Picoline			8270C				8270C		
3,3'-Dimethylbenzidine			8270C				8270C		
3-Methylchloanthrene			8270C				8270C		
4-Aminobiphenyl			8270C				8270C		
5-Nitro-o-toluidine			8270C				8270C		
7,12-Dimethylbenz(a)anthracene			8270C				8270C		
a,a-Dimethylphenethylamine			8270C				8270C		
Acetophenone			8270C				8270C		
Aramite			8270C				8270C		
Atrazine			8270C				8270C		
Benzaldehyde			8270C				8270C		
Bis(2-ethylhexyl) adipate			8270C				8270C		
Caprolactam			8270C				8270C		
Chlorobenzilate			8270C				8270C		
Diallate			8270C				8270C		
Dicyclohexyl Phthalate			8270C				8270C		
Ethyl Methacrylate			8270C				8270C		
Ethyl Methansulfonate			8270C				8270C		

Accredited Analytes/Methods (by matrix)

TriMatrix Laboratoires, Inc.

Grand Rapids, MI

Analyte	Matrix								
	Aqueous						Solid		
Famphur			8270C				8270C		
Hexachlorophene			8270C				8270C		
Hexachloropropene			8270C				8270C		
Isodrin			8270C				8270C		
Isosafrole			8270C				8270C		
Kepone			8270C				8270C		
Methapyrilene			8270C				8270C		
Methyl Methacrylate			8270C				8270C		
Methyl Methanesulfonate			8270C				8270C		
N-Nitroso-di-n-butylamine			8270C				8270C		
N-Nitrosomethylethylamine			8270C				8270C		
N-Nitrosomorpholine			8270C				8270C		
N-Nitrosopiperidine			8270C				8270C		
o,o,o-Triethylphosphorothioate			8270C				8270C		
p-Dimethylaminoazobenzene			8270C				8270C		
Phenacetin			8270C				8270C		
Pentachloroethane			8270C				8270C		
Pentachloronitrobenzene			8270C				8270C		
Pronamide			8270C				8270C		
Safrole			8270C				8270C		
Thionazin			8270C				8270C		
1,3,5-Trinitrobenzene			8270C				8270C		
<b>Carbonyls</b>									
Formaldehyde	8315A						8315A		
Acetaldehyde	8315A						8315A		
Propanal	8315A						8315A		
Crotonaldehyde	8315A						8315A		
Butanal	8315A						8315A		
Pentanal	8315A						8315A		
Cyclohexanone	8315A						8315A		
m-Tolualdehyde	8315A						8315A		
Hexanal	8315A						8315A		
Heptanal	8315A						8315A		
Octanal	8315A						8315A		
Nonanal	8315A						8315A		
Decanal	8315A						8315A		



NEW YORK STATE DEPARTMENT OF HEALTH  
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*Issued in accordance with and pursuant to section 502 Public Health Law of New York State*

MR. TOM C. BOOCHER  
TRIMATRIX LABORATORIES, INC  
5560 CORPORATE EXCHANGE CT SE  
GRAND RAPIDS, MI 49512-5503

NY Lab Id No: 11776

*is hereby APPROVED as an Environmental Laboratory in conformance with the  
National Environmental Laboratory Accreditation Conference Standards (2003) for the category*

**ENVIRONMENTAL ANALYSES NON POTABLE WATER**  
*All approved analytes are listed below:*

**Acrylates**

Acrolein (Propenal)	EPA 624
	EPA 8260C
Acrylonitrile	EPA 624
	EPA 8260C
Ethyl methacrylate	EPA 8260C
Methyl acrylonitrile	EPA 8260C
Methyl methacrylate	EPA 8260C

**Amines**

1,4-Phenylenediamine	EPA 8270D
1-Naphthylamine	EPA 8270D
2-Naphthylamine	EPA 8270D
4-Chloroaniline	EPA 8270D
4-Nitroaniline	EPA 8270D
5-Nitro-o-toluidine	EPA 8270D
Aniline	EPA 8270D
Carbazole	EPA 8270D
Methapyrilene	EPA 8270D
Pronamide	EPA 8270D
Propionitrile	EPA 8260C
Pyridine	EPA 8270D

**Benzidines**

3,3'-Dichlorobenzidine	EPA 625
	EPA 8270D
3,3'-Dimethylbenzidine	EPA 8270D
Benzidine	EPA 625

**Benzidines**

Benzidine	EPA 8270D
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**Chlorinated Hydrocarbon Pesticides**

4,4'-DDD	EPA 608
	EPA 8081B
4,4'-DDE	EPA 608
	EPA 8081B
4,4'-DDT	EPA 608
	EPA 8081B
Aldrin	EPA 608
	EPA 8081B
alpha-BHC	EPA 608
	EPA 8081B
alpha-Chlordane	EPA 8081B
beta-BHC	EPA 608
	EPA 8081B
Chlordane Total	EPA 608
	EPA 8081B
Chlorobenzilate	EPA 8270D
delta-BHC	EPA 608
	EPA 8081B
Diallate	EPA 8270D
Dieldrin	EPA 608
	EPA 8081B
Endosulfan I	EPA 608
	EPA 8081B

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**Chlorinated Hydrocarbon Pesticides**

Endosulfan II	EPA 608
	EPA 8081B
Endosulfan sulfate	EPA 608
	EPA 8081B
Endrin	EPA 608
	EPA 8081B
Endrin aldehyde	EPA 608
	EPA 8081B
Endrin Ketone	EPA 8081B
gamma-Chlordane	EPA 8081B
Heptachlor	EPA 608
	EPA 8081B
Heptachlor epoxide	EPA 608
	EPA 8081B
Lindane	EPA 608
	EPA 8081B
Methoxychlor	EPA 8081B
Toxaphene	EPA 608
	EPA 8081B

**Chlorinated Hydrocarbons**

1,2,3-Trichlorobenzene	EPA 8260C
1,2,4,5-Tetrachlorobenzene	EPA 8270D
1,2,4-Trichlorobenzene	EPA 625
	EPA 8270D
2-Chloronaphthalene	EPA 625

**Chlorinated Hydrocarbons**

2-Chloronaphthalene	EPA 8270D
Hexachlorobenzene	EPA 625
	EPA 8270D
Hexachlorobutadiene	EPA 625
	EPA 8270D
Hexachlorocyclopentadiene	EPA 625
	EPA 8270D
Hexachloroethane	EPA 625
	EPA 8260C
	EPA 8270D
Hexachloropropene	EPA 8270D
Pentachlorobenzene	EPA 8270D

**Chlorophenoxy Acid Pesticides**

2,4,5-T	EPA 8151A
2,4,5-TP (Silvex)	EPA 8151A
2,4-D	EPA 8151A
2,4-DB	EPA 8151A
Dalapon	EPA 8151A
Dicamba	EPA 8151A
Dichloroprop	EPA 8151A
Dinoseb	EPA 8151A

**Demand**

Biochemical Oxygen Demand	SM 18-21 5210B (01)
Carbonaceous BOD	SM 18-21 5210B (01)
Chemical Oxygen Demand	SM 18-21 5220D (97)

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**Dissolved Gases**

Ethane	RSK-175
Ethene (Ethylene)	RSK-175
Methane	RSK-175

**Fuel Oxygenates**

Di-isopropyl ether	EPA 8260C
Ethanol	EPA 8260C
Methyl tert-butyl ether	EPA 8260C
tert-butyl alcohol	EPA 8260C

**Haloethers**

4-Bromophenylphenyl ether	EPA 625
	EPA 8270D
4-Chlorophenylphenyl ether	EPA 625
	EPA 8270D
Bis(2-chloroethoxy)methane	EPA 625
	EPA 8270D
Bis(2-chloroethyl)ether	EPA 625
	EPA 8270D
Bis(2-chloroisopropyl) ether	EPA 625
	EPA 8270D

**Mineral**

Acidity	SM 18-21 2310B.4a (97)
Alkalinity	SM 18-21 2320B (97)
Chloride	EPA 300.0 Rev. 2.1
	EPA 9056A

**Mineral**

Chloride	SM 18-21 4500-Cl- E (97)
Fluoride, Total	EPA 300.0 Rev. 2.1
	EPA 9056A
	SM 18-21 4500-F C (97)
Hardness, Total	SM 18-21 2340B (97)
	SM 18-21 2340C (97)
Sulfate (as SO <sub>4</sub> )	ASTM D516-90 02 & 07
	EPA 300.0 Rev. 2.1
	EPA 9056A

**Nitroaromatics and Isophorone**

1,3,5-Trinitrobenzene	EPA 8330A
1,3-Dinitrobenzene	EPA 8330A
2,4,6-Trinitrotoluene	EPA 8330A
2,4-Dinitrotoluene	EPA 625
	EPA 8270D
	EPA 8330A
2,6-Dinitrotoluene	EPA 625
	EPA 8270D
	EPA 8330A
2-Amino-4,6-dinitrotoluene	EPA 8330A
2-Nitrotoluene	EPA 8330A
3-Nitrotoluene	EPA 8330A
4-Amino-2,6-dinitrotoluene	EPA 8330A
4-Nitrotoluene	EPA 8330A
Hexahydro-1,3,5-trinitro-1,3,5-triazine	EPA 8330A

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**ENVIRONMENTAL ANALYSES NON POTABLE WATER**  
*All approved analytes are listed below:*

**Nitroaromatics and Isophorone**

Isophorone	EPA 625
	EPA 8270D
Methyl-2,4,6-trinitrophenylnitramine	EPA 8330A
Nitrobenzene	EPA 625
	EPA 8270D
	EPA 8330A
Octahydro-tetranitro-tetrazocine	EPA 8330A

**Nitrosoamines**

N-Nitrosodiethylamine	EPA 8270D
N-Nitrosodimethylamine	EPA 625
	EPA 8270D
N-Nitrosodi-n-butylamine	EPA 8270D
N-Nitrosodi-n-propylamine	EPA 625
	EPA 8270D
N-Nitrosodiphenylamine	EPA 625
	EPA 8270D
N-nitrosomethylethylamine	EPA 8270D
N-nitrosopiperidine	EPA 8270D
N-Nitrosopyrrolidine	EPA 8270D

**Nutrient**

Ammonia (as N)	SM 18 4500-NH3 F or G
Kjeldahl Nitrogen, Total	EPA 351.2 Rev. 2.0
Nitrate (as N)	EPA 300.0 Rev. 2.1
	EPA 9056A
	SM 18-21 4500-NO3 F (00)

**Nutrient**

Nitrite (as N)	EPA 300.0 Rev. 2.1
	EPA 9056A
	SM 18-21 4500-NO2 B (00)
	SM 18-21 4500-NO3 F (00)
Orthophosphate (as P)	SM 18-21 4500-P E
Phosphorus, Total	SM 18-21 4500-P E

**Petroleum Hydrocarbons**

Diesel Range Organics	EPA 8015C
Gasoline Range Organics	EPA 8015C

**Phthalate Esters**

Benzyl butyl phthalate	EPA 625
	EPA 8270D
Bis(2-ethylhexyl) phthalate	EPA 625
	EPA 8270D
Diethyl phthalate	EPA 625
	EPA 8270D
Dimethyl phthalate	EPA 625
	EPA 8270D
Di-n-butyl phthalate	EPA 625
	EPA 8270D
Di-n-octyl phthalate	EPA 625
	EPA 8270D

**Polychlorinated Biphenyls**

PCB-1016	EPA 608
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**ENVIRONMENTAL ANALYSES NON POTABLE WATER**  
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**Polychlorinated Biphenyls**

PCB-1016

EPA 8082A

PCB-1221

EPA 608

EPA 8082A

PCB-1232

EPA 608

EPA 8082A

PCB-1242

EPA 608

EPA 8082A

PCB-1248

EPA 608

EPA 8082A

EPA 8270D

PCB-1254

EPA 608

EPA 8082A

PCB-1260

EPA 608

EPA 8082A

**Polynuclear Aromatics**

Acenaphthene

EPA 625

EPA 8270D

Acenaphthylene

EPA 625

EPA 8270D

Anthracene

EPA 625

EPA 8270D

Benzo(a)anthracene

EPA 625

EPA 8270D

Benzo(a)pyrene

EPA 625

EPA 8270D

**Polynuclear Aromatics**

Benzo(b)fluoranthene

EPA 625

EPA 8270D

Benzo(ghi)perylene

EPA 625

EPA 8270D

Benzo(k)fluoranthene

EPA 625

EPA 8270D

Chrysene

EPA 625

EPA 8270D

Dibenzo(a,h)anthracene

EPA 625

EPA 8270D

Fluoranthene

EPA 625

EPA 8270D

Fluorene

EPA 625

EPA 8270D

Indeno(1,2,3-cd)pyrene

EPA 625

EPA 8270D

Naphthalene

EPA 625

EPA 8270D

Phenanthrene

EPA 625

EPA 8270D

Pyrene

EPA 625

EPA 8270D

**Priority Pollutant Phenols**

2,3,4,6-Tetrachlorophenol

EPA 8270D

2,4,5-Trichlorophenol

EPA 8270D

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**ENVIRONMENTAL ANALYSES NON POTABLE WATER**  
*All approved analytes are listed below:*

**Priority Pollutant Phenols**

2,4,6-Trichlorophenol	EPA 625 EPA 8270D
2,4-Dichlorophenol	EPA 625 EPA 8270D
2,4-Dimethylphenol	EPA 625 EPA 8270D
2,4-Dinitrophenol	EPA 625 EPA 8270D
2,6-Dichlorophenol	EPA 8270D
2-Chlorophenol	EPA 625 EPA 8270D
2-Methyl-4,6-dinitrophenol	EPA 625 EPA 8270D
2-Methylphenol	EPA 8270D
2-Nitrophenol	EPA 625 EPA 8270D
3-Methylphenol	EPA 8270D
4-Chloro-3-methylphenol	EPA 625 EPA 8270D
4-Methylphenol	EPA 8270D
4-Nitrophenol	EPA 625 EPA 8270D
Pentachlorophenol	EPA 625 EPA 8270D
Phenol	EPA 625

**Priority Pollutant Phenols**

Phenol	EPA 8270D
<b>Residue</b>	
Settleable Solids	SM 18-21 2540 F (97)
Solids, Total	SM 18-21 2540B (97)
Solids, Total Dissolved	SM 18-21 2540C (97)
Solids, Total Suspended	SM 18-21 2540D (97)

**Semi-Volatile Organics**

1,2-Dichlorobenzene, Semi-volatile	EPA 8270D
1,3-Dichlorobenzene, Semi-volatile	EPA 8270D
1,4-Dichlorobenzene, Semi-volatile	EPA 8270D
2-Methylnaphthalene	EPA 8270D
Acetophenone	EPA 8270D
Dibenzofuran	EPA 8270D

**Volatile Aromatics**

1,2,4-Trichlorobenzene, Volatile	EPA 8260C
1,2,4-Trimethylbenzene	EPA 8260C
1,2-Dichlorobenzene	EPA 624 EPA 8260C
1,3,5-Trimethylbenzene	EPA 8260C
1,3-Dichlorobenzene	EPA 624 EPA 8260C
1,4-Dichlorobenzene	EPA 624 EPA 8260C
4-Chlorotoluene	EPA 8260C

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**Volatile Aromatics**

Benzene	EPA 624
	EPA 8260C
Bromobenzene	EPA 8260C
Chlorobenzene	EPA 624
	EPA 8260C
Ethyl benzene	EPA 624
	EPA 8260C
Isopropylbenzene	EPA 8260C
Naphthalene, Volatile	EPA 8260C
n-Butylbenzene	EPA 8260C
n-Propylbenzene	EPA 8260C
p-Isopropyltoluene (P-Cymene)	EPA 8260C
sec-Butylbenzene	EPA 8260C
Styrene	EPA 8260C
tert-Butylbenzene	EPA 8260C
Toluene	EPA 624
	EPA 8260C
Total Xylenes	EPA 624
	EPA 8260C

**Volatile Halocarbons**

1,1,1,2-Tetrachloroethane	EPA 8260C
1,1,1-Trichloroethane	EPA 624
	EPA 8260C
1,1,2,2-Tetrachloroethane	EPA 624
	EPA 8260C

**Volatile Halocarbons**

1,1,2-Trichloro-1,2,2-Trifluoroethane	EPA 8260C
1,1,2-Trichloroethane	EPA 624
	EPA 8260C
1,1-Dichloroethane	EPA 624
	EPA 8260C
1,1-Dichloroethene	EPA 624
	EPA 8260C
1,1-Dichloropropene	EPA 8260C
1,2,3-Trichloropropane	EPA 8260C
1,2-Dibromo-3-chloropropane	EPA 8260C
1,2-Dibromoethane	EPA 8260C
1,2-Dichloroethane	EPA 624
	EPA 8260C
1,2-Dichloropropane	EPA 624
	EPA 8260C
1,3-Dichloropropane	EPA 8260C
2,2-Dichloropropane	EPA 8260C
2-Chloro-1,3-butadiene (Chloroprene)	EPA 8260C
2-Chloroethylvinyl ether	EPA 624
	EPA 8260C
3-Chloropropene (Allyl chloride)	EPA 8260C
Bromochloromethane	EPA 8260C
Bromodichloromethane	EPA 624
	EPA 8260C
Bromoform	EPA 624

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Revised October 03, 2013

**CERTIFICATE OF APPROVAL FOR LABORATORY SERVICE**

*Issued in accordance with and pursuant to section 502 Public Health Law of New York State*

MR. TOM C. BOOCHER  
TRIMATRIX LABORATORIES, INC  
5560 CORPORATE EXCHANGE CT SE  
GRAND RAPIDS, MI 49512-5503

NY Lab Id No: 11776

*is hereby APPROVED as an Environmental Laboratory in conformance with the  
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**ENVIRONMENTAL ANALYSES NON POTABLE WATER**  
*All approved analytes are listed below:*

**Volatile Halocarbons**

Bromoform	EPA 8260C
Bromomethane	EPA 624
	EPA 8260C
Carbon tetrachloride	EPA 624
	EPA 8260C
Chloroethane	EPA 624
	EPA 8260C
Chloroform	EPA 624
	EPA 8260C
Chloromethane	EPA 624
	EPA 8260C
cis-1,2-Dichloroethene	EPA 8260C
cis-1,3-Dichloropropene	EPA 624
	EPA 8260C
Dibromochloromethane	EPA 624
	EPA 8260C
Dibromomethane	EPA 8260C
Dichlorodifluoromethane	EPA 8260C
Hexachlorobutadiene, Volatile	EPA 8260C
Methyl iodide	EPA 8260C
Methylene chloride	EPA 624
	EPA 8260C
Tetrachloroethene	EPA 624
	EPA 8260C
trans-1,2-Dichloroethene	EPA 624

**Volatile Halocarbons**

trans-1,2-Dichloroethene	EPA 8260C
trans-1,3-Dichloropropene	EPA 624
	EPA 8260C
trans-1,4-Dichloro-2-butene	EPA 8260C
Trichloroethene	EPA 624
	EPA 8260C
Trichlorofluoromethane	EPA 624
	EPA 8260C
Vinyl chloride	EPA 624
	EPA 8260C

**Volatiles Organics**

1,4-Dioxane	EPA 8260C
2-Butanone (Methylethyl ketone)	EPA 8260C
2-Hexanone	EPA 8260C
2-Nitropropane	EPA 8260C
4-Methyl-2-Pentanone	EPA 8260C
Acetone	EPA 8260C
Acetonitrile	EPA 8260C
Carbon Disulfide	EPA 8260C
Di-ethyl ether	EPA 8260C
Ethyl Acetate	EPA 8260C
Isobutyl alcohol	EPA 8260C
Isopropanol	EPA 8260C
n-Butanol	EPA 8260C
o-Toluidine	EPA 8270D

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*All approved analytes are listed below:*

**Volatiles Organics**

Vinyl acetate

EPA 8260C

**Wastewater Metals I**

Barium, Total

EPA 200.7 Rev. 4.4

EPA 200.8 Rev. 5.4

EPA 6010C

EPA 6020A

Cadmium, Total

EPA 200.7 Rev. 4.4

EPA 200.8 Rev. 5.4

EPA 6010C

EPA 6020A

Calcium, Total

EPA 200.7 Rev. 4.4

EPA 6010C

Chromium, Total

EPA 200.7 Rev. 4.4

EPA 200.8 Rev. 5.4

EPA 6010C

EPA 6020A

Copper, Total

EPA 200.7 Rev. 4.4

EPA 200.8 Rev. 5.4

EPA 6010C

EPA 6020A

Iron, Total

EPA 200.7 Rev. 4.4

EPA 6010C

SM 20-21 3500-Fe B (97)

Lead, Total

EPA 200.7 Rev. 4.4

EPA 200.8 Rev. 5.4

**Wastewater Metals I**

Lead, Total

EPA 6010C

EPA 6020A

Magnesium, Total

EPA 200.7 Rev. 4.4

EPA 6010C

Manganese, Total

EPA 200.7 Rev. 4.4

EPA 200.8 Rev. 5.4

EPA 6010C

EPA 6020A

Nickel, Total

EPA 200.7 Rev. 4.4

EPA 200.8 Rev. 5.4

EPA 6010C

EPA 6020A

Potassium, Total

EPA 200.7 Rev. 4.4

EPA 6010C

Silver, Total

EPA 200.7 Rev. 4.4

EPA 200.8 Rev. 5.4

EPA 6010C

EPA 6020A

Sodium, Total

EPA 200.7 Rev. 4.4

EPA 6010C

Strontium, Total

EPA 200.7 Rev. 4.4

EPA 6010C

**Wastewater Metals II**

Aluminum, Total

EPA 200.7 Rev. 4.4

EPA 6010C

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*All approved analytes are listed below:*

**Wastewater Metals II**

Antimony, Total	EPA 200.8 Rev. 5.4 EPA 6020A
Arsenic, Total	EPA 200.7 Rev. 4.4 EPA 200.8 Rev. 5.4 EPA 6010C EPA 6020A
Beryllium, Total	EPA 200.7 Rev. 4.4 EPA 200.8 Rev. 5.4 EPA 6010C EPA 6020A
Chromium VI	EPA 7196A SM 20-21 3500-Cr B (01)
Mercury, Low Level	EPA 1631E
Mercury, Total	EPA 245.1 Rev. 3.0 EPA 7470A
Selenium, Total	EPA 200.7 Rev. 4.4 EPA 200.8 Rev. 5.4 EPA 6010C EPA 6020A
Vanadium, Total	EPA 200.7 Rev. 4.4 EPA 200.8 Rev. 5.4 EPA 6010C EPA 6020A
Zinc, Total	EPA 200.7 Rev. 4.4 EPA 200.8 Rev. 5.4

**Wastewater Metals II**

Zinc, Total	EPA 6010C EPA 6020A
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**Wastewater Metals III**

Cobalt, Total	EPA 200.7 Rev. 4.4 EPA 200.8 Rev. 5.4 EPA 6010C EPA 6020A
Molybdenum, Total	EPA 200.7 Rev. 4.4 EPA 200.8 Rev. 5.4 EPA 6010C EPA 6020A
Thallium, Total	EPA 200.7 Rev. 4.4 EPA 200.8 Rev. 5.4 EPA 6010C EPA 6020A
Tin, Total	EPA 200.7 Rev. 4.4 EPA 6010C EPA 6020A
Titanium, Total	EPA 200.7 Rev. 4.4 EPA 6010C

**Wastewater Miscellaneous**

Boron, Total	EPA 200.7 Rev. 4.4
Bromide	EPA 300.0 Rev. 2.1 EPA 9056A
Color	SM 18-21 2120B (01)

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**ENVIRONMENTAL ANALYSES NON POTABLE WATER**  
*All approved analytes are listed below:*

**Wastewater Miscellaneous**

Cyanide, Available	OIA-1677
Cyanide, Total	EPA 9014 SM 18-21 4500-CN E (99)
Oil and Grease Total Recoverable (HEM EPA 1664A	
Organic Carbon, Total	EPA 9060A SM 18-21 5310C (00)
Phenols	EPA 420.4 Rev. 1.0 EPA 9065
Silica, Dissolved	SM 18-19 4500-SI D
Specific Conductance	SM 18-21 2510B (97)
Sulfide (as S)	SM 18-21 4500-S D (00) SM 19-21 4500-S F (00)
Surfactant (MBAS)	SM 18-21 5540C (00)
Total Organic Halides	EPA 9020B
Total Petroleum Hydrocarbons	EPA 1664A
Turbidity	SM 18-21 2130 B (01)

**Sample Preparation Methods**

EPA 200.2  
EPA 3010A  
EPA 3020A  
EPA 3510C  
EPA 5030C  
SM 18-20 4500-CN C

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**ENVIRONMENTAL ANALYSES NON POTABLE WATER**  
All approved subcategories and/or analytes are listed below:

**Amines**

2-Nitroaniline  
3-Nitroaniline

EPA 8270D  
EPA 8270D



STATE OF NEW YORK  
DEPARTMENT OF HEALTH

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**ENVIRONMENTAL ANALYSES SOLID AND HAZARDOUS WASTE**

*All approved analytes are listed below:*

**Acrylates**

Acrolein (Propenal)	EPA 8260C
Acrylonitrile	EPA 8260C
Ethyl methacrylate	EPA 8260C
Methyl acrylonitrile	EPA 8260C
Methyl methacrylate	EPA 8260C

**Amines**

1,2-Diphenylhydrazine	EPA 8270D
2-Nitroaniline	EPA 8270D
3-Nitroaniline	EPA 8270D
4-Chloroaniline	EPA 8270D
4-Nitroaniline	EPA 8270D
Aniline	EPA 8270D
Carbazole	EPA 8270D

**Benzidines**

3,3'-Dichlorobenzidine	EPA 8270D
Benzidine	EPA 8270D

**Characteristic Testing**

Ignitability	EPA 1020
Synthetic Precipitation Leaching Proc.	EPA 1312
TCLP	EPA 1311

**Chlorinated Hydrocarbon Pesticides**

4,4'-DDD	EPA 8081B
4,4'-DDE	EPA 8081B
4,4'-DDT	EPA 8081B

**Chlorinated Hydrocarbon Pesticides**

Aldrin	EPA 8081B
alpha-BHC	EPA 8081B
alpha-Chlordane	EPA 8081B
beta-BHC	EPA 8081B
Chlordane Total	EPA 8081B
delta-BHC	EPA 8081B
Dieldrin	EPA 8081B
Endosulfan I	EPA 8081B
Endosulfan II	EPA 8081B
Endosulfan sulfate	EPA 8081B
Endrin	EPA 8081B
Endrin aldehyde	EPA 8081B
Endrin Ketone	EPA 8081B
gamma-Chlordane	EPA 8081B
Heptachlor	EPA 8081B
Heptachlor epoxide	EPA 8081B
Lindane	EPA 8081B
Methoxychlor	EPA 8081B
Toxaphene	EPA 8081B

**Chlorinated Hydrocarbons**

1,2,4,5-Tetrachlorobenzene	EPA 8270D
1,2,4-Trichlorobenzene	EPA 8270D
2-Chloronaphthalene	EPA 8270D
Hexachlorobenzene	EPA 8270D
Hexachlorobutadiene	EPA 8270D

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**ENVIRONMENTAL ANALYSES SOLID AND HAZARDOUS WASTE**  
*All approved analytes are listed below:*

**Chlorinated Hydrocarbons**

Hexachloroethane	EPA 8270D
Hexachloropropene	EPA 8270D

**Chlorophenoxy Acid Pesticides**

2,4,5-T	EPA 8151A
2,4,5-TP (Silvex)	EPA 8151A
2,4-D	EPA 8151A
2,4-DB	EPA 8151A
Dalapon	EPA 8151A
Dicamba	EPA 8151A
Dichloroprop	EPA 8151A
Dinoseb	EPA 8151A
MCPA	EPA 8151A
MCPP	EPA 8151A

**Haloethers**

4-Bromophenylphenyl ether	EPA 8270D
4-Chlorophenylphenyl ether	EPA 8270D
Bis(2-chloroethoxy)methane	EPA 8270D
Bis(2-chloroethyl)ether	EPA 8270D
Bis(2-chloroisopropyl) ether	EPA 8270D

**Metals I**

Barium, Total	EPA 6010C EPA 6020A
Cadmium, Total	EPA 6010C EPA 6020A

**Metals I**

Calcium, Total	EPA 6010C
Chromium, Total	EPA 6010C EPA 6020A
Copper, Total	EPA 6010C EPA 6020A
Iron, Total	EPA 6010C
Lead, Total	EPA 6010C EPA 6020A
Magnesium, Total	EPA 6010C
Manganese, Total	EPA 6010C EPA 6020A
Nickel, Total	EPA 6010C EPA 6020A
Potassium, Total	EPA 6010C
Silver, Total	EPA 6010C EPA 6020A
Sodium, Total	EPA 6010C
Strontium, Total	EPA 6010C

**Metals II**

Aluminum, Total	EPA 6010C
Antimony, Total	EPA 6020A
Arsenic, Total	EPA 6010C EPA 6020A
Beryllium, Total	EPA 6010C EPA 6020A

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**Metals II**

Chromium VI	EPA 7196A
Lithium, Total	EPA 6010C
Mercury, Total	EPA 7471B
Selenium, Total	EPA 6010C
	EPA 6020A
Vanadium, Total	EPA 6010C
	EPA 6020A
Zinc, Total	EPA 6010C
	EPA 6020A

**Metals III**

Cobalt, Total	EPA 6010C
	EPA 6020A
Molybdenum, Total	EPA 6010C
	EPA 6020A
Thallium, Total	EPA 6010C
	EPA 6020A
Tin, Total	EPA 6010C
	EPA 6020A
Titanium, Total	EPA 6010C

**Minerals**

Chloride	EPA 9056A
Fluoride, Total	EPA 9058A
Sulfate (as SO <sub>4</sub> )	EPA 9056A

**Miscellaneous**

Boron, Total	EPA 6010C
Cyanide, Total	EPA 9014
Phenols	EPA 9065
Sulfide (as S)	EPA 9034

**Nitroaromatics and Isophorone**

1,3,5-Trinitrobenzene	EPA 8330A
1,3-Dinitrobenzene	EPA 8330A
2,4,6-Trinitrotoluene	EPA 8330A
2,4-Dinitrotoluene	EPA 8270D
	EPA 8330A
2,6-Dinitrotoluene	EPA 8270D
	EPA 8330A
2-Amino-4,6-dinitrotoluene	EPA 8330A
2-Nitrotoluene	EPA 8330A
3-Nitrotoluene	EPA 8330A
4-Amino-2,6-dinitrotoluene	EPA 8330A
4-Nitrotoluene	EPA 8330A
Hexahydro-1,3,5-trinitro-1,3,5-triazine	EPA 8330A
Isophorone	EPA 8270D
Methyl-2,4,6-trinitrophenylnitramine	EPA 8330A
Nitrobenzene	EPA 8270D
	EPA 8330A
Octahydro-tetranitro-tetrazocine	EPA 8330A
Pyridine	EPA 8270D

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**Nitrosoamines**

N-Nitrosodiethylamine	EPA 8270D
N-Nitrosodimethylamine	EPA 8270D
N-Nitrosodi-n-butylamine	EPA 8270D
N-Nitrosodi-n-propylamine	EPA 8270D
N-Nitrosodiphenylamine	EPA 8270D
N-nitrosomethylethylamine	EPA 8270D
N-nitrosomorpholine	EPA 8270D
N-nitrosopiperidine	EPA 8270D
N-Nitrosopyrrolidine	EPA 8270D

**Nutrients**

Nitrate (as N)	EPA 9056A
Nitrite (as N)	EPA 9056A

**Petroleum Hydrocarbons**

Diesel Range Organics	EPA 8015C
Gasoline Range Organics	EPA 8015C

**Phthalate Esters**

Benzyl butyl phthalate	EPA 8270D
Bis(2-ethylhexyl) phthalate	EPA 8270D
Diethyl phthalate	EPA 8270D
Dimethyl phthalate	EPA 8270D
Di-n-butyl phthalate	EPA 8270D
Di-n-octyl phthalate	EPA 8270D

**Polychlorinated Biphenyls**

PCB-1016	EPA 8082A
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**Polychlorinated Biphenyls**

PCB-1221	EPA 8082A
PCB-1232	EPA 8082A
PCB-1242	EPA 8082A
PCB-1248	EPA 8082A
PCB-1254	EPA 8082A
PCB-1260	EPA 8082A

**Polynuclear Aromatic Hydrocarbons**

Acenaphthene	EPA 8270D
Acenaphthylene	EPA 8270D
Anthracene	EPA 8270D
Benzo(a)anthracene	EPA 8270D
Benzo(a)pyrene	EPA 8270D
Benzo(b)fluoranthene	EPA 8270D
Benzo(ghi)perylene	EPA 8270D
Benzo(k)fluoranthene	EPA 8270D
Chrysene	EPA 8270D
Dibenzo(a,h)anthracene	EPA 8270D
Fluoranthene	EPA 8270D
Fluorene	EPA 8270D
Indeno(1,2,3-cd)pyrene	EPA 8270D
Naphthalene	EPA 8270D
Phenanthrene	EPA 8270D
Pyrene	EPA 8270D

**Priority Pollutant Phenols**

2,4,5-Trichlorophenol	EPA 8270D
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*All approved analytes are listed below:*

**Priority Pollutant Phenols**

2,4,6-Trichlorophenol	EPA 8270D
2,4-Dichlorophenol	EPA 8270D
2,4-Dimethylphenol	EPA 8270D
2,4-Dinitrophenol	EPA 8270D
2,6-Dichlorophenol	EPA 8270D
2-Chlorophenol	EPA 8270D
2-Methyl-4,6-dinitrophenol	EPA 8270D
2-Methylphenol	EPA 8270D
2-Nitrophenol	EPA 8270D
3-Methylphenol	EPA 8270D
4-Chloro-3-methylphenol	EPA 8270D
4-Methylphenol	EPA 8270D
4-Nitrophenol	EPA 8270D
Pentachlorophenol	EPA 8270D
Phenol	EPA 8270D

**Semi-Volatile Organics**

1,2-Dichlorobenzene, Semi-volatile	EPA 8270D
1,3-Dichlorobenzene, Semi-volatile	EPA 8270D
1,4-Dichlorobenzene, Semi-volatile	EPA 8270D
2-Methylnaphthalene	EPA 8270D
Benzoic Acid	EPA 8270D
Benzyl alcohol	EPA 8270D
Dibenzofuran	EPA 8270D

**Volatile Aromatics**

1,2,4-Trichlorobenzene, Volatile	EPA 8260C
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**Volatile Aromatics**

1,2,4-Trimethylbenzene	EPA 8260C
1,2-Dichlorobenzene	EPA 8260C
1,3,5-Trimethylbenzene	EPA 8260C
1,3-Dichlorobenzene	EPA 8260C
1,4-Dichlorobenzene	EPA 8260C
2-Chlorotoluene	EPA 8260C
4-Chlorotoluene	EPA 8260C
Benzene	EPA 8260C
Bromobenzene	EPA 8260C
Chlorobenzene	EPA 8260C
Ethyl benzene	EPA 8260C
Isopropylbenzene	EPA 8260C
Naphthalene, Volatile	EPA 8260C
n-Butylbenzene	EPA 8260C
n-Propylbenzene	EPA 8260C
p-Isopropyltoluene (P-Cymene)	EPA 8260C
sec-Butylbenzene	EPA 8260C
Styrene	EPA 8260C
tert-Butylbenzene	EPA 8260C
Toluene	EPA 8260C
Total Xylenes	EPA 8260C

**Volatile Halocarbons**

1,1,1,2-Tetrachloroethane	EPA 8260C
1,1,1-Trichloroethane	EPA 8260C
1,1,2,2-Tetrachloroethane	EPA 8260C

Serial No.: 49626

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NEW YORK STATE DEPARTMENT OF HEALTH  
WADSWORTH CENTER



Expires 12:01 AM April 01, 2014  
Issued April 01, 2013  
Revised October 03, 2013

**CERTIFICATE OF APPROVAL FOR LABORATORY SERVICE**

*Issued in accordance with and pursuant to section 502 Public Health Law of New York State*

MR. TOM C. BOOCHER  
TRIMATRIX LABORATORIES, INC  
5560 CORPORATE EXCHANGE CT SE  
GRAND RAPIDS, MI 49512-5503

NY Lab Id No: 11776

*is hereby APPROVED as an Environmental Laboratory in conformance with the  
National Environmental Laboratory Accreditation Conference Standards (2003) for the category*

**ENVIRONMENTAL ANALYSES SOLID AND HAZARDOUS WASTE**

*All approved analytes are listed below:*

**Volatile Halocarbons**

1,1,2-Trichloro-1,2,2-Trifluoroethane	EPA 8260C
1,1,2-Trichloroethane	EPA 8260C
1,1-Dichloroethane	EPA 8260C
1,1-Dichloroethene	EPA 8260C
1,1-Dichloropropene	EPA 8260C
1,2,3-Trichloropropane	EPA 8260C
1,2-Dibromo-3-chloropropane	EPA 8260C
1,2-Dibromoethane	EPA 8260C
1,2-Dichloroethane	EPA 8260C
1,2-Dichloropropane	EPA 8260C
1,3-Dichloropropane	EPA 8260C
2,2-Dichloropropane	EPA 8260C
2-Chloro-1,3-butadiene (Chloroprene)	EPA 8260C
2-Chloroethylvinyl ether	EPA 8260C
3-Chloropropene (Allyl chloride)	EPA 8260C
Bromochloromethane	EPA 8260C
Bromodichloromethane	EPA 8260C
Bromoform	EPA 8260C
Bromomethane	EPA 8260C
Carbon tetrachloride	EPA 8260C
Chloroethane	EPA 8260C
Chloroform	EPA 8260C
Chloromethane	EPA 8260C
cis-1,2-Dichloroethene	EPA 8260C
cis-1,3-Dichloropropene	EPA 8260C

**Volatile Halocarbons**

Dibromochloromethane	EPA 8260C
Dibromomethane	EPA 8260C
Dichlorodifluoromethane	EPA 8260C
Hexachlorobutadiene, Volatile	EPA 8260C
Methylene chloride	EPA 8260C
Tetrachloroethene	EPA 8260C
trans-1,2-Dichloroethene	EPA 8260C
trans-1,3-Dichloropropene	EPA 8260C
trans-1,4-Dichloro-2-butene	EPA 8260C
Trichloroethene	EPA 8260C
Trichlorofluoromethane	EPA 8260C
Vinyl chloride	EPA 8260C

**Volatile Organics**

1,4-Dioxane	EPA 8260C
2-Butanone (Methylethyl ketone)	EPA 8260C
2-Hexanone	EPA 8260C
2-Nitropropane	EPA 8260C
4-Methyl-2-Pentanone	EPA 8260C
Acetone	EPA 8260C
Acetonitrile	EPA 8260C
Carbon Disulfide	EPA 8260C
Ethyl Acetate	EPA 8260C
Isobutyl alcohol	EPA 8260C
Isopropanol	EPA 8260C
Methyl tert-butyl ether	EPA 8260C

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**ENVIRONMENTAL ANALYSES SOLID AND HAZARDOUS WASTE**  
*All approved analytes are listed below:*

**Volatile Organics**

o-Toluidine	EPA 8270D
Propionitrile	EPA 8260C
tert-butyl alcohol	EPA 8260C
Vinyl acetate	EPA 8260C

**Sample Preparation Methods**

EPA 3010A
EPA 3020A
EPA 3050B
EPA 3545A
EPA 3550C
EPA 3580A
EPA 3585
EPA 5035A-H
EPA 5035A-L
EPA 9030B

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## **Appendix F**

### **Field Standard Operating Procedures**

## Logbooks

### Procedure 3-02

#### 1.0 Purpose and Scope

- 1.1 This standard operating procedure (SOP) describes the activities and responsibilities pertaining to the identification, use, and control of logbooks and associated field data records.
- 1.2 As guidance for specific activities, this procedure does not obviate the need for professional judgment. Deviations from this procedure while planning or executing planned activities must be approved in accordance with Program requirements for technical planning and review.

#### 2.0 Safety

- 2.1 In order to keep the logbook clean, store it in a clean location and use it only when outer gloves used for PPE have been removed.

#### 3.0 Terms and Definitions

##### 3.1 Logbook

A logbook is a bound field notebook with consecutively numbered, water-repellent pages that is clearly identified with the name of the relevant activity, the person assigned responsibility for maintenance of the logbook, and the beginning and ending dates of the entries.

##### 3.2 Data Form

A data form is a predetermined format utilized for recording field data that may become, by reference, a part of the logbook (e.g., soil boring logs, trenching logs, surface soil sampling logs, groundwater sample logs, and well construction logs are data forms).

#### 4.0 Training and Qualifications

- 4.1 The **Project Manager** or **designee** is responsible for determining which team members shall record information in field logbooks and for obtaining and maintaining control of the required logbooks. The **Project Manager** shall review the field logbook on at least a monthly basis. The **Project Manager** or **designee** is responsible for reviewing logbook entries to determine compliance with this procedure and to ensure that the entries meet the project requirements.
- 4.2 A knowledgeable individual such as the **Field Manager**, **Project Manager**, or **Program Quality Manager** shall perform a technical review of each logbook at a frequency commensurate with the level of activity (weekly is suggested, or, at a minimum, monthly). Document these reviews by the dated signature of the reviewer on the last page or page immediately following the material reviewed.
- 4.3 The **Program Quality Manager** is responsible for ensuring overall compliance with this procedure.
- 4.4 The **Field Manager** is responsible for ensuring that all **field personnel** follow these procedures and that the logbook is completed properly and daily. The **Field Manager** is also responsible for submitting copies to the **Project Manager**, who is responsible for filing them and submitting a copy (if required by the project's Statement of Work).



4.5 The **logbook user** is responsible for recording pertinent data into the logbook to satisfy project requirements and for attesting to the accuracy of the entries by dated signature. The **logbook user** is also responsible for safeguarding the logbook while having custody of it.

4.6 All **field personnel** are responsible for the implementation of this procedure.

## 5.0 Equipment and Supplies

5.1 Field logbooks shall be bound field notebooks with water-repellent pages.

5.2 Pens shall have indelible black ink.

## 6.0 Procedure

6.1 The field logbook serves as the primary record of field activities. Make entries chronologically and in sufficient detail to allow the writer or a knowledgeable reviewer to reconstruct the applicable events. Store the logbook in a clean location and use it only when outer gloves used for personal protective equipment (PPE) have been removed.

6.2 Individual data forms may be generated to provide systematic data collection documentation. Entries on these forms shall meet the same requirements as entries in the logbook and shall be referenced in the applicable logbook entry. Individual data forms shall reference the applicable logbook and page number. At a minimum, include names of all samples collected in the logbook even if they are recorded elsewhere.

6.3 Enter field descriptions and observations into the logbook, as described in Attachment 1, using indelible black ink.

6.4 Typical information to be entered includes the following:

- Dates (month/day/year) and times (military) of all on-site activities and entries made in logbooks/forms;
- Site name and description;
- Site location by longitude and latitude, if known;
- Weather conditions, including temperature and relative humidity;
- Fieldwork documentation, including site entry and exit times;
- Descriptions of, and rationale for, approved deviations from the work plan (WP) or field sampling plan;
- Field instrumentation readings;
- Names, job functions, and organizational affiliations of on-site personnel;
- Photograph references;
- Site sketches and diagrams made on site;
- Identification and description of sample morphology, collection locations, and sample numbers;
- Sample collection information, including dates (month/day/year) and times (military) of sample collections, sample collection methods and devices, station location numbers, sample collection depths/heights, sample preservation information, sample pH (if applicable), analysis requested (analytical groups), etc., as well as chain-of-custody (COC) information such as sample identification numbers cross-referenced to COC sample numbers;

- Sample naming convention;
- Field quality control (QC) sample information;
- Site observations, field descriptions, equipment used, and field activities accomplished to reconstruct field operations;
- Meeting information;
- Important times and dates of telephone conversations, correspondence, or deliverables;
- Field calculations;
- PPE level;
- Calibration records;
- Contractor and subcontractor information (address, names of personnel, job functions, organizational affiliations, contract number, contract name, and work assignment number);
- Equipment decontamination procedures and effectiveness;
- Laboratories receiving samples and shipping information, such as carrier, shipment time, number of sample containers shipped, and analyses requested; and
- User signatures.

6.5 The logbook shall reference data maintained in other logs, forms, etc. Correct entry errors by drawing a single line through the incorrect entry, then initialing and dating this change. Enter an explanation for the correction if the correction is more than for a mistake.

6.6 At least at the end of each day, the person making the entry shall sign or initial each entry or group of entries.

6.7 Enter logbook page numbers on each page to facilitate identification of photocopies.

6.8 If a person's initials are used for identification, or if uncommon acronyms are used, identify these on a page at the beginning of the logbook.

6.9 At least weekly and preferably daily, the **preparer** shall photocopy and retain the pages completed during that session for backup. This will prevent loss of a large amount of information if the logbook is lost.

## 7.0 Quality Control and Assurance

7.1 Review per Section 4.2 shall be recorded.

## 8.0 Records, Data Analysis, Calculations

8.1 Retain the field logbook as a permanent project record. If a particular project requires submittal of photocopies of logbooks, perform this as required.

8.2 Deviations from this procedure shall be documented in field records. Significant changes shall be approved by the **Program Quality Manager**.

## 9.0 Attachments or References

9.1 Attachment 1 – Description of Logbook Entries

9.2 Department of Defense, United States (DoD). 2005. *Uniform Federal Policy for Quality Assurance Project Plans, Part 1: UFP-QAPP Manual*. Final Version 1. DoD: DTIC ADA 427785, EPA-505-B-04-900A. In conjunction with the U. S. Environmental Protection Agency





and the Department of Energy. Washington: Intergovernmental Data Quality Task Force. March. On-line updates available at: [http://www.epa.gov/fedfac/pdf/ufp\\_qapp\\_v1\\_0305.pdf](http://www.epa.gov/fedfac/pdf/ufp_qapp_v1_0305.pdf).



## Attachment 1

### Description of Logbook Entries

Logbook entries shall be consistent with Section A.1.4 *Field Documentation SOPs* of the UFP-QAPP Manual (DoD 2005) and contain the following information, as applicable, for each activity recorded. Some of these details may be entered on data forms, as described previously.

<b>Name of Activity</b>	<b>For example, Asbestos Bulk Sampling, Charcoal Canister Sampling, Aquifer Testing.</b>
Task Team Members and Equipment	Name all members on the field team involved in the specified activity. List equipment used by serial number or other unique identification, including calibration information.
Activity Location	Indicate location of sampling area as indicated in the field sampling plan.
Weather	Indicate general weather and precipitation conditions.
Level of PPE	Record the level of PPE (e.g., Level D).
Methods	Indicate method or procedure number employed for the activity.
Sample Numbers	Indicate the unique numbers associated with the physical samples. Identify QC samples.
Sample Type and Volume	Indicate the medium, container type, preservative, and the volume for each sample.
Time and Date	Record the time and date when the activity was performed (e.g., 0830/08/OCT/89). Use the 24-hour clock for recording the time and two digits for recording the day of the month and the year.
Analyses	Indicate the appropriate code for analyses to be performed on each sample, as specified in the WP.
Field Measurements	Indicate measurements and field instrument readings taken during the activity.
Chain of Custody and Distribution	Indicate chain-of-custody for each sample collected and indicate to whom the samples are transferred and the destination.
References	If appropriate, indicate references to other logs or forms, drawings, or photographs employed in the activity.
Narrative (including time and location)	<p>Create a factual, chronological record of the team's activities throughout the day including the time and location of each activity. Include descriptions of general problems encountered and their resolution. Provide the names and affiliations of non-field team personnel who visit the site, request changes in activity, impact the work schedule, request information, or observe team activities. Record any visual or other observations relevant to the activity, the contamination source, or the sample itself.</p> <p>It should be emphasized that logbook entries are for recording data and chronologies of events. The logbook author must include observations and descriptive notations, taking care to be objective and recording no opinions or subjective comments unless appropriate.</p>
Recorded by	Include the signature of the individual responsible for the entries contained in the logbook and referenced forms.
Checked by	Include the signature of the individual who performs the review of the completed entries.



# Recordkeeping, Sample Labeling, and Chain-of-Custody

## Procedure 3-03

### 1.0 Purpose and Scope

- 1.1 The purpose of this standard operating procedure is to establish standard protocols for all field personnel for use in maintaining field and sampling activity records, writing sample logs, labeling samples, ensuring that proper sample custody procedures are utilized, and completing chain-of-custody/analytical request forms.
- 1.2 As guidance for specific activities, this procedure does not obviate the need for professional judgment. Deviations from this procedure while planning or executing planned activities must be approved in accordance with Program requirements for technical planning and review.

### 2.0 Safety

Not applicable.

### 3.0 Terms and Definitions

#### 3.1 Logbook

A logbook is a bound field notebook with consecutively numbered, water-repellent pages that is clearly identified with the name of the relevant activity, the person responsible for maintenance of the logbook, and the beginning and ending dates of the entries.

#### 3.2 Chain-of-Custody

Chain-of-custody (COC) is documentation of the process of custody control. Custody control includes possession of a sample from the time of its collection in the field to its receipt by the analytical laboratory, and through analysis and storage prior to disposal.

### 4.0 Training and Qualifications

- 4.1 The **Project Manager** is responsible for determining which team members shall record information in the field logbook and for checking sample logbooks and COC forms to ensure compliance with these procedures. The **Project Manager** shall review COC forms on a monthly basis at a minimum.
- 4.2 The **Project Manager** and **Program Quality Manager** are responsible for evaluating project compliance with the Project Procedures Manual.
- 4.3 The **Program Quality Manager** is responsible for ensuring overall compliance with this procedure.
- 4.4 The **Laboratory Project Manager** or **Sample Control Department Manager** is responsible for reporting any sample documentation or COC problems to the **Project Manager** or **Project Laboratory Coordinator** within 24 hours of sample receipt.
- 4.5 The **Field Manager** is responsible for ensuring that all **field personnel** follow these procedures. The **Project Laboratory Coordinator** is responsible for verifying that the COC/analytical request forms have been completed properly and match the sampling and analysis plan. The **Project Manager** or **Project Laboratory Coordinator** is responsible for notifying the **laboratory**, **data managers**, and **data validators** in writing if analytical request

changes are required as a corrective action. These small changes are different from change orders, which involve changes to the scope of the subcontract with the laboratory and must be made in accordance with a respective contract (e.g., CLEAN remedial action contract).

- 4.6 All **field personnel** are responsible for following these procedures while conducting sampling activities. **Field personnel** are responsible for recording pertinent data into the logbook to satisfy project requirements and for attesting to the accuracy of the entries by dated signature.

## 5.0 Procedure

This procedure provides standards for documenting field activities, labeling the samples, documenting sample custody, and completing COC/analytical request forms. The standards presented in this section shall be followed to ensure that samples collected are maintained for their intended purpose and that the conditions encountered during field activities are documented.

### 5.1 Recordkeeping

The field logbook serves as the primary record of field activities. Make entries chronologically and in sufficient detail to allow the writer or a knowledgeable reviewer to reconstruct each day's events. Field logs such as soil boring logs and ground-water sampling logs will also be used. These procedures are described in Procedure 3-02, *Logbooks*.

### 5.2 Sample Labeling

Affix a sample label with adhesive backing to each individual sample container. Place clear tape over each label (preferably prior to sampling) to prevent the labels from tearing off, falling off, being smeared, and to prevent loss of information on the label. Record the following information with a waterproof marker on each label:

- Project name or number (optional);
- COC sample number;
- Date and time of collection;
- Sampler's initials;
- Matrix (optional);
- Sample preservatives (if applicable); and
- Analysis to be performed on sample (this shall be identified by the method number or name identified in the subcontract with the laboratory).

These labels may be obtained from the analytical laboratory or printed from a computer file onto adhesive labels.

### 5.3 Custody Procedures

For samples intended for chemical analysis, sample custody procedures shall be followed through collection, transfer, analysis, and disposal to ensure that the integrity of the samples is maintained. Maintain custody of samples in accordance with the U.S. Environmental Protection Agency (EPA) COC guidelines prescribed in EPA *NEIC Policies and Procedures*, National Enforcement Investigations Center, Denver, Colorado, revised May 1986; EPA *RCRA Ground Water Monitoring Technical Enforcement Guidance Document* (TEGD); *Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA* (EPA OSWER Directive 9355 3-01); Appendix 2 of the *Technical Guidance Manual for Solid Waste Water*

*Quality Assessment Test (SWAT) Proposals and Reports; and Test Methods for Evaluating Solid Waste (EPA SW-846)*

A description of sample custody procedures is provided below.

#### 5.3.1 **Sample Collection Custody Procedures**

According to the U.S. EPA guidelines, a sample is considered to be in custody if one of the following conditions is met:

- It is in one's actual physical possession or view;
- It is in one's physical possession and has not been tampered with (i.e., it is under lock or official seal);
- It is retained in a secured area with restricted access; and
- It is placed in a container and secured with an official seal such that the sample cannot be reached without breaking the seal.

Place custody seals on sample containers immediately after sample collection and on shipping coolers if the cooler is to be removed from the sampler's custody. Place custody seals in such a manner that they must be broken to open the containers or coolers. Label the custody seals with the following information:

- Sampler's name or initials; and
- Date and time that the sample/cooler was sealed.

These seals are designed to enable detection of sample tampering. An example of a custody seal is shown in Attachment 1.

**Field personnel** shall also log individual samples onto COC forms (carbon copy or computer generated) when a sample is collected. These forms may also serve as the request for analyses. Procedures for completing these forms are discussed in Section 7.4, indicating sample identification number, matrix, date and time of collection, number of containers, analytical methods to be performed on the sample, and preservatives added (if any). The **samplers** will also sign the COC form signifying that they were the personnel who collected the samples. The COC form shall accompany the samples from the field to the laboratory. When a cooler is ready for shipment to the analytical laboratory, the **person delivering the samples for transport** will sign and indicate the date and time on the accompanying COC form. One copy of the COC form will be retained by the **sampler** and the remaining copies of the COC form shall be placed inside a self-sealing bag and taped to the inside of the cooler. Each cooler must be associated with a unique COC form. Whenever a transfer of custody takes place, **both parties** shall sign and date the accompanying carbon copy COC forms, and the **individual relinquishing the samples** shall retain a copy of each form. One exception is when the samples are shipped; the **delivery service personnel** will not sign or receive a copy because they do not open the coolers. The **laboratory** shall attach copies of the completed COC forms to the reports containing the results of the analytical tests. An example COC form is provided in Attachment 2.

#### 5.3.2 **Laboratory Custody Procedures**

The following custody procedures are to be followed by an **independent laboratory** receiving samples for chemical analysis; the procedures in their Naval Facilities Engineering Service Center-evaluated Laboratory Quality Assurance Plan must follow these same procedures. A **designated sample custodian** shall take custody of all samples upon their arrival at the

analytical laboratory. The **custodian** shall inspect all sample labels and COC forms to ensure that the information is consistent, and that each is properly completed. The **custodian** will also measure the temperature of the temperature blank in the coolers upon arrival using either a National Institute for Standards and Technology calibrated thermometer or an infra-red temperature gun. The **custodian** shall note the condition of the samples including:

- If the samples show signs of damage or tampering;
- If the containers are broken or leaking;
- If headspace is present in sample vials;
- If proper preservation of samples has occurred (made by pH measurement, except volatile organic compounds [VOCs] and purgeable total petroleum hydrocarbons [TPH] and temperature). The pH of VOC and purgeable TPH samples will be checked by the **laboratory analyst** after the sample aliquot has been removed from the vial for analysis; and
- If any sample holding times have been exceeded.

All of the above information shall be documented on a sample receipt sheet by the **custodian**.

Discrepancies or improper preservation shall be noted by the **laboratory** as an out-of-control event and shall be documented on an out-of-control form with corrective action taken. The out-of-control form shall be signed and dated by the **sample control custodian** and **any other persons** responsible for corrective action. An example of an out-of-control form is included as Attachment 4.

The **custodian** shall then assign a unique laboratory number to each sample and distribute the samples to secured storage areas maintained at 4 degrees Celsius (soil samples for VOC analysis are to be stored in a frozen state until analysis). The unique laboratory number for each sample, COC sample number, client name, date and time received, analysis due date, and storage shall also be manually logged onto a sample receipt record and later entered into the laboratory's computerized data management system. The **custodian** shall sign the shipping bill and maintain a copy.

**Laboratory personnel** shall be responsible for the care and custody of samples from the time of their receipt at the laboratory through their exhaustion or disposal. Samples should be logged in and out on internal laboratory COC forms each time they are removed from storage for extraction or analysis.

#### 5.4 **Completing COC/Analytical Request Forms**

COC form/analytical request form completion procedures are crucial in properly transferring the custody and responsibility of samples from field personnel to the laboratory. This form is important for accurately and concisely requesting analyses for each sample; it is essentially a release order from the analysis subcontract.

Attachment 2 is an example of a generic COC/analytical request form that may be used by **field personnel**. Multiple copies may be tailored to each project so that much of the information described below need not be handwritten each time. Attachment 3 is an example of a completed site-specific COC/analytical request form, with box numbers identified and discussed in text below.

COC forms tailored to each CTO can be drafted and printed onto multi-ply forms. This eliminates the need to rewrite the analytical methods column headers each time. It also eliminates the need to write the project manager, name, and number; QC Level; TAT; and the same general comments each time.



Complete one COC form per cooler. Whenever possible, place all VOC analyte vials into one cooler in order to reduce the number of trip blanks. Complete all sections and be sure to sign and date the COC form. One copy of the COC form must remain with the field personnel.

- 
- Box 2 **Bill To:** List the name and address of the person/company to bill only if it is not in the subcontract with the laboratory.
- Box 3 **Sample Disposal Instructions:** These instructions will be stated in the Master Service Agreement or each CTO statement of work with each laboratory.
- Shipment Method:** State the method of shipment (e.g., hand carry or air courier via FedEx or DHL).
- Comments:** This area shall be used by the field team to communicate observations, potential hazards, or limitations that may have occurred in the field or additional information regarding analysis (e.g., a specific metals list, samples expected to contain high analyte concentrations).
- Box 4 **Cooler No.:** This will be written on the inside or outside of the cooler and shall be included on the COC. Some laboratories attach this number to the trip blank identification, which helps track samples for VOC analysis. If a number is not on the cooler, field personnel shall assign a number, write it on the cooler, and write it on the COC.
- QC Level:** Enter the reporting quality control (QC) requirements (e.g., Full Data Package, Summary Data Package).
- Turnaround time (TAT):** TAT will be determined by a sample delivery group (SDG), which may be formed over a 14-day period, not to exceed 20 samples. Once the SDG has been completed, standard TAT is 21 calendar days from receipt of the last sample in the SDG. Entering NORMAL or STANDARD in this field will be acceptable. If quicker TAT is required, it shall be in the subcontract with the laboratory and reiterated on each COC to remind the laboratory.
- Box 5 **Type of Containers:** Write the type of container used (e.g., 1-liter glass amber, for a given parameter in that column).
- Preservatives:** Field personnel must indicate on the COC the correct preservative used for the analysis requested. Indicate the pH of the sample (if tested) in case there are buffering conditions found in the sample matrix.
- Box 6 **Sample Identification (ID) Number:** This is typically a five-character alphanumeric identifier used by the contractor to identify samples. The use of this identifier is important since the laboratories are restricted to the number of characters they are able to use. Sample numbering shall be in accordance with the project-specific sampling and analysis plan.
- Description (Sample ID):** This name will be determined by the location and description of the sample, as described in the project-specific sampling and analysis plan. This sample identification should not be submitted to the laboratory, but should be left blank. If a computer COC version is used, the sample identification can be input, but printed with this block black. A cross-referenced list of the COC Sample Number and sample identification must be maintained separately.
- Date Collected:** Record the collection date in order to track the holding time of the sample.  
Note: For trip blanks, record the date it was placed in company with samples.
- Time Collected:** When collecting samples, record the time the sample is first collected. Use of the 24-hour military clock will avoid a.m. or p.m. designations (e.g., 1815 instead of 6:15 p.m.). Record local time; the laboratory is responsible for calculating holding times to local time.
- Lab ID:** This is for laboratory use only.
-



- 
- Box 7 **Matrix/QC:** Identify the matrix (e.g., water, soil, air, tissue, fresh water sediment, marine sediment, or product). If a sample is expected to contain high analyte concentrations (e.g., a tank bottom sludge or distinct product layer), notify the laboratory in the comment section. Mark an "X" for the sample(s) that have extra volume for laboratory QC matrix spike/matrix spike duplicate (MS/MSD) purposes. The sample provided for MS/MSD purposes is usually a field duplicate.
- Box 8 **Analytical Parameters:** Enter the parameter by descriptor and the method number desired (e.g., BTEX 8260B, PAHs 8270C, etc.). Whenever practicable, list the parameters as they appear in the laboratory subcontract to maintain consistency and avoid confusion.
- If the COC does not have a specific box for number of sample containers, use the boxes below the analytical parameter, to indicate the number of containers collected for each parameter.
- Box 9 **Sampler's Signature:** The person who collected samples must sign here.
- Relinquished By:** The person who turned over the custody of the samples to a second party other than an express mail carrier, such as FedEx or DHL, must sign and date here.
- Received By:** Typically, a representative of the receiving laboratory signs and dates here. Or, a field crew member who delivered the samples in person from the field to the laboratory might sign here. A courier, such as FedEx or DHL, does not sign here because they do not open the coolers. It must also be used by the prime contracting laboratory when samples are to be sent to a subcontractor.
- Relinquished By:** In the case of subcontracting, the primary laboratory will sign and date the Relinquished By space and fill out an additional COC to accompany the samples being subcontracted.
- Received By (Laboratory):** This space is for the final destination (e.g., at a subcontracted laboratory). A representative of the final destination (e.g., subcontracted laboratory) must sign and date here.
- Box 10 **Lab No. and Questions:** This box is to be filled in by the laboratory only.
- Box 11 **Control Number:** This number is the "COC" followed by the first contractor identification number in that cooler, or contained on that COC. This control number must be unique (i.e., never used twice). Record the date the COC is completed. It should be the same date the samples are collected.
- Box 12 **Total # of Containers:** Sum the number of containers in that row.
- Box 13 **Totals:** Sum the number of containers in each column. Because COC forms contain different formats depending on who produced the form, not all of the information listed in items 1 to 13 may be recorded; however, as much of this information as possible shall be included.
- 

## 6.0 Quality Control and Assurance

- 6.1 Recordkeeping, sample labeling, and chain-of-custody activities must incorporate quality control measures to ensure accuracy and completeness.



- 6.2 Deviations from this procedure or the project-specific project work plan shall be documented in field records. Significant changes shall be approved by the **Program Quality Manager**.

## 7.0 Records, Data Analysis, Calculations

- 7.1 The COC/analytical request form shall be faxed approximately daily to the **Project Laboratory Coordinator** for verification of accuracy. Following the completion of sampling activities, the sample logbook and COC forms will be transmitted to the **Project Manager** for storage in project files. The **data validators** shall receive a copy also. The original COC/analytical request form shall be submitted by the **laboratory** along with the data delivered. Any changes to the analytical requests that are required shall be made in writing to the laboratory. A copy of this written change shall be sent to the data validators and placed in the project files. The reason for the change shall be included in the project files so that recurring problems can be easily identified.
- 7.2 Deviations from this procedure or the project-specific sampling and analysis plan shall be documented in the records. Significant changes shall be approved by the **Program Quality Manager**.

## 8.0 Attachments or References

- 8.1 Attachment 1 – Chain-of-Custody Seal
- 8.2 Attachment 2 – Generic Chain-of-Custody/Analytical Request Form
- 8.3 Attachment 3 – Sample Completed Chain-of-Custody
- 8.4 Attachment 4 – Sample Out-of-Control Form
- 8.5 Environmental Protection Agency, United States (EPA). 1988. *Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA*. Interim Final. EPA/540/G-89/004. Office of Emergency and Remedial Response. October.
- 8.6 EPA. 1992. *RCRA Groundwater Monitoring Draft Technical Guidance*. EPA/530/R-93/001. Office of Solid Waste. November.
- 8.7 EPA. 1997. Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW-846. 3rd ed., Final Update IIIA. Office of Solid Waste.
- 8.8 Water Resources Control Board, State of California. 1988. *Technical Guidance Manual for Solid Waste Water Quality Assessment Test (SWAT) Proposals and Reports*. August.
- 8.9 Procedure 3-02, *Logbooks*.



## Attachment 1 Chain-of-Custody Seal

### CHAIN-OF-CUSTODY SEAL

[LABORATORY]	SAMPLE NO.	DATE	SEAL BROKEN BY
	SIGNATURE		DATE
	PRINT NAME AND TITLE ( <i>Inspector, Analyst or Technician</i> )		



## Attachment 2

### Generic Chain-of-Custody/Analytical Request Form

M601376

CHAIN OF CUSTODY RECORD														Page ____ of ____		
Client/Project Name:				Project Location:				Analysis Requested								
Project Number:				Field Logbook No.:												
Sampler: (Print Name)/Affiliation:				Chain of Custody Tape No.:												
Signature:				Send Results/Report to:												
Field Sample No./ Identification	Date	Time	Grab	Comp	Sample Container (Size/Mat)	Sample Type (Liquid, Sludge, Etc.)	Preservative	Field Filtered							Lab I.D.	Remarks
Relinquished by: (Print Name)				Date:		Received by: (Print Name)				Date:		Analytical Laboratory (Destination):				
Signature:				Time:		Signature:				Time:						
Relinquished by: (Print Name)				Date:		Received by: (Print Name)				Date:						
Signature:				Time:		Signature:				Time:						
Relinquished by: (Print Name)				Date:		Received by: (Print Name)				Date:						
Signature:				Time:		Signature:				Time:		Serial No.				

# Attachment 3

## Sample Completed Chain-of-Custody

Chain-of-Custody										Control Number: 96H0HC205					
										Date 9 / 3 / 96 Page 1 of 1					
<b>1</b> CTO/DO Manager: Joe Smith CTO/DO Name: Former Navy Landfill CTO/DO Number: CTO 0250 <i>Deliver results to the address above or as stated in contract</i> Cooler No: 413										<b>2</b> Bill To: CLEANRAC Contractor Company: company name Address: Oahu, Hawaii		<b>3</b> Sample Disposed by Lab Shipment Method: Express Courier Comments: PACOV Level D, Measure Cooler Temperature at Lab			
<b>4</b> QC Level: PACOV Level D TAT: Normal - per contract										<b>5</b> container # (water): 1 2 2 1 2 1 2 1					
<b>6</b> Sample ID EPA ID: Sample ID (Very RPT Use Only): HC205 9/6/96 9:35 HC206 9/6/96 9:50 HC207 9/6/96 10:15 HC208 9/6/96 10:25 HC209 9/6/96 10:45 HC210 9/6/96 10:55 HC211 9/6/96 12:50										<b>7</b> Matrix/QC Water Soil Field Duplicate (MS/MSD) Other (drum, sludge, etc.)		<b>8</b> Preservatives: HCL HCL HNO3 TPH 8015R CLP VOA CLP SVOA CLP Pesticides CLP Metals EPA 8080 (PCBs only) EPA 8240 EPA 8270 Total Lead by EPA 6010		<b>9</b> MS/MSD Extra Volume HOLD Total # of Containers	
<b>10</b> Lab Use: Date collected: 9/6/96 Time collected: 9:35 Date collected: 9/6/96 Time collected: 9:50 Date collected: 9/6/96 Time collected: 10:15 Date collected: 9/6/96 Time collected: 10:25 Date collected: 9/6/96 Time collected: 10:45 Date collected: 9/6/96 Time collected: 10:55 Date collected: 9/6/96 Time collected: 12:50										<b>11</b> Lab Use: Date collected: 9/6/96 Time collected: 9:35 Date collected: 9/6/96 Time collected: 9:50 Date collected: 9/6/96 Time collected: 10:15 Date collected: 9/6/96 Time collected: 10:25 Date collected: 9/6/96 Time collected: 10:45 Date collected: 9/6/96 Time collected: 10:55 Date collected: 9/6/96 Time collected: 12:50		<b>12</b> Lab Use: Date collected: 9/6/96 Time collected: 9:35 Date collected: 9/6/96 Time collected: 9:50 Date collected: 9/6/96 Time collected: 10:15 Date collected: 9/6/96 Time collected: 10:25 Date collected: 9/6/96 Time collected: 10:45 Date collected: 9/6/96 Time collected: 10:55 Date collected: 9/6/96 Time collected: 12:50		<b>13</b> Lab Use: Date collected: 9/6/96 Time collected: 9:35 Date collected: 9/6/96 Time collected: 9:50 Date collected: 9/6/96 Time collected: 10:15 Date collected: 9/6/96 Time collected: 10:25 Date collected: 9/6/96 Time collected: 10:45 Date collected: 9/6/96 Time collected: 10:55 Date collected: 9/6/96 Time collected: 12:50	
<b>14</b> Sampler Signature Relinquished By: Received By: Relinquished By: Received By (LAB):										<b>15</b> Date Time Date Time Date Time Date Time Date Time		<b>16</b> Lab Use: Date collected: 9/6/96 Time collected: 9:35 Date collected: 9/6/96 Time collected: 9:50 Date collected: 9/6/96 Time collected: 10:15 Date collected: 9/6/96 Time collected: 10:25 Date collected: 9/6/96 Time collected: 10:45 Date collected: 9/6/96 Time collected: 10:55 Date collected: 9/6/96 Time collected: 12:50			
<b>17</b> Original (white), Lab Copy (yellow), Field Copy (pink)															



## Attachment 4 Sample Out-of-Control Form

<b>OUT OF CONTROL FORM</b>	Status	Date	Initial
	Noted OOC		
	Submit for CA*		
	Resubmit for CA*		
	Completed		

Date Recognized:	By:	<b>Samples Affected</b> (List by Accession AND Sample No.)
Dated Occurred:	Matrix	
Parameter (Test Code):	Method:	
Analyst:	Supervisor:	
1. Type of Event (Check all that apply)	2. Corrective Action (CA)* (Check all that apply)	
<input type="checkbox"/> Calibration Corr. Coefficient <0.995	<input type="checkbox"/> Repeat calibration	
<input type="checkbox"/> %RSD>20%	<input type="checkbox"/> Made new standards	
<input type="checkbox"/> Blank >MDL	<input type="checkbox"/> Reran analysis	
<input type="checkbox"/> Does not meet criteria:	<input type="checkbox"/> Sample(s) redigested and rerun	
<input type="checkbox"/> Spike	<input type="checkbox"/> Sample(s) reextracted and rerun	
<input type="checkbox"/> Duplicate	<input type="checkbox"/> Recalculated	
<input type="checkbox"/> LCS	<input type="checkbox"/> Cleaned system	
<input type="checkbox"/> Calibration Verification	<input type="checkbox"/> Ran standard additions	
<input type="checkbox"/> Standard Additions	<input type="checkbox"/> Notified	
<input type="checkbox"/> MS/MSD	<input type="checkbox"/> Other (please explain)	
<input type="checkbox"/> BS/BSD		
<input type="checkbox"/> Surrogate Recovery		
<input type="checkbox"/> Calculations Error		
<input type="checkbox"/> Holding Times Missed		
<input type="checkbox"/> Other (Please explain)	Comments:	

<b>3. Results of Corrective Action</b>	
<input type="checkbox"/>	Return to Control (indicated with)
<input type="checkbox"/>	Corrective Actions Not Successful - DATA IS TO BE FLAGGED with _____.

Analyst:	Date:
Supervisor:	Date:
QA Department:	Date:

## Sample Handling, Storage, and Shipping

### Procedure 3-04

#### 1.0 Purpose and Scope

- 1.1 This standard operating procedure describes the actions to be used by personnel engaged in handling, storing, and transporting samples. The objective is to obtain samples of actual conditions with as little alteration as possible.
- 1.2 As guidance for specific activities, this procedure does not obviate the need for professional judgment. Deviations from this procedure while planning or executing planned activities must be approved in accordance with Program requirements for technical planning and review.

#### 2.0 Safety

- 2.1 Avoid lifting heavy coolers with back muscles; instead, use leg muscles or dollies.
- 2.2 Wear proper gloves, such as blue nitrile and latex, as defined in the project-specific health and safety plan, when handling sample containers to avoid contacting any materials that may have spilled out of the sample containers.

#### 3.0 Terms and Definitions

None.

#### 4.0 Training and Qualifications

- 4.1 The **Project Manager** and the **Laboratory Project Manager** are responsible for identifying instances of non-compliance with this procedure and ensuring that future sample transport activities comply with this procedure.
- 4.2 The **Field Manager** is responsible for ensuring that all samples are shipped according to this procedure.
- 4.3 **Field personnel** are responsible for the implementation of this procedure.
- 4.4 The **Program Quality Manager** is responsible for ensuring that sample handling, storage, and transport activities conducted during all CTOs comply with this procedure.
- 4.5 All **field personnel** are responsible for the implementation of this procedure.

#### 5.0 Procedure

##### 5.1 Handling and Storage

Immediately following collection, label all samples according to Procedure 3-03, *Recordkeeping, Sample Labeling, and Chain-of-Custody*. The lids of the containers shall not be sealed with duct tape, but may be covered with custody seals or placed directly into self-sealing bags. Place the sample containers in an insulated cooler with frozen gel packs (e.g., “blue ice”) or ice in double, sealed self-sealing bags. Samples should occupy the lower portion of the cooler, while the ice should occupy the upper portion. Place an absorbent material (e.g., proper absorbent cloth material) on the bottom of the cooler to contain liquids in case of spillage. Fill all empty space between sample containers with Styrofoam® “peanuts” or other

appropriate material. Prior to shipping, wrap glass sample containers on the sides, tops, and bottoms with bubble wrap or other appropriate padding and/or surround them in Styrofoam to prevent breakage during transport. Pack all glass containers for water samples in an upright position, never stacked or on their sides. Prior to shipment, replace the ice or cold packs in the coolers so that samples will be maintained as close to 4 degrees Celsius (°C) as possible from the time of collection through transport to the analytical laboratory. Ship samples within 24 hours or on a schedule allowing the laboratory to meet holding times for analyses. The procedures for maintaining sample temperatures at 4°C pertain to all field samples.

## 5.2 Shipping

Follow all appropriate U.S. Department of Transportation regulations (e.g., 49 Code of Federal Regulations [CFR], Parts 171-179) for shipment of air, soil, water, and other samples. Elements of these procedures are summarized below.

### 5.2.1 Hazardous Materials Shipment

**Field personnel** must state whether any sample is suspected to be a hazardous material. A sample should be assumed hazardous unless enough evidence exists to indicate it is non-hazardous. If not suspected to be hazardous, shipments may be made as described in the Section 5.2.2 for non-hazardous materials. If hazardous, follow the procedures summarized below.

Any substance or material that is capable of posing an unreasonable risk to life, health, or property when transported is classified as hazardous. Perform hazardous materials identification by checking the list of dangerous goods for that particular mode of transportation. If not on that list, materials can be classified by checking the Hazardous Materials Table (49 CFR 172.102 including Appendix A) or by determining if the material meets the definition of any hazard class or division (49 CFR Part 173), as listed in Attachment 2.

All **persons shipping hazardous materials** must be properly trained in the appropriate regulations, as required by HM-126F, Training for Safe Transportation of Hazardous Materials (49 CFR HM-126F Subpart H). The training covers loading, unloading, handling, storing, and transporting of hazardous materials, as well as emergency preparedness in the case of accidents. **Carriers**, such as commercial couriers, must also be trained. Modes of shipment include air, highway, rail, and water.

When shipping hazardous materials, including bulk chemicals or samples suspected of being hazardous, the proper shipping papers (49 CFR 172 Subpart C), package marking (49 CFR 172 Subpart D), labeling (49 CFR 172 Subpart E), placarding (49 CFR 172 Subpart F, generally for carriers), and packaging must be used. Attachment 1 shows an example of proper package markings. Refer to a copy of 49 CFR each time hazardous materials/potentially hazardous samples are shipped.

According to Section 2.7 of the International Air Transport Association Dangerous Goods Regulations publication, very small quantities of certain dangerous goods may be transported without certain marking and documentation requirements as described in 49 CFR Part 172; however, other labeling and packing requirements must still be followed. Attachment 2 shows the volume or weight for different classes of substances. A "Dangerous Goods in Excepted Quantities" label must be completed and attached to the associated shipping cooler (Attachment 3). Certain dangerous goods are not allowed on certain airlines in any quantity.

As stated in item 4 of Attachment 4, the Hazardous Materials Regulations do not apply to hydrochloric acid (HCl), nitric acid (HNO<sub>3</sub>), sulfuric acid (H<sub>2</sub>SO<sub>4</sub>), and sodium hydroxide (NaOH) added to water samples if their pH or percentage by weight criteria is met. These samples may be shipped as non-hazardous materials as discussed below.



### 5.2.2 Non-Hazardous Materials Shipment

If the samples are suspected to be non-hazardous based on previous site sample results, field screening results, or visual observations, if applicable, then samples may be shipped as non-hazardous.

When a cooler is ready for shipment to the laboratory, place two copies of the chain-of-custody form inside a self-sealing bag and tape it to the inside of the insulated cooler. Then, seal the cooler with waterproof tape and label it with "Fragile," "This-End-Up" (or directional arrows pointing up), or other appropriate notices. Place chain-of-custody seals on the coolers as discussed in Procedure 3-03, *Recordkeeping, Sample Labeling, and Chain-of-Custody*.

### 5.2.3 Shipments from Outside the Continental United States

Shipment of sample coolers to the United States from locations outside the continental United States is controlled by the U.S. Department of Agriculture (USDA) and is subject to their inspection and regulation. A "USDA Soil Import Permit" is required to prove that the receiving analytical laboratory is certified by the USDA to receive and properly dispose of soil. In addition, all sample coolers must be inspected by a **USDA representative**, affixed with a label indicating that the coolers contain environmental samples, and accompanied by shipping forms stamped by the **USDA inspector** prior to shipment.

In addition, the U.S. Customs Service must clear samples shipped from U.S. territorial possessions or foreign countries upon entry into the United States. As long as the commercial invoice is properly completed (see below), shipments typically pass through U.S. Customs Service without the need to open coolers for inspection.

Completion and use of proper paperwork will, in most cases, minimize or eliminate the need for the USDA and U.S. Customs Service to inspect the contents. Attachment 5 shows an example of how paperwork may be placed on the outside of coolers for non-hazardous materials. For hazardous materials, refer to Section 5.2.1.

In summary, tape the paperwork listed below to the outside of the coolers to accompany sample shipments. If a shipment is made up of multiple pieces (e.g., more than one cooler), the paperwork need only be attached to one cooler, provided that the **courier** agrees. All other coolers in the shipment need only to be taped and have the address and chain-of-custody seals affixed.

1. **Courier Shipping Form & Commercial Invoice:** See Attachment 6 and Attachment 7 for examples of the information to be included on the commercial invoices for soil and water, respectively. Place the courier shipping form and commercial invoice inside a clear, plastic, adhesive-backed pouch that adheres to the package (typically supplied by the courier) and place it on the cooler lid as shown in Attachment 5.
2. **Soil Import Permit (soil only):** See Attachment 8 and Attachment 9 for examples of the soil import permit and soil samples restricted entry labels, respectively. The **laboratory** shall supply these documents prior to mobilization. The USDA often stops shipments of soil without these documents. Staple together the 2-inch × 2-inch USDA label (described below) and soil import permit, and place them inside a clear plastic pouch. The **courier** typically supplies the clear, plastic, adhesive-backed pouches that adhere to the package.

Placing one restricted entry label as shown in Attachment 5 (covered with clear packing tape) and one stapled to the actual permit is suggested.

The USDA does not control water samples, so the requirements for soil listed above do not apply.



3. **Chain-of-Custody Seals:** The **laboratory** should supply the seals. **CTO personnel** must sign and date these. At least two seals should be placed in such a manner that they stick to both the cooler lid and body. Placing the seals over the tape (as shown in Attachment 5), then covering it with clear packing tape is suggested. This prevents the seal from coming loose and enables detection of tampering.
4. **Address Label:** Affix a label stating the destination (laboratory address) to each cooler.
5. **Special Requirements for Hazardous Materials:** See Section 5.2.1.

Upon receipt of sample coolers at the laboratory, the **sample custodian** shall inspect the sample containers as discussed in Procedure 3-03, *Recordkeeping, Sample Labeling, and Chain-of-Custody*. The samples shall then be immediately extracted and/or analyzed, or stored in a refrigerated storage area until they are removed for extraction and/or analysis. Whenever the samples are not being extracted or analyzed, they shall be returned to refrigerated storage.

## 6.0 Quality Control and Assurance

- 6.1 Sample handling, storage, and shipping must incorporate quality control measures to ensure conformance to these and the project requirements.

## 7.0 Records, Data Analysis, Calculations

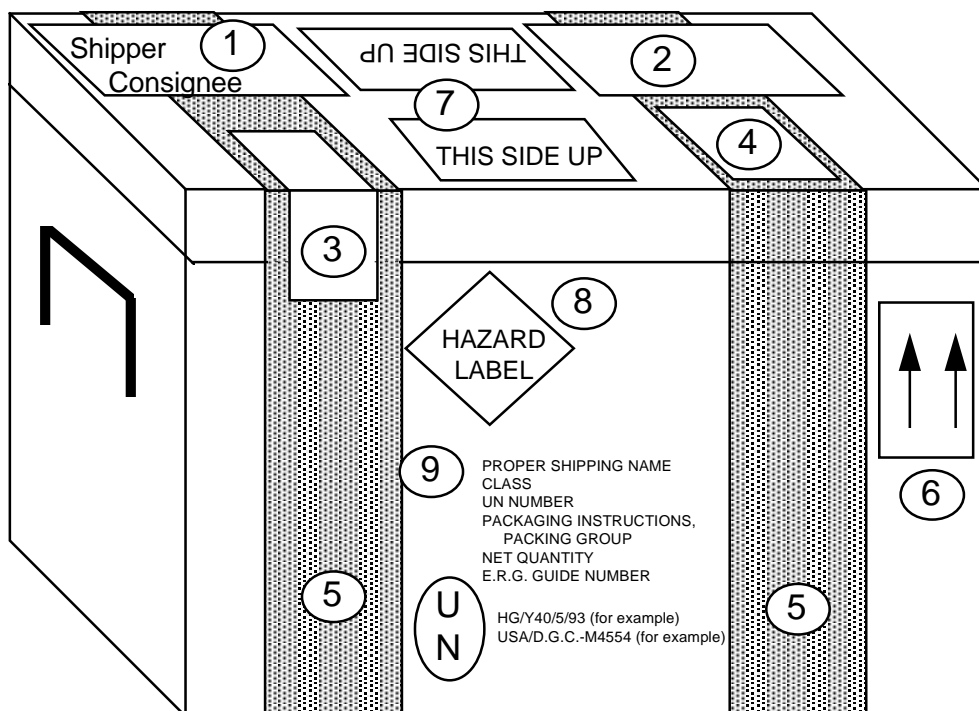
- 7.1 Maintain records as required by implementing these procedures.
- 7.2 Deviations from this procedure or the project-specific sampling and analysis plan shall be documented in field records. Significant changes shall be approved by the **Program Quality Manager**.

## 8.0 Attachments or Reference

- 8.1 Attachment 1 – Example Hazardous Material Package Marking
- 8.2 Attachment 2 – Packing Groups
- 8.3 Attachment 3 – Label for Dangerous Goods in Excepted Quantities
- 8.4 Attachment 4 – SW-846 Preservative Exception
- 8.5 Attachment 5 – Non-Hazardous Material Cooler Marking Figure for Shipment from Outside the Continental United States
- 8.6 Attachment 6 – Commercial Invoice – Soil
- 8.7 Attachment 7 – Commercial Invoice – Water
- 8.8 Attachment 8 – Soil Import Permit
- 8.9 Attachment 9 – Soil Samples Restricted Entry Labels
- 8.10 EM 200-1-6, *Chemical Quality Assurance for HTRW Projects*, October 1997.
- 8.11 NAVSEA T0300-AZ-PRO-010. *Navy Environmental Compliance Sampling and Field Testing Procedures Manual*. August 2009.
- 8.12 Procedure 3-03, *Recordkeeping, Sample Labeling, and Chain-of-Custody*.

## Attachment 1

### Example Hazardous Material Package Marking



- |  |   |
|--|---|
| 1 AIR BILL/COMMERCIAL INVOICE                  | 6 DIRECTION ARROWS STICKER - TWO REQUIRED |
| 2 USDA PERMIT (Letter to Laboratory from USDA) | 7 THIS SIDE UP STICKERS                   |
| 3 CUSTODY SEAL                                 | 8 HAZARD LABEL                            |
| 4 USDA 2" X 2" SOIL IMPORT PERMIT              | 9 HAZARDOUS MATERIAL INFORMATION          |
| 5 WATERPROOF STRAPPING TAPE                    | 10 PACKAGE SPECIFICATIONS                 |



## Attachment 2

### Packing Groups

PACKING GROUP OF THE SUBSTANCE	PACKING GROUP I		PACKING GROUP II		PACKING GROUP III	
CLASS or DIVISION of PRIMARY or SUBSIDIARY RISK	Packagings		Packagings		Packagings	
	Inner	Outer	Inner	Outer	Inner	Outer
1: Explosives	Forbidden <sup>(Note A)</sup>					
2.1: Flammable Gas	Forbidden <sup>(Note B)</sup>					
2.2: Non-Flammable, non-toxic gas	See Notes A and B					
2.3: Toxic gas	Forbidden <sup>(Note A)</sup>					
3: Flammable liquid	30 mL	300 mL	30 mL	500 mL	30 mL	1 L
4.1 Self-reactive substances	Forbidden		Forbidden		Forbidden	
4.1: Other flammable solids	Forbidden		30 g	500 g	30 g	1 kg
4.2: Pyrophoric substances	Forbidden		Not Applicable		Not Applicable	
4.2 Spontaneously combustible substances	Not Applicable		30 g	500 g	30 g	1 kg
4.3: Water reactive substances	Forbidden		30 g or 30 mL	500 g or 500 mL	30 g or 30 mL	1 kg or 1 L
5.1: Oxidizers	Forbidden		30 g or 30 mL	500 g or 500 mL	30 g or 30 mL	1 kg or 1 L
5.2: Organic peroxides <sup>(Note C)</sup>	See Note A		30 g or 30 mL	500 g or 250 mL	Not Applicable	
6.1: Poisons - Inhalation toxicity	Forbidden		1 g or 1 mL	500 g or 500 mL	30 g or 30 mL	1 kg or 1 L
6.1: Poisons - oral toxicity	1 g or 1 mL	300 g or 300 mL	1 g or 1 mL	500 g or 500 mL	30 g or 30 mL	1 kg or 1 L
6.1: Poisons - dermal toxicity	1 g or 1 mL	300 g or 300 mL	1 g or 1 mL	500 g or 500 mL	30 g or 30 mL	1 kg or 1 L
6.2: Infectious substances	Forbidden <sup>(Note A)</sup>					
7: Radioactive material <sup>(Note D)</sup>	Forbidden <sup>(Note A)</sup>					
8: Corrosive materials	Forbidden		30 g or 30 mL	500 g or 500 mL	30 g or 30 mL	1 kg or 1 L
9: Magnetized materials	Forbidden <sup>(Note A)</sup>					
9: Other miscellaneous materials <sup>(Note E)</sup>	Forbidden		30 g or 30 mL	500 g or 500 mL	30 g or 30 mL	1 kg or 1 L

**Note A:** Packing groups are not used for this class or division.

**Note B:** For inner packagings, the quantity contained in receptacle with a water capacity of 30 mL. For outer packagings, the sum of the water capacities of all the inner packagings contained must not exceed 1 L.

**Note C:** Applies only to Organic Peroxides when contained in a chemical kit, first aid kit or polyester resin kit.

**Note D:** See 6.1.4.1, 6.1.4.2, and 6.2.1.1 through 6.2.1.7, radioactive material in excepted packages.

**Note E:** For substances in Class 9 for which no packing group is indicated in the List of Dangerous Goods, Packing Group II quantities must be used.



## Attachment 3

### Dangerous Goods in Excepted Quantities

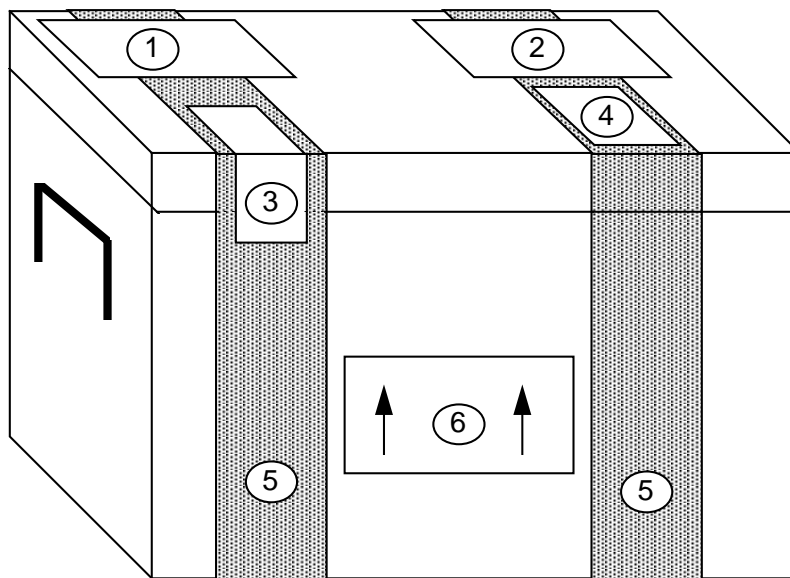
DANGEROUS GOODS IN EXCEPTED QUANTITIES							
This package contains dangerous goods in excepted small quantities and is in all respects in compliance with the applicable international and national government regulations and the IATA Dangerous Goods Regulations.							
<hr/>							
Signature of Shipper							
<hr/>				<hr/>			
Title				Date			
<hr/>							
Name and address of Shipper							
This package contains substance(s) in Class(es) (check applicable box(es))							
Class:	2	3	4	5	6	8	9
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
and the applicable UN Numbers are:							

## Attachment 4

### SW-846 Preservative Exception

Measurement	Vol. Req. (mL)	Container <sup>2</sup>	Preservative <sup>3,4</sup>	Holding Time <sup>5</sup>
MBAS	250	P, G	Cool, 4°C	48 Hours
NTA	50	P, G	Cool, 4°C	24 Hours

1. More specific instructions for preservation and sampling are found with each procedure as detailed in this manual. A general discussion on sampling water and industrial wastewater may be found in ASTM, Part 31, p. 72-82 (1976) Method D-3370.
  2. Plastic (P) or Glass (G). For metals, polyethylene with a polypropylene cap (no liner) is preferred.
  3. Sample preservation should be performed immediately upon sample collection. For composite samples each aliquot should be preserved at the time of collection. When use of an automated sampler makes it impossible to preserve each aliquot, then samples may be preserved by maintaining at 4°C until compositing and sample splitting is completed.
4. When any sample is to be shipped by common carrier or sent through the United States Mail, it must comply with the Department of Transportation Hazardous Materials Regulations (49 CFR Part 172). The person offering such material for transportation is responsible for ensuring such compliance. for the preservation requirements of Table 1, the Office of Hazardous Materials, Materials Transportation Bureau, Department of Transportation has determined that the Hazardous Materials regulations do not apply to the following materials: Hydrochloric acid (HCl) in water solutions at concentration of 0.04% by weight or less (pH about 1.96 or greater); Nitric acid (HNO<sub>3</sub>) in water solutions at concentrations of 0.15% by weight or less (pH about 1.62 or greater); Sulfuric acid (H<sub>2</sub>SO<sub>4</sub>) in water solutions at concentrations of 0.35% by weight or less (pH about 1.15 or greater); Sodium hydroxide (NaOH) in water solutions at concentrations of 0.080% by weight or less (pH about 12.30 or less).
5. Samples should be analyzed as soon as possible after collection. The times listed are the maximum times that samples may be held before analysis and still considered valid. Samples may be held for longer periods only if the permittee, or monitoring laboratory, has data on file to show that the specific types of sample under study are stable for the longer time, and has received a variance from the Regional Administrator. Some samples may not be stable for the maximum time period given in the table. A permittee, or monitoring laboratory, is obligated to hold the sample for a shorter time if knowledge exists to show this is necessary to maintain sample stability.
  6. Should only be used in the presence of residual chlorine.

**Attachment 5****Non-Hazardous Material Cooler Marking Figure for Shipment  
from Outside the Continental United States**

- ① AIR BILL/COMMERCIAL INVOICE
- ② USDA PERMIT (Letter to Laboratory from USDA)
- ③ CUSTODY SEAL
- ④ USDA 2" X 2" SOIL IMPORT PERMIT
- ⑤ WATERPROOF STRAPPING TAPE
- ⑥ DIRECTION ARROWS STICKER - TWO REQUIRED



## Attachment 6

### Commercial Invoice – Soil

DATE OF EXPORTATION 1/1/94				EXPORT REFERENCES (i.e., order no., invoice no., etc.) <CTO #>					
SHIPPER/EXPORTER (complete name and address) Joe Smith Ogden c/o <hotel name> <hotel address>				CONSIGNEE Sample Receipt <Lab Name> <Lab Address>					
COUNTRY OF EXPORT Guam, USA				IMPORTER - IF OTHER THAN CONSIGNEE					
COUNTRY OF ORIGIN OF GOODS Guam, USA									
COUNTRY OF ULTIMATE DESTINATION USA									
INTERNATIONAL AIR WAYBILL NO.				<div style="border: 1px solid black; width: 200px; height: 30px; margin: 0 auto;"></div> (NOTE: All shipments must be accompanied by a Federal Express International Air Waybill)					
MARKS/NOS	NO. OF PKGS	TYPE OF PACKAGING	FULL DESCRIPTION OF GOODS	QT Y	UNIT OF MEASURE	WEIGHT	UNIT VALUE	TOTAL VALUE	
	3	cooler	Soil samples for laboratory analysis				\$1.00	\$3.00	
		TOTAL NO. OF PKGS.					TOTAL WEIGHT		TOTAL INVOICE VALUE
		3							\$3.00
<div style="text-align: right;">Check one <input type="checkbox"/> F.O.B. <input type="checkbox"/> C&amp;F <input type="checkbox"/> C.I.F.</div>									

THESE COMMODITIES ARE LICENSED FOR THE ULTIMATE DESTINATION SHOWN.

DIVERSION CONTRARY TO UNITED STATES LAW IS PROHIBITED.

I DECLARE ALL THE INFORMATION CONTAINED IN THIS INVOICE TO BE TRUE AND CORRECT

SIGNATURE OF SHIPPER/EXPORTER (Type name and title and sign)

Joe Smith, Ogden

**Joe Smith**

**1/1/94**

\_\_\_\_\_  
Name/Title

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Date





## Attachment 7

### Commercial Invoice – Water

DATE OF EXPORTATION 1/1/94			EXPORT REFERENCES (i.e., order no., invoice no., etc.) <CTO #>					
SHIPPER/EXPORTER (complete name and address) Joe Smith Ogden c/o <hotel name> <hotel address>			CONSIGNEE Sample Receipt <Lab Name> <Lab Address>					
COUNTRY OF EXPORT Guam, USA			IMPORTER - IF OTHER THAN CONSIGNEE					
COUNTRY OF ORIGIN OF GOODS Guam, USA								
COUNTRY OF ULTIMATE DESTINATION USA								
INTERNATIONAL AIR WAYBILL NO.			<div style="border: 1px solid black; width: 150px; height: 30px; margin: 0 auto;"></div>			(NOTE: All shipments must be accompanied by a Federal Express International Air Waybill)		
MARKS/NOS	NO. OF PKGS	TYPE OF PACKAGING	FULL DESCRIPTION OF GOODS	QT Y	UNIT OF MEASURE	WEIGHT	UNIT VALUE	TOTAL VALUE
	3	coolers	Water samples for lab analysis only				\$1.00	\$3.00
	TOTAL NO. OF PKGS.					TOTAL WEIGHT		TOTAL INVOICE VALUE
	3							\$3.00
<div>Check one <input type="checkbox"/> F.O.B. <input type="checkbox"/> C&amp;F <input type="checkbox"/> C.I.F.</div>								

THESE COMMODITIES ARE LICENSED FOR THE ULTIMATE DESTINATION SHOWN.

DIVERSION CONTRARY TO UNITED STATES LAW IS PROHIBITED.

I DECLARE ALL THE INFORMATION CONTAINED IN THIS INVOICE TO BE TRUE AND CORRECT


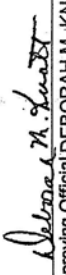
SIGNATURE OF SHIPPER/EXPORTER (Type name and title and sign)

Joe Smith, Ogden

Joe Smith

1/1/94

# Attachment 8 Soil Import Permit

 <p><b>UNITED STATES DEPARTMENT OF AGRICULTURE</b>  Animal and Plant Health Inspection Service</p>	<p><b>Soil Permit</b></p>	<p>Permit Number: <u>S-52299</u></p>	<p>Columbia Analytical Services (Lee Wolf) 1317 S. 13th Avenue Kelso, Washington 98626 TELEPHONE: (360) 577-7222</p> <p><b>Issued To:</b></p> <p>Under the authority of the Federal Plant Pest Act of May 23, 1957, permission is hereby granted to the facility/individual named above subject to the following conditions:</p> <ol style="list-style-type: none"> <li>1. Valid for shipments of soil not heat treated at the port of entry, only if a compliance agreement (PPQ Form 519) has been completed and signed. Compliance Agreements and Soil permits are non-transferable. If you hold a Soil Permit and you leave your present employer or company, you must notify your local USDA office promptly.</li> <li>2. To be shipped in sturdy, leakproof, containers.</li> <li>3. To be released without treatment at the port of entry.</li> <li>4. To be used only for analysis and only in the facility of the permittee at Columbia Analytical Services, located in Kelso, Washington.</li> <li>5. No use of soil for growing purposes is authorized, including the isolation or culture of organisms imported in soil.</li> <li>6. All unconsumed soil, containers, and effluent is to be autoclaved, incinerated, or heat treated by the permittee at the conclusion of the project as approved and prescribed by Plant Protection and Quarantine.</li> <li>7. This permit authorizes shipments from all foreign sources, including Guam, Hawaii, Puerto Rico, and the U.S. Virgin Islands through any U.S. port of entry.</li> </ol>
<p><b>Plant Protection and Quarantine</b></p>		<p>JUNE 30, 2006 Expiration Date</p> <p style="text-align: right;">               Approving Official DEBORAH M. KNOTT           </p>	
<p><b>WARNING:</b> Any alteration, forgery, or unauthorized use of this Federal form is subject to civil penalties of up to \$250,000 (7 U.S.C. s 7734(b)) or punishable by a fine of not more than \$10,000, or imprisonment of not more than 5 years, or both (18 U.S.C. s 1001).</p>			

PPQ FORM 525B (8/94)

Pt. 1 - PERMITTEE



## Attachment 9

### Soil Samples Restricted Entry Labels

<p><b>U.S. DEPARTMENT OF AGRICULTURE</b></p> <p><b>ANIMAL AND PLANT HEALTH INSPECTION</b></p> <p><b>SERVICE</b></p> <p><b>PLANT PROTECTION AND QUARANTINE</b></p> <p><b>HYATTSVILLE, MARYLAND 20782</b></p> <p><b>SOIL SAMPLES</b></p> <p><b>RESTRICTED ENTRY</b></p> <p>The material contained in this package is imported under authority of the Federal Plant Pest Act of May 23, 1957.</p> <p>For release without treatment if addressee is currently listed as approved by Plant Protection and Quarantine.</p> <p>PPQ FORM 550      <i>Edition of 12/77 may be used</i></p> <p>(JAN 83)</p>
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# Investigation Derived Waste Management

## Procedure 3-05

### 1.0 Purpose and Scope

This standard operating procedure (SOP) describes activities and responsibilities of AECOM personnel responsible for the management of investigation-derived waste (IDW). The purpose of this procedure is to provide guidance for the minimization, handling, labelling, temporary storage, inventory, classification, and disposal of IDW generated during field activities. This procedure will also apply to personal protective equipment (PPE), sampling equipment, decontamination fluids, non-IDW trash, non-indigenous IDW, and hazardous waste generated during implementation of removal or remedial actions. The information presented will be used to prepare and implement work plans (WPs) for IDW-related field activities. The results from implementation of WPs will then be used to develop and implement final IDW disposal plans.

If there are procedures whether it be from AECOM, state and/or federal that are not addressed in this SOP and are applicable to IDW then those procedures may be added as an appendix to the project specific SAP.

This procedure shall serve as management-approved professional guidance for AECOM fieldwork and is consistent with protocol in the Uniform Federal Policy-Quality Assurance Project Plan (DoD 2005). As professional guidance for specific activities, this procedure is not intended to obviate the need for professional judgment during unforeseen circumstances. Deviations from this procedure while planning or executing planned activities must be approved by both the Project Manager and the Quality Assurance (QA) Manager or Technical Director, and documented.

### 2.0 Safety

The health and safety considerations for the work associated with this SOP, including both potential physical and chemical hazards, will be addressed in the project Accident Prevention Plan/Site-specific Safety and Health Plan (APP/SSHP).

All **Field Personnel** responsible for IDW management must adhere to the APP/SSHP and must wear the PPE specified in the site-specific APP/SSHP. Generally, this includes, at a minimum, steel-toed boots or steel-toed rubber boots, safety glasses, American National Standards Institute-standard hard hats, and hearing protection (if heavy equipment is in operation). If safe alternatives are not achievable, discontinue site activities immediately.

### 3.0 Terms and Definitions

None.

### 4.0 Training and Qualifications

4.1 The **Project Manager** is responsible for ensuring that IDW management activities comply with this procedure. The **Project Manager** is responsible for ensuring that all personnel involved in IDW management shall have the appropriate education, experience, and training to perform their assigned tasks.

4.2 The **Program Quality Manager** is responsible for ensuring overall compliance with this procedure.

4.3 The **Field Manager** is responsible for ensuring that all IDW is managed according to this procedure.

4.4 All **Field Personnel** are responsible for the implementation of this procedure.

## 5.0 Equipment and Supplies

The equipment and supplies required for implementation of this SOP include the following:

- Containers for waste (e.g., [U.S. Department of Transportation] DOT approved 55-gallon open and closed top drums) and material to cover waste to protect from weather (e.g., plastic covering);
- Hazardous /non-hazardous waste drum labels (weatherproof);
- Permanent marking pens;
- Inventory forms for project file;
- Plastic garbage bags, zip lock storage bags, roll of plastic sheeting; and
- Steel-toed boots, chemical resistant gloves, coveralls, safety glasses, and any other PPE required in the HASP.

## 6.0 Procedure

The following procedures are used to handle the IDW.

### 6.1 Drum Handling

- 6.1.1 IDW shall be containerized using DOT approved drums. The drums shall be made of steel or plastic, have a 55-gallon capacity, be completely painted or opaque, and have removable lids (i.e., United Nations Code 1A2 or 1H2). Typically 55-gallon drums are used, however small drums may be used depending on the amount of waste generated. New steel drums are preferred over recycled drums.
- 6.1.2 Recycled drums should not be used for hazardous waste, PCBs or other regulated shipments. For short-term storage of liquid IDW prior to discharge, double-walled bulk steel or plastic storage tanks may be used. For this scenario, consider the scheduling and cost-effectiveness of this type of bulk storage, treatment, and discharge system versus longer-term drum storage.
- 6.1.3 For long-term IDW storage at other project locations, the DOT approved drums with removable lids are recommended. Verify the integrity of the foam or rubber sealing ring located on the underside of some drum lids prior to sealing drums containing IDW liquids.
- 6.1.4 If the ring is only partially attached to the drum lid, or if a portion of the ring is missing, select another drum lid with a sealing ring that is in sound condition.
- 6.1.5 To prepare IDW drums for labeling, wipe clean the outer wall surfaces and drum lids of all material that might prevent legible and permanent labeling. If potentially contaminated material adheres to the outer surface of a drum, wipe that material from the drum, and segregate the paper towel or rag used to remove the material with visibly soiled PPE and disposable sampling equipment. Label all IDW drums and place them on pallets prior to storage.

### 6.2 Labelling

- 6.2.1 Containers used to store IDW must be properly labelled. Two general conditions exist: 1) from previous studies or on-site data, waste characteristics are known to be either hazardous or nonhazardous; or 2) waste characteristics are unknown until additional data are obtained.
- 6.2.2 For situations where the waste characteristics are known, the waste containers should be packaged and labelled in accordance with state regulations and any federal regulations that may govern the labelling of waste.
- 6.2.3 The following information shall be placed on all non-hazardous waste labels:
- Description of waste (i.e., purge water, soil cuttings);
  - Contact information (i.e., contact name and telephone number);
  - Date when the waste was first accumulated.
- 6.2.4 The following information shall be placed on all hazardous waste labels:
- Description of waste (i.e., purge water, soil cuttings);
  - Generator information (i.e., name, address, contact telephone number);
  - EPA identification number (supplied by on-site client representative);
  - Date when the waste was first accumulated.
- 6.2.5 When the final characterization of a waste is unknown, a notification label should be placed on the drum with the words "waste characterization pending analysis" and the following information included on the label:
- Description of waste (i.e., purge water, soil cuttings);
  - Contact information (i.e., contact name and telephone number);
  - Date when the waste was first accumulated.
- 6.2.6 Once the waste has been characterized, the label should be changed as appropriate for a nonhazardous or hazardous waste.
- 6.2.7 Waste labels should be constructed of a weatherproof material and filled out with a permanent marker to prevent being washed off or becoming faded by sunlight. It is recommended that waste labels be placed on the side of the container, since the top is more subject to weathering. However, when multiple containers are accumulated together, it also may be helpful to include labels on the top of the containers to facilitate organization and disposal.
- 6.2.8 Each container of waste generated shall be recorded in the field notebook used by the person responsible for labelling the waste. After the waste is disposed of, either by transportation off-site or disposal on-site in an approved disposal area, an appropriate record shall be made in the same field notebook to document proper disposition of IDW.

### 6.3 **Types of Site Investigation Waste**

Several types of waste are generated during site investigations that may require special handling. These include solid, liquid, and used PPE, as discussed further below.

### Solid Waste

Soil cuttings from boreholes will typically be placed in containers unless site specific requirements allow for soil cuttings to be placed back into the borehole after drilling is complete. Drilling mud generated during investigation activities shall be collected in containers. Covers should be included on the containers and must be secured at all times and only open during filling activities. The containers shall be labelled in accordance with this SOP. An inventory containing the source, volume, and description of material put in the containers shall be logged on prescribed forms and kept in the project file.

Non-hazardous solid waste can be disposed on-site in the designated site landfill or in a designated evaporation pond if it is liquefied. Hazardous wastes must be disposed off-site at an approved hazardous waste landfill.

### Liquid Waste

Groundwater generated during monitoring well development, purging, and sampling can be collected in truck-mounted containers and/or other transportable containers (i.e., 55-gallon drums). Lids or bungs on drums must be secured at all times and only open during filling or pumping activities. The containers shall be labelled in accordance with this SOP. Non-hazardous liquid waste can be disposed of in one of the designated lined evaporation ponds on-site. Hazardous wastes must be handled separately and disposed off-site at an approved hazardous waste facility.

### Personal Protective Equipment

PPE that is generated throughout investigation activities shall be placed in plastic garbage bags. If the solid or liquid waste that was being handled is characterized as hazardous waste, then the corresponding PPE should also be disposed as hazardous waste. If not, all PPE should be disposed as non-hazardous waste in the designated on-site landfill. Trash that is generated as part of field activities may be disposed of in the landfill as long as the trash was not exposed to hazardous media.

## 6.4

### **Waste Accumulation On-Site**

- 6.4.1 Solid, liquid, or PPE waste generated during investigation activities that are classified as nonhazardous or "characterization pending analysis" should be disposed of as soon as possible. Until disposal, such containers should be inventoried, stored as securely as possible, and inspected regularly, as a general good practice.
- 6.4.2 Solid, liquid, or PPE waste generated during investigation activities that are classified as hazardous shall not be accumulated on-site longer than 90 days. All hazardous waste containers shall be stored in a secured storage area. The following requirements for the hazardous waste storage area must be implemented:
  - Proper hazardous waste signs shall be posted as required by any state or federal statutes that may govern the labelling of waste;
  - Secondary containment to contain spills;
  - Spill containment equipment must be available;
  - Fire extinguisher;
  - Adequate aisle space for unobstructed movement of personnel.

- 6.4.3 Weekly storage area inspections shall be performed and documented to ensure compliance with these requirements. Throughout the project, an inventory shall be maintained to itemize the type and quantity of the waste generated.

## 6.5 Waste Disposal

- 6.5.1 Solid, liquid, and PPE waste will be characterized for disposal through the use of client knowledge, laboratory analytical data created from soil or groundwater samples gathered during the field activities, and/or composite samples from individual containers.
- 6.5.2 All waste generated during field activities will be stored, transported, and disposed of according to applicable state, federal, and local regulations. All wastes classified as hazardous will be disposed of at a licensed treatment storage and disposal facility or managed in other approved manners.
- 6.5.3 In general, waste disposal should be carefully coordinated with the facility receiving the waste. Facilities receiving waste have specific requirements that vary even for non-hazardous waste, so characterization should be conducted to support both applicable regulations and facility requirements.

## 6.6 Regulatory Requirements

The following federal and state regulations shall be used as resources for determining waste characteristics and requirements for waste storage, transportation, and disposal:

- Code of Federal Regulations (CFR), Title 40, Part 261;
- CFR, Title 49, Parts 172, 173, 178, and 179.

## 6.7 Waste Transport

A state-certified hazardous waste hauler shall transport all wastes classified as hazardous. Typically, the facility receiving any waste can coordinate a hauler to transport the waste. Shipped hazardous waste shall be disposed of in accordance with all RCRA/USEPA requirements. All waste manifests or bills of lading will be signed either by the client or the client's designee.

## 7.0 Quality Control and Assurance

- 7.1 Management of IDW must incorporate quality control measures to ensure conformance to these and the project requirements.

## 8.0 Records, Data Analysis, Calculations

- 8.1 Maintain records as required by implanting the procedures in this SOP.
- 8.2 Deviations from this procedure or the sampling and analysis plan shall be documented in field records. Significant changes shall be approved by the **Program Quality Manager**.

## 9.0 Attachments or References

Department of Defense, United States (DoD). 2005. [Uniform Federal Policy for Quality Assurance Project Plans, Part 1: UFP-QAPP Manual](http://www.epa.gov/fedfac/pdf/ufp_qapp_v1_0305.pdf). Final Version 1. DoD: DTIC ADA 427785, EPA-505-B-04-900A. In conjunction with the U. S. Environmental Protection Agency and the Department of Energy. Washington: Intergovernmental Data Quality Task Force. March. On-line updates available at: [http://www.epa.gov/fedfac/pdf/ufp\\_qapp\\_v1\\_0305.pdf](http://www.epa.gov/fedfac/pdf/ufp_qapp_v1_0305.pdf).



Department of Energy, United States (DOE). 1994. [The Off-Site Rule](#). EH-231-020/0194. Office of Environmental Guidance. March.

1999. *Management of Remediation Waste under the Resource Conservation and Recovery Act (RCRA)*. Office of Environmental Policy and Assistance. 20 December.

Environmental Protection Agency, United States (EPA). 1991. *Management of Investigative-Derived Wastes During Site Inspections*. Office of Emergency and Remedial Response. EPA/540/G-91/009. May.

1992a. *Guidance for Performing Site Inspections under CERCLA*. [EPA/540/R-92/021](#). Office of Emergency and Remedial Response. September.

1992b. *Guide to Management of Investigative-Derived Wastes*. Quick reference fact sheet. OSWER Dir. 9345.3-03FS. Office of Solid Waste and Emergency Response. January.

1997a. *Sending Wastes Off Site? OSC and RPM Responsibilities under the Off-Site Rule*. EPA/540-F-97-006, Office of Solid Waste and Emergency Response. September.

1997b. *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW-846*. 3rd ed., Final Update IIIA. Office of Solid Waste. Updates available: [www.epa.gov/epaoswer/hazwaste/test/new-meth.htm](http://www.epa.gov/epaoswer/hazwaste/test/new-meth.htm).

1998. *Management of Remediation Waste under RCRA*. EPA/530-F-98-026. Office of Solid Waste and Emergency Response. October.

(No Date). *Compliance with the Off-Site Rule During Removal Actions*. Office of Regional Counsel (Region 3). Hendershot, Michael.

# Equipment Decontamination

## Procedure 3-06

### 1.0 Purpose and Scope

- 1.1 This standard operating procedure (SOP) describes methods of equipment decontamination, to be used for activities where samples for chemical analysis are collected or where equipment will need to be cleaned before leaving the site or before use in subsequent activities.
- 1.2 As guidance for specific activities, this procedure does not obviate the need for professional judgment. Deviations from this procedure while planning or executing planned activities must be approved in accordance with Program requirements for technical planning and review.

### 2.0 Safety

It is the responsibility of the **Site Safety Officer (SSO)** to set up the site zones (i.e., exclusion, transition, and clean) and decontamination areas. Generally the decontamination area is located within the transition zone, upwind of intrusive activities, and serves as the washing area for both personnel and equipment to minimize the spread of contamination into the clean zone. Typically, for equipment, a series of buckets are set up on a visqueen-lined bermed area. Separate spray bottles containing cleaning solvents as described in this procedure or the project Work Plan (WP) and distilled water are used for final rinsing of equipment. Depending on the nature of the hazards and the site location, decontamination of heavy equipment, such as augers, pump drop pipe, and vehicles, may be accomplished using a variety of techniques.

All **Field Personnel** responsible for equipment decontamination must adhere to the site-specific Accident Prevention Plan/Site-specific Safety and Health Plan (APP/SSHP) and must wear the personal protective equipment (PPE) specified in the site-specific APP/SSHP. Generally this includes, at a minimum, Tyvek® coveralls, steel-toed boots with boot covers or steel-toed rubber boots, safety glasses, American National Standards Institute-standard hard hats, and hearing protection (if heavy equipment is in operation). Air monitoring by the **SSO** may result in an upgrade to the use of respirators and cartridges in the decontamination area; therefore, this equipment must be available on site. If safe alternatives are not achievable, discontinue site activities immediately.

In addition to the aforementioned precautions, the following sections describe safe work practices that will be employed.

#### 2.1 Chemical Hazards associated with Equipment Decontamination

- Avoid skin contact with and/or incidental ingestion of decontamination solutions and water.
- Utilize PPE as specified in the site-specific APP/SSHP to maximize splash protection.
- Refer to material safety data sheets, safety personnel, and/or consult sampling personnel regarding appropriate safety measures (i.e., handling, PPE including skin and respiratory).
- Take the necessary precautions when handling detergents and reagents.

#### 2.2 Physical Hazards associated with Equipment Decontamination

- To avoid possible back strain, it is recommended to raise the decontamination area 1 to 2 feet above ground level.
- To avoid heat stress, over exertion, and exhaustion, it is recommended to rotate equipment decontamination among all site personnel.
- Take necessary precautions when handling field sampling equipment.

### 3.0 Terms and Definitions

None.

### 4.0 Training and Qualifications

- 4.1 The **Project Manager** is responsible for ensuring that decontamination activities comply with this procedure. The **Project Manager** is responsible for ensuring that all personnel involved in equipment decontamination shall have the appropriate education, experience, and training to perform their assigned tasks.
- 4.2 The **Program Quality Manager** is responsible for ensuring overall compliance with this procedure.
- 4.3 The **Field Manager** is responsible for ensuring that all field equipment is decontaminated according to this procedure.
- 4.4 All **Field Personnel** are responsible for the implementation of this procedure.

### 5.0 Procedure

Decontamination of equipment used in soil/sediment sampling, groundwater monitoring, well drilling and well development, as well as equipment used to sample groundwater, surface water, sediment, waste, wipe, asbestos, and unsaturated zone, is necessary to prevent cross-contamination and to maintain the highest integrity possible in collected samples. Planning a decontamination program requires consideration of the following factors:

- Location where the decontamination procedures will be conducted
- Types of equipment requiring decontamination
- Frequency of equipment decontamination
- Cleaning technique and types of cleaning solutions appropriate to the contaminants of concern
- Method for containing the residual contaminants and wash water from the decontamination process
- Use of a quality control measure to determine the effectiveness of the decontamination procedure

The following subsections describe standards for decontamination, including the frequency of decontamination, cleaning solutions and techniques, containment of residual contaminants and cleaning solutions, and effectiveness.

#### 5.1 Decontamination Area

Select an appropriate location for the decontamination area at a site based on the ability to control access to the area, the ability to control residual material removed from equipment, the need to store clean equipment, and the ability to restrict access to the area being investigated.

Locate the decontamination area an adequate distance away and upwind from potential contaminant sources to avoid contamination of clean equipment.

## **5.2 Types of Equipment**

Drilling equipment that must be decontaminated includes drill bits, auger sections, drill-string tools, drill rods, split barrel samplers, tremie pipes, clamps, hand tools, and steel cable. Decontamination of monitoring well development and groundwater sampling equipment includes submersible pumps, bailers, interface probes, water level meters, bladder pumps, airlift pumps, peristaltic pumps, and lysimeters. Other sampling equipment that requires decontamination includes, but is not limited to, hand trowels, hand augers, slide hammer samplers, shovels, stainless-steel spoons and bowls, soil sample liners and caps, wipe sampling templates, composite liquid waste samplers, and dippers. Equipment with a porous surface, such as rope, cloth hoses, and wooden blocks, cannot be thoroughly decontaminated and shall be properly disposed of after one use.

## **5.3 Frequency of Equipment Decontamination**

Decontaminate down-hole drilling equipment and equipment used in monitoring well development and purging prior to initial use and between each borehole or well. Down-hole drilling equipment, however, may require more frequent cleaning to prevent cross-contamination between vertical zones within a single borehole. When drilling through a shallow contaminated zone and installing a surface casing to seal off the contaminated zone, decontaminate the drilling tools prior to drilling deeper. Initiate groundwater sampling by sampling groundwater from the monitoring well where the least contamination is suspected. Decontaminate groundwater, surface water, and soil sampling devices prior to initial use and between collection of each sample to prevent the possible introduction of contaminants into successive samples.

## **5.4 Cleaning Solutions and Techniques**

Decontamination can be accomplished using a variety of techniques and fluids. The preferred method of decontaminating major equipment, such as drill bits, augers, drill string, and pump drop-pipe, is steam cleaning. To steam clean, use a portable, high-pressure steam cleaner equipped with a pressure hose and fittings. For this method, thoroughly steam wash equipment and rinse it with potable tap water to remove particulates and contaminants.

A rinse decontamination procedure is acceptable for equipment such as bailers, water level meters, new and re-used soil sample liners, and hand tools. The decontamination procedure shall consist of the following: (1) wash with a non-phosphate detergent (Alconox®, Liquinox®, or other suitable detergent) and potable water solution; (2) rinse with potable water; (3) spray with laboratory-grade isopropyl alcohol; (4) rinse with deionized or distilled water; and (5) spray with deionized or distilled water. If possible, disassemble equipment prior to cleaning. Add a second wash at the beginning of the process if equipment is very soiled.

Decontaminating submersible pumps requires additional effort because internal surfaces become contaminated during usage. Decontaminate these pumps by washing and rinsing the outside surfaces using the procedure described for small equipment or by steam cleaning. Decontaminate the internal surfaces by recirculating fluids through the pump while it is operating. This recirculation may be done using a relatively long (typically 4 feet) large-diameter pipe (4-inch or greater) equipped with a bottom cap. Fill the pipe with the decontamination fluids, place the pump within the capped pipe, and operate the pump while recirculating the fluids back into the pipe. The decontamination sequence shall include: (1) detergent and potable water; (2) potable water rinse; (3) potable water rinse; and (4) deionized water rinse. Change the decontamination fluids after each decontamination cycle.

Solvents other than isopropyl alcohol may be used, depending upon the contaminants involved. For example, if polychlorinated biphenyls or chlorinated pesticides are contaminants of concern, hexane may be used as the decontamination solvent; however, if samples are also to be analyzed for volatile organics, hexane shall not be used. In addition, some decontamination solvents have health effects that must be considered. Decontamination water shall consist of distilled or deionized water. Steam-distilled water shall not be used in the decontamination process as this type of water usually contains elevated concentrations of metals. Decontamination solvents to be used during field activities will be specified in the project WP or SAP.

Rinse equipment used for measuring field parameters, such as pH (indicates the hydrogen ion concentration – acidity or basicity), temperature, specific conductivity, and turbidity with deionized or distilled water after each measurement. Also wash new, unused soil sample liners and caps with a fresh detergent solution and rinse them with potable water followed by distilled or deionized water to remove any dirt or cutting oils that might be on them prior to use.

#### 5.5 **Containment of Residual Contaminants and Cleaning Solutions**

A decontamination program for equipment exposed to potentially hazardous materials requires a provision for catchment and disposal of the contaminated material, cleaning solution, and wash water.

When contaminated material and cleaning fluids must be contained from heavy equipment, such as drill rigs and support vehicles, the area must be properly floored, preferably with a concrete pad that slopes toward a sump pit. If a concrete pad is impractical, planking can be used to construct solid flooring that is then covered by a nonporous surface and sloped toward a collection sump. If the decontamination area lacks a collection sump, use plastic sheeting and blocks or other objects to create a bermed area for collection of equipment decontamination water. Situate items, such as auger flights, which can be placed on metal stands or other similar equipment, on this equipment during decontamination to prevent contact with fluids generated by previous equipment decontamination. Store clean equipment in a separate location to prevent recontamination. Collect decontamination fluids contained within the bermed area and store them in secured containers as described below.

Use wash buckets or tubs to catch fluids from the decontamination of lighter-weight drilling equipment and hand-held sampling devices. Collect the decontamination fluids and store them on site in secured containers, such as U.S. Department of Transportation-approved drums, until their disposition is determined by laboratory analytical results. Label containers in accordance with Procedure 3-05, *IDW Management*.

### **6.0 Quality Control and Assurance**

A decontamination program must incorporate quality control measures to determine the effectiveness of cleaning methods. Quality control measures typically include collection of equipment blank samples or wipe testing. Equipment blanks consist of analyte-free water that has been poured over or through the sample collection equipment after its final decontamination rinse. Wipe testing is performed by wiping a cloth over the surface of the equipment after cleaning. These quality control measures provide "after-the fact" information that may be useful in determining whether or not cleaning methods were effective in removing the contaminants of concern.

### **7.0 Records, Data Analysis, Calculations**

Any project where sampling and analysis is performed shall be executed in accordance with an approved sampling and analysis plan. This procedure may be incorporated by reference or may be incorporated with modifications described in the plan.



Deviations from this procedure or the sampling and analysis plan shall be documented in field records. Significant changes shall be approved by the **Program Quality Manager**.

## **8.0 Attachments or References**

- 8.1 ASTM Standard D5088. 2008. *Standard Practice for Decontamination of Field Equipment Used at Waste Sites*. ASTM International, West Conshohocken, PA. 2008. DOI: 10.1520/D5088-02R08. [www.astm.org](http://www.astm.org).
- 8.1 EM 200-1-6, *Chemical Quality Assurance for HTRW Projects*, October 1997.
- 8.2 NAVSEA T0300-AZ-PRO-010. *Navy Environmental Compliance Sampling and Field Testing Procedures Manual*. August 2009.
- 8.3 Procedure 3-05, *IDW Management*.

## Monitoring Well Sampling

### Procedure 3-14

#### 1.0 Purpose and Scope

- 1.1 This standard operating procedure (SOP) describes the actions to be used during monitoring well sampling activities and establishes the method for sampling groundwater monitoring wells for water-borne contaminants and general groundwater chemistry. The objective is to obtain groundwater samples that are representative of aquifer conditions with as little alteration to water chemistry as possible.
- 1.2 This procedure is the Program-approved professional guidance for work performed by Resolution Consultants under the Comprehensive Long-Term Environmental Action Navy (CLEAN) contract (Contract Number N62470-11-D-8013).
- 1.3 As guidance for specific activities, this procedure does not obviate the need for professional judgment. Deviations from this procedure while planning or executing planned activities must be approved in accordance with Program requirements for technical planning and review.

#### 2.0 Safety

- 2.1 Depending upon the site-specific contaminants, various protective programs must be implemented prior to sampling the first well. All field sampling personnel responsible for sampling activities must review the project-specific health and safety plan (HASP) paying particular attention to the control measures planned for the well sampling tasks. Conduct preliminary area monitoring of sampling wells to determine the potential hazard to field sampling personnel. If significant contamination is observed, minimize contact with potential contaminants in both the vapor phase and liquid matrix through the use of appropriate personal protective equipment (PPE).
- 2.2 Observe standard health and safety practices according to the project-specific HASP. Suggested minimum protection during well sampling activities includes inner disposable vinyl gloves, outer chemical-protective nitrile gloves and rubberized steel-toed boots. Half-face respirators and cartridges and Tyvek® suits may be necessary depending on the contaminant concentrations. Refer to the project-specific HASP for the required PPE.
- 2.3 Physical Hazards associated with Well Sampling
  - To avoid lifting injuries associated with pump and bailers retrieval, use the large muscles of the legs, not the back.
  - Stay clear of all moving equipment, and avoid wearing loose fitting clothing.
  - When using tools for cutting purposes, cut away from yourself. The use of appropriate, task specific cutting tools is recommended.
  - To avoid slip/trip/fall conditions as a result of pump discharge, use textured boots/boot cover bottoms.
  - To avoid heat/cold stress as a result of exposure to extreme temperatures and PPE, drink electrolyte replacement fluids (1 to 2 cups per hour is recommended) and, in cases of extreme cold, wear fitted insulating clothing.
  - Be aware of restricted mobility due to PPE.

### 3.0 Terms and Definitions

None.

### 4.0 Interferences

4.1 Potential interferences could result from cross-contamination between samples or sample locations. Minimization of the cross-contamination will occur through the following:

- The use of clean sampling tools at each location as necessary.
- Avoidance of material that is not representative of the media to be sampled.

### 5.0 Training and Qualifications

#### 5.1 Qualifications and Training

The individual executing these procedures must have read, and be familiar with, the requirements of this SOP.

#### 5.2 Responsibilities

5.2.1 The **Contract Task Order (CTO) Manager** is responsible for ensuring that monitoring well sampling activities comply with this procedure. The **CTO Manager** is responsible for ensuring that all field sampling personnel involved in monitoring well sampling shall have the appropriate education, experience, and training to perform their assigned tasks.

5.2.2 The **Program Quality Manager** is responsible for ensuring overall compliance with this procedure.

5.2.3 The **Field Manager** is responsible for ensuring that all field sampling personnel follow these procedures.

5.2.4 **Field sampling personnel** are responsible for the implementation of this procedure.

5.2.5 The field sampler and/or task manager is responsible for directly supervising the groundwater sampling procedures to ensure that they are conducted according to this procedure and for recording all pertinent data collected during sampling.

### 6.0 Equipment and Supplies

#### 6.1 Purging and Sampling Equipment

- Pump (Peristaltic, Portable Bladder, Submersible)
- Polyethylene or Teflon bladders (for portable bladder pumps)
- Bladder pump controller (for portable bladder pumps)
- Air compressor (for portable bladder pumps)
- Nitrogen cylinders (for portable bladder pumps)
- 12-volt power source
- Polyethylene inlet and discharge tubing (except for VOC analysis which requires Teflon tubing)
- Silicone tubing appropriate for peristaltic pump head



- Teflon bailer appropriately sized for well
- Disposable bailer string (polypropylene)
- Individual or multi-parameter water quality meter(s) with flow-through cell to measure temperature, pH, specific conductance, dissolved oxygen (DO), oxidation reduction potential (ORP), and/or turbidity
- Turbidity meter
- Water level meter
- Oil/water interface probe

## 6.2 General Equipment

- Sample kit (i.e., bottles, labels, preservatives, custody records and tape, cooler, ice)
- Sample Chain-of-Custody (COC) forms
- Sample Collection Records
- Sample packaging and shipping supplies
- Waterproof marker or paint
- Distilled/deionized water supply
- Water dispenser bottles
- Flow measurement cup or bucket
- 5-gallon buckets
- Instrument calibration solutions
- Stopwatch or watch
- Disposable Nitrile gloves
- Paper towels
- Trash bags
- Zipper-lock bags
- Equipment decontamination supplies
- Health and safety supplies (as required by the HASP)
- Approved plans such as: project-specific HASP and Sampling and Analysis Plan (SAP)
- Well keys or combinations
- Monitoring well location map(s)
- Field project logbook/pen

## 7.0 Calibration or Standardization

- 7.1 Field instruments will be calibrated daily according to the requirements of the SAP and manufacturer's specifications for each piece of equipment. Equipment will be checked daily with the calibration solutions at the end of use of the equipment. Calibration records shall be recorded in the field logbook or appropriate field form.

- 7.2 If readings are suspected to be inaccurate, the equipment shall be checked with the calibration solutions and/or re-calibrated.

## **8.0 Procedure**

### **8.1 Preparation**

#### **8.1.1 Site Background Information**

Establish a thorough understanding of the purposes of the sampling event prior to field activities. Conduct a review of all available data obtained from the site and pertinent to the water sampling. Review well history data including, but not limited to, well locations, sampling history, purging rates, turbidity problems, previously used purging methods, well installation methods, well completion records, well development methods, previous analytical results, presence of an immiscible phase, historical water levels, and general hydrogeologic conditions.

Previous groundwater development and sampling logs give a good indication of well purging rates and the types of problems that might be encountered during sampling, such as excessive turbidity and low well yield. They may also indicate where dedicated pumps are placed in the water column. To help minimize the potential for cross-contamination, well purging and sampling and water level measurement collection shall proceed from the least contaminated to the most contaminated well as indicated by previous analytical results. This order may be changed in the field if conditions warrant it, particularly if dedicated sampling equipment is used. A review of prior sampling procedures and results may also identify which purging and sampling techniques are appropriate for the parameters to be tested under a given set of field conditions.

#### **8.1.2 Groundwater Analysis Selection**

Establish the requisite field and laboratory analyses prior to water sampling. Decide on the types and numbers of quality assurance/quality control (QA/QC) samples to be collected (refer to the project-specific SAP), as well as the type and volume of sample preservatives, the type and number of sample containers, the number of coolers required, and the quantity of ice or other chilling materials. The field sampling personnel shall ensure that the appropriate number and size sample containers are brought to the site, including extras in case of breakage or unexpected field conditions. Refer to the project-specific SAP for the project analytical requirements.

### **8.2 Groundwater Sampling Procedures**

Groundwater sampling procedures at a site shall include:

- 1) An evaluation of the well security and condition prior to sampling;
- 2) Decontamination of equipment;
- 3) Measurement of well depth to groundwater;
- 4) Assessment of the presence or absence of an immiscible phase;
- 5) Assessment of purge parameter stabilization;
- 6) Purging of static water within the well and well bore; and
- 7) Obtaining a groundwater sample.

Each step is discussed in sequence below. Depending upon specific field conditions, additional steps may be necessary. As a rule, at least 24 hours should separate well development and well sampling events. In all cases, consult the State and local regulations

for the site, which may require more stringent time separation between well development and sampling.

#### **8.2.1 Well Security and Condition**

At each monitoring well location, observe the conditions of the well and surrounding area. The following information may be noted on a Groundwater Sample Collection Record (Attachment 1) or in the field logbook:

- Condition of the well's identification marker.
- Condition of the well lock and associated locking cap.
- Integrity of the well – well pad condition, protective outer casing, obstructions or kinks in the well casing, presence of water in the annular space, and the top of the interior casing.
- Condition of the general area surrounding the well.

#### **8.2.2 Decontamination of Equipment**

Where possible, dedicated supplies should be used at each well location to minimize the potential for cross-contamination and minimize the amount of investigation derived waste (IDW) fluids resulting from the decontamination process. If decontamination is necessary, establish a decontamination station before beginning sampling. The station shall consist of an area of at least 4 feet by 2 feet covered with plastic sheeting and be located upwind of the well being sampled. The station shall be large enough to fit the appropriate number of wash and rinse buckets, and have sufficient room to place equipment after decontamination. One central cleaning area may be used throughout the entire sampling event. The area around the well being sampled shall also be covered with plastic sheeting to prevent spillage. Further details are presented in SOP 3-06, Equipment Decontamination.

Decontaminate each piece of equipment prior to entering the well. Also, conduct decontamination prior to sampling at a site, even if the equipment has been decontaminated subsequent to its last usage. Additionally, decontaminate each piece of equipment used at the site prior to leaving the site. It is only necessary to decontaminate dedicated sampling equipment prior to installation within the well. Do not place clean sampling equipment directly on the ground or other contaminated surfaces prior to insertion into the well. Dedicated sampling equipment that has been certified by the manufacturer as being decontaminated can be placed in the well without on-site decontamination.

#### **8.2.3 Measurement of Static Water Level Elevation**

Before purging the well, measure water levels in all of the wells within the zone of influence of the well being purged. The best practice, if possible, is to measure all site wells (or wells within the monitoring well network) prior to sampling. If the well cap is not vented, remove the cap several minutes before measurement to allow water levels to equilibrate to atmospheric pressure.

Measure the depth to standing water and the total depth of the well to the nearest 0.01 foot to provide baseline hydrologic data, to calculate the volume of water in the well, and to provide information on the integrity of the well (e.g., identification of siltation problems). If not already present, mark an easily identified reference point for water level measurements which will become the measuring point for all water level measurements. This location and elevation must be surveyed.

The device used to measure the water level surface and depth of the well shall be sufficiently sensitive and accurate in order to obtain a measurement to the nearest 0.01 foot reliably. An electronic water level meter will usually be appropriate for this measurement; however, when the groundwater within a particular well is highly contaminated, an inexpensive weighted tape measure can be used to determine well depth to prevent adsorption of contaminants onto the meter tape. The presence of light, non-aqueous phase liquids (LNAPLs) and/or dense, non-aqueous phase liquids (DNAPLs) in a well requires measurement of the elevation of the top and the bottom of the product, generally using an interface probe. Water levels in such wells must then be corrected for density effects to accurately determine the elevation of the water table.

At each location, measure water levels several times in quick succession to ensure that the well has equilibrated to atmospheric conditions prior to recording the measurement. As stated above, measure all site wells (or wells within the monitoring well network) prior to sampling whenever possible. This will provide a water level database that describes water levels across the site at one time (a synoptic sampling). Prior to sampling, measure the water level in each well immediately prior to purging the well to ascertain that static conditions have been achieved prior to sampling.

#### **8.2.4 Detection of Immiscible Phase Layers**

Complete the following steps for detecting the presence of LNAPL and DNAPL before the well is purged for conventional sampling. These procedures may not be required for all wells. Consult the project-specific SAP to determine if assessing the presence of LNAPL and/or DNAPL is necessary.

- 1) Sample the headspace in the wellhead immediately after the well is opened for organic vapors using either a PID or an organic vapor analyzer, and record the measurements.
- 2) Lower an interface probe into the well to determine the existence of any immiscible layer(s), LNAPL and/or DNAPL, and record the measurements.
- 3) Confirm the presence or absence of an immiscible phase by slowly lowering a clear bailer to the appropriate depth, then visually observing the results after sample recovery.
- 4) In rare instances, such as when very viscous product is present, it may be necessary to utilize hydrocarbon- and water-sensitive pastes for measurement of LNAPL thickness. This is accomplished by smearing adjacent, thin layers of both hydrocarbon- and water-sensitive pastes along a steel measuring tape and inserting the tape into the well. An engineering tape showing tenths and hundredths of feet is required. Record depth to water, as shown by the mark on the water-sensitive paste, and depth to product, as shown by the mark on the product-sensitive paste. In wells where the approximate depth to water and product thickness are not known, it is best to apply both pastes to the tape over a fairly long interval (5 feet or more). Under these conditions, measurements are obtained by trial and error and may require several insertions and retrievals of the tape before the paste-covered interval of the tape encounters product and water. In wells where approximate depths of air-product and product-water interfaces are known, pastes may be applied over shorter intervals. Water depth measurements should not be used in preparation of water table contour maps until they are corrected for depression by the product.
- 5) If the well contains an immiscible phase, it may be desirable to sample this phase separately. Section 8.2.6 presents immiscible phase sampling procedures. It may not be meaningful to conduct water sample analysis of water obtained from a well

containing LNAPLs or DNAPLs. Consult the **CTO Manager** and **Program Quality Manager** if this situation is encountered.

#### 8.2.5 Purging Equipment and Use

##### General Requirements

The water present in a well prior to sampling may not be representative of in situ groundwater quality and shall be removed prior to sampling. Handle all groundwater removed from potentially contaminated wells in accordance with the IDW handling procedures in SOP 3-05, IDW Management. Purging shall be accomplished by methods as indicated in the project-specific SAP or by those required by State requirements. For the purposes of this SOP, purging methods will be described by removing groundwater from the well using low-flow techniques.

According to the U.S. Environmental Protection Agency (EPA) (EPA, 1996), the rate at which groundwater is removed from the well during purging ideally should be less than 0.2 to 0.3 liters/minute. EPA further states that wells should be purged at rates below those used to develop the well to prevent further development of the well, to prevent damage to the well, and to avoid disturbing accumulated corrosion or reaction products in the well. EPA also indicates that wells should be purged at or below their recovery rate so that migration of water in the formation above the well screen does not occur.

Realistically, the purge rate should be low enough that substantial drawdown in the well does not occur during purging. In addition, a low purge rate will reduce the possibility of stripping volatile organic compounds (VOCs) from the water, and will reduce the likelihood of increasing the turbidity of the sample due to mobilizing colloids in the subsurface that are immobile under natural flow conditions.

The field sampler shall ensure that purging does not cause formation water to cascade down the sides of the well screen. Wells should not be purged to dryness if recharge causes the formation water to cascade down the sides of the screen, as this will cause an accelerated loss of volatiles. This problem should be anticipated based on the results of either the well development task or historical sampling events. In general, place the intake of the purge pump in the middle of the saturated screened interval within the well to allow purging and at the same time minimize disturbance/overdevelopment of the screened interval in the well. Water shall be purged from the well at a rate that does not cause recharge water to be excessively agitated unless an extremely slow recharging well is encountered where complete evacuation is unavoidable. During the well purging procedure, collect water level and/or product level measurements to assess the hydraulic effects of purging. Sample the well when it recovers sufficiently to provide enough water for the analytical parameters specified. If the well is purged dry, allow the well to recover sufficiently to provide enough water for the specified analytical parameters, and then sample it.

Evaluate water samples on a regular basis during well purging and analyze them in the field preferably using in-line devices (i.e., flow through cell) for temperature, pH, specific conductivity, dissolved oxygen (DO), and oxidation-reduction (redox) potential. Turbidity should be measured separately (outside of the flow-through cell) with a nephelometer or similar device.

Readings should be taken every 2 to 5 minutes during the purging process. These parameters are measured to demonstrate that the natural character of the formation waters has been restored.

Purging shall be considered complete per the requirements set forth in the project-specific SAP, State requirements, or when three consecutive field parameter measurements of temperature, pH, specific conductivity, DO and ORP stabilize within approximately 10 percent

and the turbidity is at or below 10 nephelometric turbidity units (NTU) or within  $\pm 10\%$  if above 10 NTU. This criterion may not be applicable to temperature if a submersible pump is used during purging due to the heating of the water by the pump motor. Enter all information obtained during the purging and sampling process into a groundwater sampling log. Attachment 1 shows an example of a groundwater sampling log and the information typically included in the form. Whatever form is used, all blanks need to be completed on the field log during field sampling.

Groundwater removed during purging shall be stored according to the project-specific SAP or per SOP 3-05, IDW Management.

### **Purging Equipment and Methods**

#### ***Submersible Pump***

A stainless steel submersible pump may be utilized for purging both shallow and deep wells prior to sampling the groundwater for semivolatile and non-volatile constituents, but are generally not preferred for VOCs unless there are no other options (e.g., well over 200 feet deep). For wells over 200 feet deep, the submersible pump is one of the few technologies available to feasibly accomplish purging under any yield conditions. For shallow wells with low yields, submersible pumps are generally inappropriate due to overpumpage of the wells (<1 gallon per minute), which causes increased aeration of the water within the well.

Steam clean or otherwise decontaminate the pump and discharge tubing prior to placing the pump in the well. The submersible pump shall be equipped with an anti-backflow check valve to limit the amount of water that will flow back down the drop pipe into the well. Place the pump in the middle of the saturated screened interval within the well and maintain it in that position during purging.

#### ***Bladder Pump***

A stainless steel bladder pump can be utilized for purging and sampling wells up to 200 feet in depth for volatile, semivolatile, and non-volatile constituents. Use of the bladder pump is most effective in low to moderate yield wells and are often the preferred method for low-flow sampling. When sampling for VOCs and/or SVOCs, Teflon bladders should be used. Polyethylene bladders may be used when sampling for inorganics.

Either compressed dry nitrogen or compressed dry air, depending upon availability, can operate the bladder pump. The driving gas utilized must be dry to avoid damage to the bladder pump control box. Decontaminate the bladder pump prior to use.

#### ***Centrifugal, Peristaltic, or Diaphragm Pump***

A centrifugal, peristaltic, or diaphragm pump may be utilized to purge a well if the water level is within 20 feet of ground surface. New or dedicated tubing is inserted into the midpoint of the saturated screened interval of the well. Water should be purged at a rate that satisfies low-flow requirements (i.e., does not cause drawdown). Centrifugal, peristaltic, or diaphragm pump are generally discouraged for VOCs sampling; however, follow methods allowed per the project-specific SAP or State requirements.

#### ***Air Lift Pump***

Airlift pumps are not appropriate for purging or sampling.

#### ***Bailer***

Avoid using a bailer to purge a well because it can result in overdevelopment of the well and create excessive purge rates. If a bailer must be used, the bailer should either be dedicated or



disposable. Teflon-coated cable mounted on a reel is recommended for lowering the bailer in and out of the well.

Lower the bailer below the water level of the well with as little disturbance of the water as possible to minimize aeration of the water in the well. One way to gauge the depth of water on the reel is to mark the depth to water on the bailer wire with a stainless steel clip. In this manner, less time is spent trying to identify the water level in the well.

#### **8.2.6 Monitoring Well Sampling Methodologies**

##### **Sampling Light, Non-Aqueous Phase Liquids (LNAPL)**

Collect LNAPL, if present, prior to any purging activities. The sampling device shall generally consist of a dedicated or disposable bailer equipped with a bottom-discharging device. Lower the bailer slowly until contact is made with the surface of the LNAPL, and to a depth less than that of the immiscible fluid/water interface depth as determined by measurement with the interface probe. Allow the bailer to fill with LNAPL and retrieve it.

When sampling LNAPLs, never drop bailers into a well and always remove them from the well in a manner that causes as little agitation of the sample as possible. For example, the bailer should not be removed in a jerky fashion or be allowed to continually bang against the well casing as it is raised. Teflon bailers should always be used when sampling LNAPL. The cable used to raise and lower the bailer shall be composed of an inert material (e.g., stainless steel) or coated with an inert material (e.g., Teflon).

##### **Sampling Dense, Non-Aqueous Phase Liquids (DNAPL)**

Collect DNAPL prior to any purging activities. The best method for collecting DNAPL is to use a double-check valve, stainless steel bailer, or a Kemmerer (discrete interval) sampler. The sample shall be collected by slow, controlled lowering of the bailer to the bottom of the well, activation of the closing device, and retrieval.

##### **Groundwater Sampling Methodology**

The well shall be sampled when groundwater within it is representative of aquifer conditions per the methods described in Section 8.2.5. Prior to sampling the flow-through cell shall be removed and the samples collected directly from the purge tubing. Flow rates shall not be adjusted once aquifer conditions are met. Additionally, a period of no more than 2 hours shall elapse between purging and sampling to prevent groundwater interaction with the casing and atmosphere. This may not be possible with a slowly recharging well. Measure and record the water level prior to sampling in order to monitor drawdown when using low-flow techniques and gauge well volumes removed and recharged when using non-low-flow techniques.

Sampling equipment (e.g., especially bailers) shall never be dropped into the well, as this could cause aeration of the water upon impact. Additionally, the sampling methodology utilized shall allow for the collection of a groundwater sample in as undisturbed a condition as possible, minimizing the potential for volatilization or aeration. This includes minimizing agitation and aeration during transfer to sample containers, minimizing exposure to sunlight, and immediately placing the sample on ice once collected.

Sampling equipment shall be constructed of inert material. Equipment with neoprene fittings, polyvinyl chloride (PVC) bailers, Tygon® tubing, silicon rubber bladders, neoprene impellers, polyethylene, and Viton® are not acceptable when sampling for organics. If bailers are used, an inert cable/chain (e.g., fluorocarbon resin-coated wire or stainless steel wire or cable) shall be used to raise and lower the bailer. Dedicated equipment is highly recommended for all sampling programs.

##### ***Submersible Pumps***

The submersible pump must be specifically designed for groundwater sampling (i.e., pump composed of stainless steel and Teflon, sample discharge lines composed of Teflon) and must have a controller mechanism allowing the required low-flow rate. Adjust the pump rate so that flow is continuous and does not pulsate to avoid aeration and agitation within the sample discharge lines. Run the pump for several minutes at the low-flow rate used for sampling to ensure that the groundwater in the lines was obtained at the low-flow rate.

### ***Bladder Pumps***

A gas-operated stainless steel bladder pump with adjustable flow control and equipped with a Teflon bladder and Teflon-lined tubing can be effectively utilized to collect a groundwater sample and is considered to be the best overall device for sampling inorganic and organic constituents. If only inorganics are being sampled, polyvinyl bladders and tubing may be used. Operate positive gas displacement bladder pumps in a continuous manner so that they minimize discharge pulsation that can aerate samples in the return tube or upon discharge.

When using a compressor, take several precautions. If the compressor is being powered by a gasoline generator, position the generator downwind of the well. Ground fault circuit interrupters (GFCIs) should always be used when using electric powered equipment. Do not connect the compression hose from the compressor to the pump controller until after the engine has been started.

When all precautions are completed and the compressor has been started, connect the compression hose to the pump controller. Slowly adjust the control knobs to discharge water in the shortest amount of time while maintaining a near constant flow. This does not mean that the compressor must be set to discharge the water as hard as possible. The optimal setting is one that produces the largest volume of purge water per minute (not per purge cycle) while maintaining a near constant flow rate.

Prior to sampling, adjust the flow rate (purge rate) to yield 100 to 300 mL/minute. Avoid settings that produce pulsating streams of water instead of a steady stream if possible. Operate the pump at this low flow rate for several minutes to ensure that drawdown is not occurring. At no time shall the sample flow rate exceed the flow rate used while purging.

For those samples requiring filtration, it is recommended to use an in-line high capacity filter after all non-filtered samples have been collected.

### ***Peristaltic Pumps:***

A peristaltic pump is a type of positive displacement pump that moves water via the process of peristalsis. The pump uses a flexible hose fitted inside a circular pump casing. A rotor with cams compresses the flexible tube as the rotor turns, which forces the water to be pumped to move through the tube. In peristaltic pumps, no moving parts of the pump are in contact with the water being pumped. Displacement is determined by tube size, so delivery rate can only be changed during operation by varying pump speed. Peristaltic pumps are simple and quite inexpensive for the flow rates they provide.

There are several methods available for transferring the sample into the laboratory containers. The selected method may vary based on State requirements and should be documented in the project-specific SAP. Samples typically can be collected directly from the discharge end of the Teflon tubing, after it has been disconnected from the flow through cell. For volatile analyses, the sampler should make sure that the pump is set such that a smooth laminar flow is achieved. In all cases, the project team should consult their local regulatory requirements and document the selected sample collection procedure in the project-specific SAP.

### ***Bailers***



A single- or double-check valve Teflon or stainless steel bailer equipped with a bottom discharging device can be utilized to collect groundwater samples. Bailers have a number of disadvantages, however, including a tendency to alter the chemistry of groundwater samples due to degassing, volatilization, and aeration; the possibility of creating high groundwater entrance velocities; differences in operator techniques resulting in variable samples; and difficulty in determining where in the water column the sample was collected. Therefore, use bailers for groundwater sampling only when other types of sampling devices cannot be utilized for technical, regulatory, or logistical reasons.

Dedicated or disposable bailers should always be used in order to eliminate the need for decontamination and to limit the potential of cross-contamination. Each time the bailer is lowered to the water table, lower it in such a way as to minimize disturbance and aeration of the water column within the well.

#### **8.2.7 Sample Handling and Preservation**

Many of the chemical constituents and physiochemical parameters to be measured or evaluated during groundwater monitoring programs are chemically unstable and require preservation. The U.S. EPA document entitled, *Test Methods for Evaluating Solid Waste – Physical/Chemical Methods (SW-846)* (EPA 1997), includes a discussion of appropriate sample preservation procedures. In addition, SW-846 provides guidance on the types of sample containers to use for each constituent or common set of parameters. In general, check with specific laboratory or State requirements prior to obtaining field samples. In many cases, the laboratory will supply the necessary sample bottles and required preservatives. In some cases, the field sampling personnel may add preservatives in the field.

Improper sample handling may alter the analytical results of the sample. Therefore, transfer samples in the field from the sampling equipment directly into the container that has been prepared specifically for that analysis or set of compatible parameters as described in the project-specific SAP. It is not an acceptable practice for samples to be composited in a common container in the field and then split in the laboratory, or poured first into a wide mouth container and then transferred into smaller containers.

Collect groundwater samples and place them in their proper containers in the order of decreasing volatility and increasing stability. A preferred collection order for some common groundwater parameters is:

1. VOCs and total organic halogens (TOX)
2. Dissolved gases, total organic carbon (TOC), total fuel hydrocarbons
3. Semivolatile organics, pesticides
4. Total metals, general minerals (unfiltered)
5. Dissolved metals, general minerals (filtered)
6. Phenols
7. Cyanide
8. Sulfate and chloride
9. Nitrate and ammonia
10. Radionuclides

When sampling for VOCs, collect water samples in vials or containers specifically designed to prevent loss of VOCs from the sample. The analytical laboratory performing the analysis shall provide these vials. Collect groundwater from the sampling device in vials by allowing the

groundwater to slowly flow along the sides of the vial. Sampling equipment shall not touch the interior of the vial. Fill the vial above the top of the vial to form a positive meniscus with no overflow. No headspace shall be present in the sample container once the container has been capped. This can be checked by inverting the bottle once the sample is collected and tapping the side of the vial to dislodge air bubbles. Sometimes it is not possible to collect a sample without air bubbles, particularly water that has high concentrations of dissolved gasses. In these cases, the field sampling personnel shall document the occurrence in the field logbook and/or sampling worksheet at the time the sample was collected. Likewise, the analytical laboratory shall note in the laboratory analysis reports any headspace in the sample container(s) at the time of receipt by the laboratory.

### **Special Handling Considerations**

In general, samples for organic analyses should not be filtered. However, high turbidity samples for PCB analysis may require filtering. Consult the project-specific SAP for details on filtering requirements. Samples shall not be transferred from one container to another because this could cause aeration or a loss of organic material onto the walls of the container. TOX and TOC samples should be handled in the same manner as VOC samples.

When collecting total and dissolved metals samples, the samples should be collected sequentially. The total metals sample is collected from the pump unfiltered. The dissolved metals sample is collected after filtering with a 0.45-micron membrane in-line filter. Allow at least 500 mL of effluent to flow through the filter prior to sampling to ensure that the filter is thoroughly wetted and seated in the filter capsule. If required by the project-specific SAP, include a filter blank for each lot of filters used and always record the lot number of the filters.

### **Field Sampling Preservation**

Preserve samples immediately upon collection. Ideally, sampling containers will be pre-preserved with a known concentration and volume of preservative. Certain matrices that have alkaline pH (greater than 7) may require more preservative than is typically required. An early assessment of preservation techniques, such as the use of pH strips after initial preservation, may therefore be appropriate. Guidance for the preservation of environmental samples can be found in the U.S. EPA *Handbook for Sampling and Sample Preservation of Water and Wastewater* (EPA 1982). Additional guidance can be found in other U.S. EPA documents (EPA 1992, 1996).

### **Field Sampling Log**

A groundwater sampling log provided as Attachment 1 shall document the following:

- Identification of well
- Well depth
- Static water level depth and measurement technique
- Presence of immiscible layers and detection method
- Well yield
- Purge volume and pumping rate
- Time that the well was purged
- Sample identification numbers
- Well evacuation procedure/equipment
- Sample withdrawal procedure/equipment

- Date and time of collection
- Types of sample containers used
- Preservative(s) used
- Parameters requested for analysis
- Field analysis data
- Field observations on sampling event
- Name of sampler
- Weather conditions

## **9.0 Quality Control and Assurance**

- 9.1 Field personnel will follow specific quality assurance (QA) guidelines as outlined in the project-specific SAP. The goal of the QA program should be to ensure precision, accuracy, representativeness, completeness, and comparability in the project sampling program.
- 9.2 Quality control (QC) requirements for sample collection are dependent on project-specific sampling objectives. The project-specific SAP will provide requirements for sample preservation and holding times, container types, sample packaging and shipment, as well as requirements for the collection of various QC samples such as trip blanks, field blanks, equipment rinse blanks, and field duplicate samples.

## **10.0 Data and records management**

- 10.1 Records will be maintained in accordance with SOP 3-03, Recordkeeping, Sample Labelling, and Chain-of-Custody. Various forms are required to ensure that adequate documentation is made of the sample collection activities. These forms may include:
- Sample Collection Records;
  - Field logbook;
  - Chain-of-custody forms; and
  - Shipping labels.
- 10.2 Sample collection records (Attachment 1) will provide descriptive information for the purging process and the samples collected at each monitoring well.
- 10.3 The field logbook is kept as a general log of activities and should not be used in place of the sample collection record.
- 10.4 Chain-of-custody forms are transmitted with the samples to the laboratory for sample tracking purposes.
- 10.5 Shipping labels are required if sample coolers are to be transported to a laboratory by a third party (courier service).

## **11.0 Attachments or References**

Attachment 1 – Groundwater Sampling Collection Record



ASTM Standard D5088. 2008. *Standard Practice for Decontamination of Field Equipment Used at Waste Sites*. ASTM International, West Conshohocken, PA. 2008. DOI: 10.1520/D5088-02R08. [www.astm.org](http://www.astm.org).

Environmental Protection Agency, United States (EPA). 1982. *Handbook for Sampling and Sample Preservation of Water and Wastewater*. EPA-600/4-82-029. Cincinnati: EPA Office of Research and Development, Environmental Monitoring and Support Laboratory.

EPA. 1992. *RCRA Groundwater Monitoring Draft Technical Guidance*. EPA/530/R-93/001. Office of Solid Waste. November.

EPA. 1996. *Ground Water Issue: Low-Flow (Minimal Drawdown) Ground-Water Sampling Procedures*. EPA/540/S-95/504. Office of Solid Waste and Emergency Response. April.

EPA. 1997. *Test Methods for Evaluating Solid Waste, Physical/Chemical Method (SW-846)*. 3rd ed., Final Update IIIA. Office of Solid Waste. Online updates at: <http://www.epa.gov/epaoswer/hazwaste/test/new-meth.htm>.

NAVSEA T0300-AZ-PRO-010. *Navy Environmental Compliance Sampling and Field Testing Procedures Manual*. August 2009.

SOP 3-03, *Recordkeeping, Sample Labelling, and Chain-of-Custody*.

SOP 3-05, *IDW Management*.

SOP 3-06, *Equipment Decontamination*.

<i>Author</i>	<i>Reviewer</i>	<i>Revisions (Technical or Editorial)</i>
Mark Kromis Program Chemist	Chris Barr Program Quality Manager	Rev 0 – Initial Issue (May 2012)

# Attachment 1

## Groundwater Sample Collection Record



Well ID: \_\_\_\_\_

### Groundwater Sample Collection Record

Client: \_\_\_\_\_ Date: \_\_\_\_\_ Time: Start \_\_\_\_\_ am/pm  
 Project No: \_\_\_\_\_ Finish \_\_\_\_\_ am/pm  
 Site Location: \_\_\_\_\_  
 Weather Conds: \_\_\_\_\_ Collector(s): \_\_\_\_\_

#### 1. WATER LEVEL DATA: (measured from Top of Casing)

a. Total Well Length \_\_\_\_\_ c. Length of Water Column \_\_\_\_\_ (a-b) Casing Diameter/Material \_\_\_\_\_  
 b. Water Table Depth \_\_\_\_\_ d. Calculated Well Volume (see back) \_\_\_\_\_

#### 2. WELL PURGEABLE DATA

a. Purge Method: \_\_\_\_\_  
 b. Acceptance Criteria defined (see SAP or Work Plan)  
 - Minimum Required Purge Volume (@ \_\_\_\_\_ well volumes) \_\_\_\_\_  
 - Maximum Allowable Turbidity \_\_\_\_\_ NTUs  
 - Stabilization of parameters \_\_\_\_\_ %  
 c. Field Testing Equipment used: \_\_\_\_\_ Make \_\_\_\_\_ Model \_\_\_\_\_ Serial Number \_\_\_\_\_

Time (min)	Volume Removed (gal)	Temp. (°C)	pH s.u.	Spec. Cond. (µS/cm)	DO (mg/L)	ORP (mV)	Turbidity (NTU)	Flow Rate (ml/min)	Drawdown (m)	Color/Odor/etc.

d. Acceptance criteria pass/fail  
 Has required volume been removed ☐ Yes ☐ No ☐ N/A  
 Has required turbidity been reached ☐ Yes ☐ No ☐ N/A  
 Have parameters stabilized ☐ Yes ☐ No ☐ N/A  
 If no or N/A - Explain below. \_\_\_\_\_

(continued on back)

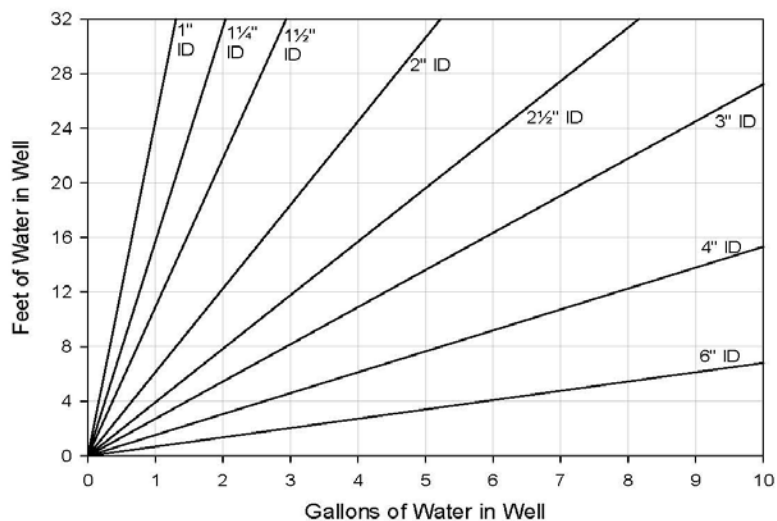
#### 3. SAMPLE COLLECTION: Method: \_\_\_\_\_

Sample ID	Container Type	No. of Containers	Preservation	Analysis Req.	Time

Comments \_\_\_\_\_

Signature \_\_\_\_\_ Date \_\_\_\_\_

## Well ID:



Volume / Linear Ft. of Pipe		
ID (in)	Gallon	Liter
¼	0.0025	0.0097
⅜	0.0057	0.0217
½	0.0102	0.0386
¾	0.0229	0.0869
1	0.0408	0.1544
1¼	0.0637	0.2413
1½	0.0918	0.3475
2	0.1632	0.6178
2½	0.2550	0.9653
3	0.3672	1.3900
4	0.6528	2.4711
6	1.4688	5.5600

(continued from front)

[illegible]

Signature \_\_\_\_\_ Date \_\_\_\_\_

## Direct Push Sampling Techniques

### Procedure 3-17

#### 1.0 Purpose and Scope

- 1.1 This standard operating procedure (SOP) provides guidance on the use of direct push techniques for the United States Navy Environmental Restoration (ER) Program, Naval Facilities Engineering Command, Atlantic (NAVFAC Atlantic).
- 1.2 This procedure is the Program-approved professional guidance for work performed by Resolution Consultants under the Comprehensive Long-Term Environmental Action Navy (CLEAN) contract (Contract Number N62470-11-D-8013).
- 1.3 This procedure shall serve as management-approved professional guidance for the ER Program and is consistent with protocol in the Uniform Federal Policy-Quality Assurance Project Plan (DoD 2005). As professional guidance for specific activities, this procedure is not intended to obviate the need for professional judgment during unforeseen circumstances. Deviations from this procedure while planning or executing planned activities must be approved by both the Contract Task Order (CTO) Manager and the Quality Assurance (QA) Manager or Technical Director, and documented.
- 1.4 If there are procedures whether it be from Resolution Consultants, state and/or federal that are not addressed in this SOP and are applicable to direct push sampling then those procedures may be added as an appendix to the project specific SAP.

#### 2.0 Safety

- 2.1 Field personnel shall perform work in accordance with the site-specific health and safety plan (HASP). During monitoring well installation, subcontractors in direct contact with potentially contaminated media shall wear the proper personal protective equipment (PPE) as outlined in the site-specific health and safety plan. Failure to comply will result in disciplinary action.
- 2.2 If circumstances warrant, a real-time immediate response instrument, such as a Miniram Dust Monitor, organic vapor analyzer, HNu, Thermo, Draeger or Sensidyne tubes, or explosimeter, should be used to monitor the work area. When real/time instrument response exceeds the permissible exposure limit, personnel shall don the appropriate PPE and alternate control measures to ensure personnel safety. If safe control measures are not achievable, field activities shall be discontinued immediately. Company-specific HASPs offer guidelines on air surveillance and on selection of PPE. In addition, the site-specific HASP includes an air monitoring program and suggested PPE.
- 2.3 In addition to the aforementioned precautions and depending upon the type of contaminant expected, employ the following safe work practices:
  - Particulate or Metal Compounds
    - 1. Avoid skin contact and/or incidental ingestion of soil.
    - 2. Wear protective clothing, steel-toed boots, gloves, safety glasses, and hearing protection as warranted.
  - VOCs
    - 1. Avoid breathing constituents venting from holes by approaching upwind, and/or by use of respiratory protection.

2. Pre-survey the area with a flame ionization detector (FID) or photoionization detector (PID) prior to sampling.
3. If monitoring results indicate organic vapors that exceed action levels as specified in the site-specific HASP, sampling activities may need to be conducted in Level C protection. At a minimum, skin protection will be required by use of gloves and Tyvek or other media that is protective against the media being encountered.

#### Flammable or Explosive Conditions

1. Monitor explosive gases as continuously as possible using an explosimeter and oxygen meter.
2. Place all ignition sources upwind or crosswind of the borehole.
3. If explosive gases exceed the designated action levels as specified in the site-specific HASP, cease operations and evaluate conditions.

#### Physical Hazards Associated With Soil Sampling

1. To avoid possible back strain associated with sample collection, use the large muscles of the legs, not the back, when retrieving soil samplers.
2. Stay clear of all moving equipment, and avoid wearing loose fitting clothing.
3. To avoid slip/trip/fall hazards, be wary of open trenches, pits, or holes.
4. Be aware of restricted mobility due to PPE.
5. To avoid hand, wrist, arm, shoulder, and back trauma due to the use of slide hammers or hand augers, rotate sampling among field personnel

### 3.0 Terms and Definitions

- 3.1 Direct push techniques are methods for subsurface sampling or monitoring that involve the application of downward pressure (usually supplied through hydraulic means) without the benefit of cutting tool rotation to enter soil. A variety of systems are available under several trade names, such as GeoProbe®. Equipment may be skid-mounted, trailered, or mounted directly on the frame of a vehicle.

### 4.0 Interferences

- 4.1 Potential interferences could result from cross-contamination between samples or sample locations. Minimization of the cross contamination will occur through the following:
  - The use of clean sampling tools at each location as necessary.
  - Avoidance of material that is not representative of the media to be sampled.

### 5.0 Training and Qualifications

#### 5.1 Qualifications and Training

The individual executing these procedures must have read, and be familiar with, the requirements of this SOP.

#### 5.2 Responsibilities

- 5.2.1 The **CTO Manager** is responsible for ensuring that these standard direct push technique procedures are followed during projects conducted under the ER Program and that a qualified individual conducts or supervises the projects. A qualified



individual for subsurface sampling or monitoring using direct push techniques is defined as a person with a degree in geology, hydrogeology, or geotechnical/civil engineering with at least 1 year of experience supervising soil boring construction using conventional drilling or direct push techniques. The CTO Manager or designee is responsible for ensuring that all personnel involved in direct push sampling techniques shall have the appropriate education, experience, and training to perform their assigned tasks as specified in Chief of Naval Operations Instruction 5090.1c (DON 2007).

- 5.2.2 The Program Quality Manager is responsible for ensuring overall compliance with this procedure.
- 5.2.3 The Field Manager is responsible for ensuring that all field personnel follow these procedures.
- 5.2.4 All Field Personnel are responsible for the implementation of this procedure.
- 5.2.5 The Field Personnel and/or Field Manager is responsible for directly supervising the direct push sampling procedures to ensure that they are conducted according to this procedure, and for recording all pertinent data collected during sampling.

## 6.0 Equipment and Supplies

In addition to those materials provided by the subcontractor, the project **Field Manager/Field Personnel** will require:

- Boring Logs;
- Spoons or scoops;
- Sample kit (bottles, labels, custody records and tape, cooler, ice), if laboratory analysis is required;
- Sample collection pan;
- Folding rule or tape measure;
- Plastic sheeting;
- Utility knife;
- Equipment decontamination materials (as described in SOP 3-06, *Equipment Decontamination*);
- Health and safety equipment (as required by HASP); and
- Field project notebook/pen.

## 7.0 Procedure

Direct push techniques may be used as a cost-effective alternative to conventional drilling techniques for obtaining subsurface soil and groundwater samples and for monitoring subsurface conditions.

### 7.1 Method Selection

Base the decision to use direct push techniques on: (1) their ability to achieve the required information at the required level of quality control and (2) their cost-effectiveness compared to conventional drilling methods. Major limitations of direct push techniques are their inability to penetrate rock or cobbles and a shallow maximum depth of penetration. The capabilities of

direct push systems vary significantly among vendors. Consider these differences in capabilities when evaluating the method for a subsurface exploration program.

Use direct push techniques to obtain groundwater samples for confirmatory analyses only if the screen placement method protects the screen from clogging during installation and allows the installation of a sand-pack around the exterior of the well screen.

## 7.2 **Inspection of Equipment**

Inspect direct push equipment prior to use for signs of fluid leakage, which could introduce contaminants to the soil. If, at any time during equipment operation, fluid is observed leaking from the rig, cease operations and immediately repair or contain the leak. Collect, containerize, and label soil and other materials affected by the leak for proper disposal (see SOP 3-05, *IDW Management*).

## 7.3 **Preparation of Work Site**

Inspect the work site prior to commencing operations to ensure that no overhead hazards exist that could impact the direct push equipment, and the work area should be cleared and/or marked by the local underground utility locating service (e.g., DigSafe). In addition, clear locations planned for subsurface exploration using either geophysical methods and/or hand excavate locations to a depth of 2 to 3 feet prior to soil penetration, unless it is certain (by virtue of subsurface clearing activities) that no utilities or other hazardous obstructions will be encountered in the first 2 to 3 feet. Hand excavation may be waived when it is not practical.

Locate the direct push rig so that it is downslope from the penetration point, if the work is to be performed on a grade. Locate the rig downwind or crosswind of the penetration point, if possible. Cover the area surrounding, and in the vicinity of, the penetration point with plastic. Establish required exclusion zones using plastic tape or cones to designate the various areas.

## 7.4 **Equipment Decontamination**

To avoid cross-contamination, thoroughly decontaminate equipment used for direct push exploration and sampling as described in SOP 3-06, *Equipment Decontamination*.

Decontaminate sampling tools and downhole equipment between each sampling event and between penetration points. At a minimum, steam clean or wash and rinse the equipment. Collect, containerize, and label all wash and rinse water for proper disposal. Clean equipment (e.g., drive rods and samplers) shall not come into contact with contaminated soils or other contaminated materials. Keep equipment on plastic or protect it in another suitable fashion. Store push rods and other equipment removed from a hole on plastic sheeting until properly decontaminated.

## 7.5 **Soil Sampling**

This SOP assumes that the subcontractor will perform sampling; therefore, detailed procedures regarding sample acquisition are not provided. Vendors of direct push equipment offer a variety of sampling systems designed specifically for their equipment. Both continuous and discrete soil samples may be obtained using sampling equipment similar to that described in Procedure 3-21, *Surface and Subsurface Soil Sampling*. The preferred methods for soil sampling using direct push techniques use brass or stainless steel split-tube samplers that are driven through the horizon to be sampled. Use plastic sample tubes (e.g., Macro-Core Samplers) only for screening purposes or, in the case of confirmatory sampling, if samples will not be analyzed for volatile organic compounds (VOCs) or semivolatile organic compounds (SVOCs).

## 7.6 **Groundwater Sampling**

Direct push vendors offer numerous methods for obtaining groundwater samples. Key differences among methods involve: (1) the maximum well diameter achievable; (2) the ability to protect the well screen from exposure to contaminated overburden soils during installation; (3) the ability to install packing around the screen; (4) flexibility in the size, materials of construction, and design of well screens; and (5) the ability to convert sampling points into permanent monitoring wells. The limitations and abilities of a given system must be thoroughly understood and matched to the needs of the project before committing to the collection of groundwater samples using direct push techniques.

Use direct push techniques only to collect screening samples unless it is confirmed that the system:

1. Effectively protects the well screen from exposure to contaminated overburden soils during installation
2. Allows the installation of effective packing around the well screen
3. Allows the well screen to be effectively sealed against the downward infiltration of overlying groundwater or surface precipitation
4. Is constructed of materials compatible with the intended sampling and analysis goals of the project
5. Allows the use of a well screen properly sized and slotted for the needs of the project

Additional information on the collection of groundwater samples can be found in SOP 3-14 Monitoring Well Sampling.

It is the responsibility of the **CTO Manager** to evaluate and determine the appropriateness of direct push systems prior to committing to their use on any project involving groundwater sampling. As part of this evaluation, it is recommended to obtain concurrence from regulatory authorities in advance for the method selection.

## 7.7

### **Borehole Abandonment**

Methods for abandoning boreholes created with direct push systems will vary among vendors. Coordinate the desired method for abandonment with the vendor in the planning stages of the project to ensure proper abandonment.

Some direct push boreholes will close naturally as the drive rods and sampling tools are withdrawn. This may occur in loose, unconsolidated soils, such as sands. Close all boreholes using one of the procedures described in this procedure, unless natural caving precludes such closure.

The three methods for closing direct push boreholes are:

1. Add granulated or pelletized bentonite and hydrate in layers, proceeding from the bottom of the hole to the surface.
2. Pour premixed cement/water (or cement/water/bentonite) mixture into the hole.
3. Fill the entire hole with granular or pelletized bentonite and hydrate by means of a previously emplaced water tube that is gradually withdrawn as water is supplied to the bentonite.

The second method is recommended. For shallow holes less than 10 feet in depth, pour a cement/water/bentonite mix directly into the opening using a funnel. For deeper holes, use a conductor (tremie) pipe to carry the grout mix to the far reaches of the borehole. Lower the conductor pipe to within 2 inches of the bottom and gradually withdraw it as grout is added, keeping the lower end of the pipe submerged in grout at all times.

The recommended grout mixture for well abandonment is 7 to 9 gallons of water per 94-pound bag of Portland cement, with 3 percent to 5 percent by weight of powdered bentonite added to the mixture. Commercial products, such as Volcay are acceptable with pre-approval of the **CTO Manager**.

Seal boreholes to within 0.5 to 2.0 feet of the surface. Inspect the abandoned borehole after 24 hours to ensure that grout shrinkage does not occur. If significant shrinkage has occurred, re-grout the borehole. Fill the remaining portion of the hole with local topsoil or appropriate paving materials.

## **8.0 Quality Control and Assurance**

- 8.1 Collection of representative samples will be ensured through adherence to the procedures in this SOP and the sampling strategy outlined in the SAP. The field quality control samples identified in the SAP must be collected. These samples may include field duplicates, equipment rinsate blanks, trip blanks, and matrix spike/matrix spike duplicates

## **9.0 Records, Data Analysis, Calculations**

- 9.1 Various forms are required to ensure that adequate documentation is made of the sample collection activities. These forms may include:
- Boring logs;
  - Field logbook;
  - Sample collection records;
  - Chain-of-custody forms; and
  - Shipping labels.
- 9.2 Boring logs (Attachment 1) will provide visual and descriptive information for samples collected at each soil boring and are often the most critical form of documentation generated during a soil sampling program.
- 9.3 The field logbook is kept as a general log of activities and should not be used in place of the boring log.
- 9.4 Chain-of-custody forms are transmitted with the samples to the laboratory for sample tracking purposes.
- 9.5 Shipping labels are required is sample coolers are to be transported to a laboratory by a third party (courier service).

## **10.0 Attachments or References**


- 10.1 Attachment 1 – Boring Log
- 10.2 NAVSEA T0300-AZ-PRO-010. *Navy Environmental Compliance Sampling and Field Testing Procedures Manual*. August 2009.
- 10.3 Department of Defense, United States (DoD). 2005. *Uniform Federal Policy for Quality Assurance Project Plans, Part 1: UFP-QAPP Manual*. Final Version 1. DoD: DTIC ADA 427785, EPA-505-B-04-900A. In conjunction with the U. S. Environmental Protection Agency and the Department of Energy. Washington: Intergovernmental Data Quality Task Force. March. On-line updates available at: [http://www.epa.gov/fedfac/pdf/ufp\\_qapp\\_v1\\_0305.pdf](http://www.epa.gov/fedfac/pdf/ufp_qapp_v1_0305.pdf).

- 10.4 Department of the Navy (DON). 2007. *Navy Environmental and Natural Resources Program Manual*. OPNAV Instruction 5090.1c. October.
- 10.5 SOP 3-05, *IDW Management*.
- 10.6 SOP 3-06, *Equipment Decontamination*.
- 10.7 SOP 3-21, *Surface and Subsurface Soil Sampling*.

Author	Reviewer	Revisions (Technical or Editorial)
Mark Kromis Program Chemist	Chris Barr Program Quality Manager	Rev 0 – Initial Issue (May 2012)

# Attachment 1

## Boring Log

							<b>Boring ID:</b>	
							Page <u>1</u> of _____	
Project Name:			Drilling Company:			Type of Surface Material:		
Project Number:			Drilling Method:			Patching Material:		
Date Started Drilling:			Rig Type:			Drilling Water Level:		
Date Finished Drilling:			Core Size:			Boring Total Depth (bgs):		
Physical Location:						Logged By:		
(Note: bgs = below ground surface)								
Depth Range	Recovery ft/ft	PID (ppm)	Moisture Content	GA Class.	USCS	GA Class: Garfield Avenue Sites classification & Modified Unified Soil Classification System		
						Ground Surface Cover and Thickness:	Sample name & #:	
0-1								
1-2								
2-3								
3-4								
4-5								
5-6								
6-7								
7-8								
8-9								
9-10								
10-11								
11-12								
12-13								
13-14								
14-15								
15-16								
16-17								
17-18								
18-19								
19-20								
<b>Stratigraphic Unit Intervals:</b>						<b>Comments:</b>		
1.)		5.)						
2.)		6.)						
5.)		6.)						

# Surface and Subsurface Soil Sampling Procedures

## Procedure 3-21

### 1.0 Purpose and Scope

- 1.1 This standard operating procedure (SOP) describes the procedures for soil sampling. The procedure includes surface and subsurface sampling by various methods using hand auguring, test pit, direct-push, and split-spoon equipment.
- 1.2 The procedure includes soil sampling for volatile organic compounds (VOCs). For project specific information (e.g. sampling depths, equipment to be used, and frequency of sampling), refer to the project-specific planning documents (e.g., Work Plan [WP] or Sampling and Analysis Plan [SAP]), which take precedence over these procedures. Surface soil sampling, typically considered to be up to two feet below ground surface by EPA standards, is typically accomplished using hand tools such as shovels or hand augers. Test pit samples are considered subsurface samples, although normally collected via hand tools similar to surface soil sampling or by excavation machinery. Direct-push and split-spoon sampling offer the benefit of collecting soil samples from a discrete or isolated subsurface interval, without the need of extracting excess material above the target depth. These methods dramatically reduce time and cost associated with disposal of material from soil cuttings when compared to test pit sampling. In addition, direct-push and split-spoon sampling methods can obtain samples at targeted intervals greater than 15 feet in depth, allowing for discrete depth soil sampling while speeding up the sampling process. Direct-push methods work best in medium to fine-grained cohesive materials such as medium to fine sands, silts, and silty clay soils. Split-spoon sampling works well in all types of soil, but is somewhat slower than direct-push methods. Samples are composited so that each sample contains a homogenized representative portion of the sample interval. Due to potential loss of analytes, samples for volatile analysis are not composited. Samples for chemical analysis can be collected by any of the above-mentioned sampling methods, as disturbed soil samples. Undisturbed samples are collected, sealed, and sent directly to the laboratory for analysis. For undisturbed samples, the samples are not homogenized.

### 2.0 Safety

- 2.1 The health and safety considerations for the work associated with this SOP, including both potential physical and chemical hazards, will be addressed in the project Accident Prevention Plan/Site-specific Safety and Health Plan (APP/SSHP).
- 2.2 Before soil sampling commences, appropriate entities (e.g. DigSafe, local public works departments, company facilities) must be contacted to assure the anticipated soil sampling locations are marked for utilities, including electrical, telecommunications, water, sewer, and gas.

### 3.0 Terms and Definitions

None.

## 4.0 Interferences

- 4.1 Low recovery of soil from sampling equipment will prevent an adequate representation of the soil profile and sufficient amount of soil sample. If low recovery is a problem, the hole may be offset and re-advanced, terminated, or continued using a larger diameter sampler.
- 4.2 Asphalt in soil samples can cause false positive results for hydrocarbons. To ensure samples are free of asphalt, do not collect samples that may contain asphalt. If the collection of samples potentially containing asphalt is unavoidable, note the sampling depths at which the presence of asphalt are suspected.
- 4.3 Instrumentation interferences addressed in SOPs for Calibration of the Photoionization Detector (PID), Headspace Screening for Total Volatile Organics, and Equipment Decontamination must also be considered.
- 4.4 Cross contamination from sampling equipment must be prevented by using sampling equipment constructed of stainless steel that is adequately decontaminated between samples.

## 5.0 Training and Qualifications

### 5.1 Qualifications and Training

The individual executing these procedures must have read, and be familiar with, the requirements of this SOP.

### 5.2 Responsibilities

- 5.2.1 The **Project Manager** is responsible for ensuring that soil sampling activities comply with this procedure.

The Project Manager is responsible for ensuring that all personnel involved in soil sampling shall have the appropriate education, experience, and training to perform their assigned tasks.
- 5.2.2 The **Program Quality Manager** is responsible for ensuring overall compliance with this procedure.
- 5.2.3 The **Field Manager** is responsible for ensuring that all soil sampling activities are conducted according to this procedure.
- 5.2.4 All **Field Personnel** are responsible for the implementation of this procedure.

## 6.0 Equipment and Supplies

The depth at which samples will be collected and the anticipated method of sample collection (direct-push, split-spoon, hand auger, shovel, or test pits) will be presented in the project planning documents. The following details equipment typically needed for soil sampling, based on the various methods.

- 6.1 Depending on the nature of suspected contamination, field screening instrumentation may be used for direct sampling. Appropriate instrumentation and calibration standards should be available. If volatile organic contaminants are suspected and a PID will be used, refer to the equipment and instrumentation listed in SOP 3-20 Operation and Calibration of a Photoionization Detector. Equipment in this SOP includes but is not limited to:



- PID/FID;
  - Calibration gas; and
  - Tedlar® gas bags (for calibration).
- 6.2 If field screening methods include jar headspace screening for volatile organics, refer to the equipment and procedure in SOP 3-19 Headspace Screening for Total VOCs. Equipment in this SOP includes but is not limited to:
- Clean soil (“drillers jars”) jars; and
  - Aluminium foil.
- 6.3 SOP 3-06 Appropriate decontamination procedures must be followed for sampling equipment. Refer to Equipment Decontamination. Equipment in this SOP includes but is not limited to:
- Phosphate-free detergent;
  - Isopropyl Alcohol;
  - Tap water;
  - Deionized Ultra-Filtered (DIUF) Water;
  - Plastic buckets or washbasins;
  - Brushes; and
  - Polyethylene sheeting.
- 6.4 The following general equipment is needed for all soil sampling, regardless of method:
- Stainless steel bowls;
  - Stainless steel trowels;
  - Appropriate sample containers for laboratory analysis;
  - Personal Protective Equipment (PPE);
  - Logbook;
  - Cooler and ice for preservation; and
  - Stakes and flagging to document sampling location.
- 6.5 The following additional equipment is needed for volatile organic sampling:
- Electronic pan scale and weights for calibration; and
  - Syringes or other discrete soil core samplers.
- 6.6 The following additional equipment may be needed for surface and test pit soil sampling:
- Hand Auger
- 6.7 The following additional equipment may be needed for soil sampling from direct push and/or split-spoon equipment:

- Tape measure or folding carpenter's rule for recording the length of soil recovered.

Note: All subsurface drilling equipment will be provided and maintained by the subcontractor.

## **7.0 Procedure**

### **7.1 General Soil Sampling Procedure for All Soil Sampling Methods**

- 7.1.1 Record the weather conditions and other relevant on-site conditions.
- 7.1.2 Select the soil sampling location, clear vegetation if necessary, and record the sampling location identification number and pertinent location details.
- 7.1.3 Verify that the sampling equipment is properly decontaminated, in working order, and situated at the intended sampling location.
- 7.1.4 Place polyethylene sheeting on the ground and assemble all necessary sampling equipment on top of it.
  - Cover surfaces onto which soils or sampling equipment will be placed (i.e. tables with polyethylene sheeting).
- 7.1.5 Follow the appropriate procedures listed below for either surface, split-spoon, direct push, or test pit sample collection (7.2, 7.3, 7.4, and 7.5 respectively).
- 7.1.6 Collect soil samples according to procedures listed in Section 7.6 depending on project specific analyses.
- 7.1.7 Record date/time, sample ID, and sample descriptions in the field logbook or field form. A sketch or description of the location may also be recorded so the sample location can be re-constructed, especially if the location will not be recorded using global positioning satellite (GPS) equipment.
- 7.1.8 Immediately label the sample containers and place them on ice, if required for preservation. Complete the chain-of-custody form(s) as soon as possible.
- 7.1.9 Dispose of all excess excavated soil in accordance with the WP/SAP.
- 7.1.10 If required, mark the sample location with a clearly labelled wooden stake or pin flag. If the location is on a paved surface, the location may be marked with spray paint.
- 7.1.11 Decontaminate the sampling equipment according to SOP 3-06 Equipment Decontamination.

### **7.2 Surface Sampling**

- 7.2.1 The criteria used for selecting surface soil locations for sampling may include the following:
  - Visual observations (soil staining, fill materials);
  - Other relevant soil characteristics;
  - Site features;
  - Screening results;
  - Predetermined sampling approach (i.e. grid or random); and
  - Sampling objectives as provided in the WP/SAP.
- 7.2.2 The following procedures are to be used to collect surface soil samples. Surface soils are considered to be soils that are up to two feet below ground surface, though state regulations

and project objectives may define surface soils differently; therefore, the WP/SAP should be consulted for direction on the depth from which to collect the surface soil samples. Sampling and other pertinent data and information will be recorded in the field logbook and/or on field forms. Photographs may be taken as needed or as specified in the WP/SAP.

1. Gently scrape any vegetative covering until soil is exposed. Completely remove any pavement.
2. Remove soil from the exposed sampling area with a trowel, hand auger, or shovel. Put soils within the sampling interval in a stainless steel bowl for homogenizing. Monitor the breathing zone and sampling area as required in the APP/SSHP.
3. For VOC analyses, collect representative soil samples directly from the recently-exposed soil using a syringe or other soil coring device (e.g., TerraCore®, EnCore®). Follow procedures in Section 7.6.1 for VOC sampling.
4. Collect sufficient soil to fill all remaining sample jars into a stainless steel bowl. Homogenize the soil samples to obtain a uniform soil composition which is representative of the total soil sample collected according to the following procedure:
  - a) Remove all rocks and non-soil objects using a stainless steel spoon or scoop.
  - b) Form a cone shaped mound with the sample material, then flatten the cone and split the sample into quarters.
  - c) Use the stainless steel spoon/scoop to mix the quarter samples that are opposite.
  - d) After mixing the opposite quarters, reform the cone shaped mound.
  - e) Repeat this procedure a minimum of five (5) times, removing any non-soil objects and breaking apart any clumps.

### 7.3 Split-Spoon Sampling

7.3.1 At each boring location, the frequency and depth of split-spoon samples will be determined from the

WP/SAP. Split-spoon samples may be collected continuously, intermittently, or from predetermined depths.

7.3.2 Split-spoon samplers shall be driven into undisturbed soil by driving the spoon ahead of the drill augers/casing. In cohesive soils, or soils where the borehole remains open (does not collapse), two split-spoon samples may be taken prior to advancing the augers/casing.

7.3.3 After split-spoons are retrieved, open the split-spoon and measure the recovery of soil. If a PID will be used for screening, immediately scan the recovered sample for VOCs using the PID. Scan the recovered soil boring by making a hole in the soil with a decontaminated trowel and placing the PID inlet very close to the hole. Be very careful not to get soil on the tip of the PID. Take PID readings every 6 inches along the split-spoon and/or in any areas of stained or disturbed soil. Record the highest PID reading and the depth at which it was observed along with all other pertinent observations. If required in the WP/SAP, VOC and headspace samples should be collected (see Section 7.6.1) prior to logging the sample.

7.3.4 If headspace screening for VOCs is required in the WP/SAP, collect a soil sample (as defined in the SAP) and perform headspace screening according to SOP 3-19 Headspace Screening for Total VOCs.

7.3.5 Soils collected using the split-spoon sampler will be logged by the field representative

using the procedure required in the WP/SAP.

- 7.3.6 Collect the remainder of the sample volume required into a stainless steel bowl. Homogenize the soil so the material is uniform in composition and representative of the total soil sample collected. Follow homogenizing techniques as described in Section 7.2.
- 7.3.7 The SAP may specify that intervals to be sent to the laboratory be determined by visual observation and/or highest PID screening or headspace results, which can only be determined once the boring is complete. In this instance, a VOC sample should be collected at each interval. The remainder of the soil from that interval will be set aside in a clearly labelled stainless steel bowl covered with aluminium foil. Once the boring has been completed and the sample interval has been determined, the remainder of the soil can be homogenized according to Section 7.2 and submitted for laboratory analysis.
- 7.3.8 Once a boring is complete and all required samples have been collected, the boring must be completed as specified in the WP/SAP (e.g., completed as a monitoring well, backfilled with bentonite, etc).

#### 7.4 **Direct Push Sampling**

At each boring location, the frequency of direct-push samples will be determined from the WP/SAP. Typically, samples with direct-push equipment are collected in 4 foot (ft) intervals, but smaller (e.g., 2 ft) and larger (e.g., 5 ft) intervals are also possible.

1. Sample using Macro-Core samplers with acetate liners to obtain discrete soil samples at the depths specified in the WP/SAP.
2. Cut open the acetate liner. If required in the WP/SAP, immediately scan the recovered soil boring for VOCs using a PID by making a hole in the soil with a decontaminated trowel and placing the PID inlet very close to the hole. Be very careful not to get soil on the tip of the PID. Take PID readings every 6 inches along the split-spoon and/or in any areas of stained or disturbed soil. Record the highest PID reading and the depth at which it was observed along with all other pertinent observations. VOC and headspace samples, if required in the WP/SAP should be collected (see Section 7.6.1) prior to logging the sample.
3. If required in the WP/SAP, collect a soil sample (as defined in the WP/SAP) and perform headspace screening according to SOP 3-19 Headspace Screening for Total VOCs.
4. Soils collected using the direct-push sampler will be logged by the field representative using the procedure required in the WP/SAP.
5. Collect the remainder of the sample into a stainless steel bowl. Homogenize the soil collected so that the material is uniform in composition and representative of the total soil sample collected. Follow homogenizing techniques as described in Section 7.2.
6. Once a boring is complete and all required samples have been collected, the boring must be completed as specified in the WP/SAP (e.g., completed as a monitoring well, backfilled with bentonite, etc).

#### 7.5 **Test Pit Sampling**

- 7.5.1 Excavate the test pit to the desired depth.
- 7.5.2 Using the excavator bucket, collect soil samples as specified in the WP/SAP. Collect a sample and perform screening analyses as required by the WP/SAP. If VOCs contamination is suspected, perform headspace screening according to SOP 3-19 Headspace Screening

for Total VOCs.

- 7.5.3 Collect the sample from center of the bucket to avoid potential contamination from the bucket.
- 7.5.4 VOC samples should also be collected from an undisturbed section soil in the excavator bucket. The top layer of exposed soil should be scraped away just prior to collecting the VOC samples.
- 7.5.5 Collect the remainder of the sample volume required into a stainless steel bowl. Homogenize the soil so the material is uniform in composition and representative of the total soil sample collected. Follow homogenizing techniques as described in Section 7.2.
- 7.5.6 Dispose of all excavated soil according to the WP/SAP.

## 7.6 Sample Collection Methods

### 7.6.1 Volatile Organics Sampling

For soils collected for analyses of volatile organics, including Volatile Petroleum Hydrocarbons (VPH) or other purgable compounds, a closed system is maintained. From collection through analysis, the sample bottles are not opened. The bottle kit for a routine field sample for these analyses will typically include three 40-mL VOA vials and one soil jar. Two 40-mL VOA vials will contain either 5 mL reagent water or

5 mL sodium bisulfate and magnetic stir bars (i.e., low level vials). The third VOA vial will contain 15 mL methanol with no magnetic stir bar (i.e., high level vial). These vials are usually provided by the laboratory and are pre-weighed, with the tare weight recorded on the affixed sample label. No

additional sample labels are affixed to the VOA vials, as addition of a label would alter the vial weight.

All information is recorded directly on the sample label using an indelible marker. The soil jar is provided for percent solids determination. For VOC or VPH analyses, samples are collected prior to sample homogenization. Collect the VOC sample in accordance with the procedure described below.

1. Determine the soil volume necessary for the required sample weight, typically 5 grams:
  - a) Prepare a 5 mL sampling corer (e.g., Terra Core®) or cut-off plastic syringe.
  - b) Tare the sampler by placing it on the scale, and zeroing the scale.
  - c) Draw back the plunger to the 5 gram mark or 5mL (5cc) mark on cut-off syringe, and insert the open end of the sampler into an undisturbed area of soil with a twisting motion, filling the sampler with soil. Note the location of the plunger with respect to the milliliter (cc) or other graduation printed on the sampler.
  - d) Weigh the filled sampler, and remove or add soil until the desired weight is obtained. Note the location of the plunger which corresponds to this weight. Do not use this sample for laboratory analysis.
2. Once the required soil volume has been determined, pull the plunger back to this mark and hold it there while filling the syringe for each sample.
3. Collect 5 grams of soil using the cut-off syringe or Terra Core® sample device. Extrude the 5- grams of soil into one of the low level 40-mL VOA vials. Quickly wipe any soil from the threads of the VOA vial with a clean Kimwipe® and immediately close the vial.

It is imperative that the threads be free from soil or other debris prior to replacing the cap on the vial in order to maintain the closed system necessary for the analysis.

4. Gently swirl the vial so that all of the soil is fully wetted with the preservative.
5. Fill the other low level 40 mL VOA vial in this manner.
6. Repeat the process for the high level VOA vials, only for the high level VOA vial three 5 gram aliquots (i.e., 15 grams total) should be extruded into the high level VOA vial.

NOTE: Depending on the laboratory, some high level VOA vials only contain 5 mL or 10 mL of methanol. If this is the case, either 5 grams total or 10 grams total, respectively, should be extruded into the high level VOA vial. In other words, the mass of soil in grams should be identical to the volume of methanol in mL (i.e., 1:1 ratio of soil to methanol).

7. Collect any additional QC sample collected (e.g., field duplicate, MS, and MSD) in the same manner as above.
8. Fill the 4-oz glass jar with soil from the same area for percent moisture determination.

#### 7.6.2 Soil Sampling Method (All other analyses except VOC/VPH)

When all the required soil for a sampling location has been obtained, the soil can be homogenized as described in section 7.2. Collect sufficient volume to fill all of the remaining sample containers at least

$\frac{3}{4}$  full for all other analyses. Homogenize the soil in a decontaminated stainless steel bowl, removing rocks, sticks, or other non-soil objects and breaking apart any lumps of soil prior to filling the remaining sample containers.

NOTE: Soil samples must contain greater than 30% solids for the data to be considered valid.

## 8.0 Quality Control and Assurance

- 8.1 Sampling personnel should follow specific quality assurance guidelines as outlined in the WP/SAP. Proper quality assurance requirements should be provided which will allow for collection of representative samples from representative sampling points. Quality assurance requirements outlined in the WP/SAP typically suggest the collection of a sufficient quantity of field duplicate, field blank, and other samples.
- 8.2 Quality control requirements are dependent on project-specific sampling objectives. The WP/SAP will provide requirements for equipment decontamination (frequency and materials), sample preservation and holding times, sample container types, sample packaging and shipment, as well as requirements for the collection of various quality assurance samples such as trip blanks, field blanks, equipment blanks, and field duplicate samples.

## 9.0 Records, Data Analysis, Calculations

All data and information (e.g., sample collection method used) must be documented on field data sheets, boring logs, or within site logbooks with permanent ink. Data recorded may include the following:

- Weather conditions;
- Arrival and departure time of persons on site;
- Instrument type, lamp (PID), make, model and serial number;



- Calibration gas used;
- Date, time and results of instrument calibration and calibration checks;
- Sampling date and time;
- Sampling location;
- Samples collected;
- Sampling depth and soil type;
- Deviations from the procedure as written; and
- Readings obtained.

## **10.0 Attachments or References**

SOP 3-06, Equipment Decontamination

SOP 3-19, Headspace Screening for Total VOCs

SOP 3-20, Operation and Calibration of a Photoionization Detector



# Water Quality Parameter Testing for Groundwater Sampling

## Procedure 3-24

### 1.0 PURPOSE

This standard operating procedure (SOP) represents minimum standard of practice. State and federal requirements may vary, and this SOP does not replace state and federal requirements that must be consulted before work begins. Further, if a project-specific work plan has been created, the work plan should be considered the ruling document. This SOP may be modified to meet specific regulatory, client, or project specific criteria.

If there are procedures whether it be from Resolution Consultants, state and/or federal that are not addressed in this SOP and are applicable to water quality parameter testing, then those procedures may be added as an appendix to the project-specific Sampling and Analysis Plan (SAP).

### 2.0 SCOPE

This procedure provides guidance for expected sampling methods and protocols by all personnel related to the measurement of water quality parameters.

Field measurements of water quality parameters are commonly performed to evaluate surface water and groundwater. These tests are often performed to evaluate basic water quality parameters, to evaluate natural attenuation parameters, and to assess the presence of pore water entering a well.

As professional guidance for specific activities, this procedure is not intended to obviate the need for professional judgment during unforeseen circumstances. Deviations from this procedure while planning or executing planned activities must be approved by either the Contract Task Order (CTO) Manager or the Quality Assurance (QA) Manager, and documented.

### 3.0 DEFINITIONS

#### 3.1 Barometric Pressure (BP)

The density of the atmosphere, which varies according to altitude and weather conditions.

#### 3.2 Conductivity/Specific Conductance

A measure of the ability of water to pass electrical current, which increases with the amount of dissolved ionic substances (i.e., salts). Conductivity is inversely related to the resistance of a solution and is measured in units of mhos per centimeter (mhos/cm) (inverse ohms/cm, Siemens/cm). The conductivity of water increases with increasing temperature.

Specific Conductance is corrected for 25 degrees Celsius (°C); for this reason, it is best to record Specific Conductance. If Conductivity is recorded, the temperature of the sample MUST recorded.





### **3.3 Dissolved Oxygen (DO)**

The amount of oxygen present in water and available for respiration. DO is typically measured in milligrams per liter (mg/L). Oxygen is less soluble in warm and salty waters, so the instrument compensates the apparent percent saturation for changes in temperature and conductivity. Most probes measure the current resulting from the electrochemical reduction of oxygen (at a gold cathode) diffusing through a selective membrane. Because oxygen is being removed from the sample to perform the measurement, sample flow is required to prevent false low readings due to depletion of oxygen in the solution in front of the probe. Optical DO probes do not remove oxygen from the sample and are less affected by salts. The common range of DO in groundwater is 0.0 to

3.0 mg/L. Measurements outside of this range suggest that the meter may not be operating correctly.

### **3.4 Nephelometric Turbidity Unit (NTU)**

The measurement of light passing through a sample based on the scattering of light caused by suspended particles.

### **3.5 pH**

A measure of acidity and alkalinity of a solution using a logarithmic scale on which a value of 7 represents neutrality, lower numbers indicate increasing acidity, and higher numbers are increasingly basic.

### **3.6 Oxidation-Reduction Potential (ORP)**

Also known as redox or eH, ORP is a measurement of the potential for a reaction to occur, which generally indicates the oxygen status of a sample. The probe consists of a platinum electrode, the potential of which is measured with respect to a reference electrode that rapidly equilibrates with the potential of the sample solution. A positive value indicates that oxygen is present. A negative value indicates an anaerobic environment or reducing condition. For this reason, negative ORP readings should be associated with DO readings of less than 0.5 mg/l; with negative ORP readings the water may exhibit a sulfur odor or gray color. Positive ORP readings should be associated with DO readings greater than 0.5 mg/L and lack of sulfur odors. Because of the complex relationship between ORP and temperature, no compensation is attempted; it is thus best to report both the ORP and temperature of a water sample.

### **3.7 Total Dissolved Solids**

A measure of the quantity of materials in water that are either dissolved or too small to be filtered.

### **3.8 Turbidity**

Measure of the clarity of water in NTUs. Potable water typically has NTU values between 0.0 and 0.3 NTUs, depending on the state or regulatory program.



## **4.0 RESPONSIBILITIES**

The CTO Manager, or designee, is responsible for ensuring that these standard groundwater sampling activities are followed and shall review all groundwater sampling forms at the conclusion of a sampling event. The CTO Manager is responsible for ensuring that all personnel involved in monitoring well sampling shall have the appropriate education, experience, and training to perform their assigned tasks. The QA Manager or Technical Director is responsible for ensuring overall compliance with this procedure. The Field Manager is responsible for ensuring that all project field staff follows these procedures.

Field sampling personnel are responsible for the implementation of this procedure. Personnel are required to be knowledgeable of the procedures in this SOP. Training and familiarization with this SOP shall be documented in the training file for each employee. The field sampler and/or Field Manager is responsible for directly supervising the calibration procedures to ensure that they are conducted according to this procedure, and for recording all pertinent data. If deviations from the procedure are required because of anomalous field conditions, they must first be approved by the CTO Manager, QA Manager, or Technical Director and then documented in the field logbook and associated report or equivalent document.

## **5.0 PROCEDURES**

### **5.1 Purpose**

The procedures will vary depending on parameters being measured, method of sampling, and the method of measurement used. The information here is a general guidance and the site-specific documents and manufacturer manuals supersede these procedures.

### **5.2 Cautions**

Improper use of water quality testing equipment could result in equipment damage or compromised sampling results. Personnel should be trained to operate the test equipment being used for a field operation and should be trained in the proper techniques for collecting and logging water quality parameters. Personnel should also be able to recognize problems with test equipment and have someone available for basic troubleshooting and repair.

### **5.3 Interferences**

During field testing, water quality data that is documented from field testing equipment may be influenced by certain outside factors that are unrelated to the actual site water quality. Such parameters and equipment include the following:

#### **pH Meters**

- Coatings of oils, greases, and particles may impair the electrode's response. Pat the electrode bulb dry with lint-free paper or cloth and rinse with de-ionized water. For cleaning hard-to-remove films, use isopropyl alcohol very sparingly so that the electronic surface is not damaged.
- Poorly buffered solutions with low specific conductance (less than 200 microsiemens per centimeter) may cause fluctuations in the pH readings. Equilibrate electrode by immersing in several aliquots of sample before taking pH.

## Dissolved Oxygen

- Dissolved gases (e.g., hydrogen sulfide, halogens, sulfur dioxide) are a factor with the performance of DO probes. The effect is less pronounced on optical DO meters. Meter type and potential interferences should be considered based on potential sulfate/sulfide or nitrate/nitrite reducing environments.
- Exposure of the sample to the atmosphere will cause elevated DO measurements.

## Turbidity Meter

- If the weather is warm and humidity is high, condensation may collect on the cuvet. To avoid this, allow the sample to warm and dry the outside of the cuvet before making the measurement. One method used to accomplish this is to place the cuvet against one's body (armpits work well).

## Temperature

- Sample temperature will change rapidly when there are significant differences between the sample and ambient air.

## 5.4 Apparatus and Materials

Field personnel shall consult the site work plan and SAP to review the equipment requirements for the sampling procedures to be followed during the sampling effort. The specific apparatus and materials required will depend on the water quality parameters being monitored. Table 1 shows the common equipment used in water quality parameter testing.

**Table 1**  
**Water Quality Parameter Testing — Common Equipment**

Water Quality Parameter Instrument	Calibration Standards Required	Other Equipment
pH Meter	Yes - 2 or 3 Point Standards depending on groundwater range. Calibration must cover the range to be measured. If samples are above or below typical buffer standards (4, 7 and 10), special order buffers that fall outside groundwater pH range.	Container or flow thru cell for holding sample
Specific Conductance	Yes	Container or flow thru cell for holding sample
ORP Meter	Yes	Container or flow thru cell for holding sample
Turbidity Meter	Yes	Container or flow thru cell for holding sample
DO	No	Container or flow thru cell for holding sample
Thermometer	No	Container or flow thru cell for holding sample
Flow Rate	No	Calibrated Container

### Notes:

ORP = Oxidation-Reduction Potential  
DO = Dissolved Oxygen

## 5.5 Instrument or Method Calibration

Most monitoring instruments require calibration before use, and this calibration must be conducted in the field under the ambient climatic conditions that will be present during field sampling. Calibration of monitoring instruments shall be performed in accordance with the manufacturer's specifications and recorded in the provided form in Attachment 1. Site-specific instrument calibration requirements should be specified in the SAP. The following minimum calibration requirements apply to the various types of meters used to gather water quality measurements.

**Initial Calibration (IC):** Before use, the instrument or meter electronics are adjusted (manually or automatically) to a theoretical value (e.g., DO saturation) or a known value of a calibration standard. An IC is performed in preparation for the first use of an instrument or if a calibration verification does not meet acceptance criteria.

**Initial Calibration Verification (ICV):** The instrument or meter calibration is checked or verified directly following IC by measuring a calibration standard of known value as if it were a sample and comparing the measured result to the calibration acceptance criteria for the instrument/parameter. If an ICV fails to meet acceptance criteria, immediately recalibrate the instrument using the applicable initial calibration procedure or remove it from service.

**Continuing Calibration Verification (CCV):** After use, the instrument or meter calibration is checked or verified by measuring a calibration standard of known value as if it were a sample and comparing the measured result to the calibration acceptance criteria for the instrument/parameter.

### 5.5.1 Calibration Checks

Calibration checks are conducted by measuring a known standard. They must be completed after calibration and should be performed at least one other time (i.e., after lunch) and anytime suspect measurements are encountered. Table 2 provides general acceptance ranges to be used during calibration checks. If a meter is found to be outside of the acceptance range, the meter **must** be recalibrated. If the meter remains out of range, the project manager and/or the supplier of the meter should be contacted to determine alternative measures.



**Table 2**  
**Calibration Check Acceptance Limits**

<b>Parameter</b>	<b>Acceptance Criteria</b>
Dissolved Oxygen	±0.3 mg/L of the theoretical oxygen solubility
Oxidation-Reduction Potential	±10 mv from the theoretical standard value at that temperature
pH	±0.2 Standard pH Units
Specific Conductance	±5% of the standard
Turbidity	0.1 to 10 NTU: ±10% of the standard
	11 to 40 NTU: ±8% of the standard
	41 to 100 NTU: ±6.5% of the standard

Notes:

mg/L = milligrams per liter  
mv = millivolts  
NTU = nephelometric turbidity units

### 5.5.2 Possible and Suspected Ranges

The concentration for each parameter range should be known so that concentrations outside of the range can be noted. Table 3 presents the maximum range of the parameter in groundwater. The table also presents the suspected range. Measurements outside of the maximum/minimum range should be considered in error and the measurement method should be checked. Concentrations outside the normal range should be treated as suspect but may be the result of contaminant impact. For example, a pH of 2.0 would be out of the normally suspected range for groundwater but not at a site impacted with an acid.

**Table 3**  
**Minimum and Maximum Result Ranges**

Parameter	Units	Possible Min	Possible Max	Normal Min	Normal Max	Notes
						The colder the sample, the higher the DO reading.
Dissolved Oxygen	mg/L	0.0	14.6 (0°C) 10.1 (15°C) 8.3 (2°C)	0.0	5	DO greater than 1 mg/L, ORP positive should not have sulfur odor, sulfide, ferrous iron and/or gray color.  DO less than 1 mg/L, ORP negative, may have <u>sulfur odor, sulfide, ferrous iron and/or gray color.</u>
pH	SU	0	14	5	9	pH values exceeding 10 could indicate grout contamination
ORP	mv					DO greater than 1 mg/L, ORP positive should not have sulfur odor, sulfide, ferrous iron and/or gray color.  DO less than 1 mg/L, ORP negative, may have <u>sulfur odor, sulfide, ferrous iron and/or gray color.</u>
Specific Conductance	µS/cm			varies	varies	
Temperature	°C	0	100	5	30	
Turbidity	NTU	0	Greater than 1,000	0	Greater than 1,000	50 NTU or greater suggests cloudiness.

**Notes:**

mg/L = milligrams per liter  
 °C = degrees Celsius  
 DO = dissolved oxygen  
 SU = standard units  
 ORP = oxidation reduction potential  
 mv = millivolts  
 mS/cm = micro Siemens per cm  
 NTU = nephelometric turbidity units

### 5.5.3 Field Instruments and Calibration Criteria

The calibration acceptance criteria for each instrument are summarized in Table 4 along with special considerations related to each field instrument.

**Table 4**  
**Calibration Check Acceptance Limits**

Parameter	Acceptance Criteria
Dissolved Oxygen	$\pm 0.3$ mg/L of the theoretical oxygen solubility.
Oxidation-Reduction Potential	$\pm 10$ mv from the theoretical standard value at that temperature.
pH	$\pm 0.2$ Standard pH Units
Specific Conductance	$\pm 5\%$ of the standard
Turbidity	0.1 to 10 NTU: $\pm 10\%$ of the standard
	11 to 40 NTU: $\pm 8\%$ of the standard
	41 to 100 NTU: $\pm 6.5\%$ of the standard

Notes:

mg/L = milligrams per liter  
mv = millivolts  
NTU = nephelometric turbidity units

### pH Meters

- For the most accurate of pH measurements, pH meters should receive a three-point calibration. However, if a two-point calibration will bracket the groundwater pH of the site, a two-point calibration is acceptable. Three-point calibrations typically include calibrating to solutions of pH 7.00, 4.00, and 10.00. If groundwater pH is outside the calibration range of the solution standards, special buffers must be ordered to bracket the pH. Some meters will report the slope of the calibration and this may be used in checking the meter calibration (refer to the meter's manual). When performing an ICV, the result must be within  $\pm 0.2$  pH units of the stated buffer value.
- pH meters should be calibrated across the range of values to be measured. The maximum and minimum calibration solutions shall be outside the range of anticipated values. For example, if the expected range is between 7.50 and 9.00, the 7.00 and the 10.00 standard should be used for calibration. Perform the IC using at least two buffers, and always use the pH 7.00 buffer first. A reading that is above the maximum (or below the minimum) calibration standard is an estimate only and is not valid. This condition requires obtaining a new standard that is above (or below) the reported value, depending on the measurement.

- A percent slope of less than 90 percent indicates a bad electrode that must be changed or repaired. If percent slope cannot be determined, or the manufacturer's optimum specifications are different, follow the manufacturer's recommendation for maintaining optimum meter performance.

### **Specific Conductivity Meters**

- For IC, when the sample measurements are expected to be 100 microsiemens per centimeter ( $\mu\text{S}/\text{cm}$ ) or greater, use two standard potassium chloride (KCl) solutions that bracket the range of expected sample conductivities. Calibrate the instrument with the first standard. Verify the calibration of the instrument with the second standard, bracketing the range of expected sample values.
- If the instrument can be calibrated with more than one standard, choose additional calibration standards within the range of expected sample values.
- When the sample measurements are expected to be less than 100  $\mu\text{S}/\text{cm}$ , a lower bracket is not required, but one standard (KCl) solution that is within the range of expected measurements must be used for the IC and the ICV.
- Accept the calibration if the meter reads within  $\pm 5$  percent of the value of any calibration standard used to verify the calibration.
- Most field instruments read conductivity directly. Record all readings and calculations in the calibration records.
- For CCV, check the meter with at least one KCl standard with a specific conductance in the range of conductivity measured in environmental samples. The reading for the calibration verification must also be within  $\pm 5$  percent of the standard value.
- If new environmental samples are encountered outside the range of the IC, verify the instrument calibration with two standards bracketing the range of sample values. If these calibration verifications fail, recalibrate the instrument.



### **Dissolved Oxygen Meters**

- Before calibrating, check the probe membrane for bubbles, tears, or wrinkles. These conditions require replacement of the membrane in accordance with the manufacturer's directions.
- If the meter provides readings that are off-scale, will not calibrate, or drift, check the leads, contacts, etc., for corrosion and/or short circuits. These conditions require replacement maintenance in accordance with the manufacturer's directions.
- Most DO meters must be calibrated based on an environment of 100 percent humidity and a known elevation and barometric pressure (BP).
- For 100 percent humidity, place the probe in the calibration container with a moist towel and allow the probe to remain, undisturbed, for 10 to 20 minutes.
- The IC is an air calibration at 100% saturation. Before use, verify the meter calibration in water-saturated air to make sure it is properly calibrated and operating correctly. Make a similar verification at the end of the day or sampling event. Follow the manufacturer's instructions for your specific instrument. Allow an appropriate warm up period before IC. Wet the inside of the calibration chamber with water, pour out the excess water (leave a few drops), wipe any droplets off the membrane/sensor and insert the sensor into the chamber (this ensures 100 percent humidity). Allow adequate time for the DO sensor and the air inside the calibration chamber to equilibrate. Once the probe/calibration chamber is stable at ambient temperature, check the air temperature and determine, from the DO versus temperature table (see Attachment 2) what DO should measure. The acceptance criterion for DO ICV is +/- 0.3 mg/L.
- Use the same procedure as above for CCV.

### **ORP Meters**

- Verify electrode response before use in the field.
- Equilibrate the standard solution to the temperature of the sample. The standard solution is based on a 25°C temperature; however, the calibration solution standard's value will require adjustment based on the temperature.

- Immerse the electrodes and gently stir the standard solution in a beaker (or flow cell). Turn the meter on, placing the function switch in the millivolt (mv) mode.
- Let the electrode equilibrate and record the reading to the nearest millivolt. The reading must be within  $\pm 10$  mv from the theoretical redox standard value at that temperature. If not, determine the problem and correct it before proceeding. Switch to temperature display and read the value.
- Record the mv reading and temperature in the field notebook or in form. Rinse the electrode with distilled water and proceed with the sample measurement, unless using a flow cell. If a flow cell is used, rinse between sample locations.

### **Turbidity Meters**

- Perform an initial calibration using at least two primary standards.
- If the instrument cannot be calibrated with two standards, calibrate the instrument with one standard and verify with a second standard.
- Perform an ICV by reading at least one primary standard as a sample. The acceptance criterion for the ICV depends on the range of turbidity of the standard value:
  1. Standard Value = 0.1 to 10 NTU: the response must be within 10 percent of the standard;
  2. Standard Value = 11 to 40 NTU: the response must be within 8 percent of the standard;
  3. Standard Value = 41 to 100 NTU: the response must be within 6.5 percent of the standard; and
  4. Standard Value greater than 100 NTU: the response must be within 5 percent of the standard.
- Determining the Values of Secondary Standards: Use only those certified by the manufacturer for a specific instrument. Secondary standards may be used for CCVs.

To initially determine the value of a secondary standard, assign the value that is determined immediately after an ICV or verification with primary standards. This is done by reading the secondary standard as a sample. This result must be within the manufacturer's stated tolerance range and +/- 10 percent of the assigned standard value. If the +/- 10 percent criterion is not met, assign this reading as the value of the standard. If the reading is outside the manufacturer's stated tolerance range, discard the secondary standard.

- CCV: Perform a CCV using at least one primary or secondary standard. The calibration acceptance criteria are the same as those for an ICV.

## **5.6 Direct Measurements**

Direct measurements with meters are the most common methods and can be accomplished by placing a sample in a container with the probe or by allowing the water to flow past the probe in a flow cell. The use of a flow-through cell improves measurement quality by allowing the constant flow of water over the probes and reduces interaction of the sample with the atmosphere. Sample cups should be avoided. The quantity of samples, timing, and methodology should be described in the project SAP.

Following calibration of required probes, connect the bottom flow-cell port to the discharge line of the pump. Connect the top port to a discharge line directed to a bucket to collect the purge water. Allow the flow cell to completely fill. As the water flows over the probe, record the measurements. Continue to record the measurements at regular intervals, as specified in the SAP.

When the ambient air temperatures are much higher or lower than the temperature of the water sample, it is best to keep the length of tubing between the wellhead and the flow cell as short as possible to prevent heating or cooling of the water. Tubing and flow-through cell should not be exposed to direct sunlight, particularly in the summer, if at all possible, to avoid heating of water samples.

## **5.7 Data Acquisitions, Calculations, and Data Reduction**

### **5.7.1 Specific Conductivity Correction Factors**

If the meter does not automatically correct for temperature (i.e., read Specific Conductivity) record Conductivity and adjust for temperature upon returning to the office. The following equation can be used to convert Conductivity to Specific Conductivity.



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Convert inHG to mmHg:

$$\text{mmHg} = 30.49 \text{ inHg} \times 25.4 = 774.4 \text{ mmHg}$$

Calculate True BP:

$$\text{TrueBP} = (774.4 \text{ mmHg}) - [2.5 * (544 / 100)] = 774.4 - 13.6 = 760.8 \text{ mmHg}$$

## **6.0 RECORDS**

Data will be recorded promptly, legibly, and in indelible ink on the appropriate logbooks and forms. At the completion of a field effort, all logbooks, field data forms, and calibration logs shall be scanned and made electronically available to the project team. The original field forms, calibrations logs, and log book will be maintained in the project file.

## **7.0 HEALTH AND SAFETY**

Detailed Health and Safety requirements can be found in the site specific Health and Safety Plan. Ensure that a Safe Work Assessment and Permit form is filled out daily prior to any work in the field and reviewed with all project personnel in a daily safety brief.

Safety glasses with side shields or goggles and disposable gloves shall be worn during calibration activities.

## **8.0 REFERENCES**

None

## **9.0 ATTACHMENTS**

Attachment 1: Example Field Instrument Calibration Form

Attachment 2: Solubility of Oxygen at Given Temperatures

Attachment 3: Example Field Data Form

**Attachment 1**  
**Example Field Instrument Calibration Form**

Field Instrument Calibration Form

calibrated by: \_\_\_\_\_  
Date: \_\_\_\_\_

Equipment (Make/Model/Serial #): \_\_\_\_\_  
— Equipment (Make/Model/Serial #) -

pH (su) standard: $\pm 0.2$ standard units				DO (mg/l) Standard: $\pm 0.3$ mg/ of theoretical*			
Initial calibration		Initial calibration Verification		C (Temp):		rev (Temp):	
pH71	Hach SL	Reading	Pine SL	Reading	Saturation (%)	Reading (%)	Theoretical (mg/L)
pH41					100		
Continuing calibration Verification				CCV (Temp):			
pH71	Hach SL	Reading	Deviation	Variance (Y/N)	Saturation (%)	Reading (%)	Acceptable Variance (Y/N)
pH41					100		
				Theoretical (mg/L)			
				Reading (mg/L)			
				Deviation			
				Variance (Y/N)			
Standard: NA				Standard: $\pm 10\%$ of Standard			
(Zobell SL: )				Initial calibration			
TCS				Standard			
(Std/Temp)				Reading			
Reading							
CCV (Zobell SL: )				Continuing calibration			
Verification							
TCS				Standard			
(Std/Temp)				Reading			
Reading				Deviation			
				Acceptable Variance (Y/N)			
Conductivity (ms"/cm) standard: $\pm 5\%$ of standard value				Comments:			
IC (YS SL: )							
Standard							
Reading							
standard							
Reading							
CCV (YSISL: )							
Acceptable							
Standard							
Reading							
Deviation							
Variance (Y/N)							

riOmS: TCS Std Temp  
temperature corrected standard temperature  
su mV Te mo/l.  
S :noMo UNIS milvolts  
miligrams per liter  
nw °C m:??cm  
degrees Celsius  
millisaemens per centimeter (temperature corrected)  
Theoretical value



**Attachment 2**  
**Solubility of Oxygen at Given Temperatures**

## Field Measurement of Dissolved Oxygen

Solubility of Oxygen in Water at Atmospheric Pressure			
Temperature	Oxygen Solubility	Temperature	Oxygen Solubility
°C	mg/L	°C	mg/L
0.0	14.621	26.0	8.113
1.0	14.216	27.0	7.968
2.0	13.829	28.0	7.827
3.0	13.460	29.0	7.691
4.0	13.107	30.0	7.559
5.0	12.770	31.0	7.430
6.0	12.447	32.0	7.305
7.0	12.139	33.0	7.183
8.0	11.843	34.0	7.065
9.0	11.559	35.0	6.950
10.0	11.288	36.0	6.837
11.0	11.027	37.0	6.727
12.0	10.777	38.0	6.620
13.0	10.537	39.0	6.515
14.0	10.306	40.0	6.412
15.0	10.084	41.0	6.312
16.0	9.870	42.0	6.213
17.0	9.665	43.0	6.116
18.0	9.467	44.0	6.021
19.0	9.276	45.0	5.927
20.0	9.092	46.0	5.835
21.0	8.915	47.0	5.744
22.0	8.743	48.0	5.654
23.0	8.578	49.0	5.565
24.0	8.418	50.0	5.477
25.0	8.263		

**Notes:**

The table provides three decimals to aid interpolation

Under equilibrium conditions, the partial pressure of oxygen in air-saturated water is equal to that of the oxygen in water saturated

°C = degrees Celsius

mg/L = milligrams per liter

**Attachment 3**  
**Example Field Data Form**

WELL DEVELOPMENT & GROUNDWATER SAMPLING FORM											
DATE:			JOB NUMBER:			EQUIPMENT (Make/Model#/Serial#):					
PROJECT:			EVENT:			/ /					
WELL ID:			LOCATION:			/ /					
WEATHER CONDITIONS:			AMBIENT TEMP:			/ /					
REVIEWED BY:			PERSONNEL:			/ /					
WELL DIA:					WELL DEVELOPMENT						
TOTAL DEPTH from TOC (ft.):					START:		FINISH:				
DEPTH TO WATER from TOC (ft.):					VOLUME PURGED (gal):						
LENGTH OF WATER COL. (ft.):					GROUNDWATER SAMPLING						
1 VOLUME OF WATER (gal):					START:		FINISH:				
3 VOLUMES OF WATER (gal):					VOLUME PURGED (gal):						
					ANALYSIS:						
WELL DEVELOPMENT PARAMETERS					GW SAMPLING PARAMETERS						
Temperature: ±1.0°C					Temperature: ±0.2°C						
pH: ±0.5 standard units					pH: ±0.2 standard units						
Specific Conductance: ±10% of the past measurement					Specific Conductance: ±5% of the past measurement						
Turbidity: relatively stable					DO: ±20% saturation						
					ORP: ±10 millivolts						
					Turbidity: ≤10 NTU						
IN-SITU TESTING											
Circle one: <input type="checkbox"/> DEVELOPMENT <input type="checkbox"/> SAMPLING <input type="checkbox"/> Bailer <input type="checkbox"/> Pump       Description:											
Time (hh:mm):											
pH (units):											
Conductivity (mS/cm):											
Turbidity (NTU):											
DO (mg/L): YSI556											
DO (mg/L): YSI550											
Temperature (C°):											
ORP(mV):											
Volume Purged (gal):											
Depth to Water (ft):											
Well Goes Dry While Purging <input type="checkbox"/>											
SAMPLE DATA											
Sample ID	Date (m/d/y)	Time (hh:mm)	<input type="checkbox"/> Bailer <input type="checkbox"/> Pump	Bottles (total to lab)	Filtered	Remarks					
					10.45nmL						
Purging/Sampling Device Decon Process:											

COMMENTS:

Purge water placed in drum#. \_\_\_\_\_

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